

PROJECT MANUAL



DENVER
INTERNATIONAL
AIRPORT

**Sturgeon
Electric
Company, Inc.**

**Runway 8-26 Complex Lighting
Rehabilitation**

CONTRACT NO. 201313528

PART I

PROJECT REQUIREMENTS

Issued for Bid November 8, 2013

**CITY & COUNTY OF DENVER
DEPARTMENT OF AVIATION**



DENVER
INTERNATIONAL
AIRPORT
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Department of Aviation
Airport Office Building
8500 Peña Boulevard
Denver, Colorado
(303) 342-2200
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December 5, 2013

Runway 8-26 Complex Lighting Rehabilitation

CONTRACT NO. 201313528

ADDENDUM NUMBER ONE

This Addendum Number One supersedes and/or supplements all portions of the Contract Documents with which it conflicts. Bidders must acknowledge receipt of this addendum on page B-1 of the Bid Forms.

Dave Laporte *on Behalf of*
Deputy Manager of AIM

J. SOMER STINDLER
SR DIRECTOR OF AIM

**CITY AND COUNTY OF DENVER
CONTRACT NO. CE201313528**

**RUNWAY 8-26 COMPLEX LIGHTING REHABILITATION
DENVER INTERNATIONAL AIRPORT**

ADDENDUM NUMBER ONE

December 4, 2013

Scope of this Addendum

Addendum Number One includes modifications to the following Contract Documents issued November 6, 2013. These modifications are deemed necessary by the City and County of Denver.

PART I – PROJECT REQUIREMENTS

1. SCHEDULE OF PRICES AND QUANTITIES

Replace the schedule of prices and quantities dated November 1, 2013 with the revised attached schedule of prices and quantities dated December 4, 2013 incorporating the following changes:

- a. Schedule A, Item 01575d: Quantity changed from 2 EA to 3 EA.
- b. Schedule A, Item L-125c: Quantity changed from 6 EA to 19 EA.
- c. Schedule A, Item L-125i: Quantity changed from 55 EA to 54 EA.
- d. Schedule A, Item L-125cc: Quantity changed from 41 EA to 40 EA.
- e. Schedule A, Item L-125gg: Quantity changed from 27 EA to 28 EA.
- f. Schedule A, Item L-125ss: Quantity changed from 28 EA to 26 EA.
- g. Schedule A, Item L-125mmm: Quantity changed from 130 EA to 132 EA.
- h. Schedule A, Item L-125nnn: Quantity changed from 90 EA to 89 EA.
- i. Schedule A, Item L-125sss: Quantity changed from 1857 EA to 260.
- j. Schedule A, Item 13410Aa: Pricing information added.
- k. Schedule A, Item 13410Ad: Pricing information added.
- l. Schedule A, Item 13410Ae: Pricing information added.
- m. Schedule A, Item 13410Af: New line item added. Pricing information added
- n. Schedule B, Item L-125sss: Item removed.
- o. Schedule C, Item L-125nn: Line item description updated.
- p. Schedule C, Item 13410Ab: Pricing information added.
- q. Schedule D, Item L-125e: Quantity changed from 265 EA to 138 EA.
- r. Schedule D, Item L-125n: Quantity changed from 314 EA to 155 EA.
- s. Schedule D, Item L-125oo: Line item description updated and quantity changed from 265 EA to 138 EA.
- t. Schedule D, Item L-125tt: Line item description updated.
- u. Schedule D, Item L-125aaa: Quantity changed from 314 EA to 155 EA.
- v. Schedule D, Item L-125sss: Quantity changed from 890 EA to 75 EA.
- w. Schedule F, Item 13410Ac: Pricing information added.
- x. Schedule G, Item 13410Aa: Pricing information added.
- y. Schedule G, Item 13410Ab: Pricing information added.
- z. Schedule G, Item 13410Ac: Pricing information added.
- aa. Schedule G, Item 13410Ad: Pricing information added.
- bb. Schedule G, Item 13410Ae: Pricing information added.
- cc. Schedule H, Item L-125www: New line item added.
- dd. Schedule I, Item L-125vvv: New line item added.

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PART II – DIVISION II – TECHNICAL SPECIFICATIONS

1. L-108 – AIRPORT UNDERGROUND CABLE

Section 3.02 – INSTALLATION IN DUCT OR CONDUIT. Third paragraph, eighth sentence. Change the sentence to read: "Provide mechanical equipment or adequate personnel to feed cables into the conduits or ducts to minimize tension at the point of feed."

2. L-122C – CONSTANT CURRENT REGULATOR CONSTRUCTION

Section 3.04 – POWER SUPPLY EQUIPMENT. Change the last sentence to read: "Power supply equipment noted to be removed shall be transported to a location on Airport property as directed by the DIA Project Manager."

3. L-125 – AIRPORT LIGHTING SYSTEMS

- a. Section 2.02, C – Add the following sentence: "Any defective LED fixture shall be returned by the Contractor for repair or complete replacement for the first two years of the warranty period. Beyond two years into the warranty period, DIA will coordinate directly with the manufacturer for fixture replacement or repair."
- b. Section 2.10 – Change third sentence to read "The frangible coupling shall be a 2" – NPT."
- c. Section 2.11 – Change paragraph to read "ELEVATED STOP BAR LIGHT. The runway stop bar lights shall be L-862S type with 150W quartz lamps. Fixtures shall be Class 2, Mode 1 (6.6A), have an overall mounting height of 24". The frangible coupling shall be a 2" – NPT. Mount fixture on a heavy ($\geq 3/8$ " thick) base plate with a neoprene gasket."
- d. Section 3.01, O – Change the first sentence to read "Existing airfield lighting bolting hardware consists of either ceramic-metallic/flouropolymer coated bolts, stainless steel bolts, or carbon steel bolts."

4. L-140 – FIELD PHOTOMETRIC TESTING

Section 1.03C – Spares. Delete the section and replace with the following: "Spare lights provided as part of Item L-125, Appendix A, shall be on-site and available for use by the Contractor prior to the scheduled photometric testing. Any fixtures replaced as part of the photometric testing shall be shipped back to the manufacturer for repair or replacement and delivered back to DIA."

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5. 13410A – AIRFIELD LIGHTING CONTROL AND MONITORING SYSTEM MODIFICATIONS

Section 1.01 – Include the following paragraph: ” F. Provide sensors to monitor the remote/off/local switches in the three remote input/output Circuit Selector Switch racks associated with the Runway 8-26 Complex. The first rack includes two ADB CSSs with four-series circuit relays each. The remaining two racks each consist of one Crouse-Hinds CSS with four-series circuit relays. Any one switch at a CSS rack left in either the off or local position shall provide an alarm back to all monitors.”

6. 13410C – AIRFIELD LIGHTING CONTROL AND MONITORING SYSTEM CONSTRUCTION MODIFICATIONS

Section 1.01, A – Change the section to read: “ The Contractor shall remove the existing Brite III remote units in the airfield associated with the Runway 8-26 complex and deliver them to a site on Airport property as directed by the DIA Project Manager. Install new Brite III remote units for the inset runway guard/stop bar lights and elevated stop bar lights.”

7. Appendix A – MEASUREMENT AND PAYMENT

a. Section L-108 – UNDERGROUND POWER CABLE FOR AIRPORTS

Item L-108a, first paragraph, change “. . . rubber electrical tape, and . . .” to read “. . . rubber electrical tape, Amerace T connectors, and . . .”

b. Section L-122A – PROCURE CONSTANT CURRENT REGULATORS

Items L-122Aa through L-122Ae,
Change the second paragraph to read “Payment will be made at the contract unit price for each item procured in accordance with the plans and specifications. Procurement line item unit costs includes shipping costs to DIA and 3.62% city tax. State and RTD taxes are exempted based on the Contractor obtaining tax exempt status for this contract by filing State Form DR-0172. Questions regarding this form can be directed to (303)238-7378. This price shall be full compensation for furnishing each constant current regulator.”

c. Section L-125 – AIRPORT LIGHTING SYSTEMS

i. Items L-125a through L-125w,

Add the following paragraph to the Method of Measurement and Payment “Elevated and inset light fixture procurement shall include the fixture only. Frangible couplings, cover plates, and isolation transformers sized as recommended by the manufacturer will be included as part of the various installation bid items.”

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- ii. Items L-125y through L-125ii,
Change the second paragraph to read "Incidental to Install Semi-Flush Light shall include properly sized isolation transformer(s), vinyl and rubber tape, fixture ground conductor, and retrofit ground lug. Each fixture includes the installation of SAE grade 2 bolts with ceramic-metallic/ fluorocarbon polymer coating, and two piece lock washers. Fixtures supplied for these items will be paid for under the various associated procurement bid items."
- iii. Item L-125jj,
Change the third paragraph to read "Incidental to Install L-852GS(L) 2-Circuit, Runway Stop Bar/Guard Light shall include properly sized isolation transformer(s), installation of ADB Brite Remote, vinyl and rubber tape, fixture ground conductor, and retrofit ground lug. Each fixture includes the installation of SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating, and two piece lock washers. Fixtures and Brite remotes supplied for this item will be paid for under the procurement bid items L-125l and 13410Ae respectively."
- iv. Items L-125kk through L-125uu,
Change the second paragraph to read "Incidental to Install Semi-Flush Light shall include new galvanized steel spacer ring(s), new galvanized steel spacer ring with concrete dam, o-ring, adhesive, sealant, epoxy, properly sized isolation transformer(s), vinyl and rubber tape, fixture ground conductor, and retrofit ground lug. Each fixture includes the installation of SAE grade 2 bolts with ceramic-metallic/ fluorocarbon polymer coating, and two piece lock washers. Fixtures supplied for these items will be paid for under the various associated procurement bid items."
- v. Item L-125vv,
Change the third paragraph to read "Incidental to Install L-852GS(L) 2-Circuit, Runway Stop Bar/Guard Light shall include new galvanized steel spacer ring(s), new galvanized steel spacer ring with concrete dam, o-ring, adhesive, sealant, epoxy, properly sized isolation transformer(s), installation of ADB Brite Remote, vinyl and rubber tape, fixture ground conductor, and retrofit ground lug. Each fixture includes the installation of SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating, and two piece lock washers. Fixtures and Brite remotes supplied for this item will be paid for under the procurement bid items L-125l and 13410Ae respectively."

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- vi. Item L-125ww,
Change the second paragraph to read “Incidental to Install L-850C Runway Edge Light and Adapter Ring shall include, new galvanized steel spacer ring(s), new galvanized adapter plate with o-ring, adhesive, sealant, epoxy, properly sized isolation transformer, vinyl and rubber tape, fixture ground conductor, and retrofit ground lug. Each fixture includes the installation of SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating, and two piece lock washers. Fixtures supplied for this item will be paid for under the procurement bid item L-125c.”
- vii. Items L-125xx and L-125yy,
Change the second paragraph to read “Incidental to Install Semi-Flush Light on a New Foundation shall include a, new Size B 24” deep L-868 galvanized steel base can, internal and external ground lug, new galvanized steel spacer ring(s), new galvanized steel spacer ring with concrete dam, rubber grommets, end bells, rebar, concrete, o-ring, adhesive, sealant, epoxy, properly sized isolation transformer, vinyl and rubber tape, ground rod, and fixture ground conductor. Each fixture includes the installation of SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating, two piece lock washers, and fixture ID marker. Fixtures supplied for these items will be paid for under the various associated procurement bid items. Installation of conduit and counterpoise to reconnect to existing shall be incidental to this line item and shall not be measured or paid for separately.”
- viii. Item L-125zz,
Change the second paragraph to read “Incidental to Install L-804(L) Elevated Runway Guard Light shall include properly sized isolation transformer, tether, heavy duty baseplate, rubber gasket, vinyl and rubber tape, fixture ground conductor, and retrofit ground lug. Each fixture includes the installation of SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating. Aim per the drawings. Fixtures supplied for this item will be paid for under the procurement bid item L-125m.”
- ix. Items L-125aaa through L-125ccc,
Change the second paragraph to read “Incidental to Install Elevated Edge Light shall include properly sized isolation transformer, corten baseplate, rubber gasket, vinyl and rubber tape, fixture ground conductor, and retrofit ground lug. Each fixture includes the installation of SAE grade 2 bolts with ceramic-metallic/fluorocarbon

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polymer coating. Fixtures supplied for these items will be paid for under the various associated procurement bid items.”

- x. Item L-125ddd,
Change the second paragraph to read “Incidental to Install L-862 Runway Stop Light shall include properly sized isolation transformer, installation of ADB Brite Remote, corten baseplate, rubber gasket, vinyl and rubber tape, fixture ground conductor, and retrofit ground lug. Each fixture includes the installation of SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating. Aim per the drawings. Fixtures and Brite remotes supplied for this item will be paid for under the procurement bid items L-125q and 13410Ad respectively.”
- xi. Items L-125eee through L-125ggg,
Add to the end of the second paragraph “Isolation transformers supplied for these items will be paid for under the various associated procurement bid items.”
- xii. Item L-125hhh,
Add to the end of the second paragraph “Stanchions supplied for this item will be paid for under the procurement bid item L-125u.
- xiii. Items L-125iii and L-125jjj,
Add to the end of the second paragraph “Cable rack arms supplied for these items will be paid for under the procurement bid items L-125v and L-125w.”
- xiv. Item L-125kkk,
Add to the end of the second paragraph “Base can extensions supplied for this item will be paid for under the procurement bid item L-125x.
- xv. Item L-125qqq,
Add to the end of the third paragraph “Brite remotes supplied for this item will be paid for under the procurement bid item 13410Ae.”
- xvi. Item L-125rrr,
Add to the end of the third paragraph “Brite remotes supplied for this item will be paid for under the procurement bid item 13410Ae.”
- xvii. Add the following items
“L-125vvv Install L-858(L) Guidance Sign, Size 3, 2 Module, 1 Face, Style 5”

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The quantity of airfield guidance signs to be paid for under this item shall be the number of each type installed, complete and in place, ready for operation, and accepted by the DIA Project Manager.

Incidental to Install L-858(L) Guidance Sign, Size 3, 2 Module, 1 Face, Style 5 shall include procurement and installation of a new sign as noted, properly sized isolation transformer, vinyl and rubber tape, L-867 Size B base can, galvanized steel cover plate, SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating, two piece lock washers, concrete, wire mesh, ground rod with inspection pit, secondary cable extension, and sign ID marker,

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

L-125www Procure L-868 Base Cans, Size B, 24" Deep

The quantity of light base cans to be paid for under this item shall be the number of each type supplied and shipped to the project site.

Incidental to the base cans are four-2" grommet openings at 90⁰ increments, load ring, 3 anti-rotation fins, internal and external ground lugs, and Class 1A.

Payment will be made at the contract unit price for each item procured and shipped to the Airport and accepted by the DIA Project Manager."

d. Section 13410A – AIRFIELD LIGHTING CONTROL AND MONITORING SYSTEM MODIFICATIONS, add the following item:

- i. "Item 13410Af Procure Sensors and ALCMS Modifications for Monitoring the Remote/Off/Local Switches for Three Remote I/O Racks Along Runway 8-26

The quantity of remote/off/local position sensors shall be measured per lump sum for ALCMS modifications, complete and in place, ready for operation, and accepted by the DIA Project Manager.

Payment will be made at the contract unit price per lump sum for the total number of items procured. This price shall be full compensation

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for furnishing all materials and for all preparation, assembly, and installation instructions of these materials, and for all incidentals necessary to complete this item. Payment for software modifications associated with the installation of the Circuit Selector Switch local/off/remote switches will be paid for as part of Item 13410Aa”

- ii. Items 13410Ad and 13410Ae
Change the second paragraph to read “Payment will be made at the contract unit price for each item procured in accordance with the plans and specifications. Procurement line item unit costs includes shipping costs to DIA and 3.62% city tax. State and RTD taxes are exempted based on the Contractor obtaining tax exempt status for this contract by filing State Form DR-0172. Questions regarding this form can be directed to (303)238-7378. This price shall be full compensation for furnishing each Brite remote equipment.”

- e. SECTION 13410C – CONSTRUCTION FOR RUNWAY 8-26 ALCMS MODIFICATIONS
 - i. Item 13410Ca, change the first paragraph from “The construction quantity for the Brite remote re-installation, . . .” to read “The construction quantity for the Brite remote installation, . . .”

 - ii. Change the second paragraph from “Runway 8-26 ALCMS modification shall include re-installation and addressing of Brite units to communicate . . .” to read “Runway 8-26 ALCMS modification shall include installation of new Brite units to communicate . . .”

PART III – CONTRACT DRAWINGS

1. **Sheet GI002 – INDEX TO DRAWINGS AND ABBREVIATIONS**
Index to Drawings, Sheet No.3, delete “(Not Included)” from description.

2. **Sheet GI003 – SUMMARY OF APPROXIMATE QUANTITIES**
Replace Sheet GI003 dated November 1, 2013 with revised attached Sheet GC003 dated December 2, 2013.

3. **Sheet GI104 – GENERAL AND SAFETY NOTES**
Note 18, change the first sentence to read “The DIA north recycle yard on Queensburg Street may be utilized under this contract, at the contractor’s discretion, for only concrete and asphalt spoils generated from this project.”

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- 4. Sheet GC101 – OVERALL PHASING PLAN**
Replace Sheet GC101 dated November 1, 2013 with revised attached Sheet GC101 dated December 2, 2013.
- 5. Sheet GC103 – CONSTRUCTION PHASING PLAN – PHASE 2**
Replace Sheet GC103 dated November 1, 2013 with revised attached Sheet GC103 dated December 2, 2013.
- 6. Sheet GC201 – ELECTRICAL PHASING PLAN-PHASE 1**
Guidance sign east of Taxiway M and north of extended Taxiway Z (sign #TMS3-19503), add the note: "Install tie-back at sign TMS3-19503 to de-energize Taxiway "M" guidance signs north of Taxiway "Z". For reference to location, see Sheet EL141.
- 7. Sheet EL001 – ELECTRICAL NOTES**
Note 30, change the portion of the first sentence ". . . I/O racks near Taxiways "R3" and "R8" . . ." to read ". . . I/O racks near Taxiways , "M", "R3" and "R8" . . .".
- 8. Sheet EL002 – ELECTRICAL LEGEND**
Left column, third symbol from the bottom, change description from "New L-852C(L), bi-directional, 180° yellow, 180° red, LED . . ." to read "New L-852C(L), bi-directional, 180° yellow, 180° green, LED . . ."

Right column, second symbol from top, change description second sentence to add the following text to the end of the sentence ", 3/4" thick, galvanized steel, Size B, with recessed bolt holes".
- 9. Sheet EL501 – ELECTRICAL DETAILS**
Detail 9, include the following notes:

 - "1. Length of #6 insulated ground conductor shall be of sufficient length to allow the inset light fixture or base plate to be easily set aside without removal.
 2. After tapping of the base can rim is completed, vacuum out any debris and metal shavings from the bottom of the can.
 3. Existing L-868 base cans include 12 threaded bolt holes, of which only six are required for the mounting of a light fixture. The contractor may attach the ground lug using one of the unused threaded bolt holes. There may some excess silicone in the bolt holes that will require removal."

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10. Sheet EL504 – ELECTRICAL DETAILS

Detail 2, callout for bonding counterpoise to rebar cage, change to show bonding is only required at one location. Include to the callout: "Use split bolt, Burndy Type KSU or approved equal."

Note 13, change note to read: "Brite remotes shall be salvaged and delivered to a site on airport property as directed by the DIA Project Manager. New Brite remotes will be installed with the L-852GS and L-862S fixtures."

11. Sheet EL505 – ELECTRICAL DETAILS

Detail 1, callout to ADB Brite unit, change "Reinstall . . ." to read "Install new . . ."

Detail 2, light fixture callouts, change "LED elevated L-861T fixture" to read "45W quartz elevated L-861 fixture". L-823 connector callout, change to read "L-823 primary connector kit, see Detail 5, Sheet EL501"

12. Sheet EL506 – ELECTRICAL DETAILS

Details 1 and 2, delete callouts referring to corten base plates.

Detail 2, callout to Brite remote, change "Reinstall new . . ." to read "Install new . . .".

13. Sheet EL510 – ELECTRICAL DETAILS

GENERAL NOTE, include: Note 2, See Note 30, Sheet EL001 for additional work required in the three RI/O racks."

14. Sheet EL511 – ELECTRICAL DETAILS

Detail 3, change circuit callouts to CKT M from "TR1SB3, TR2SB3, and TR3SB3" to read "TR123SB3".

15. Sheet EL513 – ELECTRICAL DETAILS

Detail 2, change description to "Installation of Sign Size 3 Detail".

16. Sheet EL804– EAST VAULT SECTIONS AND DETAILS

Detail 1, horizontal conduit for control wiring, change "1" RGS" to read "1 ¼" RGS".

Include the following note "Note: The mounting pedestal to be supplied shall be made of A-36 steel, 1/8" thick. The pedestal shall form a "C", 5.25" wide x 2.5" deep top and bottom. The bracket shall be continuously welded to a 1/8" thick, 8"x8" steel plate. Hot dip galvanize after fabrication."

END OF ADDENDUM ONE

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PART II TECHNICAL PROVISIONS

(The following documents are published separately; they ARE NOT included in this document)

VOLUME 2:

DIVISION 1: GENERAL REQUIREMENTS

DIVISION 2: Technical Specifications (See Index in Technical Specifications)

VOLUME 3:

CONTRACT DRAWINGS

**CITY AND COUNTY OF DENVER
NOTICE OF INVITATION FOR BIDS
CONTRACT NO. 201313528
Runway 8-26 Complex Lighting Rehabilitation**

The Department of Aviation, City and County of Denver, has issued an Invitation for Bids for the construction project named above. Complete contract documents, including specifications, are available on the DIA Contract Procurement website at <http://business.flydenver.com/bizops/bids.asp>.

SEALED BIDS will be due no later than **2:00 PM, Tuesday, December 10, 2013** Local Time, delivered in the triple wide trailer, located within the DIA South Campus at 7128 North Trussville Street, Unit A, Denver, CO 80249 (F.K.A. 27301 E. 71st Ave, Unit #2). Bids must be time stamped no later than 2:00 PM, Tuesday, December 10, 2013, immediately after which a public bid opening will commence. Any bids to be submitted more than one hour prior to Bid Opening must be submitted at the office of Business Management Services, attention Nathan Jones, Room 8810, Airport Office Building (AOB), Denver International Airport, 8500 Peña Blvd., Denver, CO 80249-6340.

GENERAL STATEMENT OF WORK

Remove and replace runway centerline lights, touchdown zone lights, stop bar lights, edge lights, transformers, and cabling on RW 8-26. Remove and replace taxiway edge lights, transformers, and cabling on TW R and its connectors. Remove and replace taxiway centerline and edge lights, transformers, and cabling on TWs EE, Z, and L&M south to and including the intersection with Z. Perform photometric testing on the new lights. Replace the home-run cables between the East Vault and EMH-03010. Remove and replace electrical regulators. Remove and replace a few, selected concrete slabs. Construct two, short access roads. Install several electrical manhole drains that will consist of installing underdrain pipe. Improve drainage around an EMH.

PREQUALIFICATION

Each bidder must be pre-qualified in the category of 2(d) Buildings: Electrical, at the \$12,000,000.00 level, in accordance with the City's Rules and Regulations Governing Prequalification of Contractors. Each bidder must have submitted a prequalification application a minimum of ten (10) calendar days prior to the bid opening date. Prequalification applications must be submitted to the Department of Public Works, Prequalification Section, Dept. 614, 201 West Colfax Avenue, Denver, CO 80202. To view the Rules and Regulations and to obtain a prequalification application, please visit our website at www.denvergov.org/prequalification, or call (720) 865-2539 for prequalification information ONLY.

PRE-BID CONFERENCE AND INSPECTION

All bidders are invited to a pre-bid conference at 10:00 AM, Tuesday, November 19, 2013, in the triple wide trailer, located within the DIA South Campus at 7128 North Trussville Street, Unit A, Denver, CO 80249 (F.K.A. 27301 E. 71st Ave, Unit #2). A site visit will be conducted

immediately following the Pre-Bid Conference.

DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION

Federally-funded construction, reconstruction, remodeling, and professional design services contracts made and entered into by the City and County of Denver are subject to Federal statutes and regulations regarding Disadvantaged Business Enterprise participation.

The Director of the Division of Small Business Opportunity (DSBO) is authorized to establish project goals for expenditures on construction, reconstruction and remodeling and professional design services work let by the City and County of Denver. The specific goal for this project is **20% Disadvantaged Business Enterprise (DBE)**.

The project goal must be met with certified participants as set forth in 49 CFR Part 26 or through the demonstration of a sufficient good faith effort under 49 CFR Part 26.

The Director of the Division of Small Business Opportunity urges all participants in the construction, reconstruction, remodeling, and professional design services projects not to discriminate against women and minorities or any other persons and to assist in achieving these goals.

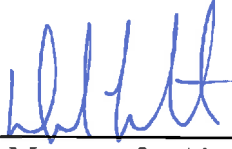
MISCELLANEOUS

As its best interests may appear, the City and County of Denver reserves the right to reject any or all bids and to waive informalities in bids.

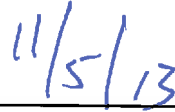
The work under the Contract is subject to minimum wage rates established by the City and County of Denver Career Service Board.

Publication Dates: November 8, 2013, November 11, 2013, November 12, 2013
Published in The Daily Journal

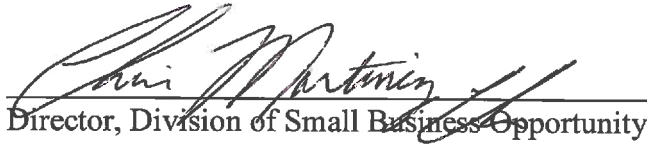
DO NOT PUBLISH ANYTHING BELOW THIS LINE



Deputy Manager for Airport Infrastructure Management



Date



Director, Division of Small Business Opportunity



Date

**INSTRUCTIONS TO BIDDERS
CITY AND COUNTY OF DENVER
DEPARTMENT OF AVIATION**

IB-1 INSTRUCTIONS TO BIDDERS

These Instructions to Bidders are a part of the Contract Documents and are intended to serve as a guide to bidders. They are general in nature and may be amended or supplemented as needed to support any one specific invitation to bid. Each bidder shall prepare its bid in strict compliance with all requirements of the Contract Documents and by careful application of these instructions.

IB-2 BIDDING

The bound copy of these Contract Documents contains Bid Forms and Bid Data Forms. The bidder must complete these Bid Forms and submit them as its bid.

Each bid must be enclosed in a sealed envelope, addressed to the Manager of Aviation, showing on the face of the envelope the name of the bidder, the project number, and descriptive title of the work for which the offer is made. The Notice of Invitation for Bids identifies where and when the bid must be delivered.

Addenda to the contract documents will be issued by publication in their entirety on the DIA Contract Procurement Website, <http://business.flydenver.com/bizops.asp>, from which each addendum document may be downloaded by planholders. Such addenda may include replacements for or additions to some or all of the pages of the Bid Forms, and all Bid Form pages added by addendum shall be submitted with the Bid Forms. Either a complete addendum or a notice of its issuance will be posted on the Contractor's Bulletin Board. Prior to submitting bids, Bidders shall read the Contractor's Bulletin Board and/or DIA Contract Procurement website to confirm that they have received all addenda.

If Sensitive Security Information ("SSI") will be provided to potential bidders prior to award of the Contract, each potential bidder shall be required to comply with Department of Aviation, Standard Policies and Procedures No. 6003, "Contractor Protection of Sensitive Security Information," or its successor. A copy of this Policies and Procedures document will be provided with the Bid Documents, or upon request by the Department of Aviation, Business Management Services Office.

Each bidder shall submit the following, completed and executed in accordance with the Contract Documents:

- (1) the separately bound Bid Forms booklet;
- (2) all Bid Form pages not bound in such booklet which are included in any addendum to the Contract Documents;
- (3) the Bidder's Bid Bond or Bid Guarantee in conformance with IB-13; and

- (4) the Bidder/Contractor Disclosure Form described in IB-29 and included with the Bid Forms, unless the Bidder has a current disclosure form on file with the City Clerk.

IB-3 COMPLETING AND SIGNING BID FORMS

The bidder must complete the Bid Forms by legibly writing or printing in ink, words or figures, or both if required, all the bidder's offered prices for performing the work. All blank spaces which require a response of the bidder must be properly filled in. In filling out the Bid Forms, the bidder should avoid making changes to the extent possible, but, if changes are necessary, any interlineation, white outs, or erasures should be initialed.

For any contracts containing unit prices, the bidder shall specify in the Bid Forms a unit price for each item for which a quantity is given and shall write in figures the products of the respective unit prices and quantities in the "Amount" column provided for that purpose.

Each bidder must sign the Bid Forms and give the bidder's current business address. If an individual, the signature must be of the individual offering the bid; if a partnership, the signature must be that of a general partner; and if a joint venture, by each joint venture participant in their individual capacity as a corporation, partnership, or individual; if a corporation, both the president or a vice president and the secretary must sign and the seal of the corporation must be affixed. Signatures of other persons may be acceptable if the Bid contains evidence satisfactory to the Manager to prove that the other persons are authorized to bind the bidder.

IB-4 UNACCEPTABLE BIDS

The City will not accept Bids from bidders in arrears to the City upon debt or contract, or which are defaulters (as surety or otherwise) upon any obligation to the City, or that are deemed irresponsible or unreliable by the Manager of Aviation. A history or pattern of litigation against the City and County of Denver by any bidder, proposed subcontractor, interested party, or any person, firm, or corporation affiliated with any bidder, among other items, will be considered by the Manager in determining the responsibility and reliability of bidders. Bidders may be required to submit satisfactory evidence that they have a practical knowledge of the particular work bid upon and that they have the necessary financial resources to complete the proposed work.

IB-5 ONLY ONE BID ACCEPTED

The City will accept only one Bid for the same work from any one bidder. This includes Bids that may be submitted under different names by one firm or corporation. Evidence of collusion among bidders shall be grounds for exclusion of any bidder who is a participant in any such collusion.

IB-6 OPENING OF BIDS

Bidders are invited to be present at the bid opening which shall occur in the triple wide trailer, located within the delivered in the triple wide trailer, located within the DIA South Campus at 7128 North Trussville Street, Unit A, Denver, CO 80249 (F.K.A. 27301 E. 71st Ave, Unit #2) on the date set forth in the Notice of Invitation for Bids.

IB-7 CONSIDERATION OF BIDS

After the Bids are opened and read and any discrepancies have been reviewed, bids will be compared based on the Total Contract Bid Amount written on page B-1 of the Bid Letter.

If a discrepancy exists between a price or amount written in words and the price or amount written in figures, the price or amount written in words shall govern, except that in the case where a price or amount shown in figures has been crossed out and replaced with a new, legible, initialed figure, the initialed figure shall govern.

Any bid discrepancies which the City corrects in accordance with the general rules described above shall be corrected with the understanding that the Apparent Low Bidder waives any claims against the City because of the bidder's mistakes in its bid.

The City reserves the right to waive informalities, to reject any and all bids, and to advertise for new bids where it is in the best interest of the City.

IB-8 INFORMAL AND UNBALANCED BIDS

Bids shall be considered informal and may be rejected for the following reasons:

- (a) If the bid is on a form other than the Bid Forms furnished by the City, or if the form is altered or any part thereof is detached.
- (b) If there are unauthorized additions, conditional or alternate bids, or irregularities of any kind which may tend to make the bid incomplete, indefinite, or ambiguous.
- (c) If the bidder fails to acknowledge in the bid receipt of any or all addenda current on the date of opening of bids.
- (d) If the bid does not contain a unit price or lump sum amount for each item listed except in the case of authorized alternative items.
- (e) If there is an interlineation, white out, or erasure in the Bid Forms.
- (f) If the bid is unbalanced so that (1) each pay item does not reasonably carry its own proportion of cost, or (2) any pay item contains an inadequate or

unreasonable price.

IB-9 BASIS FOR SELECTING THE APPARENT LOW BIDDER

The selection of the Apparent Low Bidder will be made on the basis of the lowest responsive bid by a qualified bidder whose bid complies with all of the requirements prescribed herein. The lowest bidder shall be determined by the Total Contract Bid Amount. This selection shall be subject to the approval of such resulting contract in accordance with the Charter and ordinances of the City and County of Denver.

IB-10 NOTICE TO APPARENT LOW BIDDER - EXECUTION OF CONTRACT

The Apparent Low Bidder will be given written notice of such status on the form included in the Bid Documents within sixty (60) days from the date of opening of bids.

The Apparent Low Bidder shall execute the contract and return it to the City along with the required bonds and insurance forms within five (5) consecutive working days from and including the date of the Notice to Apparent Low Bidder. When the executed contract and the required bonds and insurance certificates are received, approval for the City to contract with the Apparent Low Bidder shall be sought in accordance with the Charter of the City and County of Denver. Such notice shall not create any rights in the Apparent Low Bidder to any contract with the City.

IB-11 CONFORMED TECHNICAL SPECIFICATIONS AND CONTRACT DOCUMENTS

The bidder understands that the City may elect, in its sole discretion, to deliver either one of the contract documents described below for execution.

- (a) A bound document containing the original Bid Documents and all of the prebid addenda, or
- (b) A bound document containing Part I of the original Bid Documents, the portions of the addenda which apply to Part I, and a single conformed set of Technical Specifications and Contract Documents which are produced by posting or otherwise incorporating in Part II of the original Bid Documents all of the changes to Part II which are described in the prebid addenda. If the City elects to prepare a conformed set of Technical Specifications and Contract Drawings, the following provision shall be incorporated in the Conformed Technical Specifications after the first page of its Table of Contents:

CONFORMED CONSTRUCTION DOCUMENTS

The Technical Specifications and the Contract Drawings which were included in the Bid Documents, hereinafter referred to as the "Bid Document Specifications and Drawings," have been conformed by the City. The conformed Technical Specifications and Contract Drawings were prepared by posting or otherwise incorporating the changes noted in the prebid addenda into the Bid Document Specifications and Drawings to form a single set of construction documents. This set of construction documents is attached hereto and is hereinafter referred to in this document as the "Issued for Construction Documents."

The City's objective in preparing the Issued for Construction Documents is to produce a single set of documents which the Contractor and City will use during construction and which will facilitate the administration of the Contract. The city, however, recognizes that discrepancies between the Issued for Construction Documents and the prebid addenda could occur. Therefore, the Contractor and City agree that both parties shall have 90 days after a fully executed contract is delivered to the Contractor to identify any such discrepancies.

If the Contractor identifies any discrepancy, it shall describe it in a written notice delivered to the City's Project Manager within the 90-day period. If the City agrees that a discrepancy exists, the City shall correct the Issued for Construction Documents in accord with the written notice to assure that the Issued for Construction Documents accurately reflect and are consistent with the Bid Document Specifications and Drawings and changes thereto reflected in the prebid addenda.

If the City identifies a discrepancy, it shall describe it in a written notice delivered to the Contractor's Superintendent within the above-described 90-day period. The City shall, thereafter, correct the Issued for Construction Documents in accord with the written notice. If the Contractor disagrees with any City proposed correction or any City refusal to accept a Contractor proposed correction, the Contractor shall have the right to submit a Contractor Change Request and request a Change order in accordance with General Condition 1103.

During the 90-day period, the Bid Document Specifications and Drawings and the prebid addenda shall be part of the Contract Documents and are incorporated herein by this reference. After the 90-day period has elapsed, the parties (1) agree that the Issued for Construction Documents, as corrected pursuant to this provision, accurately reflect all of the changes to the Bid Document Specifications and Drawings contained in the addenda, and (2) agree that the Bid Document Specifications and Drawings and the portions of the prebid addenda which pertain thereto shall no longer be considered Contract Documents.

IB-12 QUANTITIES IN THE BID FORM ENTITLED SCHEDULE OF PRICES AND QUANTITIES (PART 2 OF THE BID FORMS)

Except for items designated as Lump Sum, the quantities appearing in the Bid Forms are approximate only and are included for the purpose of comparing of bids.

Payment to the Contractor will be based on the actual quantities of work performed, measured, and accepted or materials furnished in accordance with the Contract Documents.

Any of the estimated quantities of work and materials shown in the Bid Forms may each be increased, decreased, or omitted as provided in the General Conditions, Special Conditions, or Technical Specifications.

IB-13 BID GUARANTEE; BONDS; INSURANCE

As a guarantee of good faith on the part of the bidder, each Bid must be accompanied by a Bid guarantee consisting of either a certified or cashier's check made payable without condition to the order of the City and County of Denver or a bid bond written by an approved corporation surety in favor of the City and County of Denver. If the Bid of a bidder is acceptable and the bidder is notified by the Manager of Aviation that it is considered to be the Apparent Low Bidder and said bidder fails to (1) execute a

contract in the form prescribed, (2) furnish the payment and performance bonds described in Title 15 of the General Conditions, (3) furnish the required evidence of insurance described in Title 16 of the General Conditions or in the Special Conditions, or (4) satisfy any other condition precedent to contract execution within its power within five (5) working days after such notice is made by the City, said bid guarantee shall be forfeited to the City as liquidated damages and not as a penalty. The bid guarantee shall be in the amount of five percent (5%) of the Total Contract Bid Amount written in the Bid Letter of the Bid Forms. A Bid Bond form for execution by the bidder is supplied with each set of contract documents. IF A BID BOND IS USED, IT MUST BE THE FORM OF BID BOND SUPPLIED WITH THE CONTRACT DOCUMENTS.

IB-14 RETURN OF BID GUARANTEE

As soon as bid prices have been compared, bid guarantees of all except the three lowest bidders will be returned. When the Apparent Low Bidder executes the contract and delivers to the City satisfactory performance and payment bonds and required insurance documentation, and any other conditions precedent to contract execution by the City have been satisfied, including, where applicable, City Council contract approval, the bid guarantees of the three lowest bidders shall be returned to them.

IB-15 CONTRACTOR'S BULLETIN BOARD; BUSINESS.FLYDENVER.COM

It shall be conclusively presumed that the Bidder did, before submitting a bid, read all addenda, posted decisions, and other information items relevant to the Bid which appeared on the Contractor's Bulletin Board and the DIA Contract Procurement website at <http://business.flydenver.com/bizops.asp>.

The Contractor's Bulletin Board is located at Denver International Airport, 8500 Peña Blvd., Denver, CO 80249-6340, on the wall south of the entrance to the Airport Office Building (AOB). The AOB entrance is reached by way of the corridor leading to Concourse A from the North end of the Terminal on Level 6, and is located west of the Concourse A security screening area. The AOB entrance and the Contractor's Bulletin Board are both located outside the security screening area.

IB-16 SITE INSPECTION AND INVESTIGATIONS

Prior to submitting an offer, the bidder shall inspect the work site and its surroundings. A site visit will be undertaken at the time of the pre-bid conference. Requests for additional site visits must be made at least five (5) working days prior to the bid opening and such visits must be requested in a letter sent to Keith Johnson, Airport Infrastructure Management Office, 7th Floor, Airport Office Building, 8500 Peña Boulevard, Denver, Colorado, 80249-6340. For purposes of the contract, it shall be conclusively presumed that the bidder has made a thorough inspection of the site and has waived the right to later claim extra payment or time extensions for conditions which would have been evident during that inspection.

Drawings and specifications, defining the work to be done, were prepared on the basis of interpretation by design professionals of information derived from investigations of the work site and site condition data provided by the City. Such information and data are subject to sampling errors, and the interpretation of the information and data depends to a degree on the judgment of the design professional. In view of this, the bidder is invited to make additional investigations as the bidder's judgment dictates the need for such investigations. If the bidder desires to perform site investigations, it shall request in writing the right to do so. This request shall be sent to Keith Johnson, Airport Infrastructure Management Office, 7th Floor, Airport Office Building, 8500 Peña Boulevard, Denver, Colorado, 80249-6340; fax number: 303-342-2697.

Because the bid information cannot be guaranteed, the Contractor shall have assumed the risks attendant to successful performance of the work except for the risk of encountering differing site conditions which are defined in the General Conditions and shall never make claim for additional payments or time extensions on the grounds that the nature or amount of work to be done was not understood by the bidder at the time of bidding.

IB-17 INTERPRETATION OF BID DOCUMENTS

During the Bid period, Bidder shall request, in writing, clarification or interpretation of any apparent errors or omissions in the contract documents, any apparent inconsistencies between different provisions of the contract documents, or any other point in the contract documents which the Bidder believes requires clarification or interpretation by the City. Any such request must be submitted in writing by email to contract.procurement@flydenver.com, must have the words "Request for Clarification" and "Contract No. 201313528" in the email subject line, and must be received not later than ten (10) calendar days before the date and time set for receipt of Bids. For purposes of the contract, it shall be conclusively presumed that prior to bidding, the Bidder requested clarification or interpretation of any apparent errors, inconsistencies, or other point in the contract documents believed to require clarification or interpretation, and has waived the right to later claim extra payment or time extensions on account of any such error, omission, inconsistency, or other matter in the contract documents.

Information about any interpretation or clarification made by the City in response to such request will be posted on the DIA Contract Procurement website, <http://business.flydenver.com/bizops/bids.asp>. It shall be the Bidder's responsibility to ensure it has reviewed all such interpretations or clarifications. After Bids are opened, all Bidders must abide by the decision of the Manager of Aviation or his authorized representative as to the interpretation or clarification. If the Manager of Aviation or his authorized representative determines that his decision or interpretation requires that an addendum to the Bid documents be issued, such addendum will be posted on the DIA Contract Procurement website and either the complete addendum or a notice of its issuance will be posted on the Contractor's Bulletin Board. It shall

be the Bidder's responsibility to ensure it has received all such addenda, and each Bidder must acknowledge receipt of all addenda on the Bid Forms when it submits its Bid.

The City shall not be bound by and the Bidder shall not rely on any oral interpretation or clarification of the Bid Documents.

IB-18 MATERIALS AND SUBSTITUTIONS

It is often convenient and practical to specify materials and equipment to be incorporated into the work by a proprietary name or by the name of its manufacturer. When so specified and further qualified by the phrases "or equal" or "or equivalent," it shall be understood that such specification is not intended to limit the material and equipment selection process. Rather, the specification is intended to indicate a standard of quality and capability which will be accepted. However, all bidders desiring to use materials other than the specified material must obtain the written approval of the Project Manager. All such requests for approval of equal or equivalent material must be made in writing, and except as hereinafter provided, be received by the Designer of Record, Bryan Keas, CH2M Hill, 9191 South Jamaica Street, Englewood, CO 80112-5946; phone 303-771-0900; fax 720-286-9711; with a copy to the Project Manager, Keith Johnson; fax: 303-342-2697. Airport Infrastructure Management Office, 7th Floor, Airport Office Building, 8500 Peña Boulevard, Denver, Colorado, 80249-6340, and received not later than ten (10) calendar days prior to the date and time set for opening of bids so that all such approvals will be included in addenda to ensure full and complete disclosure to all potential bidders of all approved equal or equivalent materials. All requests for approval of equal or equivalent material shall contain adequate technical data to clearly demonstrate equivalency. Incomplete submittals will not be reviewed. Requests must be submitted on the attached form titled "Request for 'or equal' Approval." Requests containing inadequate or incomplete information will not be considered.

If the bidder is awarded the contract and elects to use an "OR EQUAL" which has been added by addendum, the bidder shall be deemed to have warranted that;

- (a) the use of the "OR EQUAL" fulfills the specification requirements contained in the Contract Documents.
- (b) the installation of the "OR EQUAL" will not impact the spatial requirements for the Work or the scheduling of work performed by the City or other contractors.

Additionally, the bidder agrees that it shall modify any building system(s) (HVAC, structural, electrical, etc.) impacted by the use of an "OR EQUAL" at no cost to the City or other contractors under contract with the City and shall make no claims for delay or disruption arising out of such modification.

IB-19 WITHDRAWAL OF BID

A bidder may withdraw its Bid at any time prior to the time for opening of bids set forth in the Notice of Invitation for Bids by making written request to the Manager of Aviation. After the expiration of the bid period, no bid can be withdrawn for one hundred twenty (120) calendar days after the date bids are opened or until after a contract for the work described in these Bid Documents is fully executed by the City, whichever date is earlier.

Such a request must be signed by persons authorized to bind the bidder as defined in IB-3, "Completing and Signing Bid Forms."

IB-20 SUBCONTRACTOR LISTS IN BID

The bidder shall, on the forms included in the Bid Forms, identify each element of the work which the bidder plans to subcontract, provide an estimate of the total cost to perform each element, and include the name and address of the proposed subcontractor.

IB-21 PERMIT FEES

The Contractor agrees to pay the permit fees associated with the construction of this project described in General Condition 317, and in the Special Conditions and Technical Specifications.

IB-22 TAXES

1. General. Bidders are referred to the General Conditions, G.C. 323, as to taxes to which they may be subject in performing the Work under this contract, including but not limited to sales and use taxes and the Denver Occupational Privilege Tax. The following instructions are to be considered along with the General Conditions and not in lieu of them.
2. Sales and Use Tax. Construction and building materials sold to contractors and subcontractors for use on structures, roads, streets, highways, and other public works owned by the City and County of Denver at Denver International Airport are exempt from state, RTD, and Cultural Facilities District sales and use taxes. However, such materials will be subject to sales and use taxes imposed by the City and County of Denver.
3. Exemption Certificates – Sales and Use Tax. It is responsibility of the Contractor and its subcontractors to apply to the Colorado Department of Revenue ("CDOR") for a certificate, or certificates, of exemption indicating that their purchase of construction or building materials is for a public project, and to deliver to the City copies of such applications as soon as possible after approval by the CDOR. Bidders shall not include in their bid amounts the exempt State,

RTD, and Cultural Facilities District Sales and Use Taxes.

4. Denver Occupational Privilege Tax. Any employee working for a contractor or a subcontractor who earns over \$500 working in Denver during a calendar month is subject to the payment of the Employee Occupational Privilege Tax. The Contractor and any subcontractor must pay the Business Occupational Privilege Tax for each of its employees who are subject to such tax.

IB-23 NONDISCRIMINATION IN THE AWARD OF CITY CONTRACTS

It is the policy of the City and County of Denver to prohibit discrimination in the award of construction contracts and subcontracts for public improvements. Further, the City and County of Denver encourages contractors to utilize minority and women owned businesses and to divide the construction work into economically feasible units or segments to allow the most opportunity for subcontracting.

IB-24 DISADVANTAGED BUSINESS ENTERPRISES (DBE) REQUIREMENTS

Department of Transportation (DOT) 49 CFR Part 26 (“Part 26”) applies to this Project and will be incorporated into any agreement entered into by the City and contained in County of Denver Bid Documents. It is the policy of DOT and the City and County of Denver to ensure non-discrimination in the award and administration of DOT-assisted contracts financed in whole or in part with Federal funds. Consequently, the Bidders must fully comply with the DBE requirements of Part 26 in bidding and performing hereunder.

Part 26 provides for the adoption of a good faith goals program, to be administered by the Division of Small Business Opportunity (DSBO). As such, each bidder must comply with the terms and conditions of the Part 26 in making its bid and, if awarded the Contract, in performing all Work thereunder. A bidder’s failure to comply with Part 26, any Rules or Regulations promulgated pursuant thereto, or any additional requirements contained herein may render a bid non-responsive and may constitute cause for rejection.

In order to comply with the bid requirements of Part 26, a Bidder shall either meet the established DBE Project goal or, in the alternative, demonstrate that the bidder has made sufficient good faith efforts to meet the goal. In preparing a bid to meet the established DBE Project goal, bidders should consider the following instructions relating to compliance with Part 26:

1. Under Part 26, the Director of the DSBO establishes a project goal for this project. The specific goal for this project is stated in the Notice of Invitation for Bids bound herein.
2. In preparing its bid, each Bidder shall list on the Bid Form pages entitled "List of Proposed Disadvantaged Business Enterprise Bidders, Sub-contractors, Suppliers,

Manufacturers, or Brokers" the name, address, work description/supply, committed level of participation and other required information for each DBE of any tier which the bidder intends to use in performing the Work on this Project. Only DBEs identified and the levels of participation listed for each on this Bid Form page at the time of bid opening will be considered in determining whether the bidder has met the designated participation goal. Additional, revised or corrected participation submitted after bid opening will not be considered in determining responsiveness.

3. All DBE firms listed on the Bid Form must be properly certified under guidelines of the Department of Transportation 49 CFR Part 26 by the City of Denver DSBO's Office or the State of Colorado Department of Transportation (CDOT's) Office in order to count towards meeting the designated goals. Both DSBO and CDOT maintain a current listing of certified DBE firms which can be accessed on CDOT's website at http://www.dot.state.co.us/app_ucp/. Bidders are encouraged to utilize this directory to assist them in locating DBEs for the work/supply required on the project. The most current directories must be utilized in preparing a bid. DBE certification does not, however constitutes a representation or warranty by the City as to the qualifications of any listed firm.
4. In accordance with the requirements of Part 26, DSBO will evaluate each bid to determine the responsiveness of the bid to Part 26 requirements. In determining if a bidder's committed levels of participation meet or exceed the stated DBE goal, DSBO will base its calculation of applicable amounts and percentages on the total base bid amount, not including any listed alternates, of each bid as follows:
 - a. The bid information provided by the agency will be used to determine the total base bid amount of each bid. Each bidder's total base bid amount will be multiplied by the DBE percentage goal established for the project to determine the exact dollar amounts of required DBE participation for the project. These amounts will then be compared against the dollar amounts for the DBE firm(s) committed for participation by the bidder. If the total dollar amount of participation listed meets or exceeds the established DBE dollar amount goal listed, then the DSBO will determine that goals have been met.
 - b. In addition, DSBO will determine the exact commitment percentage for each listed DBE firm by dividing the dollar amount listed for each firm by the total base bid dollar amount submitted by the bidder. These individual percentages, when totaled for all listed DBEs, will establish the total committed percentage level of DBE participation that the bidder must comply with during the life of the contract. In all cases, the committed percentage level of DBE participation must equal or exceed the assigned DBE goal for the project.
 - c. In providing the exact dollar amount of participation for each listed DBE firm a bidder should take care never to round up in determining whether or not the total of these amounts meets or exceeds the established percentage goal. The

goal must be met or exceeded by both dollar amounts and percentage for DSBO to determine that the bidder has met or exceeded the applicable DBE goal.

- d. As previously mentioned, compliance with the DBE goal will be determined on the base bid alone. If a bid contains alternates, participation contained in any alternate will not count towards satisfaction of the project goals. However, should any designated alternate be selected by the City for inclusion in the contract ultimately awarded, the DBE goal percentage level submitted at bid time, on the base bid, will also apply to the selected alternates and must be maintained for the life of the contract on the total contract amount, including any alternate work. Thus, even though such participation will not be considered in evaluating bids, bidders are urged to consider participation in preparing bids for designated alternates.
5. In accordance with Part 26 the City and County of Denver will require the total DBE participation commitment to be achieved in accordance with the following:

DBE bidders can count themselves for self-performance toward meeting the DBE goal, but only for the scope of work and at a percentage level that is performed by the DBE's own forces.

Work actually performed by DBEs is deemed to include the cost of materials and supplies purchased and equipment leased by the DBE from non-DBE sources. Work subcontracted can only count if the subcontractor is another DBE.

The entire fee or commission charged by a DBE, if reasonable and not excessive, will be counted.

Under Joint Ventures, the total value of distinct and clearly defined portions of the work of the contract that the DBE performs with its own workforce will be counted.

Each DBE must perform a "commercially useful function" to be counted toward the goal and at least 30% of the work must be performed by a DBE of the total cost of its contract for the DBE to be presumed to be performing a "commercially useful function".

Supplies or materials can be only counted for 60% of the total cost of the materials or supplies toward meeting the DBE goal and a DBE manufacture can count 100% of the cost of the materials or supplies toward the goal.

In utilizing the DBE participation of a broker, only the bona fide fees and commissions earned by them for their performance of a commercially

useful function will count toward meeting the project goals. The bidder must separate the bona fide brokerage fees and commissions from the actual cost of the supplies or materials provided to determine the actual dollar amount of participation that can be counted towards meeting the goal.

6. On or before the fifth (5th) working day after bid opening, all of the bidders are required to submit an executed "DBE Letter of Intent" for each DBE listed on the Bid Form as a subcontractor, supplier, manufacturer, or broker of any tier. Each Letter of Intent shall be submitted only for the DBEs listed at the time of bid opening, since this is the only participation that will be counted toward satisfaction of the project goals. A form for the DBE Letter of Intent is included with the Bid Form. The DBE Letter of Intent is a written communication from the bidder to the City evidencing an understanding that the bidder has or will enter into a contractual relationship with the DBE and/or that its subcontractor(s) and supplier(s), manufacturer(s), and broker(s) will do so. Each DBE Letter of Intent shall be accompanied by a copy of the City and County of Denver's DBE certification letter for each proposed DBE firm identified at bid time that has been certified by the City prior to bid time. Bidders are urged to carefully review these Letters before submission to the City to ensure that they are properly completed and executed by the appropriate parties.

In preparing a bid to demonstrate a good faith effort, bidders should consider the following instructions relating to compliance with Part 26:

- a. If any bidder is unable to meet the designated project DBE goal at the time the bids are opened or elects to present a good faith effort in lieu of or in addition to attempting to satisfy the designated project goals, that bidder shall submit on or before the fifth (5th) working day after the bid opening a detailed statement, with supporting documentation, setting forth its good faith efforts made prior to bid opening. This statement shall address each of the following items in the good faith effort. The different kinds of efforts as well as the quantity and intensity of the efforts will be considered in determining whether the bidder has made a good faith effort. A bidder who fails to meet the project goal and cannot show, to the Director's satisfaction, that it made a good faith effort to meet the DBE goal shall be considered non-responsive.
- b. The statement of good faith efforts shall include a specific response to each of the following items. In addition a bidder may include any additional information the bidder believes may be relevant. Failure of a bidder to show good faith efforts as to any one of the following categories may render its overall good faith showing insufficient and its bid non-responsive. Items (1) through (7) of the good faith effort are set forth below:
 1. If pre-bid meetings are scheduled by the City at which DBEs may be informed of subcontracting opportunities under a proposed contract to be

bid, attendance at such pre-bid meetings is not mandatory; however, bidders are responsible for the information provided at these meetings. The good faith effort statement must reflect the bidder's knowledge of the information provided at these meetings.

2. Written verification of the placing of an advertisement soliciting bids from DBEs for three (3) consecutive days in general or construction-related publications approved by the Director. All such advertisements must expressly advertise a given project and expressly state that DBE participation on that project is being sought; other incidental references to the project or listing of the bidder as a planholder are not sufficient. All such advertisements shall begin at least fifteen (15) days prior to bid opening. If the City publishes notice for bids on a project less than fifteen (15) days prior to bid opening, verification of advertisements for at least four (4) consecutive days shall be provided.
3. Verification of efforts made by the bidder to contact, by written notice, all certified DBEs who have the capability to perform the work of the contract, that their interest in the contract is being solicited, in sufficient time to allow the DBEs to participate effectively is required. The notice shall expressly describe the potential subcontracting, supplier or broker opportunities for all applicable certification categories for the particular project.
4. Verification that, reasonably consistent with industry practice and the bidder's past practices on similar projects, the bidder analyzed the needs of the project in light of such industry practice and past practice, together with the goal of facilitating DBE participation on the project, and identified portions of the work to be performed by DBEs in order to achieve the project goal.
5. For each DBE which contacted the bidder or which the bidder contacted or attempted to subcontract with, consistent with industry practice, a statement giving the reasons why the bidder and the DBE did not succeed in reaching a subcontracting, supplier, manufacturer or broker agreement.
6. Verification that the bidder rejected DBEs because they did not submit the lowest bid or they were not qualified. Such verification shall include a verified statement of the amounts of all bids received from potential subcontractors, suppliers, manufacturers or brokers on the project and a verified statement that the bidder rejected DBEs because they did not submit the lowest bid from among such bids or were not qualified.
7. Verification that the bidder made efforts to assist DBEs in obtaining bonds, if any are required.

In accordance with Part 26 the bidder agrees that it is committed to meeting either the

DBE participation goal or the DBE participation set forth in its statement of good faith efforts. This commitment must be expressly indicated on the "Commitment to Disadvantaged Business Enterprise Participation" form included with the Bid Form. This commitment includes the following understandings:

1. The bidder understands it must maintain the committed DBE participation goal level throughout the life of the Contract consistent with 49 C.F.R. Section 26.53(f).
2. The bidder understands that it must establish and maintain records and submit regular reports, as required, which will allow the City to assess progress toward satisfying the DBE participation goal and other affirmative action efforts.
3. The bidder understands that if Change Orders or any other Contract modifications are issued under the Contract, the bidder shall have a continuing obligation to immediately inform DSBO in writing of any agreed upon increase or decrease in the scope of work of such Contract, regardless of whether such increase or decrease in scope of work has been reduced to writing at the time of notification.
4. The bidder understands that if change orders or other contract modifications are issued under the Contract that include an increase in the scope of work of a contract for construction, reconstruction, or remodeling, whether by amendment, change order, force account or otherwise which increases the dollar value of the contract, whether or not such change is within the scope of work designated for performance by a DBE at the time of contract award, then such amendment, change order or other modification shall be contemporaneously submitted to the DSBO. Those amendments, change orders, force accounts or other contract modifications that involve a changed scope of work that cannot be performed by existing project subcontractors or by the Bidder shall be subject to goals or good faith efforts for DBEs equal to the original goal on the contract which were included in the bid.

All bidders are charged with knowledge of and are solely responsible for complying with each requirement of Part 26 in making a bid and, if awarded, in performing the Work described in the Contract Documents. These instructions are intended only to generally assist the bidder in preparing and submitting a compliant bid. Should any questions arise regarding specific circumstances, bidders must consult 49 CFR Part 26, appropriate DOT Rules and Regulations, or contact the Project's designated DSBO representative at (720) 913-1700.

INSTRUCTIONS TO BIDDERS - All bidders must submit a DSBO's Bidder's Information Form for themselves, as well as any subcontractor/supplier/manufacture/manufacture representative/broker that contacted the bidder or that the bidder contacted who provided a bid or quote, regardless if the firm is a DBE or a non-DBE firm. DSBO is required by DOT 49 CFR Part 26 Regulations to create and maintain a bidders list on DOT-assisted projects. Therefore, bidders need to provide these completed forms at the time of bid as a part of their Bid Form and Submittal

Document.

IB-25 WAGE RATE REQUIREMENTS

The Davis Bacon Act and the United States Department of Labor regulations regarding payment of wages will apply to wages paid for work performed under this contract. A copy of the current applicable wage rates is included in the bid documents. If the Department of Labor issues a modification to those wage rates more than ten (10) days prior to the scheduled bid opening, those modifications will be published in an addendum issued to all prospective bidders by the City in accordance with FAA regulations. The FAA may determine on a case-by-case basis whether wage rate modifications issued by the Department of Labor less than ten (10) days prior to bid opening must be included in an addendum. Modifications issued by the Department of Labor which are not included in an addendum will not apply to this contract.

The wage rates identified in the bidding documents, including addenda, will be in effect for the life of the contract.

IB-26 CONSTRUCTION SCHEDULING

The bidder should refer to the General Conditions, Special Conditions, and Division I of the Technical Specifications for scheduling requirements for this contract.

IB-27 EQUAL EMPLOYMENT OPPORTUNITY

1. Article III, Division 2 of Chapter 28 applies to this contract. It is the policy of the City to provide equal opportunity in employment without regard to race, color, creed, sex, national origin, religion, marital status, or political opinion or affiliation. It is hereby deemed and declared to be for the public welfare and in the best interest of the City to require bidders, contractors and subcontractors soliciting and receiving, directly or indirectly, compensation from or through the City, for the performance of such contracts, to meet certain affirmative action and equal employment opportunity requirements. Additionally, contractors and subcontractors that hold any contracts which are federally-assisted shall be required to adhere to the Department of Labor's Contract Compliance program under Executive Order 11246 as defined in the regulations of the Secretary of Labor at 41 CFR Chapter 60-4.
2. After the Notice to Apparent Low Bidder has been issued, the Apparent Low Bidder shall submit the following to the Division of Small Business Opportunity:
 - (a) A statement that the bidder shall implement the affirmative action steps set forth in the Rules and Regulations and Bid Conditions of the Manager of Public Works pertaining to Equal Employment Opportunity, attached hereto, or the bidder's affirmative action plan which meets these requirements, and

- (b) A projection of its anticipated workforce for this contract on the attached "EEO Questionnaire." Both of these submittals are required before the Division of Small Business Opportunity will approve the Notice to Proceed.
3. The bidder which is awarded this contract shall comply with the provisions and requirements, including the goals of minority and female participation and specific affirmative action steps, set forth in the Rules and Regulations and Bid Conditions of the Manager of Public Works pertaining to Equal Employment Opportunity, as said rules and regulations may be amended or readopted from time to time by the Manager of Public Works or the Director of the Division of Small Business Opportunity.

IB-28 CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

The bidder certifies, by submission of its bid or acceptance of this contract, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or involuntarily excluded from participation in any government contract by any Federal, State, or local government department or agency. It further agrees by submitting its bid that it will include this clause without modification in all lower tier transactions, solicitations, proposals, contracts, and subcontracts. Where the bidder or any lower tier participant is unable to certify to this statement, it shall attach an explanation to its bid.

IB-29 INSURANCE REQUIREMENTS, ROCIP PROGRAM, SAFETY MANUAL

In preparing its Bid, the Bidders shall assure that insurance requirements contained in the Contract Documents are met. In accordance with the provisions of General Contract Condition 1601, INSURANCE, the minimum insurance requirements for this Contract are set forth in the form **CITY AND COUNTY OF DENVER INSURANCE CERTIFICATE** contained in the Special Conditions Section of the Contract Documents. Bidders are urged to consider in preparing a bid hereunder that the Contractor and all subcontractors performing Work on the Project must comply with each condition, requirement or specification set forth in the form certificate, unless such requirements are specifically excepted in writing by the City's Risk Management Administrator. The Contractor must either include all subcontractors performing work hereunder as insureds under each required policy or furnish a separate certificate (on the form certificate provided) for each subcontractor.

City may at its sole option provide an Rolling Owner Controlled Insurance Program (ROCIP), which coverage City agrees will be primary over any other insurance provided by an enrolled party. A copy of the ROCIP proposed coverage and Safety Manual are included in the Contract Documents. Bidder should review the proposed coverage and Safety Manual in preparing its bid. Bidder shall submit additional insurance costs if the City determines not to provide an ROCIP.

IB-30 INVOICING

All invoices must be submitted electronically in PDF format to ContractAdminInvoices@Flydenver.com. If using an invoice transmittal form, submit that form in EXCEL format. Submitting your invoices to ContractAdminInvoices@Flydenver.com starts the official prompt payment process step one. Any invoices submitted to other parties will not be considered part of the process and all other methods of invoice submittal will be rejected.

Contractor recognizes and agrees that the City intends to use the Textura® Construction Payment Management System (CPM System) for this contract. Proposers/Bidders are urged, when preparing a proposal/bid, to contact the Textura® Corporation at 866-TEXTURA (866-839-8872) for pricing schedule and fees, as all fees associated with the CPM System are to be paid by the Contractor and subcontractor for billings for work performed.

IB-31 PROJECT CONTROLS REQUIREMENTS

The Contractor will be required to use Primavera Contract Management (PCM) and Primavera P6 to comply with the requirements of DIA's Project Controls System. The Project Controls System is Airport Infrastructure Management's tool for project and information management, data analysis and document control. Denver International Airport will be responsible for providing the licensing and training for PCM. The Contractor will be responsible for providing Primavera P6. The Contractor will also be responsible for providing and maintaining the computer hardware, software and system environment capable of supporting Project Controls System requirements including as the minimum: internet connection; Microsoft Internet Explorer 8 or better; Microsoft Office 2010; Oracle Java JRE 1.7.0 Update 5 and Adobe Acrobat X Pro. This is the only project management system that will be accepted.

REQUEST FOR “OR EQUAL” APPROVAL

Contract No.: 201313528
 Title: Runway 8-26 Complex Lighting Rehabilitation

This request, **in duplicate**, must be received by the City Project Manager and Designer of Record at the following addresses, by noon at least 10 days prior to bid date.

City Project Manager: Keith Johnson Airport Infrastructure Management Office Denver International Airport 7 th Floor, Airport Office Building 8500 Peña Boulevard Denver, CO 80249-6240 Fax: 303-342-2697	Designer of Record: Bryan Keas CH2M Hill 9191 South Jamaica Street Englewood, CO 80112-5946 Fax: 720-286-9711
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To be completed and signed by requesting party:

Specification Section/Drawing Number:	Page No./Paragraph No./Subparagraph No.:
Specified Product:	Specified Manufacturer:
	Specified Model No.:
“Or Equal” Product:	“Or Equal” Manufacturer:
	“Or Equal” Model No.
Reason for “Or Equal” substitution:	
Prior Applications [Installations of at least 3 years length]:	
(1) Project: _____	Date: _____
(2) Project: _____	Date: _____
(3) Project: _____	Date: _____

[PAGE 1 OF 2 PAGES]

General product literature/catalog cuts/drawings or other appropriate information detailing the “Or Equal” product with respect to the project specifications must be attached to this form for approval.

I have reviewed the attached product literature and certify the following:

- (1) That the above described “Or Equal” product fulfills the specification requirements as detailed in the Contract Documents.
- (2) That the installation of the above described “Or Equal” product in no way impacts the spatial requirements of the project.
- (3) That I, if selected as the Contractor, shall modify any building system(s) (HVAC, structural, electrical, etc.) impacted by the use of the above described “Or Equal” product at no additional cost to the City and County of Denver and shall make no claim for delay with respect to any such modification.
- (4) That the above described “Or Equal” product meets all physical and performance attributes of the specified material or equipment except (if no difference, so state):

REQUESTING PARTY: _____

Date: _____ By: _____

Title: _____

For City use:

Approved Disapproved Date: _____
Reason for disapproval [if applicable]:

DESIGNER OF RECORD:

[Signature]

PROJECT MANAGER:

Date:

[Signature]

DEPUTY MANAGER:

Date:

[Signature]

Bidder(s) Notified By

Addendum No.

Date:

THIS IS PAGE 2 OF 2 PAGES

EEO QUESTIONNAIRE
Contract No: 201313528

1. Name of Business: _____
2. Address: _____
3. City, State, Zip Code: _____
4. Telephone Number: (_____) _____
5. Name and title of your firm's EEO Contact: _____
6. Are you an affiliate or a subsidiary of another business organization (branches, etc.)?
 Yes No
7. Type of business you are engaged in: _____
8. Does the organization have a procedure for resolving discrimination complaints?
 Yes No
9. Has your firm been charged with discrimination within the past eighteen (18) months?
 Yes No
10. Is your firm required to submit an EEO-1 annually to the EEOC?
 Yes No
11. Are you now working or have you worked on a City and County of Denver contract during the past twelve (12) months? Yes No
 If yes, complete the following information:

<u>Type of Contract</u>	<u>Contract Number</u>	<u>Total Cost of Each Contract</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

(You may use additional sheets if necessary)

(Page 1 of 2 pages)

PROJECTION OF ANTICIPATED WORKFORCE
Contract No. 201313528

12. List the number of anticipated new employees needed by the contractor to perform this contract by trade/craft positions.

ANTICIPATED NUMBER OF NEW EMPLOYEES FOR THIS CONTRACT

Trade Craft	Estimated Total Manpower	Estimated Total Hours	Number of Employees Minority/Female	Total Estimated Employees Minority/Female
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

13. What is the anticipated number of employees from the apparent low bidder's current work force to be utilized to perform this contract? _____

14. Estimate manpower utilization for the project below:

ESTIMATE OF MANPOWER UTILIZATION

Trade Craft	Estimated Total Manpower	Estimated Total Hours	Number of Employees Minority/Female	Total Estimated Employees Minority/Female
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

15. Will the estimated total manpower (anticipated new hires and current staff to be utilized on this contract) meet the City's minority employment and female employment goals?
 Yes No

(Page 2 of 2 pages)

PREVAILING WAGES

The Prevailing Wage Schedule(s) which apply to this contract are contained in the pages immediately following this page. These pages are not included in the page numbering of this contract document.



DENVER
THE MILE HIGH CITY

Career Service Authority

Denver's Human Resource Agency

201 W. Colfax, Department 412

Denver, CO 80202

p: 720.913.5751

f: 720.913.5720

www.denvergov.org/csa

TO: All Users of the City of Denver Prevailing Wage Schedules
FROM: Seth Duhon-Thornton Staff HR Professional
DATE: Friday January 18, 2013
SUBJECT: Latest Change to Prevailing Wage Schedules

Please be advised, prevailing wage rates for some building, heavy, and highway construction trades have not been updated by the United States Department of Labor (DOL) since March 1, 2002. The Career Service Authority Board, in their meeting held on April 21, 2011, approved the use of the attached supplemental wage rates until prevailing wage rates for these classifications of work are again published by the United States Department of Labor in accordance with the Davis-Bacon Act. The rates will be provided as a supplemental to the Davis-Bacon Highway rates issued by CSA.

The effective date for this publication is **Friday January 18, 2013** and applies to the City and County of Denver for **HIGHWAY CONSTRUCTION PROJECTS** in accordance with the Denver Revised Municipal Code, Section 20-76(c).

General Wage Decision No. CO130019
Superseded General Decision No. CO20120019
Modification No. 0
Publication Date: 01/04/2013
(8 pages)

Unless otherwise specified in this document, apprentices shall be permitted only if they are employed pursuant to, and individually registered in, a bona fide apprenticeship program registered with the U.S. Department of Labor (DOL). The employer and the individual apprentice must be registered in a program, which has received prior approval, by the DOL. Any employer, who employs an apprentice and is found to be in violation of this provision, shall be required to pay said apprentice the full journeyman scale.

For questions call (720) 913-5018

Attachments as listed above.

General Decision Number: CO130019 01/04/2013 CO19

Superseded General Decision Number: CO20120019

State: Colorado

Construction Type: Highway

Counties: Denver and Douglas Counties in Colorado.

HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/04/2013

CARP9901-008 10/01/2010

	Rates	Fringes
CARPENTER (Form Work Only).....	\$ 24.00	11.28

ELEC0068-016 03/01/2011

	Rates	Fringes
TRAFFIC SIGNALIZATION:		
Traffic Signal Installation		
Zone 1.....	\$ 26.42	4.75%+8.68
Zone 2.....	\$ 29.42	4.75%+8.68

TRAFFIC SIGNAL INSTALLER ZONE DEFINITIONS

Zone 1 shall be a 35 mile radius, measured from the following addresses in each of the following cities:
Colorado Springs - Nevada & Bijou
Denver - Ellsworth Avenue & Broadway
Ft. Collins - Prospect & College
Grand Junction - 12th & North Avenue
Pueblo - I-25 & Highway 50
All work outside of these areas shall be paid Zone 2 rates.

* ENGI0009-008 06/25/2012

	Rates	Fringes
POWER EQUIPMENT OPERATOR:		
(3)-Hydraulic Backhoe (Wheel Mounted, under 3/4 yds), Hydraulic Backhoe (Backhoe/Loader combination), Drill Rig Caisson (smaller than Watson 2500 and similar), Loader (up to and including 6 cu. yd.).....		
	\$ 24.27	8.62
(3)-Loader (under 6 cu. yd.)		
Denver County.....	\$ 24.27	8.62
(3)-Motor Grader (blade-rough)		
Douglas County.....	\$ 24.27	8.62

(4)-Crane (50 tons and under), Scraper (single bowl, under 40 cu. yd).....	\$ 24.42	8.62
(4)-Loader (over 6 cu. yd) Denver County.....	\$ 24.42	8.62
(5)-Drill Rig Caisson (Watson 2500 similar or larger), Crane (51-90 tons), Scraper (40 cu.yd and over),.....	\$ 24.57	8.62
(5)-Motor Grader (blade-finish) Douglas County.....	\$ 24.57	8.62
(6)-Crane (91-140 tons).....	\$ 24.72	8.62

SUCO2011-004 09/15/2011

	Rates	Fringes
CARPENTER (Excludes Form Work)...	\$ 19.27	5.08
CEMENT MASON/CONCRETE FINISHER		
Denver.....	\$ 20.18	5.75
Douglas.....	\$ 18.75	3.00
ELECTRICIAN (Excludes Traffic Signal Installation).....	\$ 35.13	6.83
FENCE ERECTOR (Excludes Link/Cyclone Fence Erection).....	\$ 13.02	3.20
GUARDRAIL INSTALLER.....	\$ 12.89	3.20
HIGHWAY/PARKING LOT STRIPING:Painter		
Denver.....	\$ 12.62	3.21
Douglas.....	\$ 13.89	3.21
IRONWORKER, REINFORCING (Excludes Guardrail Installation).....	\$ 16.69	5.45
IRONWORKER, STRUCTURAL (Includes Link/Cyclone Fence Erection, Excludes Guardrail Installation).....	\$ 18.22	6.01
LABORER		
Asphalt Raker.....	\$ 16.29	4.25
Asphalt Shoveler.....	\$ 21.21	4.25
Asphalt Spreader.....	\$ 18.58	4.65
Common or General		
Denver.....	\$ 16.76	6.77
Douglas.....	\$ 16.29	4.25
Concrete Saw (Hand Held)....	\$ 16.29	6.14
Landscape and Irrigation....	\$ 12.26	3.16
Mason Tender-Cement/Concrete		
Denver.....	\$ 16.96	4.04
Douglas.....	\$ 16.29	4.25
Pipelayer		

Denver.....	\$ 13.55	2.41
Douglas.....	\$ 16.30	2.18
Traffic Control (Flagger)...	\$ 9.55	3.05
Traffic Control (Sets Up/Moves Barrels, Cones, Install Signs, Arrow Boards and Place Stationary Flags) (Excludes Flaggers).....	\$ 12.43	3.22
PAINTER (Spray Only).....	\$ 16.99	2.87
POWER EQUIPMENT OPERATOR:		
Asphalt Laydown		
Denver.....	\$ 22.67	8.72
Douglas.....	\$ 23.67	8.47
Asphalt Paver		
Denver.....	\$ 24.97	6.13
Douglas.....	\$ 25.44	3.50
Asphalt Roller		
Denver.....	\$ 23.13	7.55
Douglas.....	\$ 23.63	6.43
Asphalt Spreader.....	\$ 22.67	8.72
Backhoe/Trackhoe		
Douglas.....	\$ 23.82	6.00
Bobcat/Skid Loader.....	\$ 15.37	4.28
Boom.....	\$ 22.67	8.72
Broom/Sweeper		
Denver.....	\$ 22.47	8.72
Douglas.....	\$ 22.96	8.22
Bulldozer.....	\$ 26.90	5.59
Concrete Pump.....	\$ 21.60	5.21
Drill		
Denver.....	\$ 20.48	4.71
Douglas.....	\$ 20.71	2.66
Forklift.....	\$ 15.91	4.68
Grader/Blade		
Denver.....	\$ 22.67	8.72
Guardrail/Post Driver.....	\$ 16.07	4.41
Loader (Front End)		
Douglas.....	\$ 21.67	8.22
Mechanic		
Denver.....	\$ 22.89	8.72
Douglas.....	\$ 23.88	8.22
Oiler		
Denver.....	\$ 23.73	8.41
Douglas.....	\$ 24.90	7.67
Roller/Compactor (Dirt and Grade Compaction)		
Denver.....	\$ 20.30	5.51
Douglas.....	\$ 22.78	4.86
Rotomill.....	\$ 16.22	4.41
Screed		
Denver.....	\$ 22.67	8.38
Douglas.....	\$ 29.99	1.40
Tractor.....	\$ 13.13	2.95
TRAFFIC SIGNALIZATION:		
Groundsman		
Denver.....	\$ 17.90	3.41
Douglas.....	\$ 18.67	7.17

TRUCK DRIVER

Distributor		
Denver.....	\$ 17.81	5.82
Douglas.....	\$ 16.98	5.27
Dump Truck		
Denver.....	\$ 15.27	5.27
Douglas.....	\$ 16.39	5.27
Lowboy Truck.....	\$ 17.25	5.27
Mechanic.....	\$ 26.48	3.50
Multi-Purpose Specialty & Hoisting Truck		
Denver.....	\$ 17.49	3.17
Douglas.....	\$ 20.05	2.88
Pickup and Pilot Car		
Denver.....	\$ 14.24	3.77
Douglas.....	\$ 16.43	3.68
Semi/Trailer Truck.....	\$ 18.39	4.13
Truck Mounted Attenuator....	\$ 12.43	3.22
Water Truck		
Denver.....	\$ 26.27	5.27
Douglas.....	\$ 19.46	2.58

WELDERS - Receive rate prescribed for craft performing
operation to which welding is incidental.

Career Service Authority

**Supplemental to the Davis-Bacon *HIGHWAY* Construction Projects rates
(Specific to the Denver Projects)
(Supp 35, Date: 01-13-2012)**

Classification		Base	Fringe
Millwrights		\$28.00	\$10.00
Line Construction:			
	Lineman, Gas Fitter/Welder	\$36.88	\$9.55
	Line Eq Operator/Line Truck Crew	\$25.74	\$8.09
Power Equipment Operators (Tunnels Above and Below Ground, shafts and raises):			
	GROUP 1	\$25.12	\$10.81
	GROUP 2	\$25.47	\$10.85
	GROUP 3	\$25.57	\$10.86
	GROUP 4	\$25.82	\$10.88
	GROUP 5	\$25.97	\$10.90
	GROUP 6	\$26.12	\$10.91
	GROUP 7	\$26.37	\$10.94
Power Equipment Operators:			
	GROUP 1	\$22.97	\$10.60
	GROUP 2	\$23.32	\$10.63
	GROUP 3	\$23.67	\$10.67
	GROUP 4	\$23.82	\$10.68
	GROUP 5	\$23.97	\$10.70
	GROUP 6	\$24.12	\$10.71
	GROUP 7	\$24.88	\$10.79
Ironworkers (Ornamental)		\$24.80	\$10.03
Laborers (Removal of Asbestos)		\$21.03	\$8.55
Plumbers		\$30.19	\$13.55
Pipefitters		\$30.45	\$12.85
Truck Drivers:			
	GROUP 1	\$18.42	\$10.00
	GROUP 2	\$19.14	\$10.07
	GROUP 3	\$19.48	\$10.11
	GROUP 4	\$20.01	\$10.16
	GROUP 5	\$20.66	\$10.23
	GROUP 6	\$21.46	\$10.31

POWER EQUIPMENT OPERATOR CLASSIFICATIONS
(TUNNELS ABOVE AND BELOW GROUND, SHAFTS, AND RAISES):

GROUP 1 - Brakeman

GROUP 2 - Motorman

GROUP 3 - Compressor

GROUP 4 - Air Tractors; Grout Machine; Gunnite Machine; Jumbo Form

GROUP 5 - Concrete Placement Pumps; Mucking Machines and Front End Loaders, Underground, Slusher; Mine Hoist Operator; Mechanic

GROUP 6 - Mechanic Welder

GROUP 7 - Mole

NOTE: Any equipment listed below being used in tunnel work, below or above ground shall be paid not less than \$2.00 per hour above the listed wage rates.

POWER EQUIPMENT OPERATOR CLASSIFICATIONS:

GROUP 1 - Air compressor, brakeman, drill operator -smaller than Watson 2500 and similar, operators of 5 or more light plants, welding machines, generators, single unit conveyor, pumps, vacuum well point system, tractor, under 70 hp with or without attachments compressors, 360 C.F.M. or less

GROUP 2 - Conveyor, handling building materials, ditch witch and similar trenching machine, forklift, haulage motor man, pugmill, portable screening plant with or without a spray bar, screening plants, with classifier, self-propelled roller, rubber-tires under 5 tons.

GROUP 3 - asphalt plant, backfiller; cableway signalman; C.M.I. and similar, concrete batching plants, concrete finish machine, concrete gang saw on concrete paving, concrete mixer, less than 1 yd., under 8 inches, distributors, bituminous surfaces dozer, drill, diamond or core, elevating graders, elevator operator, lubricating and service engineer, grout machine, gunnite machine, hoist, 1 drum, horizontal directional drill operator, hydraulic backhoes; road stabilization machine, sandblasting Machine, single unit portable crusher, with or without washer, Tie tamper, wheel mounted, trenching machine operator, winch on truck.

GROUP 4 - Cable operated power shovels, draglines, clamshells, 5 cubic yards and under, concrete mixer over 1 Cubic yard, concrete pavers 34E or similar, grade Checker, hoist, 2 drums, mechanic, mixer mobile, Portable crusher, with or without washer; tractor with sideboom, roto-M ill and similar, welder.

GROUP 5 - Cable operated power shovels, draglines, clamshells and Backhoes over 5 cubic yards, caisson drill Watson 2500 similar or larger, motor grader blade-finish, hoist 3 drum or more.

GROUP 6 - Cableway, derrick, quad nine push unit, wheel excavator, belt or elevating loader.

GROUP 7 - tower cranes all types.

TRUCK DRIVER CLASSIFICATIONS:

GROUP 1 - Greasemen, Servicemen and Ambulance Drivers, Battery Men, Shuttle Truck or Bus, Flat Rack Tandem Axle.

GROUP 2 - Fork Lift Driver, Straddle Truck Driver, Lumber Carrier, Liquid and Bulk Tankers Single Axle, Combination, Euclid Electric or Similar, Specialty and Hoisting, Truck Drivers Fuel Truck, Grease Truck, Combination Fuel and Grease.

GROUP 3 - Truck Driver Snow Plow, Truck Driver Dump or Type Jumbo and similar type equipment.

GROUP 4 - Cement Mixer Agitator Truck over 10 cubic yards to and including 15 cubic yards, Tire Man, Cab Operated Distributor Truck Driver.

GROUP 5 - Heavy Duty Diesel Mechanic, Body Man, Welders or Combination Men.

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

**DENVER INTERNATIONAL AIRPORT
BID FORMS**

**CONTRACT NAME: Runway 8-26 Complex Lighting Rehabilitation
Contract No.: 201313528**

Bid Letter

BIDDER Sturgeon Electric Company, Inc.

Manager of Aviation
City and County of Denver
Business Management Services (Procurement) Office
Airport Office Building, Room 8810
Denver International Airport
8500 Peña Boulevard
Denver, Colorado 80249

This letter is in response to the Notice of Invitation for Bids first published on November 8, 2013, for Contract No. 201313528, Denver International Airport, Runway 8-26 Complex Lighting Rehabilitation.

This contract is for:

Remove and replace runway centerline lights, touchdown zone lights, stop bar lights, edge lights, transformers, and cabling on RW 8-26. Remove and replace taxiway edge lights, transformers, and cabling on TW R and its connectors. Remove and replace taxiway centerline and edge lights, transformers, and cabling on TWs EE, Z, and L&M south to and including the intersection with Z. Perform photometric testing on the new lights. Replace the home-run cables between the East Vault and EMH-03010. Remove and replace electrical regulators. Remove and replace a few, selected concrete slabs. Construct two, short access roads. Install several electrical manhole drains that will consist of installing underdrain pipe. Improve drainage around an EMH.

The undersigned Bidder declares that it has carefully examined the location of the proposed work and has carefully read and examined all of the Contract Documents which include, but are not limited to, the Contract Drawings, Technical Specifications, Construction Contract General Conditions, Special Conditions, Instruction to Bidders, and EEO provisions, and hereby proposes to furnish all labor, materials, equipment, tools, transportation and services, and to discharge all duties and obligations necessary and required to perform and complete the Work as required in the Contract Documents which are provided herewith and by this reference made a part hereof for the prices shown in the bid forms and totaled below:

Total Contract Bid Amount: Seven Million Nine Hundred Four Thousand Eighty One Dollars and seventy seven Cents (\$7,904,081.77).

The undersigned acknowledges receipt, understanding and full consideration of the following addenda to the Contract Documents:

Addenda Nos.: #1-12/5/13,

The undersigned agrees that this bid is a firm offer to the City to perform and complete the Contract described above which cannot be withdrawn for one hundred twenty (120) calendar days after the bids are opened or until after a contract for the work described in these bid documents is fully executed by the City, whichever date is earlier.

The undersigned Bidder hereby agrees to appear at Denver International Airport, Business Management Services Office, Room 8810, Airport Office Building, at any time within five (5) working days from the date of a written notice from the Manager to do so, mailed, emailed, or faxed to the business address of Bidder and at that time the Bidder shall: (1) deliver an executed Contract which conforms with this bid; (2) furnish the required performance and payment bonds in the sum of the Total Contract Bid Amount shown above, executed by a surety company acceptable to the Manager; and (3) furnish the required insurance documents.

Enclosed herewith is a bid guarantee, as defined in the Instructions to Bidders, in the amount of which bid guarantee the undersigned Bidder agrees is to be paid to and become the property of the City as liquidated damages should the bid be considered to be the best by the City and the undersigned Bidder notified that it is the apparent low bidder and it fails to enter into contract in the form prescribed and to furnish the required performance and payment bonds and evidences of insurance within five (5) working days as stipulated above.

Attached and incorporated herein are the proposed Schedule of Prices and Quantities and Bid Data Forms. All of the forms must be completed. Bidder acknowledges that the City may incorporate, at its option, any or all of the data submitted by the Bidder into a contract arising out of this Bid.

The undersigned Bidder acknowledges the right of the City to waive informalities in the bids, to reject any or all bids submitted, and to re-advertise for bids.

The undersigned certifies that it has examined and is fully familiar with all of the provisions of the Contract Documents and is satisfied that they are accurate; that it has carefully checked all words and figures and all statements made in these Bid forms; and that it has satisfied itself with respect to the actual site conditions and the nature and location of the Work, the general and local conditions which may be encountered in the performance of the Work, and other matters which in any way affect the Work or the cost thereof.

[CERTIFICATION AND SIGNATURE ON FOLLOWING PAGES]

This bid is submitted upon the declaration that neither, I (we), nor, to the best of my (our) knowledge, none of the members of my (our) firm or company have either directly or indirectly entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this bid.

Dated this 10th day of December, 2013.

BUSINESS ADDRESS OF BIDDER: 12150 E. 112th Avenue

City, State, Zip Code: Henderson, CO 80640

Telephone Number of Bidder: (303) 286-8000

Fax Number of Bidder: (303) 286-1811

Email Address: jwaneka@myrgroup.com

Social Security or Employer Id. No. of Bidder: 84-0681206

SIGNATURE OF BIDDER:

If a Corporation:

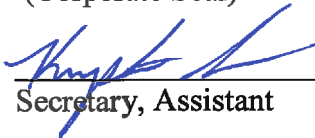
PRINT NAME OF CORPORATION:

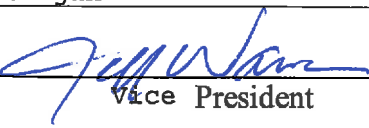
Sturgeon Electric Company, Inc.

Attest:

(Corporate Seal)

a Michigan Corporation


Secretary, Assistant

By: 
Vice President

If a Limited Liability Company:

PRINT NAME OF LIMITED LIABILITY COMPANY:

Organized in the State of _____

By: _____

[signature blocks for partnerships, limited partnerships and joint ventures are on following pages]

If a Partnership:

PRINT NAME OF PARTNERSHIP:

By: _____
General Partner

If an Individual:

_____, doing

business as

Signature:

(Signature blocks for joint ventures are on the next page)

If a Joint Venture, signature of all Joint Venture partners is required:

PRINT NAME OF JOINT VENTURE:

Joint Venture Partner -- Name of Firm:

Joint Venture Partner -- Name of Firm:

Corporation () or Partnership ()

Corporation () or Partnership ()

By: _____
Signature

By: _____
Signature

Title: _____

Title: _____

Required for a corporation:

Required for a corporation:

ATTEST:
(Corporate Seal)

ATTEST:
(Corporate Seal)

Secretary

Secretary

Joint Venture Partner -- Name of Firm:

Joint Venture Partner -- Name of Firm:

Corporation () or Partnership ()

Corporation () or Partnership ()

By: _____
Signature

By: _____
Signature

Title: _____

Title: _____

Required for a corporation:

Required for a corporation:

ATTEST:
(Corporate Seal)

ATTEST:
(Corporate Seal)

Secretary

Secretary

SCHEDULE OF PRICES AND QUANTITIES

**The Schedule of Prices and Quantities which apply to this contract are
contained in the pages immediately following this page.
These pages are not included in the page numbering of this contract document.**

DENVER INTERNATIONAL AIRPORT
 RUNWAY 8-26 COMPLEX LIGHTING REHABILITATION
 CONTRACT NO. 201313528

Part 2 - Schedule of Prices and Quantities

<u>Item No.</u>	<u>Description and Price</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Extension</u>
SCHEDULE A: REPLACE RUNWAY 8-26 LIGHTING, AND REPLACE PARALLEL TAXIWAY "R" AND CONNECTOR TAXIWAY CENTERLINE LIGHTING (FEDERAL)					
01505a	Mobilization at the lump sum of Ninety Six Thousand Two Hundred Four Dollars and _____ Sixty Four _____ cents. (\$ 96,204.64 _____) per lump sum.	1	LS	\$ 96,204.64	\$ 96,204.64
01575a	Cover Elevated Edge Lights at the unit price of _____ Twenty Eight _____ dollars and _____ Fifteen _____ cents. (\$ 28.15 _____) per each.	85	EA	\$ 28.15	\$ 2,392.75
01575b	Cover Panel on Guidance Sign at the unit price of _____ Ninety _____ dollars and _____ Fifteen _____ cents. (\$ 90.15 _____) per each.	3	EA	\$ 90.15	\$ 270.45
01575c	Install Shorting Plug on Secondary of Isolation Transformer at the unit price of _____ One Hundred Forty Two _____ dollars and _____ Forty Three _____ cents. (\$ 142.43 _____) per each.	27	EA	\$ 142.43	\$ 3,845.61
01575d	Install Tie Back at the unit price of _____ Nine Hundred Eighteen _____ dollars and _____ Eighty Seven _____ cents. (\$ 918.87 _____) per each.	3	EA	\$ 918.87	\$ 2,756.61
01575e	Install Temporary Jumper at the unit price of _____ Eight _____ dollars and _____ Sixty Eight _____ cents. (\$ 8.68 _____) per linear foot.	138	LF	\$ 8.68	\$ 1,197.84
01575f	Install Isolation Transformer, 65W, 6.6A/6.6A at the unit price of _____ Two Hundred Forty Nine _____ dollars and _____ Seventy Eight _____ cents. (\$ 249.78 _____) per each.	5	EA	\$ 249.78	\$ 1,248.90
01575g	Maintain Lighted X's at the lump sum of _____ Seventy Two Thousand Six Hundred Five _____ dollars and _____ Fifty Two _____ cents. (\$ 72,605.52 _____) per lump sum.	1	LS	\$ 72,605.52	\$ 72,605.52
01576a	Traffic Control at the lump sum of _____ Eighty Thousand Nine Hundred Ninety Four _____ dollars and _____ Sixty Two _____ cents. (\$ 80,994.62 _____) per lump sum.	1	LS	\$ 80,994.62	\$ 80,994.62
P-150a	Remove Taxiway Centerline Light and Foundation at the unit price of _____ Three Thousand Seven Hundred Fifty Six _____ dollars and _____ No _____ cents. (\$ 3,756.00 _____) per each.	2	EA	\$ 3,756.00	\$ 7,512.00
P-150d	Remove 17-inch Non-Reinforced Concrete Pavement at the unit price of _____ One Hundred Forty _____ dollars and _____ Forty _____ cents. (\$ 140.40 _____) per square yard.	131	SY	\$ 140.40	\$ 18,392.40
P-161a	Bondbreaker Fabric at the unit price of _____ Twenty One _____ dollars and _____ Sixty _____ cents. (\$ 21.60 _____) per square yard.	131	SY	\$ 21.60	\$ 2,829.60

P-401Ca	CDOT Bituminous Surface Course (3-Inch) at the unit price of Six Hundred Forty Seven _____ dollars and Ninety Six _____ cents. (\$ 647.96 _____) per each.	2	TN	\$ 647.96	\$ 1,295.92
P-401Cc	CDOT Bituminous Base Course (7-Inch) at the unit price of Four Hundred Eighty Five _____ dollars and Ninety Seven _____ cents. (\$ 485.97 _____) per linear foot.	5	TN	\$ 485.97	\$ 2,429.85
P-501a	17-Inch Portland Cement Concrete Pavement, Plain at the unit price of Four Hundred Twenty One _____ dollars and Seventeen _____ cents. (\$ 421.17 _____) per square yard.	131	SY	\$ 421.17	\$ 55,173.27
L-108a	Install Cable, 1/C #8, 19 Strand, 5000V, L-824, Type C at the unit price of One _____ dollars and Twenty One _____ cents. (\$ 1.21 _____) per linear foot.	465,750	LF	\$ 1.21	\$ 563,557.50
L-108b	Install Cable, 1/C #8, 600V, Green Insulated Ground at the unit price of One _____ dollars and Nine _____ cents. (\$ 1.09 _____) per linear foot.	13,476	LF	\$ 1.09	\$ 14,688.84
L-110a	Install 1-Way, 2-Inch PVC in CLSM at the unit price of Thirty Eight _____ dollars and Forty Two _____ cents. (\$ 38.42 _____) per linear foot.	499	LF	\$ 38.42	\$ 19,171.58
L-110b	Install 1-Way, 2-Inch PVC (CE), in Existing Pavement at the unit price of Four Hundred Ninety Two _____ dollars and Sixty _____ cents. (\$ 492.60 _____) per linear foot.	26	LF	\$ 492.60	\$ 12,807.60
L-110c	Install 2-Way, 4-Inch PVC (CE) at the unit price of Sixty Six _____ dollars and Fifty Four _____ cents. (\$ 66.54 _____) per linear foot.	840	LF	\$ 66.54	\$ 55,893.60
L-125a	Procure L-850A(L) Runway Centerline Light at the unit price of One Thousand Two Hundred Fifty Five _____ dollars and Sixteen _____ cents. (\$ 1,255.16 _____) per each.	238	EA	\$ 1,255.16	\$ 298,728.08
L-125b	Procure L-850B(L) Runway Touchdown Zone Light at the unit price of Nine Hundred Eighty Two _____ dollars and Ninety Eight _____ cents. (\$ 982.98 _____) per each.	180	EA	\$ 982.98	\$ 176,936.40
L-125c	Procure L-850C Runway Edge Light at the unit price of Six Hundred Seventy Four _____ dollars and Nine _____ cents. (\$ 674.09+B133 _____) per each.	19	EA	\$ 674.09	\$ 12,807.71
L-125d	Procure L-852C(L) Unidirectional Taxiway Centerline Light at the unit price of Five Hundred Seventy Two _____ dollars and Twelve _____ cents. (\$ 572.12 _____) per each.	34	EA	\$ 572.12	\$ 19,452.08
L-125e	Procure L-852C(L) Bidirectional Taxiway Centerline Light at the unit price of Six Hundred Sixty Six _____ dollars and Fourteen _____ cents. (\$ 666.14 _____) per each.	281	EA	\$ 666.14	\$ 187,185.34
L-125f	Procure L-852C(L) 2-Circuit, Bidirectional Taxiway Centerline Light at the unit price of One Thousand Twenty Eight _____ dollars and Fifty Seven _____ cents. (\$ 1,028.57 _____) per each.	8	EA	\$ 1,028.57	\$ 8,228.56

L-125g	Procure L-852D(L) Unidirectional Taxiway Centerline Light at the unit price of Six Hundred Sixty Four _____ dollars and Eighty _____ cents. (\$ 664.80 _____) per each.	136	EA	\$ 664.80	\$ 90,412.80
L-125i	Procure L-852K(L) Unidirectional Taxiway Centerline Light at the unit price of Seven Hundred Sixty Four _____ dollars and Eight _____ cents. (\$ 764.08 _____) per each.	54	EA	\$ 764.08	\$ 41,260.32
L-125j	Procure L-852K(L) Bidirectional Taxiway Centerline Light at the unit price of Nine Hundred Ninety Three _____ dollars and Forty Eight _____ cents. (\$ 993.48 _____) per each.	108	EA	\$ 993.48	\$ 107,295.84
L-125k	Procure L-852K(L) 2-Circuit, Bidirectional Taxiway Centerline Light at the unit price of One Thousand One Hundred Forty Four _____ dollars and Fifty _____ cents. (\$ 1,144.50 _____) per each.	20	EA	\$ 1,144.50	\$ 22,890.00
L-125m	Procure L-804(L) Elevated Runway Guard Light at the unit price of Four Thousand Two Hundred _____ dollars and Nine+B215ty _____ cents. (\$ 4,200.90 _____) per each.	18	EA	\$ 4,200.90	\$ 75,616.20
L-125o	Procure L-862 Runway Edge Light at the unit price of One Hundred Seventy Five _____ dollars and Twenty Six _____ cents. (\$ 175.26 _____) per each.	101	EA	\$ 175.26	\$ 17,701.26
L-125p	Procure L-862E Runway Threshold Light at the unit price of Two Hundred Ten _____ dollars and Seventy _____ cents. (\$ 210.70 _____) per each.	16	EA	\$ 210.70	\$ 3,371.20
L-125q	Procure L-862S Runway Stop Light at the unit price of Four Hundred Twenty Six _____ dollars and Fifty Nine _____ cents. (\$ 426.59 _____) per each.	18	EA	\$ 426.59	\$ 7,678.62
L-125s	Procure Isolation Transformer, 150W, 5.5A/6.2A at the unit price of One Hundred Nine _____ dollars and Twenty _____ cents. (\$ 109.25 _____) per each.	11	EA	\$ 109.25	\$ 1,201.75
L-125t	Procure Isolation Transformer, 200W, 5.5A/6.2A at the unit price of One Hundred Seventeen _____ dollars and Seventy Eight _____ cents. (\$ 117.78 _____) per each.	12	EA	\$ 117.78	\$ 1,413.36
L-125u	Procure Manhole 36 Stanchion at the unit price of " Seventy Three _____ dollars and Thirty Two _____ cents. (\$ 73.32 _____) per each.	50	EA	\$ 73.32	\$ 3,666.00
L-125v	Procure 8 Cable Rack Arm at the unit price of " Forty Four _____ dollars and Eighty _____ cents. (\$ 44.80 _____) per each.	75	EA	\$ 44.80	\$ 3,360.00
L-125w	Procure 11 Cable Rack Arm at the unit price of " Forty Six _____ dollars and Thirty Seven _____ cents. (\$ 46.37 _____) per each.	75	EA	\$ 46.37	\$ 3,477.75
L-125x	Procure 2 L-868B Base Can Extension at the unit price of " One Hundred Forty Two _____ dollars and Fifty Four _____ cents. (\$ 142.54 _____) per each.	10	EA	\$ 142.54	\$ 1,425.40

L-125y	Install L-850A(L) Runway Centerline Light at the unit price of _____ Five Hundred Thirty Five _____ dollars and _____ Fifty Two _____ cents. (\$ _____ 535.52 _____) per each.	10	EA	\$	535.52	\$	5,355.20
L-125z	Install L-850B(L) Runway Touchdown Zone Light at the unit price of _____ Four Hundred Eighty Eight _____ dollars and _____ Sixty Three _____ cents. (\$ _____ 488.63 _____) per each.	31	EA	\$	488.63	\$	15,147.53
L-125aa	Install L-850C Runway Edge Light at the unit price of _____ Five Hundred Twenty Eight _____ dollars and _____ Sixty Six _____ cents. (\$ _____ 528.66 _____) per each.	4	EA	\$	528.66	\$	2,114.64
L-125bb	Install L-852C(L) Unidirectional Taxiway Centerline Light at the unit price of _____ Four Hundred Eighty Eight _____ dollars and _____ Sixty Six _____ cents. (\$ _____ 488.66 _____) per each.	14	EA	\$	488.66	\$	6,841.24
L-125cc	Install L-852C(L) Bidirectional Taxiway Centerline Light at the unit price of _____ Five Hundred Forty Six _____ dollars and _____ Ninety Three _____ cents. (\$ _____ 546.93 _____) per each.	40	EA	\$	546.93	\$	21,877.20
L-125dd	Install L-852C(L) 2-Circuit, Bidirectional Taxiway Centerline Light at the unit price of _____ Six Hundred Fifty Nine _____ dollars and _____ Ninety Four _____ cents. (\$ _____ 659.94 _____) per each.	4	EA	\$	659.94	\$	2,639.76
L-125ee	Install L-852D(L) Unidirectional Taxiway Centerline Light at the unit price of _____ Five Hundred Thirty Five _____ dollars and _____ Fifty One _____ cents. (\$ _____ 535.51 _____) per each.	13	EA	\$	535.51	\$	6,961.63
L-125gg	Install L-852K(L) Unidirectional Taxiway Centerline Light at the unit price of _____ Five Hundred Forty Six _____ dollars and _____ Ninety Three _____ cents. (\$ _____ 546.93 _____) per each.	28	EA	\$	546.93	\$	15,314.04
L-125hh	Install L-852K(L) Bidirectional Taxiway Centerline Light at the unit price of _____ Five Hundred _____ dollars and _____ Five _____ cents. (\$ _____ 500.05 _____) per each.	42	EA	\$	500.05	\$	21,002.10
L-125ii	Install L-852K(L) 2-Circuit, Bidirectional Taxiway Centerline Light at the unit price of _____ Seven Hundred Six _____ dollars and _____ Seventy Six _____ cents. (\$ _____ 706.76 _____) per each.	3	EA	\$	706.76	\$	2,120.28
L-125kk	Install L-850A(L) Runway Centerline Light and Spacer Rings at the unit price of _____ Nine Hundred Fifty Eight _____ dollars and _____ Ninety Eight _____ cents. (\$ _____ 958.98 _____) per each.	228	EA	\$	958.98	\$	218,647.44
L-125ll	Install L-850B(L) Runway Touchdown Zone Light and Spacer Rings at the unit price of _____ Nine Hundred Fifty Eight _____ dollars and _____ Ninety Nine _____ cents. (\$ _____ 958.99 _____) per each.	149	EA	\$	958.99	\$	142,889.51
L-125mm	Install L-850C Runway Edge Light and Spacer Rings at the unit price of _____ Nine Hundred Ninety Eight _____ dollars and _____ Ninety Nine _____ cents. (\$ _____ 998.99 _____) per each.	2	EA	\$	998.99	\$	1,997.98
L-125nn	Install L-852C(L) Unidirectional Taxiway Centerline Light and Spacer Rings at the unit price of _____ Nine Hundred Fifty Eight _____ dollars and _____ Ninety Eight _____ cents. (\$ _____ 958.98 _____) per each.	20	EA	\$	958.98	\$	19,179.60

L-125-oo	Install L-852C(L) Bidirectional Taxiway Centerline Light and Spacer Rings at the unit price of ____ Nine Hundred Seventy _____ dollars and ____ Fourty _____ cents. (\$ ____ 970.40 _____) per each.	235	EA	\$	<u>970.40</u>	\$	<u>228,044.00</u>
L-125pp	Install L-852C(L) 2-Circuit, Bidirectional Taxiway Centerline Light and Spacer Rings at the unit price of ____ One Thousand One Hundred Thirty _____ dollars and ____ Twenty Nine _____ cents. (\$ ____ 1,130.29 _____) per each.	4	EA	\$	<u>1,130.29</u>	\$	<u>4,521.16</u>
L-125qq	Install L-852D(L) Unidirectional Taxiway Centerline Light and Spacer Rings at the unit price of ____ Nine Hundred Fifty Eight _____ dollars and ____ Ninety Eight _____ cents. (\$ ____ 958.98 _____) per each.	123	EA	\$	<u>958.98</u>	\$	<u>117,954.54</u>
L-125ss	Install L-852K(L) Unidirectional Taxiway Centerline Light and Spacer Rings at the unit price of ____ Nine Hundred Seventy _____ dollars and ____ Thirty Nine _____ cents. (\$ ____ 970.39 _____) per each.	26	EA	\$	<u>970.39</u>	\$	<u>25,230.14</u>
L-125tt	Install L-852K(L) Bidirectional Taxiway Centerline Light and Spacer Rings at the unit price of ____ Nine Hundred Seventy _____ dollars and ____ Fo+B535rty _____ cents. (\$ ____ 970.40 _____) per each.	66	EA	\$	<u>970.40</u>	\$	<u>64,046.40</u>
L-125uu	Install L-852K(L) 2-Circuit, Bidirectional Taxiway Centerline Light and Spacer Rings at the unit price of ____ One Thousand One Hundred Thirty _____ dollars and ____ Thirty Three _____ cents. (\$ ____ 1,130.33 _____) per each.	17	EA	\$	<u>1,130.33</u>	\$	<u>19,215.61</u>
L-125ww	Install L-850C Runway Edge Light and Adapter Plate at the unit price of ____ One Thousand Sixty One _____ dollars and ____ Ninety Seven _____ cents. (\$ ____ 1,061.97 _____) per each.	13	EA	\$	<u>1,061.97</u>	\$	<u>13,805.61</u>
L-125xx	Install L-852C(L) Bidirectional Taxiway Centerline Light on a New Foundation at the unit price of ____ One Thousand Nine Hundred Thirty Nine _____ dollars and ____ Seventy Four _____ cents. (\$ ____ 1,939.74 _____) per each.	5	EA	\$	<u>1,939.74</u>	\$	<u>9,698.70</u>
L-125zz	Install L-804(L) Elevated Runway Guard Light at the unit price of ____ Six Hundred Ninety Seven _____ dollars and ____ Seventy Seven _____ cents. (\$ ____ 697.77 _____) per each.	18	EA	\$	<u>697.77</u>	\$	<u>12,559.86</u>
L-125bbb	Install L-862 Runway Edge Light at the unit price of ____ Six Hundred Six _____ dollars and ____ Thirty Four _____ cents. (\$ ____ 606.34 _____) per each.	101	EA	\$	<u>606.34</u>	\$	<u>61,240.34</u>
L-125ccc	Install L-862E Runway Threshold Light at the unit price of ____ Six Hundred Eighteen _____ dollars and ____ Six _____ cents. (\$ ____ 618.06 _____) per each.	16	EA	\$	<u>618.06</u>	\$	<u>9,888.96</u>
L-125ddd	Install L-862S Runway Stop Light at the unit price of ____ Five Hundred Fifty Four _____ dollars and ____ Seven _____ cents. (\$ ____ 554.07 _____) per each.	18	EA	\$	<u>554.07</u>	\$	<u>9,973.26</u>
L-125fff	Install Isolation Transformer, 150W, 5.5A/6.2A at the unit price of ____ One Hundred Fifty Four _____ dollars and ____ Twenty Five _____ cents. (\$ ____ 154.25 _____) per each.	11	EA	\$	<u>154.25</u>	\$	<u>1,696.75</u>
L-125ggg	Install Isolation Transformer, 200W, 5.5A/6.2A at the unit price of ____ Two Hundred Four _____ dollars and ____ Forty Eight _____ cents. (\$ ____ 204.48 _____) per each.	12	EA	\$	<u>204.48</u>	\$	<u>2,453.76</u>

L-125hhh	Install Manhole 36" Stanchion at the unit price of <u>One Hundred One</u> dollars and <u>Fifty One</u> cents. (\$ <u>101.51</u>) per each.	50	EA	\$ <u>101.51</u>	\$ <u>5,075.50</u>
L-125iii	Install 8" Cable Rack Arm at the unit price of <u>Seventeen</u> dollars and <u>Eighty Five</u> cents. (\$ <u>17.85</u>) per each.	75	EA	\$ <u>17.85</u>	\$ <u>1,338.75</u>
L-125jjj	Install 11" Cable Rack Arm at the unit price of <u>Seventeen</u> dollars and <u>Eighty Five</u> cents. (\$ <u>17.85</u>) per each.	75	EA	\$ <u>17.85</u>	\$ <u>1,338.75</u>
L-125kkk	Install 2" L-868B Base Can Extension at the unit price of <u>Three Hundred Forty Eight</u> dollars and <u>Seventy</u> cents. (\$ <u>348.70</u>) per each.	10	EA	\$ <u>348.70</u>	\$ <u>3,487.00</u>
L-125lll	Install Fixture ID Marker at the unit price of <u>Fifty Seven</u> dollars and <u>Seventy Two</u> cents. (\$ <u>57.72</u>) per each.	132	EA	\$ <u>57.72</u>	\$ <u>7,619.04</u>
L-125mmm	Remove Fixture, Epoxy, and Spacer Rings and Install Spacer Rings, Coverplate, and Epoxy at the unit price of <u>Six Hundred Twenty</u> dollars and <u>Eleven</u> cents. (\$ <u>620.11</u>) per each.	132	EA	\$ <u>620.11</u>	\$ <u>81,854.52</u>
L-125nnn	Remove Fixture and Install Coverplate at the unit price of <u>One Hundred Ninety Four</u> dollars and <u>Forty Six</u> cents. (\$ <u>194.46</u>) per each.	90	EA	\$ <u>194.46</u>	\$ <u>17,501.40</u>
L-125ooo	Remove and Install Fixture ID Marker at the unit price of <u>Fifty Seven</u> dollars and <u>Seventy Three</u> cents. (\$ <u>57.73</u>) per each.	86	EA	\$ <u>57.73</u>	\$ <u>4,964.78</u>
L-125ppp	Remove L-852GS 2-Circuit, Runway Stop Bar/Guard Light at the unit price of <u>Seventy</u> dollars and <u>Twenty Nine</u> cents. (\$ <u>70.29</u>) per each.	114	EA	\$ <u>70.29</u>	\$ <u>8,013.06</u>
L-125qqq	Reinstall L-852GS 2-Circuit, Runway Stop Bar/Guard Light at the unit price of <u>Three Hundred Eighty Four</u> dollars and <u>Seventeen</u> cents. (\$ <u>384.17</u>) per each.	32	EA	\$ <u>384.17</u>	\$ <u>12,293.44</u>
L-125rrr	Reinstall L-852GS 2-Circuit, Runway Stop Bar/Guard Light and Spacer Rings at the unit price of <u>One Thousand Seven</u> dollars and <u>Eight Two</u> cents. (\$ <u>007.82</u>) per each.	82	EA	\$ <u>1,007.82</u>	\$ <u>82,641.24</u>
L-125sss	Drill Out Existing Bolt and Rethread Existing Bolt Hole at the unit price of <u>One Hundred Eighty</u> dollars and <u>Fifty Three</u> cents. (\$ <u>180.53</u>) per each.	260	EA	\$ <u>180.53</u>	\$ <u>46,937.80</u>
L-125ttt	CSS Rack Modifications at the unit price of <u>Three Thousand Nine Hundred Forty Five</u> dollars and <u>Fifty Seven</u> cents. (\$ <u>3,945.57</u>) per each.	2	EA	\$ <u>3,945.57</u>	\$ <u>7,891.14</u>
L-125uuu	Modify Unidirectional Light Fixture Base Cans with Toe-in at the unit price of <u>Ninety Nine</u> dollars and <u>Thirty Three</u> cents. (\$ <u>99.33</u>) per each.	225	EA	\$ <u>99.33</u>	\$ <u>22,349.25</u>

L-127a	Remove and Install Externally Lighted L-806(L) Supplemental Wind Cone at the unit price of 2 Five Thousand Two Hundred Fifty Six _____ dollars and Six _____ cents. (\$ 5,256.06 _____) per each.	2	EA	\$ 5,256.06	\$ 10,512.12
L-140a	Photometric Testing for Runway 8-26 Complex Light Fixtures at the lump sum of 1 Ten Thousand Three Hundred Eighty Eight _____ dollars and Thirteen _____ cents. (\$ 10,388.13 _____) per lump sum.	1	LS	\$ 10,388.13	\$ 10,388.13
13410Aa	ALCMS Modifications, Testing, and Calibration Services for Runway 8-26 Complex at the lump sum of 1 Thirty-one thousand, two hundred sixty-five _____ dollars and seventy-eight _____ cents. (\$ 31,265.78 _____) per lump sum.	1	LS	\$ 31,265.78	\$ 31,265.78
13410Ad	Procure Brite III Remote Unit, One Channel at the unit price of 18 Five hundred eighty _____ dollars and eighty-six _____ cents. (\$ 580.86 _____) per each.	18	EA	\$ 580.86	\$ 10,455.48
13410Ae	Procure Brite III Remote Unit, Dual Channel at the unit price of 114 Seven hundred seventy-eight _____ dollars and sixty-three _____ cents. (\$ 778.63 _____) per each.	114	EA	\$ 778.63	\$ 88,763.82
13410Af	Procure Sensors and ALCMS Modifications for Monitoring the Remote/Off/Local Switches for Three Remote I/O Racks Along Runway 8-26 Six thousand, six hundred seventy-five _____ dollars and fifty-five _____ cents. (\$ 6,675.55 _____) per lump sum.	1	LS	\$ 6,675.55	\$ 6,675.55
13410Ca	Construction for Runway 8-26 ALCMS Modifications at the lump sum of 1 Two Thousand Seven _____ dollars and Eighty Six _____ cents. (\$ 2,007.86 _____) per lump sum.	1	LS	\$ 2,007.86	\$ 2,007.86

Schedule A Total: **\$ 3,625,169.42**

SCHEDULE B: REPLACE TAXIWAY "R" AND CONNECTOR TAXIWAY EDGE LIGHTING (FEDERAL)

01505a	Mobilization at the lump sum of 1 Ten Thousand Five Hundred Ninety _____ dollars and Sixty Six _____ cents. (\$ 10,590.66 _____) per lump sum.	1	LS	\$ 10,590.66	\$ 10,590.66
P-150b	Remove Taxiway Edge Light and Install Blank Coverplate at the unit price of 10 One Hundred Ninety Six _____ dollars and Sixty Four _____ cents. (\$ 196.64 _____) per each.	10	EA	\$ 196.64	\$ 1,966.40
P-401Ca	CDOT Bituminous Surface Course (3-Inch) at the unit price of 2 Seven Hundred Forty Five _____ dollars and Fifteen _____ cents. (\$ 745.15 _____) per each.	2	TN	\$ 745.15	\$ 1,490.30
P-401Cc	CDOT Bituminous Base Course (7-Inch) at the unit price of 5 Five Hundred Thirty Nine _____ dollars and Ninety Six _____ cents. (\$ 539.96 _____) per each.	5	TN	\$ 539.96	\$ 2,699.80
L-108a	Install Cable, 1/C #8, 19 Strand, 5000V, L-824, Type C at the unit price of 161,000 One _____ dollars and Twenty One _____ cents. (\$ 1.21 _____) per linear foot.	161,000	LF	\$ 1.21	\$ 194,810.00

L-110a	Install 1-Way, 2-Inch PVC in CLSM at the unit price of ____ Thirty Eight _____ dollars and ____ Forty Eight _____ cents. (\$ ____ 38.48 _____) per linear foot.	763	LF	\$	<u>38.48</u>	\$	<u>29,360.24</u>
L-110b	Install 1-Way, 2-Inch PVC (CE), in Existing Pavement at the unit price of ____ Four Hundred Eighty Two _____ dollars and ____ Ninety One _____ cents. (\$ ____ 482.91 _____) per linear foot.	65	LF	\$	<u>482.91</u>	\$	<u>31,389.15</u>
L-125n	Procure L-861T Taxiway Edge Light at the unit price of ____ One Hundred Sixteen _____ dollars and ____ Fifty Four _____ cents. (\$ ____ 116.54 _____) per each.	465	EA	\$	<u>116.54</u>	\$	<u>54,191.10</u>
L-125r	Procure Isolation Transformer, 100W, 5.5A/6.2A at the unit price of ____ One Hundred Nine _____ dollars and ____ Ten _____ cents. (\$ ____ 109.10 _____) per each.	4	EA	\$	<u>109.10</u>	\$	<u>436.40</u>
L-125s	Procure Isolation Transformer, 150W, 5.5A/6.2A at the unit price of ____ One Hundred Nine _____ dollars and ____ Twenty Five _____ cents. (\$ ____ 109.25 _____) per each.	20	EA	\$	<u>109.25</u>	\$	<u>2,185.00</u>
L-125t	Procure Isolation Transformer, 200W, 5.5A/6.2A at the unit price of ____ One Hundred Seventeen _____ dollars and ____ Seventy Seven _____ cents. (\$ ____ 117.77 _____) per each.	8	EA	\$	<u>117.77</u>	\$	<u>942.16</u>
L-125aaa	Install L-861T Taxiway Edge Light at the unit price of ____ Five Hundred Eighty Three _____ dollars and ____ Forty Five _____ cents. (\$ ____ 583.45 _____) per each.	465	EA	\$	<u>583.45</u>	\$	<u>271,304.25</u>
L-125eee	Install Isolation Transformer, 100W, 5.5A/6.2A at the unit price of ____ One Hundred Fifty Four _____ dollars and ____ Thirty Three _____ cents. (\$ ____ 154.33 _____) per each.	4	EA	\$	<u>154.33</u>	\$	<u>617.32</u>
L-125fff	Install Isolation Transformer, 150W, 5.5A/6.2A at the unit price of ____ One Hundred Fifty Four _____ dollars and ____ Twenty Seven _____ cents. (\$ ____ 154.27 _____) per each.	20	EA	\$	<u>154.27</u>	\$	<u>3,085.40</u>
L-125ggg	Install Isolation Transformer, 200W, 5.5A/6.2A at the unit price of ____ Two Hundred Four _____ dollars and ____ Forty Four _____ cents. (\$ ____ 204.44 _____) per each.	8	EA	\$	<u>204.44</u>	\$	<u>1,635.52</u>

Schedule B Total: \$ 606,703.70

SCHEDULE C: REPLACE TAXIWAYS "EE", "M", AND "L" CENTERLINE AND EDGE LIGHTING (FEDERAL)

01505a	Mobilization at the lump sum of ____ Four Thousand Two Hundred Fifty Four _____ dollars and ____ Thirty Three _____ cents. (\$ ____ 4,254.33 _____) per lump sum.	1	LS	\$	<u>4,254.33</u>	\$	<u>4,254.33</u>
L-108a	Install Cable, 1/C #8, 19 Strand, 5000V, L-824, Type C at the unit price of ____ One _____ dollars and ____ Nineteen _____ cents. (\$ ____ 1.19 _____) per linear foot.	86,250	LF	\$	<u>1.19</u>	\$	<u>102,637.50</u>
L-110a	Install 1-Way, 2-Inch PVC in CLSM at the unit price of ____ Thirty Six _____ dollars and ____ Fifty Nine _____ cents. (\$ ____ 36.59 _____) per linear foot.	48	LF	\$	<u>36.59</u>	\$	<u>1,756.32</u>

L-125d	Procure L-852C(L) Unidirectional Taxiway Centerline Light at the unit price of <u>Five Hundred Seventy Two</u> dollars and <u>Twelve</u> cents. (\$ <u>572.12</u>) per each.	79	EA	\$ <u>572.12</u>	\$ <u>45,197.48</u>
L-125e	Procure L-852C(L) Bidirectional Taxiway Centerline Light at the unit price of <u>Six Hundred Sixty Six</u> dollars and <u>Fourteen</u> cents. (\$ <u>666.14</u>) per each.	15	EA	\$ <u>666.14</u>	\$ <u>9,992.10</u>
L-125h	Procure L-852D(L) Bidirectional Taxiway Centerline Light at the unit price of <u>One Thousand Forty Four</u> dollars and <u>Three</u> cents. (\$ <u>1,044.03</u>) per each.	5	EA	\$ <u>1,044.03</u>	\$ <u>5,220.15</u>
L-125j	Procure L-852K(L) Bidirectional Taxiway Centerline Light at the unit price of <u>Nine Hundred Ninety Three</u> dollars and <u>Forty Seven</u> cents. (\$ <u>993.47</u>) per each.	150	EA	\$ <u>993.47</u>	\$ <u>149,020.50</u>
L-125n	Procure L-861T Taxiway Edge Light at the unit price of <u>One Hundred Sixteen</u> dollars and <u>Fifty Four</u> cents. (\$ <u>116.54</u>) per each.	147	EA	\$ <u>116.54</u>	\$ <u>17,131.38</u>
L-125s	Procure Isolation Transformer, 150W, 5.5A/6.2A at the unit price of <u>One Hundred Nine</u> dollars and <u>Twenty Five</u> cents. (\$ <u>109.25</u>) per each.	2	EA	\$ <u>109.25</u>	\$ <u>218.50</u>
L-125t	Procure Isolation Transformer, 200W, 5.5A/6.2A at the unit price of <u>One Hundred Seventeen</u> dollars and <u>Seventy Seven</u> cents. (\$ <u>117.77</u>) per each.	15	EA	\$ <u>117.77</u>	\$ <u>1,766.55</u>
L-125cc	Install L-852C(L) Bidirectional Taxiway Centerline Light at the unit price of <u>Five Hundred Forty Six</u> dollars and <u>Ninety Three</u> cents. (\$ <u>546.93</u>) per each.	15	EA	\$ <u>546.93</u>	\$ <u>8,203.95</u>
L-125ff	Install L-852D(L) Bidirectional Taxiway Centerline Light at the unit price of <u>Four Hundred Forty Four</u> dollars and <u>Twenty Seven</u> cents. (\$ <u>444.27</u>) per each.	2	EA	\$ <u>444.27</u>	\$ <u>888.54</u>
L-125hh	Install L-852K(L) Bidirectional Taxiway Centerline Light at the unit price of <u>Five Hundred</u> dollars and <u>Six</u> cents. (\$ <u>500.06</u>) per each.	19	EA	\$ <u>500.06</u>	\$ <u>9,501.14</u>
L-125nn	Install L-852C(L) Unidirectional Taxiway Centerline Light and Spacer Rings at the unit price of <u>Nine Hundred Fifty Eight</u> dollars and <u>Ninety Eight</u> cents. (\$ <u>958.98</u>) per each.	79	EA	\$ <u>958.98</u>	\$ <u>75,759.42</u>
L-125rr	Install L-852D(L) Bidirectional Taxiway Centerline Light and Spacer Rings at the unit price of <u>Eight Hundred Sixty Seven</u> dollars and <u>Sixty Two</u> cents. (\$ <u>867.62</u>) per each.	3	EA	\$ <u>867.62</u>	\$ <u>2,602.86</u>
L-125tt	Install L-852K(L) Bidirectional Taxiway Centerline Light and Spacer Rings at the unit price of <u>Nine Hundred Seventy</u> dollars and <u>Thirty Nine</u> cents. (\$ <u>970.39</u>) per each.	131	EA	\$ <u>970.39</u>	\$ <u>127,121.09</u>
L-125aaa	Install L-861T Taxiway Edge Light at the unit price of <u>Five Hundred Eighty Three</u> dollars and <u>Forty Five</u> cents. (\$ <u>583.45</u>) per each.	147	EA	\$ <u>583.45</u>	\$ <u>85,767.15</u>

L-125fff	Install Isolation Transformer, 150W, 5.5A/6.2A at the unit price of 2 _____ One Hundred Fifty Four _____ dollars and _____ Thirty Three _____ cents. (\$ _____ 154.33 _____) per each.	2	EA	\$ 154.33	\$ 308.66
L-125ggg	Install Isolation Transformer, 200W, 5.5A/6.2A at the unit price of _____ Two Hundred Four _____ dollars and _____ Forty Six _____ cents. (\$ _____ 204.46 _____) per each.	15	EA	\$ 204.46	\$ 3,066.90
L-125mmm	Removed Fixture, Epoxy, and Spacer Rings and Install Spacer Rings, Coverplate, and Epoxy at the unit price of _____ Six Hundred Twenty _____ dollars and _____ Ten _____ cents. (\$ _____ 620.10 _____) per each.	120	EA	\$ 620.10	\$ 74,412.00
L-125nnn	Remove Fixture and Install Coverplate at the unit price of 24 _____ One Hundred Ninety Six _____ dollars and _____ Sixty Four _____ cents. (\$ _____ 196.64 _____) per each.	24	EA	\$ 196.64	\$ 4,719.36
L-125ooo	Remove and Install Fixture ID Marker at the unit price of 61 _____ Fifty Seven _____ dollars and _____ Seventy Two _____ cents. (\$ _____ 57.72 _____) per each.	61	EA	\$ 57.72	\$ 3,520.92
L-125sss	Drill Out Existing Bolt and Rethread Existing Bolt Hole at the unit price of 90 _____ One Hundred Eighty _____ dollars and _____ Fifty Three _____ cents. (\$ _____ 180.53 _____) per each.	90	EA	\$ 180.53	\$ 16,247.70
L-140b	Photometric Testing for Taxiway "EE", "M" and "L" Light Fixtures at the lump sum of 1 _____ Ten Thousand Three Hundred Eighty Eight _____ dollars and _____ Twelve _____ cents. (\$ _____ 10,388.12 _____) per lump sum.	1	LS	\$ 10,388.12	\$ 10,388.12
13410Ab	ALCMS Modifications, Testing, and Calibration Services for Taxiways EE, M, and L at the lump sum of Thirteen thousand, eight hundred ninety-five _____ dollars and _____ ninety _____ cents. (\$ _____ 13,895.90 _____) per lump sum.	1	LS	\$ 13,895.90	\$ 13,895.90

Schedule C Total: \$ 773,598.52

SCHEDULE D: REPLACE TAXIWAY "Z" CENTERLINE AND EDGE LIGHTING (FEDERAL)

01505a	Mobilization at the lump sum of 1 _____ Five Thousand Six Hundred Sixty Nine _____ dollars and _____ Sixty Six _____ cents. (\$ _____ 5,669.66 _____) per lump sum.	1	LS	\$ 5,669.66	\$ 5,669.66
L-108a	Install Cable, 1/C #8, 19 Strand, 5000V, L-824, Type C at the unit price of 109,250 _____ One _____ dollars and _____ Nineteen _____ cents. (\$ _____ 1.19 _____) per linear foot.	109250	LF	\$ 1.19	\$ 130,007.50
L-125e	Procure L-852C(L) Bidirectional Taxiway Centerline Light at the unit price of 138 _____ Six Hundred Sixty Six _____ dollars and _____ Fourteen _____ cents. (\$ _____ 666.14 _____) per each.	138	EA	\$ 666.14	\$ 91,927.32
L-125j	Procure L-852K(L) Bidirectional Taxiway Centerline Light at the unit price of _____ Nine Hundred Ninety Three _____ dollars and _____ Forty Seven _____ cents. (\$ _____ 993.47 _____) per each.	80	EA	\$ 993.47	\$ 79,477.60

L-125n	Procure L-861T Taxiway Edge Light at the unit price of <u>One Hundred Sixteen</u> dollars and <u>Fifty Four</u> cents. (\$ <u>116.54</u>) per each.	155	EA	<u>\$ 116.54</u>	<u>\$ 18,063.70</u>
L-125s	Procure Isolation Transformer, 150W, 5.5A/6.2A at the unit price of <u>One Hundred Nine</u> dollars and <u>Twenty Three</u> cents. (\$ <u>109.23</u>) per each.	1	EA	<u>\$ 109.23</u>	<u>\$ 109.23</u>
L-125t	Procure Isolation Transformer, 200W, 5.5A/6.2A at the unit price of <u>One Hundred Seventeen</u> dollars and <u>Seventy Seven</u> cents. (\$ <u>117.77</u>) per each.	2	EA	<u>\$ 117.77</u>	<u>\$ 235.54</u>
L-125oo	Install L-852C Bidirectional Taxiway Centerline Light and Spacer Rings at the unit price of <u>Nine Hundred Seventy</u> dollars and <u>Thirty Nine</u> cents. (\$ <u>970.39</u>) per each.	138	EA	<u>\$ 970.39</u>	<u>\$ 133,913.82</u>
L-125tt	Install L-852K Bidirectional Taxiway Centerline Light and Spacer Rings at the unit price of <u>Nine Hundred Seventy</u> dollars and <u>Thirty Nine</u> cents. (\$ <u>970.39</u>) per each.	80	EA	<u>\$ 970.39</u>	<u>\$ 77,631.20</u>
L-125aaa	Install L-861T Taxiway Edge Light at the unit price of <u>Five Hundred Eighty Three</u> dollars and <u>Fourty Five</u> cents. (\$ <u>583.45</u>) per each.	155	EA	<u>\$ 583.45</u>	<u>\$ 90,434.75</u>
L-125fff	Install Isolation Transformer, 150W, 5.5A/6.2A at the unit price of <u>One Hundred Fifty Four</u> dollars and <u>None</u> cents. (\$ <u>154.00</u>) per each.	1	EA	<u>\$ 154.00</u>	<u>\$ 154.00</u>
L-125ggg	Install Isolation Transformer, 200W, 5.5A/6.2A at the unit price of <u>Two Hundred Four</u> dollars and <u>Fifty Three</u> cents. (\$ <u>204.53</u>) per each.	2	EA	<u>\$ 204.53</u>	<u>\$ 409.06</u>
L-125mmm	Remove Fixture, Epoxy, and Spacer Rings and Install Spacer Rings, Coverplate, and Epoxy at the unit price of <u>Six Hundred Twenty</u> dollars and <u>Ten</u> cents. (\$ <u>620.10</u>) per each.	80	EA	<u>\$ 620.10</u>	<u>\$ 49,608.00</u>
L-125sss	Drill Out Existing Bolt and Rethread Existing Bolt Hole at the unit price of <u>One Hundred Eighty</u> dollars and <u>Fifty Three</u> cents. (\$ <u>180.53</u>) per each.	75	EA	<u>\$ 180.53</u>	<u>\$ 13,539.75</u>
L-140c	Photometric Testing for Taxiway "Z" Light Fixtures at the lump sum of <u>Ten Thousand Three Hundred Eighty Eight</u> dollars and <u>Twelve</u> cents. (\$ <u>10,388.12</u>) per lump sum.	1	LS	<u>\$ 10,388.12</u>	<u>\$ 10,388.12</u>

Schedule D Total: \$ 701,569.25

SCHEDULE E: REPLACE HOMERUN CABLE (FEDERAL)

L-108a	Install Cable, 1/C #8, 19 Strand, 5000V, L-824, Type C at the unit price of One _____ doll: and <u>Twenty</u> _____ cents. (\$ <u>1.20</u> _____) per linear foot.	402,500	LF	\$ <u>1.20</u> \$ <u>483,000.00</u>
L-108b	Install Cable, 1/C #8, 600V, Green Insulated Ground at the unit price of One _____ dollars and <u>Nine</u> _____ cents. (\$ <u>1.09</u> _____) per linear foot.	8,989	LF	\$ <u>1.09</u> \$ <u>9,798.01</u>

Schedule E Total: \$ 492,798.01

SCHEDULE F: EAST AIRFIELD LIGHTING VAULT MODIFICATIONS (FEDERAL)

01505a	Mobilization at the lump sum of <u>Six Thousand Four Hundred Twenty One</u> _____ dollars and <u>Forty Two</u> _____ cents. (\$ <u>6,421.42</u> _____) per lump sum.	1	LS	\$ <u>6,421.42</u> \$ <u>6,421.42</u>
L-122Ca	Install L-829 Constant Current Regulator with Integral Control, 10kW, 3-Step, 480V Input at the unit price of <u>Three Thousand Two Hundred Nine</u> _____ dollars and <u>Sixty Eight</u> _____ cents. (\$ <u>3,209.68</u> _____) per each.	2	EA	\$ <u>3,209.68</u> \$ <u>6,419.36</u>
L-122Cb	Install L-829 Constant Current Regulator with Integral Control, 20kW, 5-Step, 480V Input at the unit price of <u>Three Thousand Four Hundred Three</u> _____ dollars and <u>Twenty Two</u> _____ cents. (\$ <u>3,403.22</u> _____) per each.	3	EA	\$ <u>3,403.22</u> \$ <u>10,209.66</u>
L-122Cc	Install L-829 Constant Current Regulator with Integral Control, 30kW, 5-Step, 480V Input at the unit price of <u>Three Thousand Seven Hundred Twenty Two</u> _____ dollars and <u>Seventy Five</u> _____ cents. (\$ <u>3,722.75</u> _____) per each.	1	EA	\$ <u>3,722.75</u> \$ <u>3,722.75</u>
L-122Cd	Install L-829 Constant Current Regulator with Integral Control, 20kW, 3-Step, 480V Input at the unit price of <u>Three Thousand Three Hundred Seventy Two</u> _____ dollars and <u>Thirty Five</u> _____ cents. (\$ <u>3,372.35</u> _____) per each.	5	EA	\$ <u>3,372.35</u> \$ <u>16,861.75</u>
L-122Ce	Install L-829 Constant Current Regulator with Integral Control, 30kW, 3-Step, 480V Input at the unit price of <u>Three Thousand Six Hundred Eighty</u> _____ dollars and <u>One</u> _____ cents. (\$ <u>3,680.01</u> _____) per each.	6	EA	\$ <u>3,680.01</u> \$ <u>22,080.06</u>
L-122Cf	Install 30A, 3-Phase Bus Plug Circuit Breaker at the unit price of <u>Four Thousand Three Hundred Sixty One</u> _____ dollars and <u>Six</u> _____ cents. (\$ <u>4,361.06</u> _____) per each.	2	EA	\$ <u>4,361.06</u> \$ <u>8,722.12</u>
L-122Cg	Install 60A, 3-Phase Bus Plug Circuit Breaker at the unit price of <u>Four Thousand Three Hundred Sixty Seven</u> _____ dollars and <u>Ninety Two</u> _____ cents. (\$ <u>4,367.92</u> _____) per each.	8	EA	\$ <u>4,367.92</u> \$ <u>34,943.36</u>
L-122Ch	Install 90A, 3-Phase Bus Plug Circuit Breaker at the unit price of <u>Five Thousand Seventy Eight</u> _____ dollars and <u>Thirty Two</u> _____ cents. (\$ <u>5,078.32</u> _____) per each.	7	EA	\$ <u>5,078.32</u> \$ <u>35,548.24</u>

L-122Ci	Vault Modifications at the unit price of 2 ___Ten Thousand One Hundred Twelve_____dollars and___Twenty Eight_____cents. (\$___10,112.28_____) per each.	2	EA	<u>\$ 10,112.28</u>	<u>\$ 20,224.56</u>
13410Ac	ALCMS Modifications, Testing, and Calibration Services for East Vault at the lump sum of 1 Twenty-four thousand, three hundred seventeen _____dollars and___eighty-three_____cents. (\$___24,317.83_____) per lump sum.	1	LS	<u>\$ 24,317.83</u>	<u>\$ 24,317.83</u>
13410Cb	Construction for the Vault ALCMS Modifications at the lump sum of 1 ___Two Thousand Four Hundred Eighty Three_____dollars and___Six_____cents. (\$___2,483.06_____) per lump sum.	1	LS	<u>\$ 2,483.06</u>	<u>\$ 2,483.06</u>

Schedule F Total: \$ 191,954.17

SCHEDULE G: PROCURE CONSTANT CURRENT REGULATORS (NON-FEDERAL)

L-1222Aa	Procure L-829 Constant Current Regulator with Integral Control, 10kW, 3-step, 480V Input at the Unit price of Ten thousand, four hundred forty-six_____dollars and___ninety-seven_____cents. (\$___10,446.97_____) per each.	3	EA	<u>\$ 10,446.97</u>	<u>\$ 31,340.91</u>
L-122Ab	Procure L-829 Constant Current Regulator with Integral Control, 20kW, 3-Step, 480V Input at the unit price of Thirteen thousand, seven hundred eighty-three_____dollars and___ninety-eight_____cents. (\$___13,783.98_____) per each.	6	EA	<u>\$ 13,783.98</u>	<u>\$ 82,703.88</u>
L-122Ac	Procure L-829 Constant Current Regulator with Integral Control, 30kW, 3-Step, 480V Input at the unit price of Fifteen thousand, three hundred eighteen_____dollars and___sixty-three_____cents. (\$___15,318.63_____) per each. Procure L-829 Constant Current Regulator with Integral Control, 20kW, 5-Step, 480V Input at the unit price	7	EA	<u>\$ 15,318.63</u>	<u>\$ 107,230.41</u>
L-122Ad	Procure L-829 Constant Current Regulator with Integral Control, 20kW, 5-Step, 480V Input at the unit price of Thirteen thousand, eight hundred thirty-three_____dollars and___forty-four_____cents. (\$___13,833.44_____) per each.	3	EA	<u>\$ 13,833.44</u>	<u>\$ 41,500.32</u>
L-122Ae	Procure L-829 Constant Current Regulator with Integral Control, 30kW, 5-Step, 480V Input at the unit price of Fifteen thousand, five hundred sixty-six_____dollars and___twenty-two_____cents. (\$___15,566.22_____) per each.	1	EA	<u>\$ 15,566.22</u>	<u>\$ 15,566.22</u>

Schedule G Total: \$ 278,341.74

SCHEDULE H: PAVEMENT REPAIRS (NON-FEDERAL)

01505a	Mobilization at the lump sum of ___Ninety Five Thousand Eight Hundred Four_____dollars and ___Sixty Two_____cents. (\$ <u>95,804.62</u>) per lump sum.	1	LS	\$ <u>95,804.62</u>	\$ <u>95,804.62</u>
01566a	Erosion Control Sediment Log at the unit price of ___Forty Three_____dollars and ___Nineteen_____cents. (\$ <u>43.19</u>) per linear foot.	263	LF	\$ <u>43.19</u>	\$ <u>11,358.97</u>
P-150c	Remove Asphalt Shoulder at the unit price of ___Two Hundred Forty Two_____dollars and ___Ninety Eight_____cents. (\$ <u>242.98</u>) per square yard.	13	SY	\$ <u>242.98</u>	\$ <u>3,158.74</u>
P-150d	Remove 17-Inch Non-Reinforced Concrete Pavement at the unit price of ___One Hundred Forty_____dollars and ___Thirty Nine_____cents. (\$ <u>140.39</u>) per square yard.	394	SY	\$ <u>140.39</u>	\$ <u>55,313.66</u>
P-150e	Remove 17-inch Reinforced Concrete Pavement at the unit price of ___One Hundred Ninety Four_____dollars and ___Thirty Eight_____cents. (\$ <u>194.38</u>) per square yard.	44	SY	\$ <u>194.38</u>	\$ <u>8,552.72</u>
P-152a	Topsoil Embankment from Stockpile at the unit price of ___Seventy One_____dollars and ___Twenty Seven_____cents. (\$ <u>71.27</u>) per cubic yard.	83	CY	\$ <u>71.27</u>	\$ <u>5,915.41</u>
P-152b	Unclassified Excavation, Embankment On Site at the unit price of ___Seventy Nine_____dollars and ___Ninety One_____cents. (\$ <u>79.91</u>) per cubic yard.	407	CY	\$ <u>79.91</u>	\$ <u>32,523.37</u>
P-161a	Bondbreaker Fabric at the unit price of ___Twenty One_____dollars and ___Fifty Nine_____cents. (\$ <u>21.59</u>) per square yard.	438	SY	\$ <u>21.59</u>	\$ <u>9,456.42</u>
P-161b	Geotextile Fabric at the unit price of ___Twenty Six_____dollars and ___Ninety Nine_____cents. (\$ <u>26.99</u>) per square yard.	13	SY	\$ <u>26.99</u>	\$ <u>350.87</u>
P-304Ca	Crushed Aggregate Base Course, CDOT Class 6 (10-Inch) at the unit price of ___Twenty Three_____dollars and ___Seventy Five_____cents. (\$ <u>23.75</u>) per square yard.	1,650	SY	\$ <u>23.75</u>	\$ <u>39,187.50</u>
P-401Ca	CDOT Bituminous Surface Course (3-Inch) at the unit price of ___Six Hundred Forty Seven_____dollars and ___Ninety Five_____cents. (\$ <u>647.95</u>) per linear foot.	2	TN	\$ <u>647.95</u>	\$ <u>1,295.90</u>
P-401Cb	CDOT Bituminous Surface Course (6-Inch) at the unit price of ___Three Hundred Seventy Seven_____dollars and ___Ninety Seven_____cents. (\$ <u>377.97</u>) per each.	118	TN	\$ <u>377.97</u>	\$ <u>44,600.46</u>
P-401Cc	CDOT Bituminous Base Course (7-Inch) at the unit price of ___Four Hundred Eighty Five_____dollars and ___Ninety Six_____cents. (\$ <u>485.96</u>) per each.	5	TN	\$ <u>485.96</u>	\$ <u>2,429.80</u>
P-403a	Asphalt Treated Permeable Base Course (5-Inch) at the unit price of ___One Hundred Eighty Eight_____dollars and ___Ninety Eight_____cents. (\$ <u>188.98</u>) per square yard.	13	SY	\$ <u>188.98</u>	\$ <u>2,456.74</u>

P-501a	17-Inch Portland Cement Concrete Pavement, Plain at the unit price of ___ Four Hundred Twenty One _____ dollars and ___ Seventeen _____ cents. (\$ 421.17 _____) per square yard.	394	SY	\$ 421.17	\$ 165,940.98
P-501b	17-Inch Portland Cement Concrete Pavement, Reinforced at the unit price of ___ Four Hundred Seventy Five _____ dollars and ___ Sixteen _____ cents. (\$ 475.16 _____) per square yard.	44	SY	\$ 475.16	\$ 20,907.04
D705a	6-Inch Non-Perforated Corrugated Polyethylene Underdrain Pipe at the unit price of ___ One Hundred Eighty Eight _____ dollars and ___ Ninety Eight _____ cents. (\$ 188.98 _____) per linear foot.	683	LF	\$ 188.98	\$ 129,073.34
D751a	Seeding at the unit price of ___ Twenty Eight Thousand Four Hundred Sixty One _____ dollars and ___ Sixty _____ cents. (\$ 28,461.60 _____) per each.	1	EA	\$ 28,461.60	\$ 28,461.60
L-125www	Procure L-868 Base Cans, Size B, 24" Deep ___ Three Hundred Eighty _____ dollars and ___ Fourteen _____ cents. (\$ 380.14 _____) per each.	4	EA	\$ 380.14	\$ 1,520.56
T-901a	Seeding at the unit price of ___ Five _____ dollars and ___ Sixty One _____ cents. (\$ 5.61 _____) per square yard.	1,870	SY	\$ 5.61	\$ 10,490.70
T-908a	Hydraulic Mulching at the unit price of ___ Five _____ dollars and ___ Sixty One _____ cents. (\$ 5.61 _____) per square yard.	1,870	SY	\$ 5.61	\$ 10,490.70

Schedule H Total: \$ 679,290.10

SCHEDULE I: CLEARANCE BAR INSTALLATION (FEDERAL)

01505a	Mobilization at the lump sum of ___ Thirty Seven Thousand One Hundred Seventy Two _____ dollars and ___ Thirty Five _____ cents. (\$ 37,172.35 _____) per lump sum.	1	LS	\$ 37,172.35	\$ 37,172.35
01575b	Cover Panel on Guidance Sign at the unit price of ___ Ninety _____ dollars and ___ Thirteen _____ cents. (\$ 90.13 _____) per each.	1	EA	\$ 90.13	\$ 90.13
01575c	Install Shorting Plug on Secondary of Isolation Transformer at the unit price of ___ One Hundred Forty Two _____ dollars and ___ Forty Three _____ cents. (\$ 142.43 _____) per each.	61	EA	\$ 142.43	\$ 8,688.23
01576a	Traffic Control at the lump sum of ___ Thirty Two Thousand Three Hundred Ninety Seven _____ dollars and ___ Eighty Four _____ cents. (\$ 32,397.84 _____) per lump sum.	1	LS	\$ 32,397.84	\$ 32,397.84
P-150a	Remove Taxiway Centerline Light and Foundation at the unit price of ___ Three Thousand Seven Hundred Fifty Six _____ dollars and ___ None _____ cents. (\$ 3,756.00 _____) per each.	2	EA	\$ 3,756.00	\$ 7,512.00

P-150d	Remove 17-inch Non-Reinforced Concrete Pavement at the unit price of <u> One Hundred Forty </u> dollars and <u> Thirty Nine </u> cents. (\$ <u> 140.39 </u>) per square yard.	175	SY	\$	<u>140.39</u>	\$	<u>24,568.25</u>
P-161a	Bondbreaker Fabric at the unit price of <u> Twenty One </u> dollars and <u> Fifty Nine </u> cents. (\$ <u> 21.59 </u>) per square yard.	175	SY	\$	<u>21.59</u>	\$	<u>3,778.25</u>
P-501a	17-Inch Portland Cement Concrete Pavement, Plain at the unit price of <u> Four Hundred Twenty One </u> dollars and <u> Seventeen </u> cents. (\$ <u> 421.17 </u>) per square yard.	175	SY	\$	<u>421.17</u>	\$	<u>73,704.75</u>
L-108a	Install Cable, 1/C #8, 19 Strand, 5000V, L-824, Type C at the unit price of <u> One </u> dollars and <u> Thirty Three </u> cents. (\$ <u> 1.33 </u>) per linear foot.	863	LF	\$	<u>1.33</u>	\$	<u>1,147.79</u>
L-125e	Procure L-852C(L) Bidirectional Taxiway Centerline Light at the unit price of <u> Six Hundred Sixty Six </u> dollars and <u> Fourteen </u> cents. (\$ <u> 666.14 </u>) per each.	2	EA	\$	<u>666.14</u>	\$	<u>1,332.28</u>
L-125g	Procure L-852D(L) Unidirectional Taxiway Centerline Light at the unit price of <u> Six Hundred Sixty Four </u> dollars and <u> Eighty </u> cents. (\$ <u> 664.80 </u>) per each.	6	EA	\$	<u>664.80</u>	\$	<u>3,988.80</u>
L-125xx	Install L-852C(L) Bidirectional Taxiway Centerline Light on a New Foundation at the unit price of <u> One Thousand Nine Hundred Thirty Nine </u> dollars and <u> Ninety Four </u> cents. (\$ <u> 1,939.94 </u>) per each.	2	EA	\$	<u>1,939.94</u>	\$	<u>3,879.88</u>
L-125yy	Install L-852D(L) Unidirectional Taxiway Centerline Light on a New Foundation at the unit price of <u> One Thousand Nine Hundred Twenty Eight </u> dollars and <u> Thirty </u> cents. (\$ <u> 1,928.30 </u>) per each.	6	EA	\$	<u>1,928.30</u>	\$	<u>11,569.80</u>
L-125vvv	Install L-858(L) Guidance Sign, Size 3, 2 Module, 1 Face, Style 5 <u> Thirty Three Thousand One Hundred </u> dollars and <u> Fifty Nine </u> cents. (\$ <u> 33,100.59 </u>) per each.	1	EA	\$	<u>33,100.59</u>	\$	<u>33,100.59</u>
L-140d	Photometric Testing for Clearance Bar Light Fixtures at the lump sum of <u> Ten Thousand Three Hundred Eighty Eight </u> dollars and <u> Twelve </u> cents. (\$ <u> 10,388.12 </u>) per lump sum.	1	LS	\$	<u>10,388.12</u>	\$	<u>10,388.12</u>

Schedule I Total: \$ 253,319.06

SCHEDULE J: REPLACE COMBINATION RUNWAY STOP BAR/GUARD LIGHTS (FEDERAL)

L-125I	Procure L-852GS(L) 2-Circuit, Runway Stop Bar/Guard Light at the unit price of 114 __One Thousand Nine Hundred Fourteen__ dollars and __Sixty__ cents. (\$ __1,914.60__) per each.	114	EA	\$ 1,914.60	\$ 218,264.40
L-125jj	Install L-852GS(L) 2-Circuit Runway Stopbar/Guard Light at the unit price of 32 __Four Hundred Twenty Four__ dollars and __Twelve__ cents. (\$ __424.12__) per each.	32	EA	\$ 424.12	\$ 13,571.84
L-125vv	Install L-852GS(L) 2-Circuit Runway Stopbar/Guard Light and Spacer Rings at the unit price of 82 __Eight Hundred Forty Seven__ dollars and __Fifty Eight__ cents. (\$ __847.58__) per each.	82	EA	\$ 847.58	\$ 69,501.56

Schedule J Total: \$ 301,337.80

Basis for Selecting the Apparent Low Bidder -Total for Schedules A through J: \$ 7,904,081.77

DENVER INTERNATIONAL AIRPORT

**Runway 8-26 Complex Lighting Rehabilitation
Contract No. 201313528**

Bid Data Forms

Bidder shall submit its Bid Data in accordance with the format shown on each of the following Bid Data Forms. Bidder shall prepare and use as many sheets as are necessary to provide the information required. Bidder shall ensure that each page of its Bid Data is completed and properly identified with the Bid Data form name, Bidder's name, and page number.

DENVER INTERNATIONAL AIRPORT
Runway 8-26 Complex Lighting Rehabilitation
Contract No. 201313528

Bid Data Forms
INFORMATION ABOUT CONTRACTOR

1. Name of Bidder/Contractor: Sturgeon Electric Company, Inc.

2. Type of business entity: Corporation
NOTE: If bidder is a **partnership** or **joint venture**, give full names of all partners or joint venturers. Bid must be signed by all joint venturers. If bidder is a **limited liability company**, bid must be signed by authorized manager (may be signed by member-manager if LLC is organized to allow management by members).

3. Prequalified by City and County of Denver as Construction Contractor :
Categories: Electrical
Monetary Limit: \$25,000,000

4. Address of Contractor: 12150 E. 112th Avenue
Henderson, CO 80640

Telephone: 303-286-8000 Fax: 303-286-1811
Email Address: jwaneka@myrgroup.com

5. Established where and when: _____

6. Contractor's Banks: JP Morgan Chase

7. Principal Officers of Contractor (managers and members if LLC):

Name: William A. Koertner

Name: Richard S. Swartz

Title: President & CEO

Title: Senior Vice President & COO

Name: Jeffrey Waneka

Name: Scott Greenhalge

Title: Vice President

Title: District Manager

8. Bidder's/Contractor's City and County of Denver Contractor License No.: 3
License if it has obtained one: Class: Electrical

A contractor license is required prior to start of construction but not prior to bid submittal.

9. Bidder's/Contractor's state of incorporation (state of organization if an LLC or partnership): Michigan

10. Bidder's Surety: Liberty Mutual

11. Surety's State of Incorporation: MA

12. Address of Contractor in other areas (if different from No. 4):

13. Name and address of person to receive payments: Marisa Owens
12150 E. 112th Avenue
Henderson, CO 80640

14. If the Bidder/Contractor is a joint venture, it shall attach a certified copy of the joint venture agreement. The joint venture agreement will not be included as a Contract Document.

15. The Bidder/Contractor shall identify all applicable labor agreements (if any) to be used in the performance of the Work:

IBEW Local #68

Bidder Sturgeon Electric Company, Inc.

DENVER INTERNATIONAL AIRPORT

**Runway 8-26 Complex Lighting Rehabilitation
Contract No. 201313528**

Bid Data Forms

**LIST OF PROPOSED SUBCONTRACTORS WHICH
ARE NOT DBE SUBCONTRACTORS**

Bidder shall list below the name, business address, work assignment and dollar value of each subcontractor that is not a DBE subcontractor which will perform work or labor or provide services to the Bidder relating to this contract in an amount greater than one and one-half percent of the Bidder's total bid. Only one subcontractor for each portion of the work shall be listed. Any proposed subcontractors to be utilized by the Bidder that are certified as a Small Business Enterprise shall also be listed on the "List of Proposed Subcontractors" attached to these Bid Forms.

If the bidder does not identify a subcontractor to perform portions of the work which could be subcontracted on this form or the List of Proposed DBE Subcontractors, the Bidder, if it is awarded the contract, agrees not to subcontract such portions that exceed one and one half percent of the total bid amount until the Contractor has advised the Deputy Manager of Aviation - Maintenance and Airport Infrastructure Management ("Deputy Manager") in writing of the reasons why the subcontractor was not listed in the bid and complied with the requirements of General Condition 502.

If the bidder is awarded the contract and does not enter into a subcontract with a subcontractor listed below or on the List of Proposed DBE Subcontractors, the Contractor agrees not to subcontract any of the work assignment identified for that subcontractor until the Contractor has advised the Deputy Manager in writing of the reasons why a different subcontractor is being used and has obtained approval of the Deputy Manager of the substitution. This requirement does not affect the applicability of 502.

Subcontractor	Work Assignment	Subcontract Dollar Value
NAME: <u>North/Western Electrical Corp of Colorado</u> ADDRESS: <u>10825 Irma Drive, Northglenn, CO 80233</u> PHONE: <u>303-452-8576</u>	Electrical sub	\$550,000

Subcontractor	Work Assignment	Subcontract Dollar Value
NAME: <u>Preditor Coring</u> ADDRESS: <u>PO Box 84, Watkins, CO 80137</u> PHONE: <u>303-618-9010</u>	core drilling	\$750,000
NAME: <u>Lean Photometrics</u> ADDRESS: <u>5319 University Dr. #3141</u> <u>Irvine, CA 92612</u> PHONE: <u>949-502-8687</u>	photometric testing	\$26,000
NAME: <u>Interstate Highway Construction, Inc.</u> ADDRESS: <u>PO Box 4356, Englewood, CO 80155</u> PHONE: <u>303-790-9100</u>	PCC Paving	\$1,142,000
NAME: _____ ADDRESS: _____ PHONE: _____		
NAME: _____ ADDRESS: _____ PHONE: _____		
NAME: _____ ADDRESS: _____ PHONE: _____		
NAME: _____ ADDRESS: _____ PHONE: _____		
NAME: _____ ADDRESS: _____ PHONE: _____		

(This page can be duplicated if additional sheets are required.)

**CITY AND COUNTY OF DENVER
DEPARTMENT OF AVIATION**

**List of Proposed
Disadvantaged Business Enterprise
Bidders, Subcontractors, Suppliers (Manufacturers) or Brokers**

The undersigned bidder proposes to utilize the following Disadvantaged Business Enterprise (DBE) for the project. All listed firms are CURRENTLY certified by the City and County of Denver. Only bona fide commissions may be counted for Brokers. Please copy and attach this page to list additional DBE firms for this project.

Check Box If Applicable:

Subcontractor or Supplier (Manufacturer) or Broker

Business Name: Airport Lighting Systems

Address: 931 S. Church Street, Grapevine, Texas 76051

Type of Service: Airfield Lighting Material

Contact Person: Courtney Denney

Dollar Amount: \$ 2,200,000 Percent of Project 16 %

Check One Box:

Subcontractor or Supplier (Manufacturer) or Broker

Business Name: North/Western Electric

Address: 10825 Irma Drive, Northglenn, CO 80233

Type of Service: Electrical Contractor

Contact Person: Jeff Vera

Dollar Amount: \$ 550,000 Percent of Project 7 %

Check One Box:

Subcontractor or Supplier (Manufacturer) or Broker

Business Name _____

Address _____

Type of Service _____

Contact Person _____

Dollar Amount \$ _____ Percent of Project _____ %

The undersigned Bidder hereby certifies that the aforementioned subcontractors, suppliers, manufacturers and brokers have full knowledge that their names have been offered as subcontractors, suppliers, manufacturers and brokers for the work, and the Bidder further certifies that the dollar amount of work to be performed by the aforementioned DBEs was furnished to the Bidder prior to the bid opening.

The undersigned Bidder agrees that within five (5) working days after the bid opening, it shall submit to the City a "DBE" Letter of Intent" which as been completed and executed by each of its DBE subcontractors, suppliers, and brokers on the form contained in the Contract Documents.

The undersigned Bidder acknowledges the right of the City to reject any or all bids submitted to waive informalities in bids and to re-advertise this project for bids.

The undersigned certifies that it has carefully checked all words and figures and all statements made in these Bid Forms.

This bid is submitted upon the declaration that neither, I (we), nor, to the best of (our) knowledge none of the members of my (our) firm or company have either directly or indirectly entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this bid.

Business Address of Bidder: 12150 E. 112th Avenue

City, State, Zip Code: Henderson, CO 80640

Telephone Number of Bidder: 303-286-8000

Social Security or Employer Id. No. of Bidder: 84-0681206

Name and location relative thereto, please refer to

Name: Jeffrey Waneka

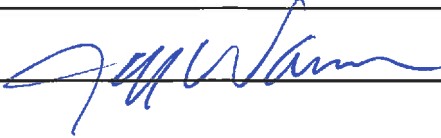
Title: Vice President

Address: 12150 E. 112th Avenue

The undersigned acknowledges receipt, understanding, and full consideration of the following addenda to the Contract Documents:

Addenda Numbers #1 Date 12/5/13

Henderson, CO 80640



SIGNATURE

10 December 2013

DATE

COMMITMENT TO DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION

**Runway 8-26 Complex Lighting Rehabilitation
Contract No. 201313528
BID DATA FORMS**

THE UNDERSIGNED HAS SATISFIED THE REQUIREMENTS OF INSTRUCTIONS TO BIDDERS, IB-23 IN THE FOLLOWING MANNER (Please check appropriate space):

 X The Bidder is committed to a minimum of 20 % DBE utilization for this contract. The Bidder understands that it must submit Letters of Intent for each DBE listed in the Bid Forms within five working days after bid opening.

 The Bidder is unable to meet the contract goal of 20% DBE but is committed to meet at a minimum % DBE participation on this contract. The Bidder understands that it must submit a detailed statement and documentation of good faith efforts it made prior to bid opening in its attempts made to meet the DBE contract goals and a Letter of Intent for each DBE listed in the Bid Forms within five working days after bid opening.

Bidder: Sturgeon Electric Company
(Name of Firm)

By: 
(Signature) (Title) Jeffrey Waneka, Vice President

Address: 12150 E. 112th Avenue. Henderson, CO 80640



Office of Economic Development
**Division of Small Business Opportunity
 Compliance Unit – DIA**
E-MAIL: small.business@flydenver.com
 8500 Peña Blvd., AOB, Suite 7810
 Denver, CO 80249
 Phone: (303) 342-2189 / Fax: (303) 342-2190

LETTER OF INTENT (LOI)

*All lines must be completed or marked N/A for Not Applicable.
 Submit the attached completed checklist with this letter.*

Project No.:	Project Name:
---------------------	----------------------

**A. The Following Section Is To Be Completed by the Bidder/Consultant
 This Letter of Intent Must be Signed by the Bidder/Consultant and M/WBE, SBE or DBE**

Name of Bidder/Consultant:		Phone:	
Contact Person:	Email:	Fax:	
Address:	City:	State:	Zip:

**B. The Following Section is To Be Completed by the M/WBE, SBE or DBE, at any Tier
 This Letter of Intent Must be Signed by the M/WBE, SBE or DBE and Bidder/Consultant**

Name of Certified Firm:		Phone:	
Contact Person:	Email:	Fax:	
Address:	City:	State:	Zip:

Please check the designation which applies to the certified firm.	<input type="checkbox"/> MBE/WBE ()	<input type="checkbox"/> SBE ()	<input type="checkbox"/> DBE ()
---	--------------------------------------	----------------------------------	----------------------------------

Indirect Utilization: If this M/WBE, SBE or DBE is not a direct first tier subcontractor/subconsultant, supplier or broker to the Bidder/Consultant, please indicate the name of the subcontractor/subconsultant, supplier or broker which is utilizing the participation of this firm: _____

A Copy of the M/WBE, SBE or DBE Letter of Certification must be Attached

Identify the scope of the work to be performed or supply item that will be provided by the M/WBE/SBE/DBE. **On unit price bids only, identify which bid line items the M/WBE/SBE/DBEs scope of work or supply corresponds to.**

<input type="checkbox"/> Subcontractor/Subconsultant ()	<input type="checkbox"/> Supplier ()	<input type="checkbox"/> Broker ()
--	---------------------------------------	-------------------------------------

Bidder intends to utilize the aforementioned M/WBE, SBE or DBE for the Work/Supply described above. The cost of the work and percentage of the total subcontractor M/WBE, SBE or DBE bid amount is:

\$	%
----	---

Consultant intends to utilize the aforementioned M/WBE, SBE or DBE for the Work/Supply described above. The percentage of the work of the total subcontractor M/WBE, SBE or DBE will perform is:

%	%
---	---

If the fee amount of the work to be performed is requested, the fee amount, is:

\$	%
----	---

Bidder/Consultant's Signature:	Date:
Title:	

M/WBE, SBE or DBE Firm's Signature:	Date:
Title:	

If the above named Bidder/Consultant is not determined to be the successful Bidder/Consultant, this **Letter of Intent** shall be null and void.

Letter of Intent (LOI) Checklist

All lines must be completed or marked N/A for Not Applicable

Submit the attached completed checklist with this letter.

Completed	
<input type="checkbox"/>	Project Number & Project Name
<input type="checkbox"/>	Section A: Name of Bidder/Consultant, Contact Person, Address, City, State, Zip, Phone, Email
<input type="checkbox"/>	Section B: Name of Certified Firm, Contact Person, Address, City, State, Zip, Phone, Email
<input type="checkbox"/>	Designation checked for MBE/WBE, SBE or DBE
<input type="checkbox"/>	Indirect Utilization: Name of subcontractor/subconsultant, supplier or broker is indicated if using the participation of a 2nd tier subcontractor/subconsultant, supplier or broker.
<input type="checkbox"/>	Scope of work performed or item supplied by M/WBE, SBE or DBE
<input type="checkbox"/>	Line items performed, if line-item bid.
<input type="checkbox"/>	Copy of M/WBE, SBE or DBE Letter of Certification Attached
<input type="checkbox"/>	Designation checked for Subcontractor/Subconsultant, Supplier or Broker
<input type="checkbox"/>	If project is a hard bid...
<input type="checkbox"/>	Bidder has indicated dollar amount for value of work going to Subcontractor/Subconsultant, Supplier or Broker
<input type="checkbox"/>	Bidder has indicated percentage for value of work going to Subcontractor/Subconsultant, Supplier or Broker
<input type="checkbox"/>	If project is an RFP/RFQ...
<input type="checkbox"/>	Consultant has indicated percentage for value of work going to Subcontractor/Subconsultant, Supplier or Broker Name & contact name for MWBE.
<input type="checkbox"/>	Fee amount if fee amount of work to be performed is requested.
<input type="checkbox"/>	Bidder/Consultant's Signature, Title & Date
<input type="checkbox"/>	M/WBE, SBE or DBE Firm's Signature, Title and Date

The complete and accurate information that is required for the Letter of Intent is based on the following sections of the Ordinance: Section 28-63 and Section 28-68. Failure to complete this information on the Letter of Intent (LOI) may automatically deem a bid or proposal non-responsive.

201 W. Colfax
 Denver, Colorado
 80202
 Phone: 720-913-1700
 Fax: 720-913-1803

**Division of Small Business
 Opportunity**

MICHAEL HANCOCK
 Mayor

Denver International Airport
 Airport Office Building
 Suite 7810
 8500 Pena Boulevard
 Denver, Colorado 80249-6340
 Phone: 303-342-2180
 Fax: 303-342-2190

BIDDER'S INFORMATION FORM*

The City & County of Denver (CCD) has established a Disadvantaged Business Enterprise (DBE) Program in accordance with regulations of the U.S. Department of Transportation (DOT) 49 CFR Part 26.

§§ 26.11(b) (c) requires that CCD create and maintain a bidders list consisting of information about all DBE and non-DBE firms that bid or quote on DOT-assisted contracts. This includes firms bidding on prime contracts and bidding or quoting subcontracts on DOT-assisted contracts.

DSBO will safeguard from disclosure to third parties information regarded as confidential business information, consistent with Federal, State, and local law.

Contractors/Consultants must complete this form and request each subcontractor/supplier/sub-consultant bidding to the Prime to complete the form and return to the Prime. The Prime must submit all completed forms to DSBO with their bid/proposal.

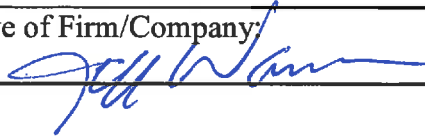
*"Bidders Information Form" requirement applies to all prime contractors, prime consultants, subcontractors, suppliers, sub-consultants that bid/quote on a DOT-assisted contract.

Bidding as a: <input checked="" type="checkbox"/> Contractor or <input type="checkbox"/> Sub Contractor/Supplier/Sub-consultant		
Type of Work/Service: Electrical		
Name of Firm/Company: Sturgeon Electric Company, Inc.		
Address of Firm/Company: Street: 12150 112th Avenue City: Henderson State: CO Zip: 80640		
Telephone: 303-286-8000	Fax: 303-287-1811	E-Mail: jwaneka@myrgroup.com
Are you certified by any governmental agency as a Disadvantaged Business Enterprise? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If yes, by whom:		
Age of Firm/Company: ¹⁰¹ _____ Years Annual Gross Receipts of Firm/Company: \$ 100,000,000		

Date Submitted: 10 December 2013

Signature of Designated Representative of Firm/Company:

Jeffrey Waneka, Vice President



201 W. Colfax
 Denver, Colorado
 80202
 Phone: 720-913-1700
 Fax: 720-913-1803

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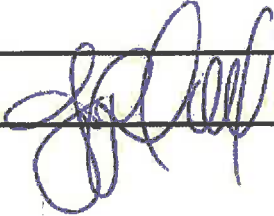
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**"Bidders Information Form" requirement applies to all prime contractors, prime consultants, subcontractors, suppliers, sub-consultants that bid/quote on a DOT-assisted contract.

Bidding as a: <input type="checkbox"/> Contractor or <input checked="" type="checkbox"/> Sub Contractor/Supplier/Sub-consultant		
Type of Work/Service: PCC Paving		
Name of Firm/Company: Interstate Highway Construction, Inc.		
Address of Firm/Company: Street: P. O. Box 4356 City: Englewood State: CO Zip: 80155		
Telephone: 303-790-9100	Fax: 303-790-8524	E-Mail: estimating@ihcquality.com
Are you certified by any governmental agency as a Disadvantaged Business Enterprise? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		
If yes, by whom:		
Age of Firm/Company: 66 Years		
Annual Gross Receipts of Firm/Company: \$ 175,000,000		

Date Submitted: 12/12/13
Signature of Designated Representative of Firm/Company: Jim Randall, President



201 W. Colfax
 Denver, Colorado
 80202
 Phone: 720-913-1700
 Fax: 720-913-1803

**Division of Small Business
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 Mayor

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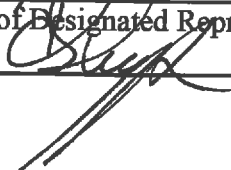
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Contractors/Consultants must complete this form and request each subcontractor/supplier/sub-consultant bidding to the Prime to complete the form and return to the Prime. The Prime must submit all completed forms to DSBO with their bid/proposal.

*"Bidders Information Form" requirement applies to all prime contractors, prime consultants, subcontractors, suppliers, sub-consultants that bid/quote on a DOT-assisted contract.

Bidding as a: <input type="checkbox"/> Contractor or <input checked="" type="checkbox"/> Sub Contractor/Supplier/Sub-consultant		
Type of Work/Service: <i>Cone Drilling / Drilling</i>		
Name of Firm/Company: <i>Predator Drilling Inc</i>		
Address of Firm/Company:		
Street:		
City: <i>PO Box 84 Watkins</i>	State: <i>CO</i>	Zip: <i>80402-80137</i>
Telephone: <i>303 618 9010</i>	Fax:	E-Mail: <i>Predator.Drilling@bhotmed.com</i>
Are you certified by any governmental agency as a Disadvantaged Business Enterprise? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If yes, by whom:		
Age of Firm/Company: <i>23</i> Years		
Annual Gross Receipts of Firm/Company: \$ <i>500,000⁰⁰</i>		

Date Submitted: 12/10/2013
Signature of Designated Representative of Firm/Company: 

201 W. Colfax
 Denver, Colorado
 80202
 Phone: 720-913-1700
 Fax: 720-913-1803

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 Mayor

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 Suite 7810
 8500 Pena Boulevard
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**"Bidders Information Form" requirement applies to all prime contractors, prime consultants, subcontractors, suppliers, sub-consultants that bid/quote on a DOT-assisted contract.

Bidding as a: <input type="checkbox"/> Contractor or <input checked="" type="checkbox"/> Sub Contractor/Supplier/Sub-consultant		
Type of Work/Service: <i>ELECTRICAL</i>		
Name of Firm/Company: <i>NORTHWESTERN ELECTRICAL CORP OF COLORADO</i>		
Address of Firm/Company: Street: <i>10825 IRMA DR</i> City: <i>NORTHGLENN</i> State: <i>COLO</i> Zip: <i>80233</i>		
Telephone: <i>303-452-8576</i>	Fax: <i>303-452-0255</i>	E-Mail: <i>HVERA@NORTHWESTERNELEC.COM</i>
Are you certified by any governmental agency as a Disadvantaged Business Enterprise? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
If yes, by whom: <i>THE DIVISION OF SMALL BUSINESS OPPORTUNITY</i> <i>THE CITY AND COUNTY OF DENVER</i>		
Age of Firm/Company: <i>30</i> Years		
Annual Gross Receipts of Firm/Company: \$		

Date Submitted:	DEC. 10-2013
Signature of Designated Representative of Firm/Company:	<i>Enrique J. Vaz</i> PRESIDENT

201 W. Colfax
 Denver, Colorado
 80202
 Phone: 720-913-1700
 Fax: 720-913-1803

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 Opportunity**

MICHAEL HANCOCK
 Mayor

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 8500 Pena Boulevard
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 Phone: 303-342-2180
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Bidding as a: <input type="checkbox"/> Contractor or <input checked="" type="checkbox"/> Sub Contractor/Supplier/Sub-consultant		
Type of Work/Service: Photometric testing		
Name of Firm/Company: Lean Photometrics		
Address of Firm/Company: Street: 5319 University Drive #3141 City: Irvine State: CA Zip: 92612		
Telephone: 949-502-8687	Fax:	E-Mail:
Are you certified by any governmental agency as a Disadvantaged Business Enterprise? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		
If yes, by whom:		
Age of Firm/Company: _____ Years		
Annual Gross Receipts of Firm/Company: \$		

Date Submitted:

Dec 10, 2013

Signature of Designated Representative of Firm/Company:

Doron Lean

Bidder Sturgeon Electric Company, Inc.

DENVER INTERNATIONAL AIRPORT

**Runway 8-26 Complex Lighting Rehabilitation
Contract No. 201313528**

**Bid Data Forms
EQUAL OPPORTUNITY REPORT STATEMENT**

Each Bidder shall complete and sign the Equal Opportunity Report Statement. A Bid may be considered unresponsive and may be rejected, in the Owner's sole discretion, if the Bidder fails to provide the fully executed Statement or fails to furnish required data. The Bidder shall also, prior to award, furnish such other pertinent information regarding its own employment policies and practices as well as those of its proposed subcontractors as the FAA, the Owner, or the Executive Vice Chairman of the President's Committee may require.

The Bidder shall furnish similar Statements executed by each of its first-tier and second-tier subcontractors and shall obtain similar compliance by such subcontractors, before awarding subcontracts. No subcontract shall be awarded to any non-complying subcontractor.

Equal Opportunity Report Statement
as Required in 41 CFR 60-1.7(b)

The Bidder shall complete the following statements by checking the appropriate blanks. Failure to complete these blanks may be grounds for rejection of bid:

1. The Bidder has X has not ___ developed and has on file at each establishment affirmative action programs pursuant to 41 CFR 60-1.40 and 41 CFR 60-2.
2. The Bidder has X has not ___ participated in any previous contract or subcontract subject to the equal opportunity clause prescribed by Executive Order 11246, as amended.
3. The Bidder has X has not ___ filed with the Joint Reporting Committee the annual compliance report on Standard Form 100 (EEO-1 Report).
4. The Bidder does X does not ___ employ fifty or more employees.

Dated: 10 December 2013

Sturgeon Electric Company
(Name of Bidder)

By: 
Jeffrey Waneka, Vice President

Title: _____

Bidder Sturgeon Electric Company, Inc.

DENVER INTERNATIONAL AIRPORT

**Runway 8-26 Complex Lighting Rehabilitation
Contract No. 201313528**

Bid Data Forms

**CERTIFICATION OF NON-SEGREGATED FACILITIES
(Must be completed and submitted with the Bid)**

The Bidder certifies that it does not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not permit its employees to perform their services at any location under its control, where segregated facilities are maintained. The Bidder certifies further that it will not maintain or provide for its employees segregated facilities at any of its establishments, and that it will not permit its employees to perform their services at any location under its control, where segregated facilities are maintained. The Bidder agrees that a breach of this certification is a violation of the equal opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, parking lots, drinking fountains, recreation or entertainment areas, transportation and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin, because of habit, local custom, or any other reason. The Bidder agrees that (except where it has obtained identical certification from proposed subcontractors for specific time period) it will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the equal opportunity clause, and that it will retain such certification in its files.

DATED: 10 December 2013

Sturgeon Electric Company, Inc.

(Name of Bidder)

By: 

Jeffrey Waneka, Vice President

Title: _____

Bidder Sturgeon Electric Company, Inc.

**DENVER INTERNATIONAL AIRPORT
Runway 8-26 Complex Lighting Rehabilitation
Contract No. 201313528**

Bid Bond

KNOW ALL MEN BY THESE PRESENTS

THAT Sturgeon Electric Company, Inc., as Principal, and Liberty Mutual Insurance Company, a corporation organized and existing under and by virtue of the laws of the State of Massachusetts, and authorized to do business within the State of Colorado as Surety, are held and firmly bound unto the City and County of Denver, Colorado, as Obligee, in the full and just sum of five percent of the bid amount Dollars and -----5%----- Cents (\$ -----5%-----) lawful money of the United States, for the payment of which sum, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents:

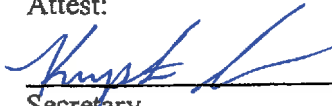
WHEREAS, the said Principal is herewith submitting its Bid, dated on December 10, 2013, for the construction of Contract No. 201313528, Runway 8-26 Complex Lighting Rehabilitation, Denver International Airport, as set forth in detail in the contract documents for the City and County of Denver, Colorado, and said Obligee has required as a condition for receiving said Bid that the Principal deposit specified bid security in the amount of not less than five percent (5%) of the amount of said Bid, as it relates to work to be performed for the City, conditioned that in event of failure of the Principal to execute the Contract for such construction and furnish required Performance and Payment Bond if the Contract is offered him, that said sum be paid immediately to the Obligee as liquidated damages, and not as a Penalty, for the Principal's failure to perform.

The condition of this obligation is such that if the aforesaid Principal shall, within the period specified therefor, on the prescribed form presented to him for signature, enter into a written Contract with the Obligee in accordance with his bid as accepted, and give Performance and Payment Bond with good and sufficient surety or sureties, upon the form prescribed by the Obligee, for the faithful performance and the proper fulfillment of said Contract, or in the event of withdrawal of said bid within the time specified, or upon the payment to the Obligee of the sum determined upon herein, as liquidated damages and not as a Penalty, in the event the Principal fails to enter into said Contract and give such Performance and Payment Bond within the time specified, then this Obligation shall be null and void, otherwise to remain in full force and effect.

[END OF PAGE]

Signed, sealed and delivered this 10th day of December, 2013.


Attest:



Secretary
[SEAL if bidder a corporation]

Sturgeon Electric Company, Inc.

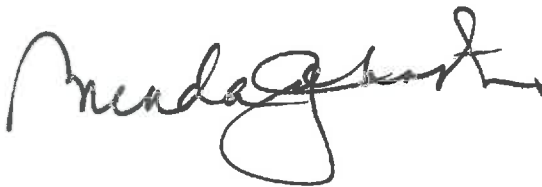

PRINCIPAL

By: 

President Jeff Waneka, Vice President

Liberty Mutual Insurance Company

SURETY


By: 

Attorney-in-Fact Sheree Kuo Hsieh

(ATTACH POWER OF ATTORNEY)

Power of Attorney shall be certified as to the date of bid.

THIS POWER OF ATTORNEY IS NOT VALID UNLESS IT IS PRINTED ON RED BACKGROUND.

4923619

This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

LIBERTY MUTUAL INSURANCE COMPANY
BOSTON, MASSACHUSETTS
POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS: That Liberty Mutual Insurance Company (the "Company"), a Massachusetts stock insurance company, pursuant to and by authority of the By-law and Authorization hereinafter set forth, does hereby name, constitute and appoint MICHAEL M. BILL, MICHAEL H. BILL, EDWARD L. MOURNIGHAN, CYNTHIA L. JENKINS, GINGER J. KRAHN, SHEREE KUO HSIEH, BRENDA JOHNSTON, CINDY STELLHORN, LAURAN REYNOLDS, ALL OF THE CITY OF INDIANAPOLIS, STATE OF INDIANA.....

, each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations in the penal sum not exceeding FOUR HUNDRED MILLION AND 00/100***** DOLLARS (\$ 400,000,000.00*****) each, and the execution of such undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents, shall be as binding upon the Company as if they had been duly signed by the president and attested by the secretary of the Company in their own proper persons.

That this power is made and executed pursuant to and by authority of the following By-law and Authorization:

ARTICLE XIII - Execution of Contracts: Section 5. Surety Bonds and Undertakings. Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

By the following instrument the chairman or the president has authorized the officer or other official named therein to appoint attorneys-in-fact.

Pursuant to Article XIII, Section 5 of the By-Laws, David M. Carey, Assistant Secretary of Liberty Mutual Insurance Company, is hereby authorized to appoint such attorneys-in-fact as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

That the By-law and the Authorization set forth above are true copies thereof and are now in full force and effect.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Company and the corporate seal of Liberty Mutual Insurance Company has been affixed thereto in Plymouth Meeting, Pennsylvania this day of 12th day of October 2011.

LIBERTY MUTUAL INSURANCE COMPANY

By David M. Carey, Assistant Secretary

COMMONWEALTH OF PENNSYLVANIA ss
COUNTY OF MONTGOMERY

On this 12th day of October, 2011, before me, a Notary Public, personally came David M. Carey, to me known, and acknowledged that he is an Assistant Secretary of Liberty Mutual Insurance Company; that he knows the seal of said corporation, and that he executed the above Power of Attorney and affixed the corporate seal of Liberty Mutual Insurance Company thereto with the authority and at the direction of said corporation.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at Plymouth Meeting, Pennsylvania, on the day and year first above written.

By Teresa Pastella, Notary Public

CERTIFICATE

I, the undersigned, Assistant Secretary of Liberty Mutual Insurance Company, do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy, is in full force and effect on the date of this certificate, and I do further certify that the officer or official who executed the said power of attorney is an Assistant Secretary specially authorized by the chairman or the president to appoint attorneys-in-fact as provided in Article XIII, Section 5 of the By-laws of Liberty Mutual Insurance Company.

This certificate and the above power of attorney may be signed by facsimile or mechanically reproduced signatures under and by authority of the following vote of the board of directors of Liberty Mutual Insurance Company at a meeting duly called and held on the 12th day of March, 1980.

VOTED that the facsimile or mechanically reproduced signature of any assistant secretary of the company, wherever appearing upon a certified copy of any power of attorney issued by the company in connection with surety bonds, shall be valid and binding upon the company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seal of the said company, this 10th day of December, 2013.

By Gregory W. Davenport, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, bank deposit, currency rate, interest rate or residual value guarantees.

To confirm the validity of this Power of Attorney call 1-610-832-8240 between 9:00 am and 4:30 pm EST on any business day.

CITY AND COUNTY OF DENVER

DEPARTMENT OF AVIATION

NOTICE TO APPARENT LOW BIDDER

Date: [Date]

To: [Bidder name and address]

The Manager of Aviation, having considered the Bids submitted for the construction of Contract No. 201313528, Runway 8-26 Complex Lighting Rehabilitation, Denver International Airport, as set forth in detail in the Contract Documents for the City and County of Denver, Colorado and it appearing that your Bid is fair, equitable and in the best interest of said City and County, the said Bid with a Total Contract Bid Amount of _____ Dollars (\$_____) is hereby declared to be acceptable, subject to the approval of the execution of the contract by the City in accordance with the Charter of the City and County of Denver.

In accordance with the terms of the Contract Documents, you are required to execute the formal Contract and furnish the required Performance Bond, Payment Bond and insurance certificates within five (5) consecutive working days from and including the date of this Notice. In addition, you are required to submit the EEO information described in IB-27 before a Notice to Proceed may be issued.

The bid security submitted with your Bid will be returned upon execution of the Contract, the City's receipt of the required Performance and Payment Bonds and insurance certificates, and, if required, City Council approval of the contract. If you should fail to execute the Contract and furnish the Performance and Payment Bonds and insurance certificate within the time limit specified, said bid security will be retained by the City and County of Denver as liquidated damages, and not as a penalty, for the delay and extra work caused thereby.

All construction contracts made and entered into by the City and County of Denver are subject to applicable City and/or Federal Affirmative Action and Equal Employment Opportunity Rules and Regulations, and each contract requiring payment by the City of Five Million Dollars (\$5,000,000.00) or more shall first be approved by the City Council acting by Ordinance and in accordance with Section 3.2.6 of the Charter of the City and County of Denver.

Prior to issuance of Notice to Proceed, all Affirmative Action and Equal Employment Opportunity requirements must be completed.

CITY AND COUNTY OF DENVER

By _____
Deputy Manager of Aviation,
Airport Infrastructure Management

By _____
Manager of Aviation

CONTRACT

THIS CONTRACT, made and entered into as of the date indicated on the City signature page below, by and between the **CITY AND COUNTY OF DENVER**, a municipal corporation of the State of Colorado, hereinafter referred to as the "CITY", Party of the First Part, and **STURGEON ELECTRIC COMPANY, INC.**, a corporation organized and existing under and by virtue of the laws of the State of **MICHIGAN**, hereinafter referred to as the "CONTRACTOR", Party of the Second Part;

WITNESSETH

WHEREAS, the City, for at least three (3) consecutive days, advertised that sealed bids would be received for furnishing all labor, tools, supplies, equipment, materials and everything necessary and required for the construction and installation of Contract No. 201313528, Runway 8-26 Complex Lighting Rehabilitation, Denver International Airport;

WHEREAS, bids to said advertisement have been received by the Manager of Aviation, who has recommended that a contract for said work be made and entered into with the above named Contractor who was the lowest, responsive, qualified bidder therefor; and

WHEREAS, said Contractor is now willing and able to perform all of said work in accordance with the Contract Documents and its bid;

NOW, THEREFORE, for and in consideration of the compensation to be paid the Contractor, the mutual agreements hereinafter contained, and subject to the terms hereinafter stated, it is mutually agreed as follows:

ARTICLE I - CONTRACT DOCUMENTS: It is agreed by the parties hereto that the following list of instruments, drawings and documents which are attached hereto and bound herewith or incorporated herein by reference constitute and shall be referred to either as the Contract Documents or the Contract, and all of said instruments, drawings and documents taken together as a whole constitute the Contract between the parties hereto, and they are as fully a part of this agreement as if they were set out verbatim and in full herein:

Advertisement of Notice of Invitation for Bids

Instructions to Bidders

Addenda (if any)

Bid Forms

 Bid letter

 Schedule of Prices and Quantities

 Bid Data Forms

 DBE Letters of Intent

Notice to Apparent Low Bidder

Contract

Performance Bond

Payment Bond

Notice to Proceed
Form of Final Receipt
Construction Contract General Conditions
Special Conditions
Prevailing wage schedules
Insurance certificate(s)
Equal Employment Opportunity Provisions
Federal Requirements and Assurances
Technical Specifications
Contract Drawings
Approved Shop Drawings
Change Order Directives
Change Orders

ARTICLE II - SCOPE OF WORK: The Contractor agrees to and shall furnish all labor and tools, supplies, equipment, superintendence, materials and everything necessary for and required to do, perform and complete all of the work described, drawn, set forth, shown and included in said Contract Documents.

ARTICLE III - TERMS OF PERFORMANCE: The Contractor agrees to begin the performance of the work required under this Contract within ten (10) days after being notified to commence work by the Deputy Manager of Aviation – Airport Infrastructure Management and agrees to fully complete the Work in its entirety within one hundred fifty (150) consecutive calendar days from the date of said Notice to Proceed. This period of performance is also referred to as Contract Time. The Contractor is not authorized to commence work prior to its receipt of the Notice to Proceed.

ARTICLE IV - LIQUIDATED DAMAGES: It is understood and agreed by and between the City and the Contractor that, if the Contractor fails to achieve Substantial Completion of the Work within the Contract Time or fails to substantially complete the Work described in a Milestone Area within the time set forth in the Special Conditions, the City will suffer substantial damages, which damages would be difficult to accurately determine. The parties hereto have considered the possible elements of damages and have agreed that the amount of liquidated damages for the Contractor's failure to substantially complete the work within the Contract Time or to substantially complete the work described in Milestone Areas within the time set forth in the Special Conditions shall be those amounts listed in the Special Conditions. If the Contractor shall fail to pay such liquidated damages promptly upon demand therefor, the Surety on its Performance Bond and Payment Bond shall pay such damages. Also, the City may withhold all, or any part of, such liquidated damages from any payment due the Contractor. Additional provisions relating to liquidated damages are set forth in the Construction Contract General Conditions and Special Conditions.

ARTICLE V - TERMS OF PAYMENT: The City agrees to pay the Contractor for the performance and completion of all of the Work as required by the Contract Documents, and the Contractor agrees to accept as its full and only compensation therefor, a total amount of **SEVEN MILLION, NINE HUNDRED FOUR THOUSAND, EIGHTY-ONE Dollars and SEVENTY**

SEVEN Cents (\$7,904,081.77).

Payments will be made to the Contractor in accordance with the City's Prompt Payment Ordinance, D.R.M.C., Section 20-107, et. seq., subject to the maximum contract amount stated above. Contractor agrees that interest and late fees shall be payable by the City hereunder only to the extent authorized and provided for in the City's Prompt Payment Ordinance.

Payment hereunder will be in accordance with the provisions of the Contract Documents, including Title 9 of the General Conditions, and will be made solely and exclusively from funds appropriated and otherwise lawfully made available for the purposes of this Contract from the City and County of Denver Airport System, Operations and Maintenance and Capital Improvement funds. The City has no obligation to make payments from any other fund or source or to make additional appropriations or allocations to such fund to satisfy such costs or other obligations.

ARTICLE VI - DISPUTES: It is agreed and understood by the parties hereto that disputes regarding this contract shall be resolved by administrative hearing under procedures described in Revised Municipal Code Section 5-17.

ARTICLE VII - CONTRACT BINDING: It is agreed that this Contract shall be binding on and inure to the benefit of the parties hereto, their heirs, executors, administrators, assigns and successors.

ARTICLE VIII - SEVERABILITY: If any part, portion or provision of this Contract shall be found or declared null, void, or unenforceable for any reason whatsoever by any court of competent jurisdiction or any governmental agency having authority thereover, only such part, portion, or provision shall be affected thereby and all other parts, portions and provisions of this Contract shall remain in full force and effect.

ARTICLE IX - ASSIGNMENT: The Contractor shall not assign the whole or any part of its duties, rights, and interests in this Contract without first obtaining the written consent of the Manager.

ARTICLE X - APPROVALS: In the event this Contract calls for the payment by the City of Five Million Dollars (\$5,000,000.00) or more, approval by the Board of Councilmen of the City and County of Denver, acting by Ordinance in accordance with Section 3.2.6 of the Charter of the City and County of Denver, is and shall be an express condition precedent to the lawful and binding execution and performance of this Contract.

ARTICLE XI - JOINT VENTURE: If the Contractor is a Joint Venture, the partners to the Joint Venture shall be jointly and severally liable to the City for the performance of all duties and obligations of the Contractor which are set forth in the Contract.

ARTICLE XII - NO DISCRIMINATION IN EMPLOYMENT: In connection with the performance of work under this Contract, the Contractor agrees not to refuse to hire, discharge, promote or demote, or to discriminate in matters of compensation against any person otherwise

qualified, solely because of race, color, religion, national origin, gender, age, military status, sexual orientation, gender variance, marital status, or physical or mental disability; and the Contractor further agrees to insert the foregoing provision in all subcontracts hereunder.

ARTICLE XIII - WAIVER OF CRS 13-20-801, et seq.: Notwithstanding any other provision of this Contract, the Contractor specifically waives all of the provisions of Colorado Revised Statutes §§ 13-20-801 – 80 as they may relate to the Contractor's performance under this Contract.

ARTICLE XIV - COORDINATION OF SERVICES: The Contractor agrees to perform its work under this Contract in accordance with the operational requirements of DIA, and all work and movement of personnel or equipment on areas included within the DIA site shall be subject to the regulations and restrictions established by the City or its authorized agents.

ARTICLE XV - COMPLIANCE WITH ALL LAWS AND REGULATIONS: All of the work performed under this Contract by the Consultant shall comply with all applicable laws, rules, regulations and codes of the United States and the State of Colorado, and with the charter, ordinances and rules and regulations of the City and County of Denver.

ARTICLE XVI – PROMPT PAY: The Contractor is subject to D.R.M.C. Section 20-112 wherein the Contractor is to pay its subcontractors in a timely fashion. A payment is timely if it is mailed to the subcontractor no later than seven days after receipt of any payment from City. Any late payments are subject to a late payment penalty as provided for in the prompt pay ordinance (Section 20-107 through 20-118).

ARTICLE XVII – COLORADO OPEN RECORDS ACT: The Contractor acknowledges that the City is subject to the provisions of the Colorado Open Records Act, Colorado Revised Statutes §24-72-201 et seq., and the Contractor agrees that it will fully cooperate with the City in the event of a request or lawsuit arising under such act for the disclosure of any materials or information which the Contractor asserts is confidential and exempt from disclosure. Any other provision of this Contract notwithstanding, including exhibits, attachments and other documents incorporated into this Contract by reference, all materials, records and information provided by the Contractor to the City shall be considered confidential by the City only to the extent provided in the Open Records Act, and the Contractor agrees that any disclosure of information by the City consistent with the provisions of the Open Records Act shall result in no liability of the City.

ARTICLE XVII – ELECTRONIC SIGNATURES AND ELECTRONIC RECORDS: Contractor consents to the use of electronic signatures by the City. The Contract, and any other documents requiring a signature hereunder, may be signed electronically by the City in the manner specified by the City. The Parties agree not to deny the legal effect or enforceability of the Contract solely because it is in electronic form or because an electronic record was used in its formation. The Parties agree not to object to the admissibility of the Contract in the form of an electronic record, or a paper copy of an electronic document, or a paper copy of a document bearing an electronic signature, on the ground that it is an electronic record or electronic signature or that it is not in its original form or is not an original.

Contract Control Number:

IN WITNESS WHEREOF, the parties have set their hands and affixed their seals at Denver, Colorado as of

SEAL

CITY AND COUNTY OF DENVER

ATTEST:

By _____

APPROVED AS TO FORM:

REGISTERED AND COUNTERSIGNED:

By _____

By _____

By _____



Contract Control Number: PLANE-201313528-00

Contractor Name: STURGEON ELECTRIC COMPANY INC

By: 

Name: Richard S. Swartz
(please print)

Title: Sr. Vice President & COO
(please print)

ATTEST: [if required]

By: 

Name: Krysta Brewer
(please print)

Title: Asst. Secretary
(please print)



PERFORMANCE BOND Bond No. 014066862

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned Sturgeon Electric, Company, Inc., a corporation organized under the laws of the State of Michigan, hereinafter referred to as the "Contractor" and Liberty Mutual Insurance Company, a corporation organized under the laws of the State of Massachusetts and authorized to transact business in the State of Colorado, hereinafter referred to as Surety, are held and firmly bound unto the CITY AND COUNTY OF DENVER, a municipal corporation of the State of Colorado, hereinafter referred to as the "CITY", in the penal sum of SEVEN MILLION, NINE HUNDRED FOUR THOUSAND, EIGHTY-ONE AND 77/100 Dollars (\$7,904,081.77), lawful money of the United States of America, for the payment of which sum the Contractor and Surety bind themselves and their heirs, executors, administrators, successors and assigns, jointly and severally by these presents.

WHEREAS, the above Contractor has entered into a written contract with the City for furnishing all labor, materials, equipment, tools, superintendence, and other facilities and accessories for the construction of Contract No. 201313528, Runway 8-26 Complex Lighting Rehabilitation, Denver International Airport, in accordance with the Technical Specifications, Contract Drawings and all other Contract Documents therefor which are incorporated herein by reference and made a part hereof, and are herein referred to as the Contract.

NOW, THEREFORE, the condition of this performance bond is such that if the Contractor:

1. Promptly and faithfully observes, abides by and performs each and every covenant, condition and part of said Contract, including, but not limited to, its warranty provisions, in the time and manner prescribed in the Contract, and
2. Pays the City all losses, damages (liquidated or actual, including, but not limited to, damages caused by delays in the performance of the Contract), expenses, costs and attorneys' fees, that the City sustains resulting from any breach or default by the Contractor under the Contract, then this bond is void; otherwise, it shall remain in full force and effect.

IN ADDITION, if said Contractor fails to duly pay for any labor, materials, team hire, sustenance, provisions, provender, or any other supplies used or consumed by said Contractor or its subcontractors in its performance of the work contracted to be done or fails to pay any person who supplies rental machinery, tools, or equipment, all amounts due as the result of the use of such machinery, tools, or equipment in the prosecution of the work, the Surety shall pay the same in an amount not exceeding the amount of this obligation, together with interest as provided by law.

PROVIDED FURTHER, that the said Surety, for value received, hereby stipulates and agrees that any and all changes in the Contract or compliance or noncompliance with the formalities in the Contract for making such changes shall not affect the Surety's obligations under this bond and the Surety hereby waives notice of any such changes.

(End of Page)

IN WITNESS WHEREOF, said Contractor and said Surety have executed these presents as of this 23rd day of January, 2014.

STURGEON ELECTRIC COMPANY, INC.
CONTRACTOR

By: 
President

Richard S Swartz, Sr. Vice President & CO

Liberty Mutual Insurance Company
SURETY

By: 
Attorney-in-Fact Sheree Kuo Hsieh

(Accompany this bond with Attorney-in-Fact's authority from the Surety to execute bond, certified to include the date of the bond.)

CITY AND COUNTY OF DENVER

By: 
MAYOR

By: 
Manager of Aviation

APPROVED AS TO FORM:

D. SCOTT MARTINEZ, Attorney for the
City and County of Denver

By: 
Assistant City Attorney

THIS POWER OF ATTORNEY IS NOT VALID UNLESS IT IS PRINTED ON RED BACKGROUND.

4923666

This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

LIBERTY MUTUAL INSURANCE COMPANY
BOSTON, MASSACHUSETTS
POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS: That Liberty Mutual Insurance Company (the "Company"), a Massachusetts stock insurance company, pursuant to and by authority of the By-law and Authorization hereinafter set forth, does hereby name, constitute and appoint MICHAEL M. BILL, MICHAEL H. BILL, EDWARD L. MOURNIGHAN, CYNTHIA L. JENKINS, GINGER J. KRAHN, SHEREE KUO HSIEH, BRENDA JOHNSTON, CINDY STELLHORN, LAURAN REYNOLDS, ALL OF THE CITY OF INDIANAPOLIS, STATE OF INDIANA.....

each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations in the penal sum not exceeding FOUR HUNDRED MILLION AND 00/100 DOLLARS (\$ 400,000,000.00) each, and the execution of such undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents, shall be as binding upon the Company as if they had been duly signed by the president and attested by the secretary of the Company in their own proper persons.

That this power is made and executed pursuant to and by authority of the following By-law and Authorization:

ARTICLE XIII - Execution of Contracts: Section 5. Surety Bonds and Undertakings.

Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

By the following instrument the chairman or the president has authorized the officer or other official named therein to appoint attorneys-in-fact:

Pursuant to Article XIII, Section 5 of the By-Laws, David M. Carey, Assistant Secretary of Liberty Mutual Insurance Company, is hereby authorized to appoint such attorneys-in-fact as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

That the By-law and the Authorization set forth above are true copies thereof and are now in full force and effect.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Company and the corporate seal of Liberty Mutual Insurance Company has been affixed thereto in Plymouth Meeting, Pennsylvania this day of 12th day of October, 2011



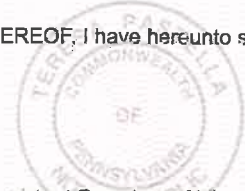
LIBERTY MUTUAL INSURANCE COMPANY

By David M. Carey
David M. Carey, Assistant Secretary

COMMONWEALTH OF PENNSYLVANIA ss
COUNTY OF MONTGOMERY

On this 12th day of October, 2011, before me, a Notary Public, personally came David M. Carey, to me known, and acknowledged that he is an Assistant Secretary of Liberty Mutual Insurance Company; that he knows the seal of said corporation; and that he executed the above Power of Attorney and affixed the corporate seal of Liberty Mutual Insurance Company thereto with the authority and at the direction of said corporation.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at Plymouth Meeting, Pennsylvania, on the day and year first above written.



By Teresa Pastella
Teresa Pastella, Notary Public

CERTIFICATE

I, the undersigned, Assistant Secretary of Liberty Mutual Insurance Company, do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy, is in full force and effect on the date of this certificate; and I do further certify that the officer or official who executed the said power of attorney is an Assistant Secretary specially authorized by the chairman or the president to appoint attorneys-in-fact as provided in Article XIII, Section 5 of the By-laws of Liberty Mutual Insurance Company.

This certificate and the above power of attorney may be signed by facsimile or mechanically reproduced signatures under and by authority of the following vote of the board of directors of Liberty Mutual Insurance Company at a meeting duly called and held on the 12th day of March, 1980.

VOTED that the facsimile or mechanically reproduced signature of any assistant secretary of the company, wherever appearing upon a certified copy of any power of attorney issued by the company in connection with surety bonds, shall be valid and binding upon the company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seal of the said company, this 23rd day of January, 2014.



By Gregory W. Davenport
Gregory W. Davenport, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, bank deposit, currency rate, interest rate or residual value guarantees.

To confirm the validity of this Power of Attorney call 1-610-832-8240 between 9:00 am and 4:30 pm EST on any business day.

PAYMENT BOND Bond No. 014066862

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned Sturgeon Electric Company, Inc., a corporation organized under the laws of the State of Michigan hereinafter referred to as the "Contractor" and Liberty Mutual Insurance Company, a corporation organized under the laws of the State of Massachusetts and authorized to transact business in the State of Colorado, hereinafter referred to as Surety, are held and firmly bound unto the CITY AND COUNTY OF DENVER, a municipal corporation of the State of Colorado, hereinafter referred to as the "CITY", in the penal sum of SEVEN MILLION, NINE HUNDRED FOUR THOUSAND, EIGHTY-ONE AND 77/100 Dollars (\$7,904,081.77), lawful money of the United States of America, for the payment of which sum the Contractor and Surety bind themselves and their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the above Contractor has entered into a written contract with the City for furnishing all labor, materials, tools, superintendence, and other facilities and accessories for the construction of Contract No. 201313528, Runway 8-26 Complex Lighting Rehabilitation, Denver International Airport, in accordance with the Technical Specifications, Contract Drawings and all other Contract Documents therefor which are incorporated herein by reference and made a part hereof, and are herein referred to as the Contract.

NOW, THEREFORE, the condition of this payment bond obligation is such that if the Contractor shall at all times promptly make payments of all amounts lawfully due to all persons supplying or furnishing it or its subcontractors with labor and materials, rental machinery, tools, or equipment, used or performed in the prosecution of work provided for in the above Contract and shall indemnify and save harmless the City to the extent of any and all payments in connection with the carrying out of such Contract which the City may be required to make under the law, then this obligation shall be null and void, otherwise, it shall remain in full force and effect;

PROVIDED FURTHER, that the said Surety, for value received, hereby stipulates and agrees that any and all changes in the Contract, or compliance or noncompliance with the formalities in the Contract for making such changes shall not affect the Surety's obligations under this bond and the Surety hereby waives notice of any such changes.

[END OF PAGE]

IN WITNESS WHEREOF, said Contractor and said Surety have executed these presents as of this 23rd day of January, 2014.

STURGEON ELECTRIC COMPANY, INC.
CONTRACTOR

By: 
President


Richard S Swartz, Sr. Vice President & COO

Liberty Mutual Insurance Company
SURETY

By: 
Attorney-in-Fact Sheree Kuo Hsieh

(Accompany this bond with Attorney-in-Fact's authority from the Surety to execute bond, certified to include the date of the bond.)

CITY AND COUNTY OF DENVER

By: 
MAYOR

By: 
Manager of Aviation

APPROVED AS TO FORM:

D. SCOTT MARTINEZ, Attorney for the
City and County of Denver

By: 
Assistant City Attorney

THIS POWER OF ATTORNEY IS NOT VALID UNLESS IT IS PRINTED ON RED BACKGROUND.

4923649

This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

LIBERTY MUTUAL INSURANCE COMPANY
BOSTON, MASSACHUSETTS
POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS: That Liberty Mutual Insurance Company (the "Company"), a Massachusetts stock insurance company, pursuant to and by authority of the By-law and Authorization hereinafter set forth, does hereby name, constitute and appoint MICHAEL M. BILL, MICHAEL H. BILL, EDWARD L. MOURNIGHAN, CYNTHIA L. JENKINS, GINGER J. KRAHN, SHEREE KUO HSIEH, BRENDA JOHNSTON, CINDY STELLHORN, LAURAN REYNOLDS, ALL OF THE CITY OF INDIANAPOLIS, STATE OF INDIANA...

, each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations in the penal sum not exceeding FOUR HUNDRED MILLION AND 00/100 DOLLARS (\$ 400,000,000.00) each, and the execution of such undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents, shall be as binding upon the Company as if they had been duly signed by the president and attested by the secretary of the Company in their own proper persons.

That this power is made and executed pursuant to and by authority of the following By-law and Authorization:

ARTICLE XIII - Execution of Contracts: Section 5. Surety Bonds and Undertakings.

Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

By the following instrument the chairman or the president has authorized the officer or other official named therein to appoint attorneys-in-fact:

Pursuant to Article XIII, Section 5 of the By-Laws, David M. Carey, Assistant Secretary of Liberty Mutual Insurance Company, is hereby authorized to appoint such attorneys-in-fact as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

That the By-law and the Authorization set forth above are true copies thereof and are now in full force and effect.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Company and the corporate seal of Liberty Mutual Insurance Company has been affixed thereto in Plymouth Meeting, Pennsylvania this day of 12th day of October 2011

LIBERTY MUTUAL INSURANCE COMPANY

By David M. Carey, Assistant Secretary

COMMONWEALTH OF PENNSYLVANIA ss
COUNTY OF MONTGOMERY

On this 12th day of October, 2011, before me, a Notary Public, personally came David M. Carey, to me known, and acknowledged that he is an Assistant Secretary of Liberty Mutual Insurance Company; that he knows the seal of said corporation; and that he executed the above Power of Attorney and affixed the corporate seal of Liberty Mutual Insurance Company thereto with the authority and at the direction of said corporation.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at Plymouth Meeting, Pennsylvania, on the day and year first above written.

By Teresa Pastella, Notary Public

CERTIFICATE

I, the undersigned, Assistant Secretary of Liberty Mutual Insurance Company, do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy, is in full force and effect on the date of this certificate, and I do further certify that the officer or official who executed the said power of attorney is an Assistant Secretary specially authorized by the chairman or the president to appoint attorneys-in-fact as provided in Article XIII, Section 5 of the By-laws of Liberty Mutual Insurance Company.

This certificate and the above power of attorney may be signed by facsimile or mechanically reproduced signatures under and by authority of the following vote of the board of directors of Liberty Mutual Insurance Company at a meeting duly called and held on the 12th day of March, 1980.

VOTED that the facsimile or mechanically reproduced signature of any assistant secretary of the company, wherever appearing upon a certified copy of any power of attorney issued by the company in connection with surety bonds, shall be valid and binding upon the company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seal of the said company, this 23rd day of January, 2014

By Gregory W. Davenport, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, bank deposit, currency rate, interest rate or residual value guarantees.

To confirm the validity of this Power of Attorney call 1-610-832-8240 between 9:00 am and 4:30 pm EST on any business day.

CITY AND COUNTY OF DENVER

DEPARTMENT OF AVIATION

NOTICE TO PROCEED

Date:

TO: [Bidder name and address]

You are hereby authorized and directed to proceed on this date with the work of constructing Contract No. 201313528, Runway 8-26 Complex Lighting Rehabilitation, Denver International Airport, Denver, Colorado, as set forth in detail in the Contract Documents for the City and County of Denver.

The bid security submitted with your bid is herewith returned to you.

CITY AND COUNTY OF DENVER

By _____
Deputy Manager of Aviation
Airport Infrastructure Management

By _____
Manager of Aviation

CITY AND COUNTY OF DENVER

DEPARTMENT OF AVIATION

FINAL RECEIPT

Denver, Colorado

Received this date of the City and County of Denver, as full and final payment of the cost of the construction of Contract No. 201313528, Runway 8-26 Complex Lighting Rehabilitation, Denver International Airport, Denver, Colorado, provided for in the foregoing Contract, _____ Dollars and _____ Cents (\$_____), in cash, being the remainder of the full amount accruing to the undersigned by virtue of said Contract; said cash also covering and including full payment for the cost of all extra work and material furnished by the undersigned in the construction of said improvements, and all incidentals thereto, and the undersigned hereby releases said City and County from all claims whatsoever growing out of said Contract.

And these presents are to certify that all persons doing work upon or furnishing materials for said improvements under the foregoing Contract have been paid in full.

City and County of Denver



DENVER
THE MILE HIGH CITY

DEPARTMENT OF AVIATION
DEPARTMENT OF PUBLIC WORKS

**STANDARD SPECIFICATIONS FOR
CONSTRUCTION
GENERAL CONTRACT CONDITIONS**

2011 Edition

Statement

The City and County of Denver does not warrant or represent the accuracy or timeliness of the information contained in this page or any of its constituent pages and the information presented is for instructional purposes and illustration only and is not intended to be specific advice, legal or otherwise. The City has made every effort to provide accurate up-to-date information, however this database is dynamic and errors can occur. The City and County of Denver shall not be held responsible for errors or omissions nor be liable for any special consequential or exemplary damages resulting, in whole or in part, from any viewer(s)' uses of, or in reliance upon, this material.

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SPECIAL CONDITIONS

SC-1 CONSTRUCTION CONTRACT GENERAL CONDITIONS

The Construction Contract General Conditions which constitute a part of the Contract Documents are set forth in a separately published document, entitled “City and County of Denver, Department of Aviation and Department of Public Works, Standard Specifications for Construction, General Contract Conditions,” 2011 Edition, the Table of Contents to which is bound herein (which may be informally referred to as the Yellow Book). The General Conditions book is available for purchase for \$12.00 per copy at the following locations during the business hours stated, Monday through Friday, excluding holidays:

Office of the Cashier
Wellington E. Webb Municipal Office Building, 2nd Floor
201 West Colfax Avenue
Denver, Colorado, USA 80202
7:30 a.m. to 4:30 p.m.

The General Conditions are also available on the DIA Contract Procurement on the City and County of Denver website at:

http://www.denvergov.org/dpw_contract_admin/ContractAdministration/ContractorReferenceDocuments/tabid/440535/Default.aspx

SC-2 DRAWINGS AND SPECIFICATIONS TO BE FURNISHED BY THE CITY

The City will provide the following Contract Documents to the Contractor in electronic format at no expense to the Contractor:

Document
Volumes I & 2 (See the Master Table of Contents, page TOC-3, for the content of these volumes)

Volume 3
Contract Drawings
Change Orders and Change Order Directives

Additional copies of the foregoing documents will be furnished to the Contractor at the Contractor’s expense. The Contractor will be responsible for supplying all subcontractors with copies of the Contract Documents at its expense.

If Sensitive Security Information (“SSI”) is provided to the Contractor, the Contractor shall be required to comply with Department of Aviation, Standard Policies and Procedures No. 6003, “Contractor Protection of Sensitive Security Information,” or its successor, and 49 C.F.R. § 1520, or its successor.

The City will not supply any copies of the General Contract Conditions to the Contractor at City expense.

SC-3 REVISIONS TO G.C. 201

The second sentence of General Condition 201 is amended to read: “The unit responsible for this management and control is the Airport Infrastructure Management Office under the supervision of the Deputy Manager of Aviation for Maintenance and Airport Infrastructure Management.”

SC-4 CITY LINE OF AUTHORITY AND CONTACTS

In accordance with General Condition 214, the City’s line of authority for administration of this Contract is:

Manager of Aviation (the “Manager” under G.C. 112). The Manager of Aviation is Kim Day, Executive Office, 9th Floor, Airport Office Building, 8500 Peña Boulevard, Denver, CO 80249.

Deputy Manager of Aviation for Airport Infrastructure Management (the “Deputy Manager” under G.C. 109), who reports to the Manager. The Manager is Dave Laporte, Airport Infrastructure Management Office, 7th Floor, Airport Office Building, 8500 Peña Boulevard, Denver, CO 80249.

Assistant Manager of Aviation for Airport Infrastructure Management (the “Assistant Manager”), reports to the Deputy Manager. The Project Manager reports to the Assistant Manager. The Assistant Manager is Michael Steffens Airport Infrastructure Management Division, 7th Floor, Airport Office Building, 8500 Peña Boulevard, Denver, CO 80249.

Project Manager, the City representative who has day to day administrative responsibility of this Contract, and who reports to the Deputy Manager. All notices, requests, pay applications (pursuant to G.C. 902), and other correspondence from the Contractor shall be sent to the assigned Project Manager unless otherwise provided in this Contract. The Project Manager for this Contract is: PMname, Airport Infrastructure Management Office, 7th Floor, Airport Office Building, 8500 Peña Boulevard, Denver, CO 80249, phone 303-342-2200.

The Manager may from time to time substitute a different City official as the designated “Deputy Manager” hereunder, and any such change will be effective upon the issuance of written notice to the Contractor which identifies the successor Deputy Manager. The Deputy Manager may from time to time change the assigned Project Manager, and any such change will be effective upon the issuance of written notice to the Contractor which identifies the successor Project Manager.

SC-5 CONTRACTOR PERFORMANCE; SUBCONTRACTING

With respect to General Condition 501, no more than 60% of the work may be subcontracted.

SC-6 COOPERATION WITH OTHERS

The Technical Specifications describe the constraints on the physical work site areas. These descriptions are not exhaustive and the Contractor is required to coordinate its activities and work as may be required to meet FAA or City requirements while performing work on DIA.

Without limiting the foregoing, the following contracts administered by the City involve or may involve work overlapping or adjoining the Work under this Contract, and may be prosecuted concurrently with the Work performed under this Contract. There may also be other adjoining or overlapping contracts which are not listed.

<u>Contract No.</u>	<u>Description</u>
<u>TBD</u>	<u>Annual Airfield Pavement Rehabilitation</u>
<u>TBD</u>	<u>Annual Airfield Joint Rehabilitation</u>
<u>201310903</u>	<u>Concourse C West Apron Expansion</u>
<u>TBD</u>	<u>Concourse B Gate Pavement Rehab</u>
<u>TBD</u>	<u>Annual Runway Complex Pavement Rehabilitation</u>
<u>TBD</u>	<u>East Airfield Drainage Improvements</u>
<u>TBD</u>	<u>Glycol Recycling Plant Drainage Improvements</u>

SC-7 PROSECUTION AND COMPLETION OF THE WORK:

The Work to be performed under the Contract is described in the Technical Specifications and Contract Drawings. The Contractor shall complete the Work within one hundred fifty (150) consecutive calendar days from Notice to Proceed.

The Work to be performed under the Contract is divided into the following Milestone Areas which are described in the Technical Specifications or Contract Drawings. The Contractor shall complete the work included within these areas within the number of days set forth below:

<u>Milestone</u>	<u>Date of Completion (or, days from NTP)</u>
1. Administrative and Mobilization	60
2. RW 8-26 Complex North of TW Z	45
3. TW K and TW Z East of TW K	15
4. TW Z between TWs K & Z1	15
5. TW Z West of TW Z1	15
6. Homerun Cable Installation between East Vault & EMH 03010	45

SC-8 LIQUIDATED DAMAGES

If the Contractor fails to achieve Substantial Completion of the Work within the Contract Time, the Contractor shall be liable to the City for liquidated damages at the rate of \$10,000.00 per day until substantial completion is achieved. [Additionally, if the Contractor fails to substantially complete the Work described in a project Milestone within the time specified in SC-7 PROSECUTION AND COMPLETION OF THE WORK, the Contractor shall be liable to the

City for liquidated damages at the following rates per day until such substantial completion is achieved:]

Failure to substantially complete the Work described in Milestone:

	<u>Amount per day</u>
1.	\$1000
2.	\$20000
3.	\$5000
4.	\$5000
5.	\$5000
6.	\$5000

Article IV of the Contract and General Condition 602 cover payment and withholding of liquidated damages.

SC-9 FACILITY SECURITY AND PERSONNEL ACCESS

The Contractor shall conduct all its activities at the Airport in compliance with the Airport security system rules and regulations, which are administered by the Airport Operations Division. The Contractor shall obtain the proper access authorizations for its employees, subcontractors and suppliers (i.e., Badges and Permits), and shall be responsible for such persons' compliance with all the Airport rules and regulations. A copy of the Contractors' section of the Airport Security rules and regulations are available for Contractor review at the Airport Access Services Office, Concourse A East Subcore, 4th Level. Persons regularly entering the construction areas must obtain personnel access badges from the Airport Access Services Office and must display badges, at all times, upon entering the construction, restricted and sterile areas of the airport.. Any employee, subcontractor or supplier who violates such rules may be subject to revocation of his access authorization, including authorization for access to the construction site and all other restricted and sterile areas.

The security status of the Airport is subject to change without notice. These contract Special Conditions are applicable to the current security status of the Airport. Should the security status of the Airport change at any time during the term of this Contract, a written notice shall be issued to the Contractor detailing all applicable security modifications from the airport's current security status. The Contractor shall take immediate steps to comply with those security modifications as directed in the written notice.

If these security modifications involve any additional project cost, the Contractor shall submit a Contractor Change Request in accordance with the General Conditions for the additional cost. The Contractor Change Request shall outline in specific detail the effects of the security modifications on the Contractor's performance of the Contract, and shall provide a detailed cost breakdown for each item for which the Contractor is requesting reimbursement.

The Contractor shall return to the City, at contract completion or termination, or upon demand by the City, all access keys issued to it by the City to all areas of the Airport. If the Contractor fails

to return any such key or keys at contract completion or termination or upon demand by the City, the Contractor shall be liable to the City for all the City's costs, including the City's labor costs for employees, incurred in re-coring doors and any other work which is required to prevent compromise of the Airport security system. In order to collect such costs hereunder, the City may withhold funds in such amount from any amounts due and payable to the Contractor under this Contract.

The construction of all the Project / Task Items that involve the breaching of any airport perimeter security boundary or continued access to restricted access rooms or areas will require the posting of authorized contract security personnel to maintain required security controls. The Contractor's Guarantee Maximum Price / Total Contract BID Amount / Task Order Proposal shall include the cost of providing security services to maintain control and supervision of any and all airport perimeter security boundary breaches and for the duration of work activities where access to restricted areas is required and until the airport perimeter security boundaries are reestablished.

When security boundaries are opened for any reason, the Contractor must maintain one hundred percent (100%) control and supervision for the entire time that the openings are present to prevent unauthorized access to the secure / restricted access areas.

THE IMPORTANCE OF THIS SPECIAL CONDITION CANNOT BE OVER-EMPHASIZED. SEVERE FINANCIAL PENALTIES AS WELL AS CONTRACT TERMINATION COULD RESULT IF AIRPORT PERIMETER SECURITY REQUIREMENTS ARE NOT STRICTLY FOLLOWED. THE REQUIREMENT TO PROVIDE ONE HUNDRED PERCENT (100%) CONTROL AND SUPERVISION OF BREACHES IN THE AIRPORT'S PERIMETER SECURITY BOUNDARY IS ABSOLUTE. AT NO TIME, DURING WORK AND NON-WORK HOURS SHALL ANY BREACHES IN THE AIRPORT'S SECURITY PERIMETER BE UNSUPERVISED AND / OR UNSECURED.

For off-hours of construction, the Contractor may choose to erect a temporary wall to close all perimeter openings. The wall construction shall be of sufficient materials and strength to prevent access to the airport's Sterile/Restricted Areas. The Contractor shall submit for review and approval, the details and materials for the temporary closure of security perimeter breaches for review and approval.

The Contractor will provide contract security guard services to maintain supervision of these openings. The security services must provide coverage to allow for lunch breaks, comfort breaks and etc. The security services must be obtained from the following contract security guard company:

HSS
900 S. Broadway, Suite 100
Denver, Colorado 80209

DIA Contact: Glenn Spies
(303) 342-4323

All security guards provided for this project must have a Denver Airport SIDA Badge.

The DIA Security Guard Contractor may change between the bidding or proposal phase of this contract from Notice to Proceed to closure of all security perimeter breaches. The Contractor shall maintain a contractual relationship with the Security Guard Contractor holding the most current contract with Denver International Airport.

The Contractor shall continue to provide security of these areas until such time that the breaches in the airport's security perimeter have been permanently secured.

The Contractor shall submit a written security plan for approval to the Director of Airport Security prior to the start of construction on any work where a breach of the perimeter security boundaries is required.

SC-10 CONSTRUCTION ACCESS

The work site(s) is (are) located at East Airfield. The Contractor shall have access to the work site via Gates 4, 5 & 7.

The City will not provide parking spaces for the Contractor's employees or subcontractor employees at the Airport. Arrangements for transportation and parking for all of its and its subcontractors employees will be the responsibility of the Contractor. The Total Contract Bid Amount or Contract Amount shall include any and all costs associated with the Contractor's and subcontractors' employee parking. Information about parking facilities and charges is available from the Airport Parking Office. Refundable deposits are required for all parking passes.

Unless specifically required by the Contract Documents, the Contractor shall install no fences or other physical obstructions on or around any project work area without the approval of the City.

SC-11 VEHICLE PERMITTING

Vehicle access on the Airport Operation Area ("AOA") is controlled by and requires permission from the Airport Access Services Office. It is not anticipated that the Contractor will need to operate vehicles on the AOA to perform the Work. Only direct construction support vehicles and/or equipment will be allowed in the contractor's work areas or sites.

SC-12 VENDORS AND SUPPLIERS

The Contractor shall provide the Project Manager's office with a list of its equipment/material vendors and suppliers. Vendors or suppliers shall access the construction work areas via the Contractor's access route, described in SC-10 above. All delivery vehicles are subject to search.

SC-13 COMMUNICATION DEVICES

Any site communications devices, mobile communication devices or internet data devices used

at DIA must be approved by DIA Technologies.

SC-14 USE, POSSESSION OR SALE OF ALCOHOL OR DRUGS

The Contractor and its officers, agents, and employees shall cooperate and comply with the provisions of Executive Order No. 94 and Attachment A thereto concerning the use, possession, or sale of alcohol or drugs. Violation of these provisions or refusal to cooperate with implementation of the policy can result in the City's barring the Contractor from City facilities or participating in City operations.

SC-15 ATTORNEY'S FEES

Colorado Revised Statute 38-26-107 requires that in the event any person or company files a verified statement of amounts due and unpaid in connection with a claim for labor and materials supplied on this project, the City shall withhold from payments to the Contractor sufficient funds to insure the payment of any such claims. Should the City and County of Denver be made a party to any lawsuit to enforce such unpaid claims or any lawsuit arising out of or relating to such withheld funds, Contractor agrees to pay to the City its costs and a reasonable attorney's fee. Because the City Attorney Staff does not bill the City for legal services on an hourly basis, Contractor agrees a reasonable fee shall be computed at the rate of one hundred dollars per hour of City Attorney time.

SC-16 INSURANCE REQUIREMENTS

In accordance with the provisions of Title 16 of the General Conditions, the minimum insurance requirements for this contract are set forth in the Exhibit Q, attached to this Contract. The Contractor specifically agrees to comply with each condition, requirement or specification set forth in the attachment for each required coverage during all periods when the required coverage's are in effect.

City anticipates providing an Rolling Owner Controlled Insurance Program (ROCIP), which coverage City agrees will be primary over any other insurance provided by an enrolled party. City agrees to allow Contractor to review all proposed coverage forms prior to implementation of the ROCIP. Following implementation of the ROCIP, Contractor agrees to provide a credit to the City for the cost of insurance coverage being provided by the ROCIP. The amount of such credit will be determined based upon a review of actual ROCIP coverages. The City shall be named as an additional insured on Contractor's general liability policy in the event that Contractor includes the costs of said coverage in its bid.

Contractor and sub-contractors shall procure and maintain until all of their obligations have been discharged, including any warranty periods under this Contract are satisfied, required insurance against claims for injury to persons or damage to property which may arise from or in connection with the performance of the work hereunder by the Contractor, his agents, representatives, employees or sub-contractors.

The insurance requirements herein are minimum requirements for this Contract and in no way

limit the indemnity covenants contained in this Contract.

The City and County of Denver in no way warrants that the minimum limits contained herein are sufficient to protect the Contractor from liabilities that might arise out of the performance of the work under this Contract by the Contractor, his agents, representatives, employees or sub-contractors. The Contractor shall assess its own risks as it deems appropriate and/or prudent, maintain higher limits and/or broader coverages. The Contractor is not relieved of any liability or other obligations assumed or pursuant to the Contract by reason of its failure to obtain or maintain insurance in sufficient amounts, duration or types.

Contractor shall furnish the City and County of Denver with certificates of insurance (ACORD form or equivalent approved by CCD) as required by this Contract. The certificates for each insurance policy are to be signed by a person authorized by the insurer to bind coverage on its behalf.

All certificates and any required endorsements are to be received and approved by the City before work commences. Each insurance policy required by this Contract must be in effect at or prior to commencement of work under this Contract and remain in effect for the duration of the project. Failure to maintain the insurance policies as required by this Contract or to provide evidence of renewal is a material breach of the Contract. All insurance coverages for sub-contractors shall be subject to the minimum requirements identified in the Exhibit. All sub-contractors certificates and endorsements shall be received and approved by the Contractor before work commences. The City reserves the right to request copies of these certificates at any time.

All certificates required by this Contract shall be sent directly to Denver International Airport, Business Management Services, Airport Office Building, Room 8810, 8500 Pena Boulevard, Denver, Colorado 80249. The City project/Contract number and project description shall be noted on the certificate of insurance. The City reserves the right to require complete, certified copies of all insurance policies required by this Contract at any time.

The parties hereto understand and agree that the City and County of Denver, its officers, officials and employees, are relying on, and do not waive or intend to waive by any provisions of this Contract, the monetary limitations or any other rights, immunities and protections provided by the Colorado Governmental Immunity Act, §§ 24-10-101 - 120, C.R.S., or otherwise available to the City and County of Denver, its officers, officials and employees.

SC-17 SUBCONTRACTOR RELEASES

The release form referred to in General Condition 907 is attached to these Special Conditions. It is entitled "Denver International Airport Partial Release."

SC-18 ADDITIONAL AFFIRMATIVE ACTION REQUIREMENTS, FEDERAL PROVISIONS

This contract is subject and subordinate to the terms, reservations, restrictions, and conditions of

any existing or future agreements between the City and the United States, the execution of which has been or may be required as a condition precedent to the transfer of federal rights or property to the City for airport purposes, and the expenditure of federal funds for airport purposes. The “Federal Requirements” section attached hereto is made a part of this Contract.

SC-19 ESTIMATED QUANTITIES OF UNIT PRICED ITEMS

The “total estimated quantity” of each unit price item as stated on the bid schedules shall be the estimated quantity which is used to determine the percentage of change in such item for purposes of G.C. 1104.7.

SC-20 REVISIONS TO G.C. 1102

G.C. 1102.2 is amended by replacing the phrase “Change Request” in all its occurrences in such G.C. with the phrase “Change Notice.”

G.C. 1102.3 is amended by replacing the phrase “Field Order/Change Order Directive” in all its occurrences in such G.C. with the phrase “Change Order Directive.”

SC-21 LISTING OF ACCEPTABLE MANUFACTURERS

The Technical Specifications list “Acceptable Manufacturers” for certain products. Such listing identifies manufacturers of certain products which have been determined by a preliminary review to be able to meet the basic product and/or system technical requirements. The listing is not intended to provide a blanket endorsement or acceptance of the manufacturer’s specified products or product line. All products from listed manufacturers must meet the detailed requirements of the Technical Specifications. Products that do not meet all detailed Technical Specifications are not acceptable and will be rejected, regardless of whether the manufacturer was listed as “acceptable.” The Contractor is responsible for determining the acceptability of all products under the Technical Specifications prior to submission of products for approval.

SC-22 ACCESSIBLE PARKING SPACES, ACCESS AISLES AND ROUTES OF TRAVEL

If any Work is performed in or adjacent to parking facilities at the Airport, the Contractor is responsible for compliance with this SC-30. “Accessible” parking spaces and access aisles as used in this SC-30 mean parking spaces and access aisles which are accessible for, and reserved for use by, persons with disabilities. These parking spaces and access aisles are designed and built to standards established by federal regulations implementing the Americans with Disabilities Act of 1990 (“ADA”), and are marked by signage. “Accessible routes of travel” as used herein means routes through parking facilities which comply with ADA accessibility standards, including degree of slope and absence of obstructions.

Accessible routes of travel and accessible parking spaces and access aisles must be kept free of obstructions and construction debris at all times. No accessible parking spaces or access aisles or accessible routes of travel shall be relocated, blocked or rendered unusable unless the contractor

has obtained specific advance approval in writing for such actions from the airport's ADA Compliance Officer.

When prosecution of the Work requires that accessible spaces be temporarily blocked, those accessible spaces and their access aisles shall be temporarily relocated to another location as close as possible to an accessible building entrance. Temporary signage that identifies these parking spaces and access aisles as reserved for the handicapped shall be installed, and the accessible route shall be clearly marked as required.

Before blocking or relocating accessible parking spaces or accessible routes of travel, the contractor must obtain written approval from the DIA ADA Compliance Officer, by submitting a completed request form, which will be provided to the Contractor by the Project Manager at the preconstruction meeting if it is not included as a standard form in Section 01999 of the Technical Specifications. The request shall include the location of alternative spaces and/or routes, and specifications of the temporary signage to be used. Work shall not proceed without this approval.

If a vehicle is parked in any accessible space which is either temporary or approved to be relocated, the contractor will not remove signage or take any other action which would allow the access aisle for such parking space to be blocked. Such actions must be postponed until the parking space is no longer occupied.

SC-23 SUBCONTRACTOR PAYMENTS AND SUBCONTRACTOR RELEASES – REQUIRED USE OF THE B2G CONTRACT MANAGEMENT SYSTEM

The Contractor is required to use the City B2G Contract Management System to report all subcontractor payments and shall adhere to the City's Procedure for Reporting Subcontractor Payments. It is the Contractor's obligation to ensure that complete subcontractor information is entered into the B2G System prior to submission of the first application for payment in order to avoid any delays in payment. The Contractor shall, prior to the submission of each subsequent invoice, ensure payments to subcontractors have been entered into the B2G System, including subcontractor confirmation of amount of payment received, for services performed during the prior billing period.

SC-24 PROJECT CONTROLS REQUIREMENTS

The Contractor will be required to use Primavera Contract Management (PCM) and Primavera P6 to comply with the requirements of DIA's Project Controls System. The Project Controls System is Airport Infrastructure Management's tool for project and information management, data analysis and document control. Denver International Airport will be responsible for providing the licensing and training for PCM. The Contractor will be responsible for providing Primavera P6. The Contractor will also be responsible for providing and maintaining the computer hardware, software and system environment capable of supporting Project Controls System requirements including as the minimum: internet connection; Microsoft Internet Explorer 8 or better; Microsoft Office 2010; Oracle Java JRE 1.7.0 Update 5 and Adobe Acrobat X Pro. This is the only project management system that will be accepted.

SC-25 PAYMENTS TO CONTRACTORS

The application for payment shall be submitted through Textura® Corporations Construction Management Website. Contractor recognizes and agrees that it shall be required to use the Textura® Construction Payment Management System for this Project. Contractor further agrees that, to the fullest possible within the CPM System, the City shall be entitled to all non-Confidential records, reports, data and other information related to the project that are available to Contractor through the CPM System, including, but not limited to, information related to Contractor and subcontractor billings. To that end, Contractor agrees that it will activate any available settings within the CPM System that are necessary to grant the City access to such non-Confidential information related to the contract and the project. Applications for payment shall be based on the Contract Unit Prices or the approved Schedule of Values described in GC 903.1 In accordance with General Contract Condition 902, PAYMENT PROCEDURE, The party(ies) responsible for review of all Pay Applications shall be:

<u>Agency/Firm</u>	<u>Name</u>	<u>Telephone</u>
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In accordance with General Contract Condition 906, APPLICATIONS FOR PAYMENT, each Application submitted shall include the following:

1. The estimate of Work completed shall be based on the approved schedule of values or unit prices, as applicable, and the percent of the Work complete.
2. Each Application for Payment shall include each and every independent subcontractor's payroll information including pay dates and pay amounts.
3. The Contractor shall also submit to the Auditor and other appropriate officials of the City in a timely fashion, information required by General Contract Condition 1004, REPORTING WAGES PAID.

In accordance with General Contract condition 907, RELEASES AND CONTRACTORS CERTIFICATION OF PAYMENT, applications for Payment must be accompanied by completed Partial or Final Claim Release Form, as appropriate, from EACH subcontractor and supplier, **AND** the Contractor's Certification of Payment Form.

INSURANCE REQUIREMENTS

The insurance requirements which apply to this contract are contained in the pages immediately following this page which include the following attachments:

1. Exhibit Q, Rolling Owner Controlled Insurance Program (ROCIP)

The following link contains important information to ensure that all costs are captured within your bid proposal.

2. Safety Manual, Owner-Controlled Insurance Program (ROCIP)

<http://business.flydenver.com/bizops/documents/safetyManualROCIPAttach3.pdf>

These pages are not included in the page numbering of this contract document.

EXHIBIT Q
ROLLING OWNER CONTROLLED INSURANCE PROGRAM (ROCIP)

1.0 Definitions

Certificate of Insurance: Evidence of the insurance coverage afforded under the ROCIP. Also, evidence of insurance coverage provided by Enrolled Parties for automobile liability and offsite exposures.

Contract: The written agreement between the City and Contractor describing the Work, Contract Terms and Conditions, or a portion thereof. Also includes a written agreement between a Contractor and any tier of subcontractor.

Contractor: Prime Contractor, subcontractors of any tier.

Contractor insurance cost The Costs of ROCIP Coverage is defined as the amount of Contractor's and eligible Subcontractors' of every tier reduction in insurance costs due to the ROCIP Program.

City (Sponsor): City of Denver Owner Controlled In-surance Program (ROCIP):
A coordinated insurance program providing certain cover-age, as defined herein, for the City, Contractor and Enrolled Subcontractors, along with their Eligible Employ-ees, performing Work at the Project Site.

Eligible Employees: Employees of Enrolled Subcontractors who are not ex-cluded from the ROCIP under the "Excluded Parties" defini-tion.

Enrolled Parties: The Contractor and those Subcontractors that have submitted all necessary enrollment information and been accepted into the ROCIP as evidenced by the issuance of a Certificate of Insurance.

Excluded Parties: Parties not covered by the ROCIP because of ineligibility. No insurance coverage provided by City under the ROCIP shall extend to the activities or products of the fol-lowing:

(1) Any person or organization that fabricates or manufac-tures products, materials or supplies away from the Project Site(s);

(2) Hazardous materials remediation, removal, or trans-portion companies and their consultants;

(3) Any architect, engineer or surveyor and their consult-ants except when approved by City;

(4) Truckers, haulers, material dealers, vendors, suppliers, and others who merely transport, pick up, deliver or carry materials, personnel, parts or equipment or any other items or

persons to or from the Site;

(5) Contractors and their subcontractors and sub-consultants and any employee of an Enrolled Party, who does not work at the Project Site;

(6) Any employees of an Enrolled Party who occasionally visits the Project Site to make deliveries, pick-up supplies or personnel, to perform supervisory or progress inspections, or for any other reason;

(7) Persons or entities who are not enrolled parties or included as insureds within the policies;

(8) Any Day Labor Employees (labor service employees whose coverage is provided by their employer); or

(9) Any other person or entity specifically excluded by City, in its sole discretion, from participation as Enrolled Parties.

Insured: (liability policies) The City, Contractor and Enrolled Parties and their Eligible Employees and any other party named in the insurance policies.

Insurers Those Insurance Companies providing the ROCIP insurance coverage. The Insurers will be identified in the ROCIP Manual.

Net Bid: Contractor bids with insurance costs removed because of the obligation of any Enrolled Party to delete insurance costs for coverage provided by the ROCIP from its bid and all change orders. Net bids are subject to verification by the ROCIP Administrator through the providing of contractors' rate and declaration pages from their Insurance policies.

ROCIP Administrator: Insurance services firm selected by the City to administer the ROCIP and provide insurance brokerage services as required.

ROCIP Manual A reference document provided to contractors of all tiers, which summarizes the terms and provisions of the ROCIP and provides information about compliance with ROCIP requirements.

Off-Site Work Work performed away from the Project Site.

Payroll: For purposes of the ROCIP only, refers to Unburdened Straight Time Payroll per Workers Compensation Class Code.

Project: The Project as defined in the contract documents and as described in the Declarations of the ROCIP policies.

Project Site: Those areas designated in writing by The City of Denver in a Contract document for performance of the Work and such additional areas as may be designated in writing by The City of Denver for Contractor's use in performance of the Work. Subject to ROCIP Insurers

written approval, the term “Project Site” shall also include: (1) field office sites, (2) property used for bonded storage of material for the Project approved by The City of Denver, (3) staging areas dedicated to the Project, and (4) areas where activities incidental to the Project are being performed by Contractor or Subcontractors covered by the worker’s compensation policy included in the ROCIP, but excluding any permanent locations of Contractor or such covered Subcontractors.

Subcontract: The written agreement between Contractor and Subcontractor, or between Subcontractor and a lower tier Subcontractor, describing the Work, Subcontract Terms and Conditions, or a portion thereof.

Subcontractor: Includes those persons, firms, joint venture entities, corporations, or other parties that enter into a Subcontract with Contractor to perform Work at the Project Site and any of these Subcontractor’s lower-tier subcontractors.

Work: Operations, as fully described in the Contract and Subcontract, performed at the Project Site.

2.0 General Information

2.1 **Insurance Provided by City.** City has arranged for this Project to be insured under an ROCIP. Coverage shall be provided for Workers’ Compensation, Employer’s Liability, General Liability, Excess Liability, Builders Risk (if applicable) and Contractors Pollution Liability as outlined herein and as defined by the respective policies for each coverage, for the period from the start of Work through completion and final acceptance by City, except as otherwise provided herein.

2.2 **Enrollment Required.** Parties performing labor or services at the Project site are eligible to enroll in the ROCIP, unless they are Excluded Parties (as defined herein). Participation in the ROCIP is mandatory but not automatic. Parties eligible for enrollment shall follow the procedures and use the forms provided in the ROCIP manual to enroll in the ROCIP. When the Contractor and Subcontractors and lower-tier subcontractors are properly enrolled in the ROCIP, the ROCIP Administrator will issue or have issued to the Contractor, Subcontractor and lower-tier subcontractors, prior to their commencing Work on the Project Site, a Certificate of Insurance evidencing the coverage arranged by City.

2.4 **Exclusion of Contractor/Subcontractor Insurance Costs from Proposal and Bid Prices.** Contractor shall exclude from Contractor’s cost of work, and ensure that each Subcontractor of every tier exclude from their cost of work, normal costs for insurance without an ROCIP for those coverages provided under the ROCIP. The calculation of these costs will be determined using the forms found in the ROCIP Manual. The Costs of ROCIP Coverage includes reductions in insurance premiums, all relevant taxes and assessments, markup on insurance premiums, and losses retained through large deductibles or self-insured retentions, or self-funded other programs. Change orders shall also exclude the Cost of ROCIP Coverage.

2.5 Insurance Premiums. City will pay the insurance premiums for the ROCIP coverage. The City is responsible for all adjustments to the premiums and will be the sole beneficiary of all dividends, retroactive adjustments, return premiums, and any other monies due through audits or otherwise. The Contractor assigns to the City the right to receive all such adjustments, and will require that each subcontractor of every tier assign to City all such adjustments. The Contractor and the Subcontractors who are Enrolled Parties shall execute such further documentation as may be required by City to accomplish this assignment.

2.6 Off Site Operations. The ROCIP will provide certain insurance coverage for the City, Contractor and Enrolled Parties, along with their Eligible Employees performing Work at the Project Site. Off-site operations shall be covered only if designated in writing by the City and when all operations at such site are identified and solely dedicated to the Project. Contractors and Subcontractors are responsible to notify the ROCIP Administrator in writing, to request coverage for specified off-site operations. Coverage is not provided at the site unless confirmed in writing by the ROCIP Administrator.

2.7 ROCIP Manual. As soon as practicable, an ROCIP Manual will be sent to the Enrolled Party and will become a part of the Contract and Contractor's Subcontract with Subcontractor. The ROCIP Manual will contain the administrative and claim reporting procedures. Contractor agrees to and will require that its Subcontractors and their lower-tier subcontractors also cooperate with the ROCIP Administrator in providing all information as required in the ROCIP Manual.

2.8 Conflicts. The descriptions of the ROCIP Coverages set forth in this Section are not intended to be complete or meant to alter or amend any provision of the actual ROCIP Policies. The ROCIP coverages and exclusions are set forth in full in their respective policy forms. In the event of a conflict or omission between the coverages described in the ROCIP Policies and the coverages summarized or described in the ROCIP Manual, this Section or elsewhere in the Contract Documents, the coverages and coverage amounts set forth in the actual ROCIP Policies issued by the ROCIP Insurers shall control. In the event of a conflict between the provisions of this Section and the ROCIP Manual that does not involve any conflict with the provisions of the actual ROCIP Policies issued by the ROCIP Insurers, then the provisions of this Section shall govern.

3.0 Summary of Insurance Coverage

3.1 Insurance Provided by the City. Unless otherwise provided herein, prior to commencement of the Work, City, at its sole option and expense, shall secure and maintain at all times during the performance of this Contract the insurance specified below, insuring the City, Contractor, its Subcontractors and such other persons or interests as City may designate with limits not less than those specified below for each coverage.

Workers' Compensation & Employer's Liability:

Coverage: Statutory limits required by the Workers' Compensation Laws of the State of

Colorado:

Part One: Workers' Compensation: Statutory Limits
Part Two: Employer's Liability:
Bodily Injury by Accident: \$2,000,000 each accident
Bodily Injury by Disease: \$2,000,000 each employee
Bodily Injury by Disease: \$2,000,000 policy limit

General Liability (excluding Automobile Liability and Professional Liability):

Coverage: Third party personal injury, bodily injury and property damage liability

Limits of Liability:

Each Occurrence Limit	\$ 2,000,000
General Aggregate	\$ 4,000,000
Products/Completed Operations Aggregate	\$ 4,000,000
Personal/Advertising Injury Aggregate	\$ 2,000,000

Above limits are shared for all Roadway Projects/Contracts.

Excess/Umbrella Liability Insurance (limits noted are minimum limits. The City may elect to provide higher limits, based on the size of the Project):

Coverage: Written on a following form basis over the primary policies.

Minimum Limits of Liability:

Each Occurrence	\$50,000,000 or more
General Aggregate	\$50,000,000 or more
Products/Completed Operations Aggregate	\$50,000,000 or more

Products/Completed Operations coverage will extend to the statute of limitations.

Excess Limits above the first \$50,000,000 may apply to all Projects placed under the City's ROCIP. .

General Liability Insurance Claim Chargeback. A claims charge-back will be assessed for the amount of any loss payable under the ROCIP Commercial General Liability Policy. The Enrolled Party primarily responsible for causing any bodily injury or property damage liability loss shall be responsible for payment of the charge-back. The charge-back will be calculated on the following sliding scale:

For each Contract Per Occurrence:

\$1,000 for Enrolled Party with contracts up to \$100,000
\$5,000 for Enrolled Party with contracts between \$100,001 and \$250,000
\$10,000 for Enrolled Party with contracts between \$250,001 and \$500,000
\$25,000 for Enrolled Party with contracts over \$500,000

Contractors Pollution Liability Insurance (limits noted are minimum limits. The City may elect to provide higher limits, based on the size of the Project):

Unless other provided, the City shall purchase Contractors Pollution Liability arising from claims for pollution incidents arising from Work or services performed under contract at or from the designed Project Site.

Coverage: Liability or responsibility for unexpected and unintended pollution conditions resulting in bodily injury, property damage or environmental damage from pollution conditions caused by covered operations including completed operations. Coverage includes microbial matter and legionella pneumophila in any structure on land and the atmosphere contained with the structure.

Limits of Liability:

Each Loss:	\$10,000,000 or more
Policy Aggregate:	\$10,000,000 or more

Products/Completed Operations coverage may extend for a minimum of eight (8) years after final completion of the Project.

Contractors Pollution Insurance Claims Chargeback. A claims charge-back will be assessed for the amount of any loss payable under the Contractors Pollution. Up to the first \$5,000 of any loss will be paid by Contractor. This includes all expenses or claim payments incurred by the ROCIP Insurer for losses attributable to the Contractor's work, acts or omissions, or the work, acts or omissions of any tier of subcontractor. Contractor may elect to pass this charge through to any responsible subcontractor but in no event may require total subcontractor reimbursement in excess of \$5,000.

Builder's Risk Insurance (if required)

Unless otherwise provided, the City shall purchase and maintain, builder's risk (and/or Installation Floater) in the amount of the initial Contract Sum, plus value of subsequent Contract modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis (as defined in the builders' risk policy). Such builders risk insurance shall end when the first of the following occurs: 1) the City's interest in the Work ceases; 2) the policy expires or is cancelled; or 3) the Work is accepted by the City.

Builders' risk insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss of damage including , theft, vandalism, malicious mischief, terrorism, rigging and hoisting for materials and equipment that are part of the Project, collapse, earthquake, flood, windstorm, falsework, testing and startup (as provided by the policy), temporary buildings and debris removal including demolition occasioned by enforcement of any applicable ordinance laws, and shall cover reasonable compensation for services and expenses required as a result of such

insured loss.

This builder's risk insurance shall cover portion of the Work stored off site, and also portions of the Work in transit.

The City and Contractor shall waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by builders risk insurance obtained pursuant to this section or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the City as fiduciary. The City or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors, and they subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

Builder's Risk Insurance Claims Chargeback. A claims charge-back will be assessed for the amount of any loss payable under the Builder's Risk Policy. Up to the first \$5,000 of any loss will be paid by Contractor. This includes all expenses or claim payments incurred by the ROCIP Insurer for losses attributable to the Contractor's work, acts or omissions, or the work, acts or omissions of any tier of subcontractor. Contractor may elect to pass this charge through to any responsible subcontractor but in no event may require total subcontractor reimbursement in excess of \$5,000.

3.2 Insurance provided by Enrolled Parties. At their own expense, the Enrolled Parties of all tiers must carry the following minimum coverage and limits:

Commercial Automobile Liability Insurance for contract work both occurring on-site and off-site with limits of liability not less than:

\$2,000,000 Combined Single Limit

This insurance must apply to all owned, leased, non-owned or hired vehicles to be used in the performance of work. Such insurance shall allow contractor to waive subrogation against the City and/or its representatives and all Contractors and Subcontractors prior to loss or shall include a waiver of the insurer's right of subrogation. Contractor hereby waives rights of subrogation against City and/or its representatives and all Contractors and Subcontractors. If operations include unescorted airside access at DIA, then a \$9 million Umbrella Limit is required.

Off-Site Workers' Compensation Insurance, including Employer's Liability with minimum limits of

\$1,000,000 Bodily Injury with Accident – Each Accident
\$1,000,000 Bodily Injury with Disease – Policy Limit
\$1,000,000 Bodily Injury with Disease – Each Employee

Coverage to protect Contractor/Subcontractor from and against all claims arising from performance of Work outside the Project Site under the Contract. Such insurance (where permissible by law) shall waive subrogation against the City and/or its representatives and all Contractors and Subcontractors

Off-Site Commercial General Liability Insurance for Contract operations not physically occurring within the Project Site with a limit of liability not less than:

Primary Insurance

\$1,000,000 Each Occurrence
\$1,000,000 Personal Injury and Advertising Injury
\$2,000,000 General Aggregate
\$2,000,000 Products/Completed Operations Aggregate

Such policy shall include coverage for contractual liability assumed under the Contract, contractors' protective liability, and explosion, collapse and underground property damage hazards. The Policy Form should be CG 00 01 or equivalent. Contractor and Subcontractors of all tiers will be required to provide additional Insured status to the City for general liability policies in the name of:

CITY AND COUNTY OF DENVER AND THE DEPARTMENT AVIATION, AND MEMBERS OF THE BOARD OF SUPERVISORS OF THE CITY AND COUNTY OF DENVER AND THE DEPARTMENT OF AVIATION, AND THE OFFICERS, AGENTS AND EMPLOYEES OF THE CITY AND COUNTY OF DENVER AND THE DEPARTMENT OF AVIATION, INDIVIDUALLY AND COLLECTIVELY, AS ADDITIONAL INSUREDS

The additional Insured status shall provide coverage for the Premises/Operations and Products/Completed Operations exposures and shall indicate that such coverage is primary to any insurance carried by the City.

3.2.1 Insurance provided by Enrolled Parties for Special Situations. The Contractor or Subcontractor of any tier, at its own expense, shall provide and maintain the following insurance of the type and in limits as set forth by City risk management should construction operations warrant such coverage.

Aircraft/Aviation Liability. Should aircraft of any kind be used by the Contractor, or by anyone else on its behalf, the Contractor shall contact City risk management to ensure the appropriate aircraft/aviation liability is in place. All limits, coverages, and endorsements will be set and enforced by City risk management.

3.3 Insurance Requirements for Excluded Parties. Contractor and each Subcontractor and its lower-tier subcontractors shall require all Excluded Parties, as defined herein, to provide and maintain insurance of the type and in limits as set forth in the Contractor Subcontract Agreement. The ROCIP, ROCIP Policies, and ROCIP Coverage shall not apply to Excluded Parties, even if erroneously enrolled in the ROCIP. Excluded Parties and parties no longer enrolled or covered by the ROCIP or erroneously enrolled in the ROCIP shall obtain and maintain, and require by contract that each of their lower-tier Subcontractors obtain and maintain at a minimum, the insurance coverage required by Section 3.2 above, and as required by the ROCIP Manual.

4.0 Contractor Warranties and Agreements

4.1 Accuracy of Contractor-provided Information. Contractor warrants that all information submitted to the City or the ROCIP Administrator is accurate and complete to the best of its knowledge. Contractor will notify the City or Administrator immediately in writing of any errors discovered during the performance of the work.

4.2 Contractor Responsible To Review Coverage. Contractor acknowledges that all references to ROCIP policy terms, conditions, and limits of liability in this document, as well as the ROCIP Manual, are for reference only. Contractor and its subcontractors are responsible for conducting their own independent review and analysis of the ROCIP coverage in formulating any opinion or belief as to the applicability to such coverage in the event of any loss or potential claim. Any type of insurance or increase of limits not described above which the Contractor requires for its own protection or on account of statute shall be its own responsibility and at its own expense.

4.3 Audit. Contractor agrees to make its records available for review and to cooperate with the insurers, the City, the Auditor of the City, and the representatives of the aforesaid parties in the event of an audit. In the event that a City audit of Contractor's records, as permitted in the Contract or other ROCIP documents, reveals a discrepancy in the insurance, payroll, safety, or any other information required to be provided to City or ROCIP Administrator, or reveals inclusion of costs for ROCIP coverage in any payment for the work, City will have the right to deduct from payments due Contractor all such insurance costs as well as all audit costs.

4.4 Insurance Costs Removed. Contractor warrants that the Costs for insurance as provided under the ROCIP were not included in Contractor's bid or proposal for the Work, the Contract Price/Contract Sum, and will not be included in any change order or any request for payment for the Work or extra work.

5.0 Contractor Obligations

5.1 ROCIP Documents shall be provided to Subcontractors. Contractor shall furnish each bidding Subcontractor, vendor, supplier, material dealer or other party a copy of this ROCIP Exhibit and the ROCIP Manual and shall incorporate the terms of this Exhibit in all contracts and agreements entered into for performance of any portion of the Work.

5.2 Timely Enrollment Required. Contractor shall enroll in the ROCIP within five (5) days request by City or its ROCIP Administrator. Contractor shall notify each Subcontractor of the procedure for enrolling in City's ROCIP and confirm that enrollment is mandatory but not automatic. Contractor shall assure that Subcontractor and its lower-tier subcontractors shall not commence work until verification of enrollment is confirmed by the ROCIP Administrator by the issuance of a Certificate of Insurance.

5.3 Compliance with Conditions. Contractor shall not violate any condition of the policies of insurance provided by City under the terms of this ROCIP Exhibit or the ROCIP Manual. All requirements imposed by the subject policies and to be performed by Contractor shall likewise be imposed on, assumed, and performed by each Subcontractor and their lower-tier subcontractors.

5.4 Claims Cooperation. Contractor shall participate in the claim reporting procedures of City's ROCIP. Contractor agrees to assist and cooperate in every manner possible in connection with the adjustment of all claims arising out of operations within the scope of the Work required by the Contract, and to cooperate with the Insurer in all claims and demands which City's Insurer(s) is called upon to adjust or to defend against. Contractor shall take all necessary action to assure that its Subcontractors and their lower-tier subcontractors comply with any such request for assistance and cooperation. This obligation includes, without limitation, providing light or modified duty for injured workers, appearing in mediation, arbitration or court proceedings and/or participating in settlement meetings, as may be required

5.5 Monthly Payroll Submission. All Enrolled Parties shall submit monthly payrolls and worker-hour reports to City or ROCIP Administrator on the form required in the ROCIP manual. This reporting form will be provided to all Contractors at time of enrollment into the ROCIP. Failure to submit these reports may result in funds being held or delayed from monthly progress payments. The form must be submitted for each month, including zero (0) payroll, if applicable, until completion of the Work under each Contract and Subcontract. For those Subcontractors and lower-tier subcontractors performing Work under multiple Subcontracts, a separate form is required for each Subcontract under which Work is being performed.

5.6 Response to Information Requests. All insurance underwriting, payroll, rating or loss history information requested by City or the ROCIP Administrator shall be provided by the Contractor within three (3) business days of the request. Contractor agrees (and will require each Subcontractor to agree) that City, City's insurer or City's representative may audit the Contractor's or Subcontractor's records and the records of lower-tier subcontractors to confirm the accuracy of all insurance information provided, including, without limitation, any such information that may have any effect on insurance resulting from changes in the Work. At all times during performance of the Contract and Subcontracts, the Contractor, Subcontractor and lower-tier subcontractors shall cooperate with City, ROCIP Administrator and ROCIP insurers.

5.7 Responsibility for Safety. Notwithstanding the ROCIP, the Contractor shall initiate, maintain and supervise all safety precautions and programs in connection with the Work. Contractor is solely responsible, at no adjustment to the contract sum payable or contract time,

for initiating, maintaining, and supervising all safety precautions and programs relating to the conduct of Work, including, without limitation, any safety programs or procedures that are required by any applicable state or federal laws, rules or regulations, or by the terms of the ROCIP Manual.

5.8 Duty of Care. Nothing herein shall relieve the Enrolled Parties of their respective obligations to exercise due care in the performance of their duties in connection with the Work or to complete the Work in strict compliance with this Contract and subsequent subcontracts.

6.0 Notices, Costs

6.1 Limitations on City Provided Coverage. City assumes no obligations to provide insurance other than that evidenced by the policies referred to in Paragraph 3.1 and subparagraphs. City, however, reserves the right to furnish insurance coverage of various types and limits provided that such coverage shall not be less than that specified in Paragraph 3.1 and the costs of such insurance shall be paid by City. The ROCIP also does not cover Workers' Compensation claims or Commercial General Liability claims arising from "Off-Site Work."

6.2 Contractors Responsible for Own Equipment. Contractors' Equipment insurance for all construction tools and equipment whether owned, leased, rented, borrowed or used on work at the Project Site is the responsibility of the Contractor and/or Subcontractor, and the City shall not be responsible for any loss or damage to tools and equipment. This Contractors' Equipment insurance shall contain a waiver of subrogation against City and/or its representatives and all approved Contractors and Subcontractors. If an individual Enrolled Party does not purchase such insurance, that Enrolled Party will hold harmless City and/or its representatives and other Enrolled Parties for damage to tools and equipment.

6.3 No Release; No Waiver of Immunity. The provision of the ROCIP shall in no way be interpreted as relieving CM or any Subcontractor of any responsibility or liability under the Contract Documents, the ROCIP Policies, or Applicable Laws, including, without limitation, Contractor's and Subcontractor's responsibilities relative to indemnification and their obligation to exercise due care in the performance of the Work and to complete the Work in strict compliance with the Contract Documents. The parties hereto understand and agree that the City, its officers, officials and employees, are relying on, and do not waive or intend to waive by any provisions of this agreement, the monetary limitations or any other rights, immunities and protections provided by the Colorado Governmental Immunity Act, §§ 24-10-101 to 120, C.R.S., or otherwise available to the City, its officers, officials and employees.

6.4 City Right to Withhold Payments. In addition to any other rights of withholding that City may have under the Contract Documents, City has the right to withhold any payments otherwise due to Contractor in the event of a failure by Contractor or any Subcontractor to comply with the requirements of this Exhibit or the ROCIP Manual. City may withhold from any payment owing to Contractor the Costs of ROCIP Coverage if included in a request for payment. Such withholding by City shall not be deemed to be a default under the Construction Contract. City shall withhold from Contractor the Costs of ROCIP Coverage attributable to an increase in an Enrolled Party's total payroll for the Work over the amount reported to City and ROCIP

Administrator at time of enrollment in the ROCIP.

6.5 City Remedies. Without limitation upon any of City's other rights or remedies, any failure of an Enrolled Party to comply with any provision of this Exhibit or the ROCIP Manual shall be deemed a material breach of the Construction Contract, thereby entitling City, at its option, upon notice to Contractor, to suspend performance by Contractor, without any adjustment to Contract Sum Payable or Contract Time, until there is full compliance, or (2) or terminate this Construction Contract for cause.

6.6 Off-Site Storage. Unless otherwise provided in the Contract Documents, the property insurance provided by the City shall not cover portions of the Work stored off the Site without written approval of the City. Contractor shall be responsible for reporting such property or work if ownership has been transferred to the City. If ownership rests with the Contractor, Contractor shall be responsible for obtaining insurance to protect its interests.

6.7 Partial Occupancy. Partial occupancy or use shall not commence until the insurance company or companies providing builders risk and/or property insurance have consented to such partial occupancy or use by endorsement or otherwise. The City and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

6.8 City Right to Exclude Parties from ROCIP. City reserves the right to exclude any Subcontractor from the ROCIP, before or after enrollment by the Subcontractor into the ROCIP. If City elects to exclude a Subcontractor from the ROCIP, the Contractor will be responsible for ensuring the insurance coverage outlined in the Contractor's Subcontract Agreement are provided to the City or ROCIP Administrator before the Subcontractor can begin or resume work on the Project.

6.9 City's Right to Modify or Discontinue ROCIP Coverages. The City may, for any reason, modify the ROCIP Coverages, discontinue the ROCIP, not bind the ROCIP Coverages, or request that Contractor or any Subcontractor withdraw from the ROCIP upon thirty (30) Days' written notice. The Contractor and the Subcontractors shall in such an event secure and maintain such insurance as is required to provide replacement coverage comparable to that provided under the ROCIP. Provided that the foregoing is not the result of any failure by the Contractor or any Subcontractor to comply with the requirements of the Contract Documents or ROCIP Reference Guide, the costs of such replacement insurance shall be deemed a Cost of Work for which the Contractor shall be entitled to a Contract Adjustment, without any sum added thereto for Allowable Markup. The form, content, limits of liability, cost and the rating of the insurer issuing such replacement insurance shall be subject to the City's prior written approval.

6.10 City Right to Purchase Other Coverages. The City reserves the right at its option, and without obligation to do so, to furnish other insurance coverage of various types and limits if such coverage is not less than that specified in the Contract Documents to be provided by the City. Apart from the ROCIP Coverages, the City may at its option purchase additional insurance coverages that insure the Project that may not necessarily insure the Contractor or the

Subcontractors. Without limitation, examples of such coverage may include pollution liability, excess professional liability, and excess automobile liability insurance.

**CITY AND COUNTY OF DENVER
RULES AND REGULATIONS AND BID CONDITIONS
OF THE
MANAGER OF PUBLIC WORKS**

**PERTAINING TO EQUAL EMPLOYMENT OPPORTUNITY
IN THE CITY AND COUNTY OF DENVER**

APPROVED FOR LEGALITY

APPROVED AND ADOPTED:

/s/

/s/

Attorney for the City and County of Denver

Manager of Public Works

Adopted and Published Pursuant to Article III, Division 2 of Chapter 28
of the
Revised Municipal Code
of the
City and County of Denver

These Rules and Regulations cancel
and supercede any and all previously
issued Rules and Regulations on the Subject.

Revised November 1, 1990

**RULES AND REGULATIONS
REGARDING
EQUAL EMPLOYMENT OPPORTUNITY**

Promulgated and adopted by the Manager of Public Works pursuant to and by authority of Article III, Division 2, Chapter 28 of the Revised Municipal Code of the City and County of Denver, and for the purpose of insuring that contractors, subcontractors and suppliers soliciting and receiving compensation for contract work from or through the City and County of Denver provide equal opportunity in employment without regard to race, color, creed, sex, national origin, age religion, material status, political opinion or affiliation or mental or physical handicap and meet certain requirements for the hiring, training, promotion, and treatment during employment of members of ethnic groups subject to differential treatment, including persons of African descent (Black), Spanish-surnamed (Hispanic), Asian-American and American Indian Groups.

RULE I – DEFINITIONS

- A. “City” means the City and County of Denver.
- B. “Manager means the Manager of Public Works for the City and County of Denver.
- C. “Contract” means a contract entered into with the City and County of Denver, financed in whole or in part by local resources or funds of the City and County of Denver, for the construction of any of any public building or prosecution or completion of any public work.
- D. “Contractor” means the original party to a contract with the City and County of Denver, also referred to as the "general" or "prime" contractor.
- E. “Director” means the Director of Contract Compliance.
- F. “Subcontractor” means any person, company, association, partnership, corporation, or other entity which assumes by subordinate agreement some or all of the obligations of the general or prime contractor.
- G. “Bidding Specifications” as used in Article III, Division 2 of Chapter 28 of the Revised Municipal Code shall include BID CONDITIONS, INVITATION T BID, and NOTICE OF PROPOSAL.
- H. “Affirmative Action Program” means a set of specific and result-oriented procedures or steps to which a contractor commits himself to apply every good faith effort to employ members of ethnic minority groups, to include persons of African descent (Black), Spanish surnamed (Hispanic), Asian-American, American Indians, and persons with mental or physical handicap.

- I. “Office of Contract Compliance” means the City agency established pursuant to Article III, Division 1 of Chapter 28 of the Denver Revised Municipal Code.

RULE II – NOTICE OF HEARING

When results of conciliation efforts are unsatisfactory to the Manager and he is informed in accordance with Article III, Division 2 of Chapter 28 of the Denver Revised Municipal code that a contractor or subcontractor has apparently failed to meet affirmative action and equal employment opportunity requirements after a reasonable period of notice to correct deficiencies, the Manager will, prior to imposition of any sanctions, afford the general contractor a hearing in order to determine whether the contractor or his subcontractors have failed to comply with the affirmative action and equal employment opportunity requirements of Article III, Division 2 of Chapter 28 of the Denver Revised Municipal Code or of the contract. Written notice of such hearing shall be delivered personally or sent by certified mail, return receipt requested, to the contractor and to any subcontractor involved, at least ten (10) days prior to the date scheduled for the hearing.

RULE III – HEARING

- A. Contractors will appear at hearings and may be represented by counsel, and may present testimony orally and other evidence.
- B. Hearings shall be conducted by one or more hearing examiners designated as such by the Manager.
- C. The Director of Contract Compliance may participate in hearings as a witness.
- D. Hearings shall be held at the place specified in the notice of hearing.
- E. All oral testimony shall be given under oath or affirmation and a record of such proceedings shall be made.
- F. All hearings shall be open to the public.
- G. The hearing officer shall make recommendations to the Manager, who shall make a final decision.

REGULATIONS

REGULATION NO. 1 - ORDINANCE

The Rules and Regulations of the Manager shall be inserted in the bidding specifications for every contract for which bidding is required.

REGULATION NO. 2 - EXEMPTIONS

Each contract and subcontract, regardless of the dollar amount, shall be subject to affirmative action requirements unless specifically exempted in writing individually by the Manager. Exemptions apply only to "affirmative action" in equal employment opportunity, and are not to be construed as condonation in any manner of "discrimination" or "discriminatory practices" in employment because of race, color, creed, sex, age, national origin, religion, marital status, political opinion or mental or physical handicap.

REGULATION NO. 3 - DIRECTOR OF CONTRACT COMPLIANCE

The Director of Contract Compliance shall perform the duties assigned to such official by Article III, Division 2 Chapter 28 of the Denver Revised Municipal Code and by the Manager. The Director of Contract Compliance or designated representatives shall inform bidders and contractors of affirmative action procedures, programs, and goals in accordance with the Ordinance at pre-bid and pre-construction conference; (2) make regular on-site inspections; (3) supply contractors and subcontractors with report forms to be completed by them when requested, and furnished to the Director of Contract Compliance; and (4) review payroll records, employment records and practices of general contractors and their subcontractors and suppliers during the performance of any contract. The Director of Contract Compliance shall promptly report apparent affirmative action deficiencies to the Manager.

REGULATION NO. 4 - GOALS AND TIMETABLES

In general, goals and timetables should take into account anticipated vacancies and the availability of skills in the market place from which employees should be drawn. In addition, where discrimination in employment by a general contractor or any of his subcontractors is indicated, a corrective action program will take into account the need by the general contractor and his subcontractors to correct past discriminatory practices and reach goals of minority manpower utilization on a timely basis through such recruiting and advertising efforts as are necessary and appropriate.

REGULATION NO. 5 - AWARD OF CONTRACTS.

It shall be the responsibility of the Director of Contract Compliance to determine the affirmative action capability of bidders, contractors and subcontractors and to recommend to the Manager the award of contracts to those bidders, contractors and subcontractors and suppliers who demonstrate the ability and willingness to comply with the terms of their contract.

REGULATION NO. 6 - PUBLICATION AND DUPLICATION.

Copies of these Rules and Regulations as amended by the Manager from time to time, shall as soon as practicable and after Notice being published will be made a part of all City Contracts.

REGULATION NO. 7 - NOTICE TO PROCEED.

Prior to issuance of the Notice to Proceed, a sign-off will be required of the Director of Contract Compliance or his designee.

REGULATION NO. 8 - CONTRACTS WITH SUBCONTRACTORS.

To the greatest extent possible, the contractor shall make a good faith effort to contract with minority contractors, subcontractors and suppliers for services and supplies by taking affirmative actions which include but are not limited to the following:

1. Advertise invitations for subcontractor bids in minority community news media.
2. Contact minority contractor organizations for referral of prospective subcontractors.
3. Purchase materials and supplies from minority material suppliers.

REGULATION NO. 9 - AGENCY REFERRALS.

It shall be no excuse that the union with which the contractor or subcontractor has an agreement providing for referral, exclusive or otherwise, failed to refer minority employees.

REGULATION NO. 10 - CLAUSES.

The Manager shall include the appropriate clauses in every contract, and the contractor shall cause to be inserted in every subcontract the appropriate clauses:

1. APPENDIX A: City and County of Denver Equal Opportunity Clause - ALL CONTRACTS funded only with City and County of Denver monies.
2. APPENDIX B: Equal Opportunity Clause (11246) - ALL FEDERAL ASSISTED.
3. APPENDIX C: Section 3 - Assurance of Compliance - HUD ASSISTED PROJECTS.
4. APPENDIX D: Section 3 - Clause - HUD ASSISTED PROJECTS.

REGULATION NO. 11 - SHOW CAUSE NOTICES.

When the Manager has reasonable cause to believe that a contractor has violated Article III, Division 2 of Chapter 28 of the Denver Revised Municipal Code, he may issue a notice requiring the contractor to show cause within 15 days why enforcement procedures, or other appropriate action to insure compliance, should not be instituted.

REGULATION NO. 12 - BID CONDITIONS - AFFIRMATIVE ACTION REQUIREMENTS - EQUAL EMPLOYMENT OPPORTUNITY.

1. APPENDIX E: The Bid Conditions - Affirmative Action Requirements - Equal Employment Opportunity as amended and published by the U.S. Department of Labor Employment Standards Administration, Office of Federal Contract Compliance, shall be inserted verbatim for bidding specification in every non-exempt contract involving the use of federal funds.
2. APPENDIX F: The Bid Conditions - Affirmative Action Requirements - Equal Employment Opportunity as published by the Department of Public Works, City and County of Denver, shall be inserted verbatim as bidding specifications for every non-exempt contract using City funds.

APPENDIX B

EQUAL EMPLOYMENT OPPORTUNITY CLAUSE

[To be included in all federal AIP construction contracts in excess of \$10,000]

During the performance of this contract, the contractor agrees as follows:

1. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following:

Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

2. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.
3. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
4. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, as amended, and of the rules, regulations, and relevant orders of the Secretary of Labor.
5. The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
6. In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedure authorized in Executive Order 11246 of September 24, 1965,

and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

7. The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provision, including sanctions for noncompliance: Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the contractor may request the United States to enter into such litigation to protect the interests of the United States.

NOTICES TO BE POSTED PER PARAGRAPH (1) AND (3) OF THE EEO CLAUSE

EQUAL EMPLOYMENT OPPORTUNITY IS THE LAW

**Discrimination is Prohibited by
the Civil Rights Act of 1964
and by Executive Order No. 11246**

Title VII of the Civil Rights Act of 1964

Administered by: The Equal Employment Opportunity Commission

Prohibits discrimination because of Race, Color, Religion, sex, or National Origin by Employers with 25 or more employees, by Labor Organizations with a hiring hall of 25 or more members, by Employment Agencies, and by Joint Labor-Management Committees for Apprenticeship or Training.

ANY PERSON who believes that he or she has been discriminated against SHOULD CONTACT:

The Equal Employment Opportunity Commission (EEOC)
2401 E Street, NW
Washington, D.C. 20506

Executive Order No. 11256

Administered by: The Office of Federal Contract Compliance Programs

Prohibits discrimination because of Race, Color, Religion, Sex, or National Origin, and requires affirmative action to ensure equality of opportunity in all aspects of employment, by all Federal Government Contractors and Subcontractors, and by Contractors Performing Work Under a

Federal Assisted Construction Contract, regardless of the number of employees in either case.

ANY PERSON who believes that he or she has been discriminated against SHOULD CONTACT:

The Office of Federal Contract Compliance Programs
U. S. Department of Labor
Washington, D.C. 20210

APPENDIX E

Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246, as amended)

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.
2. The goals and timetables for minority and female participation, expressed in percentage terms for the contractor's aggregate workforce in each trade on all construction work in the covered area are as follows:

Timetables: Until Further Notice

Goals:

- (a) Minority Participation in Each Trade: 13.8 percent
- (b) Female Participation in Each Trade: 6.9 percent

These goals are applicable to all the contractor's construction work (whether or not it is Federal or Federally-assisted) performed in the covered area. If the contractor performs construction work in a geographic area located outside of the covered area, it shall apply the goal established for such geographic area where the work is actually performed. With regard to this second area, the contractor also is subject to the goal for both its Federally involved and non-Federally involved construction.

The contractor's compliance with the executive order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goal. The hours of minority employment and training must be substantially uniform throughout the length of the contract, and in each grade, and the contract shall make a good faith effort to employ minorities evenly on each of its projects. The transfer of minority employees or trainees from contractor to contractor or from project to project, for the sole purpose of meeting the contractor's goal, shall be a violation of the contract, the executive order, and the regulations in 41 CFR Part 60-4. Compliance with the goal will be measured against the total work hours performed.

3. The contractor shall provide written notification to the Director, OFCCP, within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employee identification number; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographic area in which the contract is performed.

4. As used in this notice and in the contract resulting from this solicitation, the "covered area" is the City and County of Denver, Colorado.

STANDARD FEDERAL ASSURANCES

NOTE: As used below the term "contractor" shall mean and include the "Party of the Second Part," and the term "sponsor" shall mean the "City".

During the term of this contract, the contractor, for itself, its assignees and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. Compliance with Regulations. The contractor shall comply with the Regulations relative to nondiscrimination in federally assisted programs of the Department of Transportation (hereinafter "DOT") Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.

2. Nondiscrimination. The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, sex, creed or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate either directly or indirectly in the discrimination prohibited by section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.

3. Solicitations for Subcontractors, Including Procurements of Materials and Equipment. In all solicitations either by competitive bidding or negotiations made by the contractor for work to be performed under a subcontract, including procurements or materials or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, or national origin.

4. Information and Reports. The contractor shall provide all information and reports required by the Regulations or directives issued pursuant thereto and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the sponsor or the Federal Aviation Administration (FAA) to be pertinent to ascertain compliance with such Regulations, orders, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor shall so certify to the sponsor of the FAA, as appropriate, and shall set forth what efforts it has made to obtain the information.

5. Sanctions for Noncompliance. In the event of the contractor's noncompliance with the nondiscrimination provisions of this contract, the sponsor shall impose such contract sanctions as it or the FAA may determine to be appropriate, including, but not limited to:

a. Withholding of payments to the contractor under the contract until the contractor complies, and/or

b. Cancellation, termination, or suspension of the contract, in whole or in part.

6. Incorporation of Provisions. The contractor shall include the provisions of paragraphs 1 through 5 in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations or directives issued pursuant thereto. The contractor shall take such action with respect to any subcontract or procurement as the sponsor or the FAA may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the contractor may request the sponsor to enter into such litigation to protect the interests of the sponsor and, in addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

**STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION
CONTRACT SPECIFICATIONS (41 CFR 60-4.3)
(VERSION 2, 4/23/90)**

1. As used in these specifications:

a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;

b. "Director" means Director, Office of Federal Contract Compliance Programs (OFCCP), U.S. Department of Labor, or any person to whom the Director delegates authority;

c. "Employer identification number" means the Federal social security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941;

d. "Minority" includes:

(1) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

(2) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin regardless of race);

(3) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and

(4) American Indian or Alaskan native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors shall be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an

approved plan is individually required to comply with its obligations under the EEO clause and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The contractor shall implement the specific affirmative action standards provided in paragraphs 7a through 7p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing construction work in a geographical area where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement nor the failure by a union with whom the contractor has a collective bargaining agreement to refer either minorities or women shall excuse the contractor's obligations under these specifications, Executive Order 11246 or the regulations promulgated pursuant thereto.

6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees shall be employed by the contractor during the training period and the contractor shall have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees shall be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The contractor shall document these efforts fully and shall implement affirmative action steps at least as extensive as the following:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the contractor's employees are assigned to work. The contractor, where possible, will assign two or more women to each construction project. The contractor shall specifically ensure that all foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources,

provide written notification to minority and female recruitment sources and to community organizations when the contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the contractor by the union or, if referred, not employed by the contractor, this shall be documented in the file with the reason therefore along with whatever additional actions the contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the contractor has a collective bargaining agreement has not referred to the contractor a minority person or female sent by the contractor, or when the contractor has other information that the union referral process has impeded the contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the contractor's employment needs, especially those programs funded or approved by the Department of Labor. The contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions including specific review of these items with onsite supervisory personnel such as superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the contractor's EEO policy with other contractors and subcontractors with whom the contractor does or anticipates doing business.

- i. Direct its recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students; and to minority and female recruitment and training organizations serving the contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the contractor shall send written notification to organizations, such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
 - j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a contractor's workforce.
 - k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
 - l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel, for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
 - m. Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the contractor's obligations under these specifications are being carried out.
 - n. Ensure that all facilities and company activities are nonsegregated except that separate or single user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
 - o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
 - p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the contractor's EEO policies and affirmative action obligations.
8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor union, contractor community, or other similar groups of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to

documentation which demonstrates the effectiveness of actions taken on behalf of the contractor. The obligation to comply, however, is the contractor's and failure of such a group to fulfill an obligation shall not be a defense for the contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, if the particular group is employed in a substantially disparate manner (for example, even though the contractor has achieved its goals for women generally,) the contractor may be in violation of the Executive Order if a specific minority group of women is underutilized.

10. The contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination, and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government, and to keep records. Records shall at least include for each employee, the name, address, telephone number, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

FAA FEDERAL REQUIREMENTS

FAA-1 GENERAL CONTRACT CLAUSES

The following general contract clauses are hereby incorporated into the Contract Documents. The word "Sponsor," when it is used herein, means the City and County of Denver.

FAA-1.1 AIP PROJECT

The work in this Contract will be undertaken and accomplished by the City and County of Denver in accordance with the with the terms and conditions of a grant agreement between the City and County of Denver and the United States under the Federal Airports Act (49 U.S.C. 1101) and part 51 of the Federal Aviation Regulations (14 CFR Part 151), pursuant to which the United States has agreed to pay a certain percentage of the costs of the project that are determined to be allowable project costs under that Act. The United States is not a party to this contract and no reference in this contract to the FAA or any representative thereof, or to any rights granted to the FAA or any representative thereof, or the United States, by the contract, makes the United States a party to this contract.

FAA-1.2 CONSENT TO ASSIGNMENT

The contractor shall obtain the prior written consent of the City and County of Denver to any proposed assignment of any interest in or part of this Contract.

FAA-1.3 CONVICT LABOR

No convict labor may be employed under this Contract.

FAA-1.4 VETERANS PREFERENCE

In the employment of labor (except in executive, administrative and supervisory positions), preference shall be given to qualified individuals who have served in the military service of the United Sates (as defined in Section 101(1) of the Soldiers' and Sailors' Civil Relief Act of 1940) and have been honorably discharged from that service, except that preference may be given only where that labor is available locally and is qualified to perform the work to which the employment relates. In the employment of labor (except in executive, administrative and supervisory positions), preference shall be given to veterans of the Vietnam era and disabled veterans. However, this preference shall apply only where the individuals are available and qualified to perform the work to which the employment relates.

FAA-1.5 WITHHOLDING

Whether or not payments or advances to the City and County of Denver are

withheld or suspended by the FAA, the City and County of Denver may withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics employed by the Contractor or any subcontractor on the work the full amount of wages required by this Contract.

FAA-1.6 NONPAYMENT OF WAGES

If the Contractor or subcontractor fails to pay any laborer or mechanic employed or working on the site of the work any of the wages required by this Contract the City and County of Denver may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment or advance of funds until the violations cease.

FAA-1.7 FAA INSPECTION AND REVIEW

The Contractor shall allow any authorized representative of the FAA to inspect and review any work or materials used in the performance of this Contract.

FAA-1.8 BREACH OF CONTRACT TERMS – SANCTIONS

Any violation or breach of the terms of this contract on the part of the Contractor or subcontractor may result in the suspension or termination of this Contract or such other action which may be necessary to enforce the rights of the parties to this Contract.

FAA-1.9 RIGHTS TO INVENTIONS

All rights to inventions and materials generated under this Contract are subject to regulations issued by the FAA and the City and County of Denver. Information regarding these rights is available from the FAA and the City and County of Denver.

FAA-1.10 SUBCONTRACTS

The Contractor shall insert in each of its subcontracts:

- (i) the provisions contained in paragraphs FAA-1.1 through FAA-1.9, FAA-1.13, FAA-2.1 through FAA-2.5, FAA-3.1 and 3.2, FAA-4.1 through FAA-4.10, FAA-5.1 through FAA-5.5, and FAA-6.1 through FAA-6.7;
- (ii) the Equal Opportunity Clause, specifications and notices set forth in Appendix B, “Notices to be Posted Per Paragraphs (1) and (3) of the EEO Clause,” and Appendix E, “Notice of Requirements for Affirmative Action to Ensure Equal Employment Opportunity

(Executive Order 11246, as amended)” of the Equal Employment Opportunity provisions of this Contract;

- (iii) the Davis-Bacon prevailing wage rates which are attached to the Instructions to Bidders; and
- (iv) a clause requiring the subcontractors of all tiers to include these provisions in any lower tier of subcontracts.

The Contractor shall submit to the City and County of Denver the certification attached hereto as “FAA Exhibit A.” This certification shall be signed by each subcontractor and submitted to the City before the subcontractor commences work.

FAA-1.11 TERMINATION OF CONTRACT – 14 CFR §151.49

A breach of paragraphs FAA-1.6, FAA-1.7, or FAA-1.10 may be grounds for termination of the Contract.

FAA-1.12 TERMINATION OF CONTRACT – 49 CFR PART 18

1. The City and County of Denver may, by written notice, terminate this Contract in whole or in part at any time, either for the City’s convenience or because of failure to fulfill the Contract obligations. Upon receipt of such notice, services shall be immediately discontinued (unless the notice directs otherwise) and all materials as may have been accumulated in performing this Contract, whether completed or in progress, delivered to the City.
2. If the termination is for the convenience of the City, an equitable adjustment in the Contract Price shall be made, but no amount shall be allowed for anticipated profit on unperformed services.
3. If the termination is due to failure to fulfill the Contractor’s obligations, the City may take over the Work and prosecute the same to completion by contract or otherwise. In such case, the Contractor shall be liable to the City for any additional cost occasioned to the City.
4. If, after notice of termination for failure to fulfill contract obligations, it is determined that the Contractor had not so failed, the termination shall be deemed to have been effected for the convenience of the City. In such event, adjustment in the Contract Price shall be made as provided in Paragraph 2 of this clause.
5. The rights and remedies of the City provided in this clause are in addition to any other rights and remedies provided by law or under this Contract.

FAA-1.12BUY AMERICAN – STEEL AND MANUFACTURED PRODUCTS

1. The Aviation Safety and Capacity Expansion Act of 1990 provides that preference be given to steel and manufactured products produced in the United States when funds are expended pursuant to a grant issued under the Airport Improvement Program. The Contractor shall deliver only domestic steel and manufactured products under this Contract as defined in paragraph 2 below, subject to the exceptions in paragraph 3 below.
2. The following terms apply to this clause:
 - (a) Steel and manufactured products. As used in this clause, steel and manufactured products include (i) those produced in the United States or (ii) a manufactured product produced in the United States, if the cost of its components mined, produced or manufactured in the United States exceeds 60 percent of the cost of all its components and final assembly has taken place in the United States. Components of foreign origin of the same class or kind as the products referred to in subparagraphs 3(a) or 3(b) shall be treated as domestic.
 - (b) Components. As used in this clause, components means those articles, materials, and supplies incorporated directly into steel and manufactured products.
 - (c) Cost of components. This means the costs for production of the components, exclusive of the final assembly labor costs.
3. The Contractor shall assure that only domestic steel and manufactured products will be used by the Contractor, subcontractors, material men and suppliers in the performance of this Contract, except those
 - (a) that the U.S. Department of Transportation has determined, under the Aviation Safety and Capacity Expansion Act of 1990, are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality;
 - (b) that the U.S. Department of Transportation has determined, under the Aviation Safety and Capacity Expansion Act of 1990, that domestic preference would be inconsistent with the public interest;
or
 - (c) that inclusion of domestic material will increase the cost of the overall project contract by more than 25 percent.

FAA-1.13 INSPECTION OF RECORDS – 49 CFR PART 18

The contractor shall maintain an acceptable cost accounting system. The sponsor, the FAA, the Comptroller General of the United States, or any of their duly authorized representatives, shall be allowed access to any books, documents, papers, and records of the contractor which are directly pertinent to this Contract for the purpose of making audit, examination, excerpts, and transcriptions. The contractor shall maintain all required records for three years after the City and County of Denver makes final payment and all other pending matters are closed.

FAA-1.14 LOBBYING AND INFLUENCING FEDERAL EMPLOYEES

No Federal appropriated funds shall be paid, by or on behalf of the contractor, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the making of any Federal grant and the amendment or modification of any Federal grant.

If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any Federal grant, the contractor shall complete and submit Standard Form-LLL, "Disclosure of Lobby Activities," in accordance with its instructions.

FAA-2 CIVIL RIGHTS ACT OF 1964, TITLE VI; 49 CFR PART 21 – CONTRACTUAL REQUIREMENTS

During the performance of this contract, the Contractor, for itself, its assignees and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

FAA-2.1 COMPLIANCE WITH REGULATIONS

The contractor shall comply with the Regulations relative to nondiscrimination in federally assisted programs of the Department of Transportation (hereinafter, "DOT") Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.

FAA-2.2 NONDISCRIMINATION

The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate either directly or indirectly in the discrimination prohibited by section 21.5 of the Regulations, including

employment practices when the contract covers a program set forth in Appendix B of the Regulations.

FAA-2.3 SOLICITATIONS FOR SUBCONTRACTS, INCLUDING PROCUREMENTS OF MATERIALS AND EQUIPMENT

In all solicitations either by competitive bidding or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, or national origin.

FAA-2.4 INFORMATION AND REPORTS

The contractor shall provide all information and reports required by the Regulations or directives issued pursuant thereto and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Sponsor or the Federal Aviation Administration (FAA) to be pertinent to ascertain compliance with such Regulations, orders, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor shall so certify to the sponsor or the FAA, as appropriate, and shall set forth what efforts it has made to obtain the information.

FAA-2.5 SANCTIONS FOR NONCOMPLIANCE

In the event of the contractor's noncompliance with the nondiscrimination provisions of this contract, the sponsor shall impose such contract sanctions as it or the FAA may determine to be appropriate, including, but not limited to:

- a. Withholding of payments to the contractor under the contract until the contractor complies, and/or
- b. Cancellation, termination, or suspension of the contract, in whole or in part.

FAA-2.6 INCORPORATION OF PROVISIONS

The contractor shall include the provisions of paragraphs FAA-2.1 through 2.5 in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations or directives issued pursuant thereto. The contractor shall take such action with respect to any subcontract or procurement as the sponsor or the FAA may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a

subcontractor or supplier as a result of such direction, the contractor may request the Sponsor to enter into such litigation to protect the interests of the sponsor and, in addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

FAA-2.7 NONDISCRIMINATION IN AIRPORT EMPLOYMENT OPPORTUNITIES

The contractor assures that it will comply with pertinent statutes, Executive orders and such rules as are promulgated to assure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or handicap be excluded from participating in any activity conducted with or benefiting from Federal assistance. This provision obligates the Contractor or its transferee for the period during which Federal assistance is extended to the airport program, except where Federal assistance is to provide, or is in the form of personal property or real property or interest therein or structures or improvements thereon. In these cases the provision obligates the party or any transferee for the longer of the following periods: (a) the period during which the property is used by the airport sponsor or any transferee for a purpose for which Federal assistance is extended, or for another purpose involving the provision of similar services or benefits or (b) the period during which the airport sponsor or any transferee retains ownership or possession of the property. In the case of contractors, this provision binds the contractors from the bid solicitation period through the completion of the contract.

It is unlawful for airport operators and their lessees, tenants, concessionaire and contractors to discriminate against any person because of race, color, national origin, sex, creed, or handicap in public services and employment opportunities.

FAA-3 DBE STATEMENT

FAA-3.1 POLICY

It is the policy of the Department of Transportation that disadvantaged business enterprises as defined in 49 CFR Part 26 shall have the maximum opportunity to participate in the performance of contracts financed in whole or in part with Federal funds under this agreement. Consequently, the DBE requirements of 49 CFR Part 26 apply to this agreement.

FAA-3.2 DBE OBLIGATION

The Contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy, as the recipient deems appropriate.

FAA-3.3 PROMPT PAYMENT

The Contractor agrees to pay each subcontractor in accordance with City and County of Denver Revised Municipal Code Sec 20-107, et. seq. prompt payment to Contractors, Vendors, Suppliers of goods and Services to City and lessors of City. This clause applies to both DBE and non-DBE subcontractors and suppliers.

FAA-4 DAVIS BACON REQUIREMENTS – 29 CFR PART 5

FAA-4.1 MINIMUM WAGES

(1) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to laborers or mechanics, subject to the provisions of subparagraph a(4) below; also, regular contributions made or costs

incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in paragraph d of this clause. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph a(2) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and his subcontractors at the site of the work in a prominent and accessible place where it can easily be seen by the workers.

(2) (i) The contracting officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(A) The work to be performed by the classification requested is not performed by a classification in the wage determination;

(B) The classification is utilized in the area by the construction industry; and

(C) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(ii) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days or receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215- 0140).

(iii) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for

fringe benefits where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140).

(iv) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (2)(ii) or (iii) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(3) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(4) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB control number 1215-0140).

FAA-4.2 WITHHOLDING

The FAA or the sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis- Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of work, all or part of the wages required by the contract, the Federal Aviation Administration may after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

FAA-4.3 PAYROLLS AND BASIC RECORDS.

(1) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under paragraph a(4) of this clause that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB control numbers 1215-0140 and 1251-0017).

(2) (i) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the Federal Aviation Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under paragraph c(1) above. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB control number 1215-0149).

(ii) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(A) That the payroll for the payroll period contains the information required to be maintained under paragraph c(1) above and that such information is correct and complete;

(B) That each laborer and mechanic (including each helper, apprentice and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations 29 CFR Part 3; and

(C) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(iii) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph c(2)(ii) of this section.

(iv) The falsification of any of the above certifications- may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(3) The contractor or subcontractor shall make the records required under paragraph c(1) of this section available for inspection, copying or transcription by authorized representatives of the sponsor, the Federal Aviation Administration or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

FAA-4.4 APPRENTICES AND TRAINEES

(1) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a state Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(2) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage

determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(3) Equal Employment Opportunity. The utilization of apprentices, trainees, and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

FAA-4.5 COMPLIANCE WITH COPELAND ACT REQUIREMENTS

The contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

FAA-4.6 SUBCONTRACTS

The contractor or subcontractor shall insert in any subcontracts the clauses contained in paragraphs FAA-4.1 through FAA-4.10 of this contract and such other clauses as the Federal Aviation Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

FAA-4.7 CONTRACT TERMINATION: DEBARMENT

A breach of the contract clauses in paragraphs a through j of this clause and paragraphs a through e of the fifth clause below may be grounds for termination of the contract, and for the debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

FAA-4.8 COMPLIANCE WITH DAVIS-BACON AND RELATED ACT REQUIREMENTS

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

FAA-4.9 DISPUTES CONCERNING LABOR STANDARDS

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be

resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of his subcontractors) and the contracting agency, the U.S. Department of Labor or the employees or their representatives.

FAA-4.10 CERTIFICATION OF ELIGIBILITY

(1) By entering into this contract, the contractor certifies that neither he nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(2) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(3) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

FAA-5 CONTRACT WORK HOURS AND SAFETY STANDARDS – 29 CFR PART 5

As used in the following, the term "laborers" and "mechanics" include watchmen and guards.

FAA-5.1 OVERTIME REQUIREMENTS

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek, whichever is greater.

FAA-5.2 VIOLATION; LIABILITY FOR UNPAID WAGES; LIQUIDATED DAMAGES

In the event of any violation of the clause set forth in section FAA-5.1, the contractor or any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph a above, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the

clause set forth in paragraph a above.

FAA-5.3 WITHHOLDING FOR UNPAID WAGES AND LIQUIDATED DAMAGES

The Federal Aviation Administration or the sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph b above.

FAA-5.4 SUBCONTRACTS

The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs a. through d and also a clause requiring the subcontractor to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs a through d.

FAA-5.5 WORKING CONDITIONS

No contractor or subcontractor may require any laborer or mechanic employed in the performance of any contract to work in surroundings or under working conditions that are unsanitary, hazardous or dangerous to his health or safety as determined under construction safety and health standards (29 CFR Part 1926) issued by the Department of Labor.

FAA-6 FAA REQUIRED SUPPLEMENTAL INFORMATION AND INSTRUCTIONS TO BIDDERS

The following clauses are hereby incorporated into the Contract Documents and specifically into the Instructions to Bidders which constitute a portion of such Contract Documents.

FAA-6.1 THE CITY AND COUNTY OF DENVER: NOTICE OF NON-DISCRIMINATION

The City and County of Denver, in accordance with Title V of the Civil Rights Act of 1964, 78 Stat. 252, 42 U.S.C. 2000d to 120000d-4 and Title 49, Code of Federal Regulations, Part 21, nondiscrimination in Federally-assisted programs of the Department of Transportation issued pursuant to such Act, hereby notifies all bidders that it will affirmatively insure that in any contract entered into pursuant to this advertisement, socially and economically disadvantaged business

enterprises will be afforded full opportunity to submit proposals in response to this invitation and will not be discriminated against on the grounds of race, color, creed, sex, or national origin in consideration for an award.

FAA-6.2 FURNISHING OF INFORMATION

When a determination has been made to award a contract or subcontract to a specific contractor, such contractor is required, prior to the award or after the award, or both, to furnish such other information as the FAA, the sponsor, or the Director of the Office of Federal Contract Compliance (OFCC) requests.

FAA-6.3 REPORT TO JOINT REPORTING COMMITTEE

A bidder must indicate whether he has previously had a contract subject to the equal opportunity clauses, whether he has filed all report forms required in such contract, and if not, a compliance report (Standard Form (SF) 100) must be submitted with his bid.

Any contractor having a Federal or Federally-assisted contract of 50,000 or more and 50 or more employees is required to file annual compliance reports on Standard Form 100 (EE0-1) with the Joint Reporting Committee in accordance with the instructions provided with the form. The contractor will provide a copy of such a report to the contracting agency within 30 days after the award of a contract if he has not submitted a complete compliance report within 12 months preceding the date of the award.

The contractor shall require its subcontractors to file an SF- 100 within 30 days after award of the subcontract if (1) it is not exempt from the provisions of these regulations in accordance with 60-1.5, (2) it has 50 or more employees, (3) it is first tier subcontractor, and (4)) it has a subcontract amounting to \$50,000 or more.

Subcontractors below the first tier which perform construction work at the site of construction shall be required to file such a report if (1) it is not exempt from the provisions of these regulations in accordance with 60-1.5, (2) has 50 or more employees and has a subcontract amounting to \$50,000 or more.

The SF-100 is available at the following address:

Joint Reporting Committee
P.O. Box 779
Norfolk, Virginia 23501
Phone: (804) 461-1213

FAA-6.4 CERTIFICATION OF NONSEGREGATED FACILITIES

1. A Certification of Non-segregated Facilities must be submitted prior to the award of a Federally-assisted construction contract exceeding \$10,000 which is not exempt from the provisions of the Equal Opportunity Clause.
2. Contractors receiving Federally-assisted construction contract awards exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the forwarding of the following notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed \$10,000 and are not exempt from the provisions of the Equal Opportunity Clause. NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATION OF NONSEGREGATED FACILITIES

1. A Certification of Non-segregated Facilities must be submitted prior to the award of a subcontract exceeding \$10,000 which is not exempt from the provisions of the Equal Opportunity Clause.
2. Contractors receiving subcontract awards exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause will be required to provide for the forwarding of this notice to prospective subcontractors for supplies and construction contracts where the subcontracts exceed \$10,000 and are not exempt from the provisions of the Equal Opportunity Clause. NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

FAA-6.5 CLEAN AIR AND WATER POLLUTION CONTROL REQUIREMENTS

Contractors and subcontractors agree:

1. That any facility to be used in the performance of the contract or to benefit from the contract is not listed on the Environmental Protection Agency (EPA) List of Violating Facilities.
2. To comply with all requirements of Section 114 of the Clean Air Act and Section 308 of the Federal Water Pollution Control Act and all regulations issued thereunder.
3. That as a condition for award of a contract they will notify the awarding official of the receipt of any communication from EPA indicating that a facility to be utilized for performance of or benefit from the contract is under consideration to be listed on the EPA List of Violating Facilities.
4. To include or cause to be included in any contract or subcontract which

exceeds \$100,000 the aforementioned criteria and requirements.

FAA-6.6 CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY, AND VOLUNTARY EXCLUSION - 49 CFR PART 29

The bidder certifies, by submission of its bid or acceptance of this contract, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency. It further agrees by submitting this bid that it will include this clause without modification in all lower tier transactions, solicitations, proposals, contracts, and subcontracts. Where the bidder/contractor or any lower tier participant is unable to certify to this statement, it shall attach an explanation to its bid.

FAA-6.7 TRADE RESTRICTION CLAUSE - 49 CFR PART 30

The contractor or subcontractor, by submission of an offer and/or execution of a contract, certifies that it:

- a. is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms published by the Office of the United States Trade Representative (USTR);
- b. has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country on said list, or is owned or controlled directly or indirectly by one or more citizens or nationals of a foreign country on said list;
- c. has not procured any product nor subcontracted for the supply of any product for use on the project that is produced in a foreign country on said list.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR 30.17, no contract shall be awarded to a contractor or subcontractor who is unable to certify to the above. If the contractor knowingly procures or subcontracts for the supply of any product or service of a foreign country on said list for use on the project, the Federal Aviation Administration may direct through the Sponsor cancellation of the contract at no cost to the Government.

Further, the contractor agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in each contract and in all lower tier subcontracts. The contractor may rely on the certification of a prospective subcontractor unless it has knowledge that the certification is erroneous.

The contractor shall provide immediate written notice to the sponsor if the contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The subcontractor agrees to provide written notice to the contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

This certification is a material representation of fact upon which reliance was placed when making the award. If it is later determined that the contractor or subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration may direct through the Sponsor cancellation of the contract or subcontract for default at no cost to the Government.

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code, Section 1001.

FAA EXHIBIT A

**CERTIFICATION OF INCLUSION OF LABOR & EEO
REQUIREMENTS IN SUBCONTRACTS**

AIP Project No.: _____ **Airport:** **DENVER INTERNATIONAL AIRPORT**

Subcontract Dollar Amount: _____

The prime contractor whose signature appears below certifies that a subcontract was awarded on _____ to _____ to perform the following work: _____

All of the required clauses and certifications referred to in paragraph FAA-1.8 are incorporated into the subcontract.

SIGNATURE Date

NAME AND TITLE [PRINT OR TYPE]

~~~~~  
**APPLICABLE TO SUBCONTRACTS OVER \$2,000 AND AS NOTED:**

The SUBCONTRACTOR whose signature appears below certifies that the following provisions of the prime contract of the above AIP project are incorporated into and made a part of its subcontract:

- (1) Standard Equal Employment Opportunity Clauses and Specifications (if over \$10,000)
- (2) Davis Bacon Act
- (3) Goals and Timetables for Minority and Female Participation (if over \$10,000)
- (4) Standard Assurance Provision required by 14 CFR Part 152, subpart B, "Non-discrimination in Airport Aid Program"
- (5) Minimum Wages and Wage Rates
- (6) Payrolls and Records
- (7) Apprentices and Trainees
- (8) Compliance with Copeland Regulations
- (9) Contract Work Hours and Safety Standards

- (10) Violations: Liability for Unpaid Wages; Liquidated Damages
- (11) Withholding of Funds for Unpaid Wages and Liquidated Damages
- (12) Working Conditions
- (13) Subcontracts
- (14) Contract Termination – Debarment
- (15) General Contract Clauses
- (16) Regulatory Clauses relating to Non-discrimination

[SEE NEXT PAGE FOR CONTINUATION OF SUBCONTRACTOR  
CERTIFICATION AND SIGNATURE]

The subcontract also contains the Certificate of Non-Segregated Facilities as a part of said subcontract.

The subcontractor whose signature appears below also acknowledges his responsibility under the subcontract for including these clauses in any lower tier subcontract.

---

SIGNATURE \_\_\_\_\_ Date \_\_\_\_\_

---

NAME AND TITLE [PRINT OR TYPE] \_\_\_\_\_

SOURCES OF LABOR RECEIVING STANDARD FORM 36 "NOTICE OF  
NONDISCRIMINATION IN EMPLOYMENT":

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## EXHIBIT A

### STANDARD FEDERAL ASSURANCES ATTACHMENT 1

NOTE: As used below the term "contractor" shall mean and include the "Party of the Second Part," and the term "sponsor" shall mean the "City".

During the term of this contract, the contractor, for itself, its assignees and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. Compliance with Regulations. The contractor shall comply with the Regulations relative to nondiscrimination in federally assisted programs of the Department of Transportation (hereinafter "DOT") Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.

2. Nondiscrimination. The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, sex, creed or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate either directly or indirectly in the discrimination prohibited by section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.

3. Solicitations for Subcontractors, Including Procurements of Materials and Equipment. In all solicitations either by competitive bidding or negotiations made by the contractor for work to be performed under a subcontract, including procurements or materials or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, or national origin.

4. Information and Reports. The contractor shall provide all information and reports required by the Regulations or directives issued pursuant thereto and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the sponsor or the Federal Aviation Administration (FAA) to be pertinent to ascertain compliance with such Regulations, orders, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor shall so certify to the sponsor of the FAA, as appropriate, and shall set forth what efforts it has made to obtain the information.

5. Sanctions for Noncompliance. In the event of the contractor's noncompliance with the nondiscrimination provisions of this contract, the sponsor shall impose such contract sanctions as it or the FAA may determine to be appropriate, including, but not limited to:

a. Withholding of payments to the contractor under the contract until the contractor

complies, and/or

b. Cancellation, termination, or suspension of the contract, in whole or in part.

6. Incorporation of Provisions. The contractor shall include the provisions of paragraphs 1 through 5 in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations or directives issued pursuant thereto. The contractor shall take such action with respect to any subcontract or procurement as the sponsor or the FAA may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the contractor may request the sponsor to enter into such litigation to protect the interests of the sponsor and, in addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

## **EXHIBIT B**

### **NONDISCRIMINATION IN AIRPORT EMPLOYMENT OPPORTUNITIES**

The Party of the Second Part assures that it will comply with pertinent statutes, Executive Orders and such rules as are promulgated to assure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or handicap be excluded from participating in any activity conducted with or benefiting from Federal assistance. This Provision obligates the Party of the Second Part or its transferee for the period during which Federal assistance is extended to the airport program, except where Federal assistance is to provide, or is in the form of personal property or real property or an interest therein or structures or improvements thereon. In these cases, this Provision obligates the Party of the Second Part or any transferee for the longer of the following periods: (a) the period during which the property is used by the sponsor or any transferee for a purpose for which Federal assistance is extended, or for another purpose involving the provision of similar services or benefits; or (b) the period during which the airport sponsor or any transferee retains ownership or possession of the property. In the case of contractors, this Provision binds the contractors from the bid solicitation period through the completion of the contract.

**It is unlawful for airport operators and their lessees, tenants, concessionaires and contractors to discriminate against any person because of race, color, national origin, sex, creed, or handicap in public services and employment opportunities.**

## **EXHIBIT C**

### **Certification for Contracts, Grants, Loans and Cooperative Agreements**

The Contractor certifies by execution of this Agreement to the best of its knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the Contractor to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any federal contract, grant loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the Contractor shall complete and submit Standard Form-LLL, "Disclosure of Lobby Activities," in accordance with its instructions.

(3) The Contractor shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this transaction is a prerequisite for making or entering to this transaction imposed by Section 1352 , Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.



**DENVER INTERNATIONAL AIRPORT  
PARTIAL RELEASE**

**DEPARTMENT OF AVIATION**

**FINAL/PARTIAL RELEASE AND CERTIFICATE OF PAYMENT  
(SUBCONTRACTOR/SUPPLIER)**

|                                                                                 |                                                              |
|---------------------------------------------------------------------------------|--------------------------------------------------------------|
| (CITY PROJECT NAME AND NUMBER)                                                  | Date: _____, 200__ .                                         |
| (NAME OF CONTRACTOR)                                                            | Subcontract #: _____ .                                       |
|                                                                                 | Subcontract Value: \$ _____ .                                |
| (NAME OF SUBCONTRACTOR/SUPPLIER)                                                | Last Progress Payment: \$ _____ .<br>Date: _____ .           |
| Check Applicable Box: <input type="checkbox"/> DBE <input type="checkbox"/> SBE | Total Paid to Date: \$ _____ .<br>Date of Last Work: _____ . |

The Undersigned hereby certifies that all costs, charges or expenses incurred by the undersigned or on behalf of the undersigned for any work, labor or services performed and for any materials, supplies or equipment provided on the above referenced Project or used in connection with the above referenced Subcontract (the "Work Effort") have been duly paid in full.

The Undersigned further certifies that each of the undersigned's subcontractors and suppliers that incurred or caused to be incurred, on their behalf, costs, charges or expenses in connection with the undersigned's Work Effort on the above referenced Project have been duly paid in full.

In consideration of \$\_\_\_\_\_ representing the Last Progress Payment referenced above and in further consideration of the Total Paid to Date, also referenced above, and other good and valuable consideration received and accepted by the undersigned this \_\_\_\_ day of \_\_\_\_\_, 200\_\_, the Undersigned hereby releases and discharges the City and County of Denver (the "City"), the above referenced City Project, the City's premises and property and the above referenced Contractor from all claims, liens, rights, liabilities, demands and obligations, whether known or unknown, of every nature arising out of or in connection with the performance of the work effort.

As additional consideration for the payments referenced above, the undersigned agrees to defend, indemnify and hold harmless the City, its officers, employees, agents and assigns and the above-referenced Contractor from and against all costs, losses, damages, causes of action, judgments under the subcontract and expenses arising out of or in connection with any claim or claims against the City or the Contractor which arise out of the Undersigned's performance of the Work Effort and which may be asserted by the Undersigned or any of its suppliers or subcontractors of any tier or any of their representatives, officers, agents, or employees.

It is acknowledged that this release is for the benefit of and may be relied upon by the City and the referenced Contractor.

The foregoing shall not relieve the undersigned of any obligation under the provisions of the Undersigned's subcontract, as the subcontract may have been amended, which by their nature survive completion of the Undersigned's work effort including, without limitation, warranties, guarantees, insurance requirements and indemnities.

|                                                                      |                                  |
|----------------------------------------------------------------------|----------------------------------|
| STATE OF COLORADO ) ss.<br>CITY OF _____)                            | _____<br>(Name of Subcontractor) |
| Signed and sworn before me this<br>day of _____, 200 .               | By:                              |
| Notary Public/Commissioner of<br>Oaths My Commission Expires _____ . | Title:                           |



DENVER  
INTERNATIONAL  
AIRPORT

# PROJECT MANUAL

RUNWAY 8-26 COMPLEX  
LIGHTING  
REHABILITATION  
CONTRACT NO. 201313528

## PART II TECHNICAL SPECIFICATIONS

Issued for Construction Submittal

January 7, 2014

CITY & COUNTY OF DENVER  
DEPARTMENT OF AVIATION



ENGINEERING SEALS SHEET (1 OF 1)



All General and Technical Specifications Except Electrical



Electrical Specifications

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# DIVISION 1

# GENERAL REQUIREMENTS



## DIVISION 1 – GENERAL REQUIREMENTS

### SECTION 01010

#### SUMMARY OF WORK

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Work specified in this contract consists of furnishing all management, supervision, labor, materials, tools, equipment, services, testing and incidentals for the construction of the Work indicated in the contract documents including lump sum items and unit price items.
- B. The Work in this Contract may impact operations of Denver International Airport. The Contractor shall bid, plan and execute the Work so as to minimize disruption of operations and inconvenience to the public.

##### 1.02 WORK BY OTHERS

- A. The Contractor is hereby notified that there may be other construction activities now and in the future within the project areas and adjacent to the worksites throughout the duration of this contract. The Contractor is responsible for keeping apprised of other projects and worksites and how they may affect the work.
- B. The Contractor shall maintain contact with the City and with other contractors to schedule work to minimize the effect of such construction activities on other site activities. The Contractor shall also maintain, at the direction of the Project Manager, contact with tenants to ensure minimal disruption to tenant operations.

##### 1.03 FUTURE WORK

- A. A. The Contractor is hereby notified that there may be other future construction activities within the project and adjacent to the worksites that are scheduled after completion of this contract. It is the Contractor's responsibility to keep apprised of such projects and how they may affect the Work.

##### 1.04 SITE CONDITIONS

- A. The Contractor acknowledges satisfaction as to the nature and location of the Work, all of the general and local conditions, particularly those bearing upon availability of transportation, access to the site, disposal, handling and storage of materials, availability of labor, water, power, roads, and uncertainties of weather, or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment and facilities needed preliminary to and during work, and all other matters that can in any way affect the work or the cost thereof under this contract.
- B. The Contractor further acknowledges, by submission of a bid and on each Work Request bid, satisfaction as to the character, quality and quantity of all surface and subsurface materials and all features on top of the surface or at worksites that would be encountered from his

inspection of the site and from reviewing available records of exploratory work furnished by the City. Failure by the Contractor to become acquainted with the physical conditions of the sites and all the available information will not relieve the Contractor from responsibility for properly estimating the difficulty or cost of performing the Work.

- C. The Contractor warrants that as a result of examination and investigation of all the aforesaid data and the site, that the Contractor can perform the Work in a good and workmanlike manner and to the satisfaction of the City. The City assumes no responsibility for any representations made by any of its officers or agents during or prior to the execution of this contract unless such representation is expressly stated in the contract.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.01 CONTRACTOR'S DUTIES**

- A. Except as otherwise specified, furnish the following to the full extent required by the contract:
  - 1. Labor, superintendence, supervision and products.
  - 2. Construction equipment, tools, machinery and materials.
  - 3. Utilities required for construction and related activities.
  - 4. Other facilities and services necessary to properly execute and complete the Work, including security for worksite, testing and storage and protection of all materials awaiting incorporation into the Work, providing a safe working environment for workers, City and County of Denver representatives, and the public in accordance with all local, state and federal requirements.
- B. Prosecute the Work as specified and in a timely manner. Submit a schedule of Work that will be performed at times other than during the eight-hour working day of Monday through Friday, daylight hours. Submit this schedule five working days prior to the beginning of Work to the Project Manager for review and acceptance. Approval to work at night may be obtained after Contractor presents a written program outlining special precautions to be taken to control the extraordinary hazards presented by night work. That program shall include, but not limited to, supplementary lighting of work areas, availability of medical facilities, security precautions and noise limitations.

### **3.02 COORDINATION**

- A. Coordinate prosecution of the Work with those public utilities, governmental bodies, private utilities and other contractors performing work on and adjacent to the worksites. Eliminate or minimize delays in the Work and conflicts with those utilities, bodies and contractors. Schedule governmental, private utility and public utility work that relies upon survey points, lines and grades established by the Contractor to occur immediately after those points, lines and grades have been established. Confirm coordination measures for each individual case with the City in writing.
- B. In the coordination effort of work by others, the Contractor shall obtain and refer to equipment locations and other layouts, as available, to avoid interface problems.
- C. The City reserves the right to permit access to the site of the Work for the performance of

work by other contractors and persons at such times that the City deems proper. The exercise of such reserved right shall in no way or to any extent relieve the Contractor from liability for loss and damage to the work due to or resulting from its operations or from responsibility for complete execution of the Contract. The Contractor shall cooperate with other contractors and persons in all matters requiring common effort.

### **3.03 CONTRACTOR USE OF WORKSITE**

- A. Confine worksite operations to areas permitted by law, ordinances, permits and the contract.
- B. Consider the safety of the Work and that of the people and property on and adjacent to the worksite when determining amount, location, movement and use of materials and equipment on worksite.
- C. Do not load worksite with equipment and products that would interfere with the Work. Only equipment, tools or materials required for this Work may be stored at the worksite.
- D. Protect products, equipment and materials stored on worksite.
- E. Relocate stored products, equipment and materials which interfere with operations of City, government bodies, public and private utilities, and other contractors.

## **PART 4 - MEASUREMENT**

### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

## **PART 5 - PAYMENT**

### **5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this section including any and all necessary relocations requested by the City. The cost of the work described in this section shall be included in the applicable multiplier or bid items contract price.

**END OF SECTION 01010**

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## SECTION 01012

### REFERENCED MATERIAL

#### PART 1 - GENERAL

##### 1.01 REFERENCED MATERIAL

- A. The following documents may be available for examination at the Owner's offices unless otherwise noted. The referenced material and documents are not part of the contract documents unless otherwise specified. For further information, contact Keith E. Johnson, telephone (303) 342-2736, at least ten calendar days prior to the scheduled bid opening or after Notice to Apparent Low Bidder. Unless otherwise noted, copies of referenced material may be purchased.
1. Geotechnical Reports
    - a. A geotechnical investigation was not completed for this project.

#### PART 2 - PRODUCTS (NOT USED)

#### PART 3 - EXECUTION (NOT USED)

#### PART 4 - MEASUREMENT

##### 4.01 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

#### PART 5 - PAYMENT

##### 5.01 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01012**

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## SECTION 01014

### WORK SEQUENCE AND CONSTRAINTS

#### PART 1 - GENERAL

##### 1.01 OTHER WORK

- A. Other concurrent construction contracts with which the Contractor must interface are described elsewhere in the Contract Documents. Refer to Technical Specifications Section 01310 and the Special Conditions for specific work constraints and milestones.

##### 1.02 WORK SEQUENCE

- A. The work sequence shall be in compliance with Phasing, Sequencing and Milestones as indicated in the Contract Documents and in accordance with the approved Construction Schedule developed by the Contractor. The schedule shall be in compliance with requirements indicated in the Special Conditions and Technical Specifications Section 01014 Work Sequence and Constraints. The Construction Schedule is described in Technical Specifications Section 01310 Schedule.

##### 1.03 WORK CONSTRAINTS

###### A. Site Constraints

1. Access to the project shall be generally as indicated in the Contract Documents. Access shall be organized and planned by the Contractor to ensure no disruption of airline or DIA operations.
2. Access to work sites will be strictly monitored and must comply with DIA Airport Operations and FAA Regulations. The Contractor shall provide monitoring and escorts as required by DIA Operations in the area of the work.
3. The Contractor's staging area will be as indicated in the Construction Documents.
4. Contractor employee parking will not be allowed within the existing revenue control system. To access the Terminal building, Contractor employees may use the DIA Landside Employee Parking Lot located on 78th Avenue at a cost of \$30.00 per month per employee. A free DIA shuttle to the Terminal is available from this Lot. Material for work in the Terminal may be brought in through the Terminal Loading Dock accessed via Gate 1. Employee and material access to the Concourses will be via Gate 5.
5. The Contractor shall use the haul routes specified in the plans.
6. If required, the Contractor shall provide a bus and driver to transport the Contractor's employees between the designated employee parking area and the work sites. No separate payment will be made for this bus and driver. The cost shall be included in the bid item "Mobilization". The bus driver shall be provided at all times when Contractor employees are working on the project.

###### B. System Interruptions

1. The Contractor shall submit on approved forms through the Project Manager to DIA Maintenance Control any written requests for system interruptions such as fire alarm, HVAC, electrical, water systems or other systems. System interruptions shall not be

considered if the interruptions interfere with airport operations or tenant operations, without prior approval and coordination with the Project Manager and DIA. Interruptions or system shut down shall be limited to between the hours of 11:00 p.m. and 5:30 a.m. Baggage system shutdown shall be limited to between the hours of 10:00 p.m. and 4:00 a.m. and in accordance with Technical Specifications Section 01014, paragraph 1.03.F. Roadway shutdown times are to be coordinated with Airport Operations and the DIA Project Manager prior to submitting a request for approval to shutdown a roadway.

2. The request forms shall be submitted only during the normal work week (Monday through Friday) between 8:00 a.m. and 4:00 p.m.
3. Upon approval of a system shutdown, the Contractor representatives and the individuals performing the work shall remain at the worksite and shall remain in contact with Maintenance Control until such time as the system is restored to working condition. The requesting party shall assume liability for the system until the system is restored to proper working order.
4. Fire Systems, HVAC, and Plumbing: Submit requests five working days prior to the time of requested interruption.
5. Electrical System Interruptions: Submit requests five working days prior to the time of requested interruption.

C. Airfield Operations at Denver International Airport

1. Full airport and aircraft operations are underway adjacent to this project. Contractors are required to obtain a Contractor Participant Manual from the Security Manager and must follow the guidelines in the manual. Copies of the Contractor section of the manual are available for review at the Denver International Airport Access Services Office.
  - a. If any Work contains requirements for Work activities or access through or in the restricted area, reference Technical Specifications Section 01015 and 01016 for requirements.
  - b. If not in a restricted area, the Contractor personnel still must be badged; reference Technical Specifications Section 01015.

D. CONDUCT OF PERSONS USING THE DENVER MUNICIPAL AIRPORT SYSTEM

1. Contractor activities shall comply with Airport Operations and Regulation 130 TRAFFIC and 20 CONDUCT OF PERSONS USING THE DENVER MUNICIPAL AIRPORT SYSTEM shall be followed. These regulations are available from Airport Operations at Denver International Airport.

E. OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION

1. All work shall be accomplished in accordance with FAA Advisory Circular AC150/5370-2F, "Operational Safety on Airports During Construction", FAR Part 139 and FAR Part 107 except as herein modified.

F. BAGGAGE SYSTEM SHUTDOWN AND LOCKOUT: Prior to and during work in any area that requires access adjacent to, under, or above baggage systems, the Contractor shall coordinate with baggage system representatives of United Airlines and DIA:

1. Work in these areas shall be limited to between the hours of 10:00 p.m. and 4:00 a.m. The Contractor shall schedule and plan activities within these areas during the shutdown to ensure removal of personnel and equipment within the time frame as

indicated in this Technical Specifications Section. The Contractor shall not have access to the work areas requiring shutdown and lockout during a limited number of selected days. The Contractor shall coordinate with the Project Manager and United Airlines representatives to develop detail scheduling on a day-to-day basis.

2. Scheduling for Shutdown and Lockout: The Contractor shall maintain an on-going one week look-ahead schedule of shutdown/lockout requests including areas identified on plan diagrams. This look-ahead schedule shall be provided daily to the Project Manager and United Airlines representative.
3. Sequence of Shutdown and Lockout
  - a. 10:00 p.m. Shutdown and Lockout. Prior to 10:00 p.m., the Contractor's Superintendent and the Contractor's Safety Representative shall meet with United Airlines baggage system representatives and DIA representatives to review the areas or zones to be inactivated to allow the Contractor to proceed with work.
    - 1) Baggage Mechanical Systems Lockout. United Airlines representatives in conjunction with the Contractor representatives shall install barriers provided by United Airlines on baggage system tracks to isolate the zone of the Contractor's work. The barriers are to ensure no baggage system cart intrusion into the area. Protection of equipment and other barriers are to be provided by the Contractor.
    - 2) Baggage Electrical Systems Lockout. A representative from United Airlines, in conjunction with Contractor representatives, shall place locks on power cabinets supporting baggage equipment for the identified contractor work zone. Each party shall provide a lock.
    - 3) The Contractor may begin work in baggage system zones after the Contractor's Safety Representative has confirmed lockdown and lockout have been completed. The Contractor shall begin work by first providing covers and protection of baggage system and building systems to preclude damage during the Contractor activities. DIA and/or United Airlines representatives prior to the Contractor beginning work shall review all protection systems for acceptance.
  - b. System Activation: The system shall be activated at 4:00 a.m. Before 4:00 a.m. the Contractor shall begin clearance and removal of equipment, materials, barriers, and personnel in areas and envelopes of the baggage system. The Contractor shall take all steps to ensure that all baggage systems envelopes are clear of personnel, protective coverings, and equipment prior to 4:00 a.m. The Contractor's safety representative shall contact the United Airlines representative and shall inspect areas of work to ensure removal by the Contractor of all personnel, materials and equipment between 3:30 a.m. and 4:00 a.m. At 4:00 a.m. the baggage system will be activated. After this time until the next shift (10:00 p.m.), Contractor personnel or equipment shall not be mobilized in the area of the baggage system (generally in the envelope above 8'0" in the basements).

G. Welding Equipment, Procedures and Constraints

1. Natural gas-powered portable welders or "Powcon Inverter" welders are the only acceptable welding equipment to be used inside of building basement or tunnel areas. Acceptability of equipment other than the equipment noted above shall be at the sole discretion of the Project Manager. If the Contractor proposes other types of inverter welding equipment, testing of equipment for harmonics by the Contractor must be completed prior to the request by the Contractor for use of the equipment.
2. Welding activities inside buildings require submittal of a System Interruption Request (See paragraph 1.03.B of this Specifications Section). Prior to welding in any area, the

Contractor shall locate smoke detectors and shall request interruption of the fire alarm system. Subsequent to the interruption of the fire alarm system and prior to welding activities, the Contractor shall cover and protect smoke detectors until work is complete. Prior to expiration of each interruption of the system, the Contractor shall uncover the smoke detectors.

3. Electrical Service: The Contractor shall be responsible for verifying with the DIA Project Manager or representatives locations acceptable for accessing electrical power for welders and other electrical equipment feeders. The Contractor shall be responsible for all work and equipment required to install temporary or permanent electrical modifications for construction power and lighting.
  - a. Temporary Hook-up: Pigtails wired into electrical panels - temporary only: Permanent installation shall require conduit, labeling, and all requirements of Division 16 Technical Specifications. Comply with the following:
    - 1) Provide 20 amp, 3 pole plugs.
    - 2) Wire shall be (4) #10 copper
    - 3) 480V, 3 phase, 3 pole, 4 wire twist lock ground line
    - 4) NEMA L16-20 or ANSI C73.87
  - b. The Contractor may not begin operation of the equipment prior to request for inspection by DIA representatives and acceptance of the installation.
4. Welding Practices: All standard safe welding practices must be followed, including but not limited to the following:
  - 1) Flash protection for surrounding areas
  - 2) Contractor fire extinguisher in area
  - 3) One person in each welding area solely designated as fire watch for each welder
  - 4) Protect all equipment, cable trays and contents, etc. in area
  - 5) Use fire blankets and other appropriate materials to confine sparks and molten metal from the welding, cutting, and/or grinding activities.
  - 6) All welders shall have been qualified through welding tests in accordance with applicable welding code, such as but not limited to AWS, ASME, API, within one year prior to welding taking place. Evidence of qualification shall be through Welding Performance Qualification Records (WPQR).
  - 7) All welder qualifications test shall be or shall have been administered and witnessed by an Independent Testing Agency (ITA), AWS Certified Welding Inspector (CWI).
  - 8) If re-certification of welders is required, delay costs and retesting costs shall be borne by the Contractor.
5. Grounding: Review with DIA representative's area of work prior to beginning work to ensure ground procedures do not induce undesirable charges in steel building system or other systems. This review should take place subsequent to the pre-work meeting. Do not ground to adjacent building systems, baggage system, hangers, or devices that support mechanical or electrical equipment.

#### H. Cleaning Equipment and Spoils

1. Discharge of water, liquids, or chemicals into the building waste, drain systems or storm drainage systems is prohibited. The Contractor shall comply with all Federal, State, and Local requirements for disposal of chemicals. The Contractor shall maintain and service in work areas containers for discharge of water from cleaning of any construction equipment or removal of water from excavations.

#### I. Vehicle Permitting for Tunnel and Basement Use

1. Electric carts require permitting. The Contractor shall provide at least one electric cart for Contractor use during the work in the tunnel and basements of the buildings. Only CNG powered trucks are allowed in the tunnel and basements of the buildings. CNG/gasoline trucks may be used and shall not be parked overnight or for long terms within the tunnel or basements. All vehicles require permitting. Permits may be acquired at the DIA Airport Security Office for a fee of \$5.00 each (non refundable) with a \$100.00 deposit (refundable at project completion).
  
- J. Radio and Cell Phone Use
  1. The Contractor shall have in place prior to initiation of work in the tunnel or basements communications equipment either by use of cell phone and or radio. Cell phone use is limited to “line of sight” communication. Radio equipment shall be submitted to DIA for approval of use at least 14 days prior to intended use. Radio equipment frequencies shall be submitted. Frequencies shall be subject to DIA approval.
  
- K. Keys
  1. The Contractor shall be required to contact DIA Maintenance Control to procure keys for access to all rooms having locks in order to gain access. Keys may be checked out at the beginning of each work shift by the Contractor and shall be returned to DIA Maintenance Control at the end of each work shift.

#### 1.04 COORDINATION

- A. The Contractor will designate a contact person for coordination with the Project Manager and airline tenants. The contact person shall have the authority to make decisions for the Contractor firm and shall have binding signatory power for changes in work. The contact person shall be on site at all times during work activity.
  
- B. No additional costs shall be considered for coordination activities throughout this project. The Contractor shall include in his bid costs for coordination of all activities.

#### 1.05 LATE COMPLETION

- A. The Contractor will notify the City as soon as possible, but in no case not less than four weeks in advance, of the inability to meet any of the constraints or milestones. Notification shall be consistent with the requirements of Article 5, General Conditions.

### PART 2 - PRODUCTS (NOT USED)

### PART 3 - EXECUTION

#### 3.01 DUST/PROTECTION BARRIERS

- A. Prior to any demolition the Contractor shall construct area containment doors and dust barriers at five feet outside the limits of demolition of the wall and as directed by the DIA Project Manager. Dust barrier at wall demolition shall be constructed of metal studs with ½” painted gyp board from floor to ceiling. At a minimum, any space containing electrical or telecommunications equipment will require dust barriers for the entire space during demolition and construction. Contractor shall install all required modifications to exit/egress signage until temporary barriers are removed. Contractor shall coordinate location of partition with Fire Sprinkler Contractor to ensure adequate sprinkler coverage during construction.

Temporary barriers shall be removed only after completion of the work scope within the areas including final punch list activities. Areas between ceilings and structure above shall be contained to prevent migration of any dust into adjacent areas.

- B. HVAC system containment. The Contractor shall submit to DIA Maintenance HVAC and Fire Alarm shut down requests prior to modifications to the area of work for dust containment. The HVAC system shall be interrupted, re-routed, or blocked off to prevent dust from entering return or supply ducts.
- C. Debris and Protection Barriers: The Contractor shall construct code-approved and DIA-approved dust and debris barriers on both sides of walls and doors that are to be modified. Barriers shall be constructed to allow emergency ingress and egress to and from equipment and spaces. Barriers shall be constructed to allow continual uninterrupted function of building equipment and spaces.
  - 1. Return all removed door hardware to DIA. Label each hardware set correlating the door number of the original hardware set. Coordinate with the DIA Project Manager representatives for storage and return of hardware.

### **3.02 EQUIPMENT**

- A. Equipment: CNG-powered equipment is allowed within the buildings. No other fossil fuel equipment may be used within the buildings unless the equipment is directly vented to the building exterior.
- B. Electric: Electric powered equipment is acceptable in the Work area.

### **PART 4 - (NOT USED)**

### **PART 5 - MEASUREMENT**

#### **5.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

### **PART 6 - PAYMENT**

#### **6.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01014**

## SECTION 01015

### SECURITY REQUIREMENTS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Badges and Permits: DIA requires personnel badging and vehicle permitting administered by the Denver International Airport Security Office. The Contractor shall be required to obtain the proper access authorizations for badges and permits, and the Contractor shall immediately report the presence of unauthorized (unbadged) persons or unauthorized (no permit) vehicles on site to the DIA Project Manager.
- B. Fences: If required, the Contractor shall establish and maintain a secure (fenced) perimeter at its primary operations area to include its field offices, staging and storage areas, and maintenance facilities. The responsibility for security within its operations area shall rest solely with the Contractor. Entrance gates to operations areas shall be equipped with a combination of locks to include a lock provided by the City for its use in accessing emergency equipment, should that need arise. The location, size and other physical characteristics of the Contractor's operations area must be approved by the City prior to its installation.
  - 1. Unless specifically required by the Contract Documents and with the exception of the fenced operations area described above, the Contractor shall install no fences or other physical obstructions on or around the project work area without the written approval of the City.
- C. Trash Dumpsters: To provide maximum security will all construction projects in public areas, all trash dumpsters must have the ability to be covered and locked when not in use.
- D. If the contract involves SSI information or procedures, the contractor must contact the Assistant Director of Airport Security or designee, for disclosure information, as well as protocols that must be followed with SSI distribution.

##### 1.02 VENDORS AND SUPPLIERS

- A. The Contractor shall escort ON A FULL TIME BASIS all unbadged vendors and suppliers requiring access to the restricted areas. Only those vendors and suppliers providing materials and/or supplies shall be allowed on site.

##### 1.03 AIRPORT SECURITY PARTICIPANT MANUAL

- A. Contractors are required to obtain an Airport Security Participant Manual from the Airport Security Office and must follow the guidelines in the manual. The Airport Security Participant Manual will be issued after the company has attended a Participant meeting with Airport Security. The Contractor shall comply with the Denver Municipal Airport System Rules and Regulations and TSA regulations.
  - 1. Denver Municipal Airport System Rules and Regulations **Part 130** Movement of Vehicles in the Restricted Area and **Part 20** Security must be adhered to. The Denver Municipal Airport System Rules and Regulations can be found on the flydenver.com website.

2. All work shall be accomplished in accordance with FAA Advisory Circular AC150/5370-2F, "Operational Safety on Airports During Construction", 49 CFR Part 1542 and 14 CFR Part 139 except as modified herein.
  3. The following paragraphs supplement, modify, change, delete from or add to FAA AC150/5370-2F. Where any paragraph, subparagraph or clause of the Advisory Circular is modified or deleted by these supplements, the unaltered provisions of that paragraph, subparagraph or clause shall remain in effect.
  4. The Transportation Security Administration requires has the authority to issue civil penalties for failure to adhere to their regulations.
  5. It is the responsibility of the Airport to ensure all fences and gates are secure. If a Contractor's operations necessitate the frequent use of a particular gate, the Contractor shall place two contract security guards at the gate that shall have been trained and certified by the Operations, Public Safety and Security Division to facilitate access to its work. The Contractor assumes full responsibility for maintaining security once this is done. If the perimeter gate will be used as a haul route, the contractor must also place Haul Route Monitors as dictated by the TSA approved Temporary Amendment. Any fines levied against the Airport as a result of the failure by the Contractor to provide adequate security shall be passed on to the Contractor.
  6. Contractors will be required at all times to have a supervisor or foreman at each work location in both restricted and non-restricted areas.
- B. Access to Restricted Area via Vehicles
1. The Contractor shall obtain access to the restricted area via a vehicle only when the vehicle displays a valid Vehicle Permit issued by Airport Security (refer to Technical Specifications Section 01016) and the driver has an Airport ID badge with driver authorization.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.01 SUBMITTAL FOR BADGES**

- A. Airport Id badges and vehicle permits shall not be issued prior to Notice to Proceed. The Contractor may at his own risk submit the required information to DIA Maintenance and Engineering Division and to DIA Airport Security prior to Notice to Proceed in order to expedite the badging and permitting process.
- B. By submitting information for the individual requesting or requiring an Airport Id badge that would permit unescorted access to the Sterile and/or Restricted Areas must be fingerprinted and pass a Criminal History Records Check (CHRC) and Security Threat Assessment. Passing a CHRC means the employee shall not have been convicted, given a deferred sentence, found not guilty by reason of insanity or have been arrested and are awaiting judicial proceedings of any felony charge during the ten (10) years before the date of the individual's application for unescorted access authority. For an individual to obtain driver authorization to drive within the Restricted Area, the individual must have a valid driver license that allows them to drive their contractor vehicle.
- C. An employee requesting an Airport ID Badge must resolve all pending or valid violations



before being allowed to proceed in the badging process. If the employee no longer works for the company and is attempting to be employed by a different company, a management representative from the “new” company must attend the Violation Notice Hearing along with the employee.

D. Airport ID Badges are obtained as follows:

1. The Contractor shall designate an Authorizing Agent who must attend an annual class with Airport Security. The Authorizing Agent must be an employee of the Contractor, have a valid Denver International Airport ID badge. The Authorizing Agent will be authorized to sign for the Contractor on the Fingerprinting and Badge Application Form and will be the primary designation contact for Airport Security related business.
2. The Contractor shall meet with the DIA Project Manager to review the procedures and required access points at DIA. The Contractor and the Project Manager shall visit the site to verify the access points. Access points shall be listed and submitted by the Contractor to the Project Manager for review and comment prior to Contractor's application for badging.
3. The Contractor's Authorizing Agent shall schedule a Participant Meeting with the DIA Airport Security Office to review DIA security procedures. A second meeting will be scheduled for the Authorizing Agent to learn how to successfully complete the required forms for employee badges and vehicle permits.
4. A CHRC and Security Threat Assessment (STA) are required for each employee requesting unescorted access to the restricted areas. The employee will complete the Fingerprinting and Badge Application (two-sided form) and schedule an appointment with the Airport Security Office to have the form reviewed and to be fingerprinted. The Federal Bureau of Investigation will conduct the CHRC and will return the results to the Airport Security Office. For the fee for the Fingerprinting please see the flydenver.com website. The Transportation Security Administration will process the STA and will return the results to the Airport Security Office.
5. When the Authorizing Agent is notified by Airport Security that the CHRC and STA has cleared, the individual shall call the Airport Security Office, to schedule an appointment to come to the Airport Security Office to receive regulated security and driver training. The appointment will take approximately one hour for security training and approximately two hours for security and driver training.
6. All applicants will must watch and pass all concepts of a computer based security training module for a SIDA Airport ID badge. All individuals requesting driver authorization in the non movement area must also view an interactive computer based driver training module and complete a test by passing all concepts. In addition the individual must receive non movement driver orientation training by the Contractor's driver representative before being allowed to drive on the airfield. Non Movement Orientation training should be conducted annually.
7. **ALL EMPLOYEES ARE REQUIRED TO HAVE AN AIRPORT ID BADGE.** The Contractor is advised that there is a \$10 dollar processing fee for every issued Airport ID badge. Rebadging fee is \$10.00.
8. The Airport ID badges must be returned to the Airport Security Office prior to final payment. All Airport ID badges are issued with an annual expiration date. The expiration date is determined by either the end of the estimated project date or the expiration of the vehicle insurance, whichever ever date is closer. Contractors shall notify the Project Manager as soon as possible but in no case less than four weeks in advance of any requirement to extend the duration of badge validations.

9. Total fees for startup:
  - \$ 40 Criminal History Records Check (per employee) for Unescorted access.
  - \$ 10.00 Badge (per employee)

### 3.02 DUMPSTERS

- A. Security Requirements: The following procedures must be followed to provide maximum security with all construction projects in public areas:
  1. Roll-off dumpsters must have the ability to be covered (hard side) and locked when not in use.
  2. When unlocked and in use, the Contractor shall provide an employee, or a subcontractor's employee, to stand by the dumpster to prevent unauthorized placement of prohibited items.
  3. If the Contractor is not able to have a roll-off dumpster with the ability to be locked, the dumpster shall be removed from the public area when the construction site is inactive.

## PART 4 - MEASUREMENT

### 4.01 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

## PART 5 - PAYMENT

### 5.01 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01015**

## SECTION 01016

### VEHICLE AND EQUIPMENT PERMITTING

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Contractor shall comply with the Airport Security Program. Vehicle permits are required for all vehicles operating in the Restricted Area. Two types of permits are required. The DIA vehicle permit is required for vehicles operating in the Restricted Area but limited to above grade, outdoor activity. Vehicles or machinery operating within buildings shall be required to acquire a DIA emissions permit as well as a DIA vehicle permit.
- B. Contractors performing work in or through Restricted Areas are required to become Participants in the Airport Security Program. Contractors shall comply with all Denver Municipal Airport System Rules and Regulations.
1. Denver Municipal Airport System Rules and Regulations Part **130 Movement of Vehicles in the Restricted Area** and Part **20 Security** shall be followed. These regulations are available through the flydenver.com website.
  2. All work shall be accomplished in accordance with FAA Advisory Circular AC150/5370-2F, "Operational Safety on Airports During Construction", 49 CFR Part 1542 and 14 CFR Part 139, except as herein modified.
  3. The following paragraphs supplement, modify, change, delete from or add to FAA AC150/5370-2F. Where any paragraph, subparagraph or clause of the AC is modified or deleted by these supplements, the unaltered provisions of that paragraph, subparagraph or clause shall remain in effect.
  4. Special care shall be exercised by the Contractor when operating within clear zones, under approach and departure zones of runways and in the apron area. The clearance zones shall be considered as extending to a distance of 750 feet laterally from the centerline of runways and to a distance of 193 feet laterally from the centerline of taxiways. Where these zones overlap, the greater distance shall apply. Vertical clearance in the approach and departure zones shall be considered as starting at grade 200 feet beyond the ends of runways and rising at the rate of 50 feet horizontal to one foot vertical.
  5. Access to the runways, taxiways and aprons shall be gained by the Contractor after establishing radio communications with Airport Operations. No personnel or equipment will be allowed on the runways until radio contact has been made with Airport Operations and permission given.
  6. Access to airport operations areas will be limited in order to allow the maximum efficient movement of aircraft. As part of this limitation the Contractor may be required to only use these areas late at night when there is less aircraft traffic.
  7. Once admitted into the Restricted Area, the Contractor shall proceed directly to the Work location by way of a route assigned by Airport Security. At no time shall a Contractor or any of its personnel enter onto a taxiway, runway or ramp without proper clearance from the Aviation Operations Manager or Assistant Aviation Operations Manager. Contractors or individuals violating these requirements for driving in the Restricted Area may be subject to fines, suspension or permanent revocation of the

Airport ID badge and driver authorization.

8. The Transportation Security Administration requires that all operating airports be secured from the general public and has the authority to issue citations for violations of these requirements. It is the responsibility of the Airport to ensure all fences and gates are secure. If a Contractor's operations necessitate the frequent use of a particular gate, the Contractor shall place two guards at the gate, which shall be trained and certified by the Airport Operations, to facilitate access to its work. If a Temporary Amendment is required, then the Contractor must also adhere to all requirements within the TSA approved Temporary Amendment and ensure Haul Route Monitors are trained. The Contractor assumes full responsibility for maintaining security once this is done. Any fines levied against the Airport as a result of the failure by the Contractor to provide adequate security shall be passed on to the Contractor.
  9. Cranes and Construction Equipment: The Contractor shall provide the necessary drawings and specifications to indicate all information needed by the FAA and the City including but not limited to location of construction activities and height of objects including cranes, construction equipment and vehicles. Drawings shall be scaleable site plans indicating northing and eastings of proposed equipment locations, air space northing and eastings of activity and elevations of equipment based on DIA LDP Coordinate System. Specifications shall include standard sheets on equipment specifications and any non-standard modifications to the equipment.
  10. The above information shall be submitted to the Project Manager for approval five days prior to mobilization. Changes to information submitted shall be re-submitted for approval at least five days prior to mobilization of any change.
  11. If required by DIA, standard DIA-approved warning lights and flagging will be required on any temporary equipment or structures.
  12. Lighting of the work area is subject to approval by DIA Operations and DIA Planning and Development. The Contractor shall include in item (9) above information on any site lighting proposed by the Contractor. The locations, heights and types of luminaries shall be submitted. The Contractor shall conduct his activities, especially lighting, so as not to interfere with Airport and FAA operations.
- C. General safety regulations when in aircraft operations areas may include the following:
1. At all times, the Contractor shall coordinate its work with the requirements of the Airport site and operations. All work, movement of men, materials, supplies and equipment in areas used by aircraft shall be subject to regulations and restrictions established by the City. The Contractor shall take special precautions and be fully responsible for the prevention of damage to materials and equipment in the areas affected by the jet blast of taxiing aircraft. No work shall proceed until necessary protective devices are placed as required to protect the public, airport operations, property and personnel from the hazards of the Work. The Contractor shall proceed with his work, including temporary work and storage of tools, machinery and materials, to cause no interference with or hazards to the operation of the Airport.
  2. Landings, takeoffs and taxiing shall take precedence over all Contractor operations. In the event that the Contractor is notified that an emergency landing or a takeoff is imminent, the Contractor shall stop all operations immediately, regardless of the sequence of events in progress and shall immediately evacuate his personnel and equipment from the runway and taxiway areas as directed.
  3. The Contractor shall remove its personnel and equipment to the distance specified below for the prevailing conditions:

- a. For emergencies the Contractor shall move all personnel and equipment as directed by Airport Operations or the Project Manager.
  - b. At the end of a work day in areas where aircraft are operating, all equipment shall be moved to a location that is not less than 750 lineal feet measured from the near edge of the runway, taxiway or ramp area or to the location designated by the City.
4. If the Contractor is asked to leave part of its worksite to allow aircraft operation, the Contractor shall clean the area to allow safe aircraft movement. Cleaning may include sweeping the area to prevent damage to aircraft.

D. Vehicle Permitting

1. Vehicle permits are limited to those vehicles and or equipment required for completion of the work. Employee vehicles will not be issued permits. Employee parking is addressed in Technical Specification Section 01014 or as indicated in the Contract Documents. No Contractor employee parking will be acceptable in the Restricted Area.
2. The Contractor shall obtain access to the Restricted Area only when the vehicle displays a vehicle permit, has the vehicle permit application in the vehicle and the driver has an Airport ID badge with a driver authorization. Vehicle permits may be obtained as follows:
  - a. Vehicle permits must be renewed annually and cost \$5.00 dollars. Vehicle permits must be surrendered to Airport Security before final payment will be made for work accomplished. A Vehicle Permit Application must be filled out and approved by the Project Manager prior to the issuance of the permit. The Contractor's Authorizing Agent must file a sponsorship form with the Airport Security Office and accompany any subcontractor requesting a vehicle permit. The approved vehicle application must be presented at Airport Security to obtain the vehicle permit.
  - b. All vehicles that are not permitted by Airport Operations to drive in the Restricted Area are required to be escorted. All vehicles that are escorted must have a minimum of \$1,000,000.00 combined single limit coverage with a 30 day notice of cancellation to Airport Security. All unescorted vehicles must have \$10,000,000.00 combined single limit coverage with a 30-day notice of cancellation to Airport Security prior to any permits being issued.
  - c. Vehicle permits are issued with the expiration date of the project on the permit. A \$5 fee will be charged for a new permit that requires an extension of time.
  - d. The Contractor must have a four-inch letter company logo on each side of the vehicle. All vehicles operating in the Restricted Area must display the logo at all times.
  - e. The Contractor shall obtain a driver authorization for all operators of vehicles in the Restricted Area. Reference Technical Specifications Section 01015.
  - f. Contractors will be required to have a supervisor or foreman at each work location at all times.

E. Equipment Permitting

1. Fossil fuel powered equipment to be used in the interior of buildings and/or in basement/tunnel areas shall require inspection by DIA Maintenance and the Denver Fire Department. **Only CNG fossil fuel powered equipment may be used; gasoline powered, propane powered, or diesel powered equipment will not be acceptable unless identified and operated per Specifications Section 01014.**

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.01 PERMITS**

- A. Vehicle permits shall not be issued prior to Notice to Proceed. The Contractor may, at his own risk, submit required information prior to Notice to Proceed to the following:
1. Vehicle permit: DIA Engineering Group or DIA Airport Security
  2. Equipment and vehicle emissions permit: DIA Engineering or DIA Maintenance Group.

**3.02 SCHEDULE**

- A. The Contractor shall allow in his schedule five days for DIA review of submittals for permits. Testing of equipment and review by the Denver Fire Department shall be scheduled by the Contractor. By submitting information for permits, the Contractor certifies that equipment and vehicles comply with all city, state and federal regulations including but not limited to emissions, licensing and safety requirements.

**PART 4 - MEASUREMENT**

**4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

**PART 5 - PAYMENT**

**5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item. All permits shall be returned to the City prior to the Contractor submittal for Final Settlement, Termination, and/or upon written request from the Project Manager.

**END OF SECTION 01016**

**SECTION 01020**

**UTILITIES INTERFACE**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

A. Various utilities are located within the limits of work in the project area. The owners of these utilities hereinafter noted may require that the Contractor is to work around their existing facilities until such alterations, relocation or abandonment have been completed. All known existing utilities are shown; however, the Contractor shall verify and satisfy himself that there are no other existing utilities that may not be shown.

B. The owners of known utilities within the project area and corresponding representatives are:

|                                 |                   |              |
|---------------------------------|-------------------|--------------|
| Centurylink Telephone           | Susan Jensen      | 303-391-8373 |
| DIA Telephone                   | Pat McFadden      | 303-342-2200 |
| Xcel Energy Natural Gas         | Joanna Gomez      | 303-375-3509 |
| Xcel Energy Electrical Services | Joanna Gomez      | 303-375-3509 |
| DIA Storm Water                 | Keith Johnson     | 303-342-2736 |
| DIA Sanitary Sewer              | Keith Johnson     | 303-342-2736 |
| Denver Water Department         | John Bambei       | 303-628-6669 |
| Inland Technologies             | Brian Stierman    | 303-342-6811 |
| Fuel System (ASIG)              | Gil Patron        | 303-342-3552 |
| Premise Wiring System           | Kelan Pape        | 303-342-2200 |
| FAA Duct Bank                   | Rick Silva        | 303-342-1405 |
| FAA Locates                     | Ken Baily         | 303-342-1440 |
| Oil/Gas Wells                   | Julie Brant       | 303-513-6169 |
| DIA Electrical Department       | Pat Kelly/Tai Lai | 303-342-2800 |
| Fire Alarm System               | Pat Kelly/Tai Lai | 303-342-2800 |
| Paging System                   | Pat Kelly/Tai Lai | 303-342-2800 |

C. The location and establishment of each construction vehicle crossing shall be at sites mutually agreed upon in writing by the Contractor and the owner of the utility.

D. At the locations where the Contractor needs to establish a construction vehicle crossing over any of the operating pipelines, the furnishing and placing of a crossing shall be by the Contractor. The crossing shall allow the normal operation of the pipeline at all times. Each crossing shall be adequately marked and signed for safe passage of vehicles over the crossing. Construction vehicles shall not be allowed to cross over operating pipelines at any place other than an established crossing. The maximum size of any vehicle crossing operating pipelines at any location in the project area shall be limited to no larger than a Caterpillar D6 bulldozer unless noted otherwise.

E. Coordinates for known utilities located within the project area may be available at the Denver International Airport Office. These utilities locations are based upon information provided by the utility companies or previous construction contractors that were the basis for determining utility coordinates. The City does not warrant their accuracy.

F. The Contractor shall control his operations in order to avoid creating any obstacles for the utility owner's access for maintaining or operating their equipment.

## 1.02 REGULATORY REQUIREMENTS

- A. The Contractor shall obtain and pay for all utility company permits, fees, and licenses necessary for the execution of this work. The Contractor shall give all notices and shall comply with all laws, ordinances, rules and regulations of all authorities having jurisdiction.

## 1.03 QUALITY CONTROL

- A. When the Contractor performs any operations that will impact a utility owner, the Contractor will give timely notice to the utility owner and the DIA Project Manager so that the Contractor's operations may be observed by the utility owner's representative at the discretion of the utility owner's representative and the Project Manager's representative.

## 1.04 WORK INCLUDED

- A. The work of this section includes furnishing all materials, equipment and labor necessary to provide utility crossings as required and as specified herein and subject to approval by the associated utility owner.
- B. North American Resources requires a minimum of 12 feet of total cover over their pipelines at each crossing. This required cover is to extend a minimum distance of five feet perpendicular on both sides of the pipeline, then slope away from the pipeline at a slope determined by the Contractor as sufficient for his vehicles. The top 12 inches of the cover overall shall be Colorado Department of Highways Class 6 road base.
- C. FAA Underground Duct lines: The FAA has duct lines passing under the site. The Contractor shall contact the FAA prior to beginning earthwork operations to ascertain any special requirements or conditions required to maintain this service during construction activities.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Suitable cover material shall be in accordance with Colorado Department of Highways Standard Specifications. Wet, soft or frozen material, asphalt chunks, or other deleterious substances shall not be used for cover.
- B. Aggregate for road base material shall consist of clean, sound and durable particles of crushed stone, crushed gravel or crushed slag, shall be free from coatings of clay, silt and organic matter, and shall contain no clay balls. Material shall conform to the State of Colorado Standard Specifications for Road and Bridge Construction Class 6 aggregate base.
- C. The materials for the load distribution system on top of the cover shall conform to the specification of the American Institute of Steel Construction, the American Institute of Timber Construction, or the American Concrete Institute, as applicable, depending upon the system agreed upon between the Contractor and utility owner.
- D. Materials for the sleeving of the pipelines shall be purchased by the utility owner at the Contractor's expense.

## PART 3 - EXECUTION



### 3.01 NOTIFICATION OF UTILITIES FOR LOCATING AND POTHOLING

- A. The Contractor shall verify the location of all utilities prior to any operations including physically uncovering the utility to verify location as required by the utility owner or the DIA Project Manager and shall be solely responsible for protection of the utilities during construction. Only manual labor shall be used within five feet of the suspected location of a utility to uncover it. The Contractor shall obtain written permission from each utility owner before constructing crossings or crossing pipelines in service, and provide the Project Manager with a copy of the permission 48 hours prior to commencement of crossing work.
- B. A minimum of three days notice by the Contractor shall be given to the utilities for locating and potholing their lines as needed.
- C. The Contractor shall notify the Utility Notification Center of Colorado at 811 or 1-800-922-1978 as a minimum for location of utilities.
- D. In the event that the Contractor needs to conduct Contractor's operations which will affect an operating utility, the Contractor shall be required to sign a "hold-harmless" agreement with the owner of the utility prior to the Contractor conducting any operations affecting the utility.
- E. Denver International Airport has embarked on a robust program to collect sub-surface utility engineering surveys for all airport construction projects. All construction projects that expose the location of sub-surface utilities needs to accurately capture the location and provide the data to the Planning & Design Division. Construction plans should indicate when sub-surface utilities are to be uncovered and/or new utilities installed and coordinate with the DIA Survey Department for the collection of all utility data prior to being covered. The DIA Survey Department will be responsible for the collection of utility data including Denver Water and Excel Energy utilities, but notification to the DIA Project Manager and Airport Survey Office is required by contractor three business days before items are uncovered. Refer to Design Manual 12 Chapter 5 Existing Subsurface Utilities Data Standard for more information.

### 3.02 TRENCHING AND SLEEVING

- A. All trenching, excavation, sleeving and shoring needed to cross over or under a utility shall be performed in the manner required by the party owning the utility and in such a manner as to ensure no dislocation of the existing utility. The method used to cross under the utility shall ensure it is fully supported at all times. The Contractor shall accurately locate and record the position of a utility being crossed as soon as it is uncovered and again prior to covering it and report to the Project Manager any change in location greater than 0.5 inch. The crossing shall be protected so that water or construction equipment will not dislocate or undermine unsupported sections of the utilities.

### 3.03 COVER AND COMPACTION

- A. Backfilling of trenches or adding additional cover shall be conducted at all times in a manner that will prevent damage to the pipe. If the excavated material is not suitable for backfill and cover, as determined by the DIA Project Manager, unsuitable material shall be hauled away and disposed of properly. The owner of the utility will observe at all times the installation of the backfill and cover. Backfill and cover shall be the placement of suitable materials in horizontal, uniform layers and brought up uniformly on the sides and over the pipelines.
- B. The thickness of each layer of backfill shall not exceed eight inches before being compacted to 95 percent relative compaction per ASTM D-698 or to the density required by the utility

owner and tested for density by the Contractor.

### **3.04 ROADBASE COMPACTION**

- A. If the required compacted depth of the road base exceeds eight inches, it shall be constructed in two or more layers of approximately equal thickness. The maximum compacted thickness of any layer shall not exceed eight inches before being compacted to 95 percent relative compaction per ASTM D-698 or to the density required by the utility owner.

### **3.05 REMOVAL**

- A. All temporary crossings shall be removed after completion of the work.

## **PART 4 - MEASUREMENT**

### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

## **PART 5 - PAYMENT**

### **5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable multiplier work request bid item.

**END OF SECTION 01020**

## SECTION 01025

### MEASUREMENT FOR PAYMENT

#### PART 1 - GENERAL

##### 1.01 SCOPE

- A. This Section covers the requirements for measurement of quantities for payment as they apply to this contract.
- B. Measurement methods specified in the individual sections of these specifications shall govern if they differ from methods specified in this Section.
- C. The Contractor will compute all final quantities subject to review and acceptance by the Project Manager. Where necessary, such computations will be based upon surveys performed by the Contractor as specified in Technical Specifications Section 01050.

##### 1.02 MEASUREMENT OF QUANTITIES

- A. Measurement Standards
  - 1. All work to be paid for at a contract price per unit of measurement will be measured by the Contractor in accordance with United States Standard Measures.
  - 2. Measurements are subject to check and review by the Project Manager: if errors are found the Contractor shall correct them. If, in the opinion of the Project Manager, the errors are significant or frequent enough, the Project Manager may make the measurements with his own forces at the Contractor's expense. No payment will be made on that portion of an item containing measurement or calculation errors until the errors are corrected to the satisfaction of the Project Manager.
- B. Measurement by Weight
  - 1. Items to be paid for by weight shall be measured by scale or by handbook weights for the type and quantity of material actually furnished and used. One ton shall consist of 2,000 pounds. Handbook weights will only be allowed if there is one-half of one percent or less difference between the handbook weight and the allowable deviation per manufacturer's specification of a material's finish weight.
  - 2. Material to be measured and paid for by weight shall be weighed on accurate, approved scales, furnished by and at the expense of the Contractor. Platform scales of sufficient size and capacity shall be used to permit the entire vehicle or combination of vehicles to rest on the scale platform while being weighed. Combination vehicles may be weighed as separate units provided they are disconnected while being weighed. All scales shall be inspected and certified as often as the Project Manager may deem necessary to ascertain accuracy. Costs incurred as a result of regulating, adjusting, testing, inspecting and certifying scales shall be borne by the Contractor.
    - a. Scales for weighing materials which are required to be proportioned or measured and paid for by weight shall be furnished, erected and maintained by the Contractor or be certified, permanently installed commercial scales.
    - b. Scales shall be accurate to within one-half of one percent of the correct weight throughout the range of use. The Contractor shall have the scales checked under

- the observation of the Project Manager before beginning work and at such other times as requested. The intervals shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed one-tenth of one percent of the nominal rated capacity of the scale, but not less than one pound. The use of spring balances will not be permitted.
- c. Beams, dials, platforms and other scale equipment shall be so arranged that the operator and the City's inspector can safely and conveniently view them.
  - d. Scale installations shall have suitable weights or devices available for testing the weighing equipment.
  - e. Scales must be tested for accuracy and serviced before use at a new site. Platform scales shall be installed and maintained with the platform level.
  - f. Scales "overweighing" (indicating more than correct weight) will not be permitted to operate and all materials received subsequent to the last previous correct weighing-accuracy test will be reduced by the percentage of error in excess of one-half of one percent.
  - g. In the event inspection reveals the scales have been "underweighing" (indicating less than correct weight), they shall be adjusted and no additional payment to the Contractor will be allowed for materials previously weighed and recorded.
3. The Project Manager may be present to witness the weighing and to check and compile the daily record of such scale weights; however, in any case, the Project Manager will require that the Contractor furnish weigh slips and daily summary weigh sheets. In such cases, a duplicate weigh slip or load slip for each vehicle weighed shall be furnished to the Project Manager at the point of delivery of the material.
    - a. As a minimum, the weigh slips shall contain the following information:
      - 1) Contractor's name and contract number
      - 2) Supplier's name and location of material source
      - 3) Type of material
      - 4) Haul unit's unique identification number
      - 5) Empty weight (this should be checked three times per day)
      - 6) Full weight
      - 7) Weight of material hauled
      - 8) Scale operator's signature stating the weights are correct to within one percent of standard weights.
    - b. The loads shall be weighed prior to water being added.
  4. If the material is shipped by rail, the certified car weights will be accepted provided that only actual weight of material will be paid for and not minimum car weight used for assessing freight tariff. Car weights will not be acceptable for material to be passed through mixing plants or material off loaded from rail cars and hauled to the jobsite by trucks from rail cars located off the worksite.
  5. Trucks used to haul material being paid for by weight shall be weighed empty daily and at such additional times as the Project Manager may require. Each truck shall bear a plainly legible identification mark. The Project Manager may require the weight of the material verified by weighing empty and loaded trucks on such other scales as the he may designate.
  6. When requested by the Contractor and approved by the Project Manager in writing, material specified to be measured by the cubic yard may be weighed and such weights will be converted to cubic yards for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Project Manager and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.

7. The Contractor shall comply with all legal load restrictions in the hauling of equipment or materials on public roads beyond the limits of the project. A special permit will not relieve the Contractor of liability for damage resulting from the moving of equipment or material.
- a. The operation of equipment or hauling loads that cause damage to structures, the roadway or any other construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited by the Contractor to methods and equipment that will prevent damage to the pavement structure before the expiration of the curing periods. The Contractor shall be responsible for the repair of all damage and related expenses resulting from hauling equipment and construction operations.
  - b. If a vehicle's gross weight exceeds the legal limit, and the material transported by the vehicle is delivered to the project, the material and the scale ticket (certificate of correct weight) will not be accepted, except a 500 pounds tolerance will be allowed for overweight loads.
  - c. If a scale ticket from an overweight vehicle is inadvertently accepted and the material incorporated into the project, the Project Manager will adjust the price for the overweight load as follows:
    - 1) The pay item quantity represented by the amount of material in excess of the legal weight plus 500 pounds tolerance will not be paid for.
    - 2) A price reduction will be assessed for the overweight portion of the load based on the following schedule:

| Overweight<br>(pounds) | Price Reduction<br>(dollars)                                                 |
|------------------------|------------------------------------------------------------------------------|
| 0 - 500                | 0                                                                            |
| 501 - 3,000            | 20                                                                           |
| 3,001 - 4,000          | 40                                                                           |
| 4,001 - 5,000          | 82                                                                           |
| 5,001 - 6,000          | 130                                                                          |
| 6,001 - 7,000          | 226                                                                          |
| 7,001 - 8,000          | 376                                                                          |
| 8,001 - 9,000          | 582                                                                          |
| 9,001 - 10,000         | 842                                                                          |
| Over 10,000            | 870 plus \$164 for each 1,000<br>lbs. or fraction thereof, or<br>10,000 lbs. |

8. Bituminous materials will be measured by the gallon or ton. Unless noted otherwise volume will be measured at 60 degrees Fahrenheit or will be corrected to the volume at 60 degrees Fahrenheit using ASTM D 1250 for asphalt or ASTM D 633 for tars. Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when bituminous material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work. When bituminous materials are shipped by truck or transport, net certified weights or volume subject to correction for loss or foaming will be used for computing quantities.

C. Measurement by Volumes

1. Measurement by in-place volume will be by the cubic dimension listed or indicated in the Schedule of Prices and Quantities. Volume measurements will be neat line as shown on contract documents, or if actual field measurements show that the volume is less than neat line, the actual volume will be used. Method of volume measurement

shall be by average end area method, with end areas taken at no greater than 100 feet apart or every major change in the cross section area, which ever occurs first, unless noted otherwise. The Contractor may request alternate methods subject to the approval of the Project Manager.

2. Material indicated to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable to the Project Manager provided that the body is of such shape that the actual contents may be readily and accurately determined and is water tight so that the volume can be measured by filling with water. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.

D. Measurement of Areas

1. Measurement of areas will be by the square dimension listed or indicated in the Schedule of Prices and Quantities and or Unit Price Items. Area measurements will be neat line as shown on contract documents or, if actual field measurements show that the area is less than neat line, the actual area will be used. All longitudinal measurements shall be horizontal unless noted otherwise. Method of square measurement will be as determined by the Project Manager.

E. Measurement of Linear Items

1. Linear measurement will be by the linear dimension listed or indicated in the Schedule of Prices and Quantities and/or Unit Price Items. Linear measurements will be neat line as shown on contract documents, or if actual field measurements show that the linear measurement is less than neat line, the actual linear measurement will be used. Method of linear measurement will be as determined by the Project Manager. Generally, items, components or work to be measured will be measured at the centerline of the item in place.

### 1.03 FIELD MEASUREMENT FOR PAYMENT

- A. The Contractor will compute all quantities of Work performed by the Contractor, including quantities of materials and equipment delivered to the site, for final payment purposes. Computed quantities are subject to check and review by the Project Manager. If errors are found, the Contractor shall correct them. If, in the opinion of the Project Manager, the errors are significant or frequent enough, the Project Manager may make the calculations with his own forces at the Contractor's expense. No payment will be made on that portion of an item containing calculation errors until the errors are corrected to the satisfaction of the Project Manager.
  1. The Contractor will show the actual measurements that are used to compute the quantities along with the formulas used. As requested by the Project Manager, the Contractor shall supply the Project Manager with computations and sketches indicating where measurements were taken and their relationship to the finished product.
- B. The Contractor will supply the Project Manager with an electronic copy and instruction manual of any computer programs used to calculate quantities. Any computer program used shall be executable on a PC compatible computer. The Contractor shall also provide an electronic copy of the data files used to determine quantities.
- C. The Contractor shall take all measurements for payment purpose in the presence of the Project Manager in accordance with the provisions for measurement specified herein and in

Technical Specifications Section 01050.

#### **1.04 REJECTED MATERIALS**

- A. Quantities of material wasted or disposed of in a manner not called for under the contract, rejected loads of material including material rejected after it has been placed by reasons of the failure of the Contractor to conform to the provisions of the contract, material not unloaded from the transporting vehicles, material placed outside the lines indicated on the contract drawings or established by the Project Manager, or material remaining on hand after completion of the Work will not be paid for and such quantities shall not be included in the final total quantities. No compensation will be permitted for loading, hauling and disposing of rejected material.

#### **1.05 PAYMENT CONSIDERATIONS**

- A. Payment will be full compensation for furnishing all labor, materials, tools, equipment, transportation, services and incidentals as specified in the General Conditions, technical specifications, and contract drawings, and for performing all work necessary for completing the item or work classification including all incidental work.
- B. Full compensation for all expenses involved in conforming to the requirements for measuring materials shall be considered as included in the unit or lump sum prices paid for the materials being measured and no additional compensation will be permitted.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 - EXECUTION (NOT USED)**

#### **PART 4 - MEASUREMENT**

##### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

#### **PART 5 - PAYMENT**

##### **5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01025**

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## SECTION 01050

### LAYOUT OF WORK AND SURVEYS

#### PART 1 - GENERAL

##### 1.01 SCOPE

- A. This Section covers the procedures and accuracy requirements for survey services for layout of work and field measurement of work quantities to be determined by surveys.
- B. Before commencing any layout of work and surveys the Contractor shall give the Project Manager 48 hours written advance notice so that the Project Manager may witness such work. Contact the Airport Survey Office: Dennis Hamlin, PLS DIA Land Surveyor Supervisor (Airport Survey Manager), DIA Airport Survey Office, 303-342-4428 or email: Dennis.Hamlin@flydenver.com. Contractors are responsible for obtaining DIA related survey guidance, survey points, calibration files and training materials from the Airport Survey Office prior to beginning survey work on any DIA project regardless of size, scope or duration.
- C. Reference Contract General Conditions, GC 317 and GC 318.
- D. All construction as-built surveys shall comply with Federal Aviation Administration Advisory Circulars when applicable and designated by the DIA Project Manager in the Technical Specifications for the awarded project:
  - 1. AC 150/5300-13 "Airport Design"

##### 1.02 SUBMITTALS

- A. Refer to Technical Specifications Sections 01300 and 01340 for the submittal process.
  - 1. Copies of original pages of field notes.
  - 2. Original field notebooks when filled and at end of contract.
  - 3. As-built measurements.

#### PART 2 - PRODUCTS (NOT USED)

#### PART 3 - SURVEY CONTROL

##### 3.01 GEODETIC CONTROL

- A. All airport construction project surveys must tie to DIA LDP, a Low Distortion Projection for Denver International Airport (KDEN). DIA LDP provides Geodetic Control for establishing DIA Airport Survey Control points in DIA LDP for all survey, planning, design, construction and engineering work conducted on Airport property. Denver International Airport utilized a coordinate system called DIA Grid coordinate system prior to August 1, 2011. Drawings may be found in the legacy coordinate system; however, these drawings can be used for reference purposes only unless specifically stated otherwise by the Denver International Airport Project Manager. Surveys must not utilize DIA Grid coordinate system for placing construction stakes or for collecting construction as-built information. All construction survey as-built data must be collected in DIA LDP regardless of special circumstances which allowed design and construction stake surveys to be conducted in the previous DIA GRID coordinate

system. DIA GRID is now a legacy coordinate system referenced here as historical. All of DIA Airport Control Points are cataloged at [www.ngs.noaa.gov](http://www.ngs.noaa.gov) website. The Airport Survey Office can provide coordinates of the Airport Control points in DIA LDP based upon the project site location. The Airport Survey Office is your primary point of contact for any questions regarding the Airport's use of DIA LDP.

- B. Report damaged or destroyed airport control points, bench marks, and section corner monuments to the Project Manager.
1. If section corner monuments are damaged or destroyed during construction activities, such points shall be re-established pursuant to "Laws of the State of Colorado Regulating the Practice of Land Surveying" by a Professional Land Surveyor registered in the State of Colorado.
  2. If airport control points or bench marks are damaged, moved, altered or destroyed by the Contractor, the City's cost of reestablishing such points shall be borne by the Contractor.
  3. The City will not be responsible for any increased costs or delays to the Contractor relating to reference points, airport control points, or bench marks which are damaged, moved, altered or destroyed by the Contractor or its subcontractors, suppliers, agents or employees or other Contractors working on the site.
- C. Report alleged errors in reference points, airport control points, or bench marks promptly to the Project Manager.
1. Discontinue use of reference points, airport control points, or bench marks alleged to be in error until the accuracy of points can be verified or as directed.
  2. Claims for extra compensation for alteration or reconstruction allegedly due to errors in reference points, airport control points, or benchmarks will not be allowed unless original reference points, airport points and benchmarks still exist or substantiating evidence proving error is furnished by the Contractor, and unless the Contractor has reported such errors to the Project Manager as specified herein.
- D. The following are limitations and additional information on reference points, airport control points and benchmarks:
1. The use of control monuments and GPS calibration files for construction surveying other than those shown on the contract drawings or furnished by or approved by the Airport Survey Office is strictly prohibited. Use of other monuments is at the Contractor's sole risk.
  2. The DIA Airport Control Points include NAVD 88 elevations and LDP horizontal coordinate data. These values as listed on the contract drawings or listed in the specifications are the only approved coordinate points and elevations for construction surveying.
  3. The use of control monuments for construction surveying other than those shown on the contract drawings or furnished by the Airport Survey Office is prohibited. Use of other monuments is at the Contractor's sole risk.
  4. Elevations are based upon mean sea level datum from several NGS Class 2 benchmarks, which were accessed from areas outside of DIA to establish a NAVD88 Vertical Datum at DIA., in Jan. 2007 (1st order Class 2 elevations) by Woolpert, Inc and have been accepted by the Airport for use in Construction Surveys.
  5. The X, Y, Z data listed on the contract drawings or in the specifications is the only approved data to be used for construction surveying. This data will only be available on Airport Control Points. It is recommended that contractor contact Airport Survey Office to

verify that horizontal and vertical data on contract drawings is correct, before beginning any work.

6. The coordinate (X, Y) data published on Airport Control Points is based on the DIA LDP coordinates.
7. The Airport Survey Office will provide the contractor with information on implementing the DIA LDP coordinate system. It is up to the Contractor to use the correct methodology in performing any survey task.

### 3.02 TEMPORARY CONTROL

A. When a contractor establishes temporary control stations for airport construction work they must follow FAA guidelines. All project temporary control stations must be tied to the National Spatial Reference System (NSRS) through the use of the a) National Geodetic Survey (NGS) Online User Positioning System (OPUS) or b) to DIA Survey Control Points provided by the Airport Survey Office. Temporary Control may be necessary based on project site location. Below are the acceptable means to establish temporary geodetic control for airport construction:

1. Temporary Control must be established under close cooperation with the Airport Survey Office following the procedures outlined in AC150/5300-16 *General Guidance and Specifications for Aeronautical Surveys: Establishment of Geodetic Control and Submission to National Geodetic Survey* only in the following cases:
  - a) **Large Airport Airfield Construction Project** that significantly changes the airport geometry and would trigger the need to acquire new Digital Stereo Imagery following AC 150/5300-17 *General Guidance and Specification for Aeronautical Survey Airport Imagery Acquisition and Submission to the National Geodetic Survey*. Examples include a new Runway and Taxiway Complex, significant modification of existing Runway or Taxiway system, development of new outboard deice pad complex or establishment of new mid airfield concourse and terminal complex. The size and complexity of the project will dictate the need to acquire new Digital Stereo Imagery for significant construction.
  - b) **Construction that establishes a new ILS CAT II/III Operations**
  - c) **New Instrument Development Procedure**
  - d) **New Airport Layout Plan Survey Update**
  - e) **New Airport Obstruction Chart Update**
  - f) **New Airport Mapping Database**
2. On Airport construction projects, the contractor, **excluding** large airport airfield construction projects referenced in 302.A.1, may use temporary control stations on their project site. These temporary stations must be tied to the nearest airport survey control points provided by the Airport Survey Office. All surveyors must obtain permission to establish temporary control points from the Airport Survey Office prior to beginning field work. The temporary points will have DIA LDP coordinate values only, along with NAVD88 elevations.

## PART 4 - EXECUTION

### 4.01 CONSTRUCTION LINES AND GRADES

- A. The Contractor shall make surveys and layouts as necessary to delineate the work. The Contractor shall make the surveys for the proper performance of the Work. As a part of such surveys, the Contractor shall furnish, establish and maintain in good order survey control points that may be required for the completion of the Work subject to the approval of the Project Manager as to their location, sufficiency and adequacy. However, such approval by the Project Manager shall not relieve the Contractor of his responsibility for the accuracy of his survey work.
- B. The Project Manager shall have the right to check surveys and layouts made by the Contractor prior to approving any of the Work. The Contractor shall give advance notice of not less than 48 hours to the Project Manager to enable such checking prior to placing any Work. The Contractor shall furnish assistance as may be required for checking purposes when so requested by the Project Manager.
- C. The Contractor shall furnish skilled labor, instrument platforms, ladders and such other temporary structures as may be necessary for making and maintaining points and lines in connection with the surveys required.
- D. The City may draw the Contractor's attention to errors or omissions in lines or grades, but the failure to point out such errors or omissions shall not give the Contractor any right or claim nor shall in any way relieve the Contractor of his obligations according to the terms of this contract.
- E. The Contractor's instruments and other survey equipment shall be accurate, suitable for the surveys required in accordance with recognized professional standards and in proper condition and adjustment at all times. Surveys shall be performed under the direct supervision of a Colorado licensed surveyor.
- F. Field Notes:
  - 1. The Contractor shall record surveys in field notebooks or as electronic field notes, whichever is more appropriate to the type of survey work. Copies of the original pages of field notebooks shall be furnished to Project Manager and the Airport Survey Manager at intervals required by the Project Manager. Each field notebook shall be furnished to the Project Manager when filled or completed. No erasures are allowed on the data entered in the field book. Cross out errors, and write correct entries above. The person that makes correction in the field book should initial above corrections made. An explanatory note shall be made for all corrections to original figures. All editing of computer records shall be done on a copy of the original with all changes initialed. Electronic data submission from data collectors shall be provided in formats in accordance with Design Standards Manual Volume 12 as listed in Sub Part 1.01E of this document. Electronic data files can be used to supplement field books and shall be supplied to the Project Manager and Airport Survey Manager on Compact Disk (CD).
  - 2. If the Project Manager or Airport Survey Manager finds errors in the field notes he will return them to the Contractor for correction and resubmission. This review does not relieve the Contractor from the responsibility of maintaining accurate survey data. Whichever method of note-taking the Contractor starts with, he must use the same method throughout the contract duration. If the Project Manager finds errors in the field notes he will return them to the Contractor for correction and resubmission. This review does not relieve the Contractor from the responsibility of maintaining accurate survey data.

- G. The Project Manager may at any time use line and grade points and markers established by the Contractor. The Contractor's surveys are a part of the Work and may be checked by the Project Manager or his representatives at any time. The Contractor shall be responsible for any lines, grades or measurements that do not comply with specified or proper tolerances or which are otherwise defective and for any resultant defects in the Work. The Contractor will be required to conduct re surveys or check surveys to correct errors indicated by review of the field notebooks

#### 4.02 AS-BUILT CONSTRUCTION SURVEYS

- A. Denver International Airport contractually requires record drawings of all construction projects that occur on airport property. Layout or stake-out surveys are the translation of construction plans into physical points on the ground used as a basis for the actual construction. The airport requires the collection of layout (stake-out surveys) for the placement of sub surface utilities to capture the location of sub-surface utilities before they are covered. All As-Built (Airport Record Drawing) construction surveys require electronic data submission that is compliant with Design Standards Manual Volume 12 12 as listed in Sub Part 1.01E of this document. FAA requirements for construction as-builts are contained in AC150/5300-18B Chapter 5. However, in the interest of simplification on many varying FAA standards contained in AC150/5300-18B, Denver International Airport desires standard accuracy requirements at engineering quality for all features collected in as-built airport record drawings. These requirements are for 0.25 ft horizontal accuracy and 0.25 ft vertical accuracy. Denver International Airport positional accuracy requirements often exceed FAA mandated accuracy requirements for features contained in AC150/5300-18B Chapter 5. If the contractor is unable to meet Denver International Airport engineering survey accuracy of 0.25ft, the contractor must meet minimum FAA mandated accuracy requirements contained in AC150/5300-18B Chapter 5. The contractor must notify the Project Manager of any deviations in accuracy standards that depart from 0.25 ft vertical/horizontal. Please reference the feature(s) involved, and explain why you must deviate from the accuracy requirement and what accuracy the feature(s) were collected in both vertical and horizontal planes.

General As-Built Surveys should at minimum address the following:

1. Collect all manmade objects on airport property.
2. The identification of the boundary lines of the project tract using the features in the.
3. Show lines of original lot boundaries.
4. The collection of all existing roads, alleys and easements with their widths and platted.
5. The collection of sufficient spot elevations defining the surface drainage on the project site and within 50 feet outside the boundary.
6. Identification of Airport control points used in the survey.
7. Locate and classify all visible evidence of utilities and storm water drainage features on or within 50 feet of the project boundary to include water lines, valves, backflow devices, meters and fire hydrants.
8. Sanitary sewer, manholes with invert and top elevation, pipe sizes through manholes with direction of flow indicated. Irrigation lines, catch basins, storm sewer pipes, junction boxes with inverts, type of inlet, pipe sizes, pipe types and direction of flow. This includes but is not limited to swales, curbs, gutters with spot elevations and direction of flow.

9. Sidewalk, street parking, loading areas, driveway width(s) along with the edge(s) of existing paved areas.
  10. Power poles, guy wires, and overhead power lines.
  11. Trees, tree groupings and shrubs.
  12. Model existing building structures, fences or walls on site and within 50 feet of the property line.
  13. Show existing contours on 0.50 foot intervals if existing site elevations vary by greater than 1.5 feet.
  14. Existing natural features such as high points, water courses, depressions, ponds, marshes, and swamps.
  15. Location of any protected species habitat or environmentally sensitive lands or vegetation, as well as any known historical or archaeological uncovered during construction.
  16. Identify any objects under construction as “Building Under Construction”. Determine the elevation of the object at time of survey. If a construction crane extends above a feature under construction, it is necessary to determine the elevation and position of the crane. Identify, classify and report
  17. Exceptions to survey collection requirements include: Annual weeds, corn, millet, alfalfa etc. Construction equipment and debris, including dirt piles and batch plants which are:
    - a. Temporary in nature
    - b. Under the control of the airport
    - c. Located on Airport Property
- B. As-built measurement for items that will be hidden or visible including all civil, mechanical, electrical, control work and all utilities that are placed in concrete, earth or behind walls shall be made by and under the direction of a Colorado licensed surveyor while the work is exposed and the measurements submitted to the Project Manager. Unless noted otherwise the measurements shall show the final location within 0.1ft of their actual horizontal and vertical location based upon DIA LDP coordinates and NAVD88 vertical datum. Items located within or five feet beyond a building shall be referenced to building column lines and finish floor elevations. Special attention shall be paid to items requiring service, sensors, and items with moving parts, access points and locations of junctions, elevation changes and directional changes. If a construction project alters any natural (including topography) or man-made feature that was not specifically addressed in the project scope of work, the Contractor is responsible for collecting the change in the feature(s) affected by the project and supplying those affected features in the final as-built survey.
- C. Survey notes shall be supplied to the Project Manager prior to covering up the work. Survey notes shall also be supplied to the DIA Survey Manager in an electronic format that can be read in AutoCAD 2010 or earlier version.
- D. Should the submitted as-built drawing or model fail a quality control check, the Contractor is responsible for correcting the as-built survey to comply with airport standards.
- E. The Airport Survey Office has the right to enter any construction site, at any time, and request

from the contractor any:

1. Survey Field Notes
  2. All FAA Weekly Project Status Reports
  3. Geo-tagged Photographs (if required by FAA depending on project location)
  4. Airport Survey Control Points used
  5. Survey measurement files used in data collection
  6. Inspect Survey Equipment Used by Contractor
- F. The Airport Survey Office may also check site survey work with their own survey instruments to ensure survey work is within tolerance requirements. Any problems found by the Airport Survey Office during site inspections are to be reported to the Project Manager.

#### **4.03 SUBSURFACE UTILITIES ENGINEERING (SUE)**

- A. Refer to Technical Specifications Sections 01020 for information related to underground utilities.

#### **4.04 NAVAID SURVEY**

- A. If an Airport construction project installs new aeronautical navigational equipment or changes any aspect of existing Airport Navigational Aids, compliance with FAA criteria is necessary. The Navaid may be owned or operated by either by the FAA, or the City & County of Denver, Colorado. Prior coordination with the Planning Department and Airport Survey Office is required to obtain specific technical survey requirements.

A list of common Airport Navigational Aids is provided below:

1. Air Route Surveillance Radar (ARSR)
2. Airport Surface Detection Equipment (ASDE)
3. Airport Surveillance Radar (ASR)
4. Distance Measuring Equipment (DME)
5. Fan Marker (FM)
6. Localizer (LOC)
7. Glide Slope (GS)
8. End Fire Types (GS)
9. Inner Marker (IM)
10. Middle Marker (MM)
11. Outer Marker (OM)
12. Back Course Marker (BCM)
13. Localizer Type Directional Aid (LDA)
14. MLS Azimuth Antenna (MLSAZ)
15. MLS Elevation Antenna (MLSEL)

16. Non-Directional Beacon (NDB)
17. Simplified Directional Facility (SDF)
18. Tactical Air Navigation (TACAN)
19. VHF Omni Directional Range (VOR)
20. VOR/TACAN (VORTAC)
21. Airport Beacon (APBN)
22. Visual Glide Slope Indicators (VGSI)
23. Runway end Identifier Lights (REIL)
24. Approach Light System (ALS)

**4.05 CONSTRUCTION ALTERING/REHABILITATING AIRPORT RUNWAYS (ALL RUNWAYS AT DIA)**

A. Significant application of special survey criteria for collecting as-built conditions after any construction or alteration of a runway is most critical to the FAA and hence requires construction is complete as well as utility collection when subsurface utilities are being placed in the ground. Any construction which will take place in areas defined below needs prior coordination with the DIA Planning Department to create a survey plan that meets specific FAA criteria. No surveying should take place prior to the Airport Project Manager coordinating with the DIA Planning Department and Airport Survey Office.

1. Construction on paved Runway Surface
2. Construction on Runway Shoulders
3. Construction in Runway Safety Area
4. Construction in Runway Protection Zone
5. Construction on Runway Blast Pad

**4.06 CONSTRUCTION TOPOGRAPHIC SURVEYS/DESIGN SURVEYS**

A. Topographic/Design surveys determine the shape and slope of the construction project area allowing the user to visualize the rise and fall of the land. Typically, airport topographic surveys provide landform data for planning studies, engineering designs, navigational aid installation or to support a new instrument flight procedure.

| Contour Interval                  | Vertical Positional Accuracy<br>(in feet) | Horizontal Positional Accuracy (in feet) |
|-----------------------------------|-------------------------------------------|------------------------------------------|
| 1 foot                            | ±0.50                                     | ±1.0                                     |
| 2 feet                            | ±1.30                                     | ±2.0                                     |
| 4 feet                            | ±2.60                                     | ±4.0                                     |
| 5 feet                            | ±3.20                                     | ±4.0                                     |
| 10 feet                           | ±6.50                                     | ±8.0                                     |
| Spot ground elevations            | ±0.20                                     | ±2.0                                     |
| Spot paving elevations            | ±0.05                                     | ±1.0                                     |
| Well defined planimetric features | ±0.10                                     | ±1.0                                     |

1. Document the location of permanent structures including bridges, culverts and tunnels.
2. Document the location of street or road paving entrance drives, openings, and sidewalks.



3. Classify the elevations on the top of curbs, gutters and sidewalks.
  4. Provide spot elevations covering the entire survey limits showing high points, low points, and grade changes. This should be done at sufficient intervals to represent the general character of the terrain.
  5. Location and elevation of lakes, rivers, streams or drainage courses on or near the airport or design area.
  6. Location, diameter, and species of all trees over a 6-inch diameter.
  7. Outline the perimeter outline of thickly wooded areas.
  8. Electric utilities – the location of power poles, guy wires, anchors, vaults, etc.
- B. As with other aspects of airport surveys, the positional accuracy of the topographic survey ensures the data collected meets the needs of the FAA. The following relative positional accuracies are provided above as a general guide for topographic surveys and are specified at the 95% confidence level. Collect and provide the location and elevation of water and gas components extending more than 3 inches above the surface. These components include items such as water or gas valves, standpipes, meters, regulators, fire hydrants, etc. Locate, classify, and determine the elevation (MSL) of other utility components such as telephone or light poles, manholes, boxes, etc., visible on the airport.

#### 4.07 PROPERTY BOUNDARY SURVEYING/LAND-USE

- A. All property surveys on airport property need to comply with the requirements for the State of Colorado and be conducted by a licensed surveyor in the state. For more details please see the following links.

**Colorado State Constitution**

Article XX – Home Rule

<http://www.michie.com/colorado/>

**Colorado Revised Statutes Regarding Land Surveying**

<http://www.dora.state.co.us/aes/Statute-PLS.pdf>

**State Board Rules and Regulations**

[http://www.dora.state.co.us/aes/AES2008\\_Rules\\_Bylaws\\_II.pdf](http://www.dora.state.co.us/aes/AES2008_Rules_Bylaws_II.pdf)

**State Board Policies**

<http://www.dora.state.co.us/aes/Policies-PEPLS.pdf>

**City and County of Denver Municipal Code**

Chapter 49 – Article III Layout of Streets

Chapter 50 Subdivision of Land

<http://www.municode.com/Resources/gateway.asp?pid=10257&sid=6>

- B. When necessary, the surveyor will set boundary monuments in accordance with the accepted surveying practice and legal requirements so that, upon completion of the survey, each corner of the property and each referenced control stations will be physically monumented. When it is impossible or impracticable to set a boundary monument on a corner, the surveyor will set a reference monument, similar in character to the boundary monument and preferably along one of the property

lines intersecting at the corner. When a reference monument is used, clearly identify it as a reference monument on the plat of the property and in any new deed description, written for the property. Every boundary monument and/or reference monument set by the surveyor will, when practicable:

1. Be composed of a durable material.
  2. Have a minimum length of thirty inches with a 2 inch minimum diameter durable metallic cap
  3. Have a minimum cross-section area of material of 0.2 square inches.
  4. Be identified with a durable marker bearing the surveyor's registration
  5. Number of (PLS) with company name and date, should be stamped on the cap
  6. Be detectable with conventional instruments for finding ferrous or magnetic objects.
- C. When a case arises due to physical obstructions where a boundary or reference monument cannot be conveniently or practically set, then alternative monumentation will be established for the particular situation. This alternative monumentation must be durable and identifiable (e.g. chiseled "X" in concrete, drillhole, etc.).
1. Reference Contract General Conditions, GC 31 and GC 318.

#### 4.08 SPECIAL SURVEYS

- A. Under the contract City may require a special type of data collection – High Definition Scanning (HDS) or picture images with geo-tagging. Contractor shall follow the Standards for HDS scanning. Denver International Airport currently utilizes the Leica HDS C10 Scanner to collect data and Leica Cyclone 7 to process point clouds and export deliverables for CAD/BIM/GIS.
- B. All contractors must use proper and compatible HDS instruments and post processing software to assure that the final deliverables will fit in the following requirements:
1. Acceptable file formats:
    - DWG and DXF
    - GIS SHP files
    - RVT-BIM Rivet File
    - TXT, CSV, XYZ format for points with coordinates and elevation
  2. Content in acceptable file formats
    - Solids
    - Shapes
    - Break lines
    - Point, Polyline, Line, Polygon, Multipatch
    - TIN,
    - Image –geotaged JPG, TIFF

#### **4.09 SURVEYS FOR MEASUREMENT FOR PAYMENT**

- A. When the specifications or the Project Manager require items in the Schedule of Prices and Quantities to be measured by surveying methods, the Contractor shall perform the surveys. All such surveys, including control surveys run for establishing the measurement reference lines, shall be performed in the presence of the Project Manager or his representative who will witness the surveying operation and who will sign the field notes or keep duplicate field notes, at the Project Manager's option. The Contractor will reduce the field notes and calculate final quantities for payment purposes. The note reductions and calculations will be given to the Project Manager upon request.

#### **4.10 SURVEYING ACCURACY AND TOLERANCES IN SETTING SURVEY, LAYOUT AND QUANTITY CALCULATION STAKES**

- A. Control traverse field surveys and computations shall be performed to an accuracy and precision of at least 1:40,000.
- B. The tolerances generally applicable in setting survey stakes shall be as set forth below. Such tolerances shall not supersede stricter tolerances required by the Drawings or Specifications, and shall not otherwise relieve the Contractor of responsibility for measurements in compliance therewith. Tolerances in setting survey stakes shall be as follows:
1. Tolerance on Error in Line, Kind of Survey Stake or Mark Distance Tangent, Markers on hubs and monuments, curves, on centerline and offset centerlines: 1:20,000, 0.01 ft, 10 sec.
  2. Intermediate stakes or marks on centerline and offset centerlines: 1:5,000, 0.05 ft, 1 min.
  3. Grade Stakes or Marks for: Excavation and backfill; slope stakes +/-0.10 ft
  4. Steel reinforcement and formed concrete ACI and AISC specified tolerance. If none described then the tolerance is +/- 0.02 ft.

### **PART 5 - MEASUREMENT**

#### **5.01 METHOD OF MEASUREMENT**

- A. Construction as-built surveying shall be measured per lump sum for all work described herein, including preparation of survey plan documents, field surveying, data reduction and attribution, data deliverables, and final survey report.

### **PART 6 - PAYMENT**

#### **6.01 METHOD OF PAYMENT**

- A. No separate measurement shall be made for work under this Section.

### **PART 7 - PAYMENT**

#### **7.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable work request bid item.

**END OF SECTION 01050**

**SECTION 01051**  
**PROJECT COORDINATION**

**PART 1 - GENERAL**

- A. Work specified in this Section includes coordination efforts which must be provided by the Contractor to ensure that work by others in the contract designated work area and adjacent areas does not negatively impact the Work and overall project.
- B. The construction schedule as specified in Technical Specifications Section 01310 shall reflect all interfaces and coordination efforts as specified in General Condition 701, Special Condition SC-6, Technical Specification Sections 01010, 01014, 01051, and 01650, and other related contracts and procurement documents.
- C. The Contractor will establish regular working relations with all contractors, tenants and the Airport Maintenance Department working in the same area and areas adjacent to the construction site. The Contractor will attend construction progress meetings as described in Technical Specification Section 01200 and will coordinate work as described therein.
- D. The Contractor will assign a member of his staff to act as a coordinator, who will work to coordinate the Contractor's work with other parties doing work at the Denver International Airport site.

**1.02 WORK INCLUDED**

Minimum cooperation requirements with other contractors include the following:

- 1. Regular meeting (weekly or more often)
- 2. Construction schedule coordination
- 3. Staging area and access planning (to include employee shuttle routes)
- 4. Deliveries
- 5. Traffic Control

**1.03 CONTRACTOR'S RESPONSIBILITIES**

When and where required, the Contractor shall develop appropriate coordination drawings for use by interfacing adjacent parties using the Denver International Airport site.

**1.04 COORDINATION WITH OTHER PROJECTS**

The following is a list that includes, but is not limited to all of the contractors that will be working in the area of the project limits:

- 1. Concourse C West Expansion
- 2. 2014 Annual Airfield Pavement Rehabilitation
- 3. 2014 Annual Airfield Joint Rehabilitation
- 4. South Terminal Redevelopment Project

5. DIA Maintenance Projects including but not limited to remarking the Airfield.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**PART 4 - MEASUREMENT**

**4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

**PART 5 - PAYMENT**

**5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01051**

## SECTION 01060

### REGULATORY REQUIREMENTS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. This Section identifies primary compliance with the State, City and County of Denver's regulatory requirements including:
  - 1. The Department of Aviation
  - 2. Colorado Department of Transportation
  - 3. Department of Public Works (including The Division of Wastewater Management)
  - 4. The standards which govern design and construction projects at Denver International Airport.
- B. Construction shall be based on the latest edition of the referenced codes including additions and revisions thereto that are in effect at the time of project bidding.

##### 1.02 RELATED SECTIONS

- A. 01566 – Environmental Controls: For environmental and related permitting requirements.

##### 1.03 BUILDING CODE

- A. All design and construction work shall be governed by the Building Code for the City and County of Denver, latest edition. This is based upon the International Building Code of the International Code Council with Denver Amendments to this code. Appendix N of the amendments address Airport Buildings and Structures.

##### 1.04 DENVER BUILDING DEPARTMENT

- A. For review and approval of all construction documents for compliance to the Denver building code:
  - City and County of Denver
  - Community Planning and Development
  - Building Inspection Division
  - 201 West Colfax Avenue, Dept 205
  - Denver, Colorado 80202
  - Telephone 720-865-2720
  - Fax 720-865-2880

##### 1.05 DENVER FIRE DEPARTMENT

- A. For review and approval of plans for compliance with the Denver Fire Department's requirements as they apply to the Denver International Airport:
  - Denver Fire Department
  - 745 W. Colfax Ave.
  - Denver, Colorado 80204

Telephone 720-865-2833

- B. The Contractor is advised that the Denver Fire Department – Fire Prevention Bureau requires permitting for the following activities as they apply to the scope of work. The Contractor is responsible for obtaining the appropriate permits necessary to complete the work. All costs associated with this permitting and policy compliance shall be the responsibility of the Contractor. The policies all reference the International Fire Code (IFC).
1. “Hot work”, which is defined as the operation of any equipment or tool that creates sparks, hot slag, or radiant or convective heat as a result of the work. This includes, but is not limited to, welding, cutting, brazing, or soldering.
  2. Use and storage of compressed gas for both temporary storage and permanent facility installation. This includes, but is not limited to, flammable gas (excluding propane-LPG), oxidizer (including oxygen), and inert and/or simple asphyxiates.
  3. Tank installation, which includes above-ground storage tanks (AST) and underground storage tanks (UST) for both temporary tanks and permanent facility installations.
- C. In addition to the above permits, the Denver Fire Department may require other permits that are associated with the specific work in the Contract Documents. Policies provided by the Denver Fire Department are meant to provide basic information for the most common conditions and situations. In any given occupancy, many other Uniform Fire Code requirements may be enforced. These should be addressed with the Denver Fire Department before construction begins and during construction with premise inspection(s). Any questions can be addressed to the Fire Prevention Bureau between 6:30 AM and 9:00 AM Monday-Friday at 720-913-8242 or -8237.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.01 PERMITS AND CERTIFICATIONS**

- A. The Contractor shall maintain records on site of all permits acquired by federal, state, and local agencies. Posting of permits shall conform to requirements of the respective agencies.
- B. At the completion of any inspection by other agencies, the Contractor shall forward copies of the status of the inspection and copies of any approved or "signed-off" inspections by the respective agencies to the Project Manager.
- C. At the time of request for Substantial Completion, the Contractor shall forward to the Project Manager all permits approved by the respective agencies.

## **PART 4 - MEASUREMENT**

### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

## **PART 5 - PAYMENT**



**5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01060**

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## SECTION 01070

### ABBREVIATIONS AND SYMBOLS

#### PART 1 - GENERAL

##### 1.01 REFERENCE LIST

- A. Documents published by the following agencies may be referenced within these Contract Documents to define the quality of materials, equipment, workmanship and other features of work. Unless otherwise stated, the reference documents shall be of the latest edition as of the date of the Advertisement for Bids.
- B. Wherever used in the Contract Documents, the following abbreviations will have the meanings listed:

|        |                                                                    |
|--------|--------------------------------------------------------------------|
| AALA   | American Association of Laboratory Accreditation                   |
| AAN    | American Association of Nurserymen                                 |
| AAO    | Affirmative Action Officer                                         |
| AASHTO | American Association of State Highway and Transportation Officials |
| ACI    | American Concrete Institute                                        |
| AFI    | Air Filter Institute                                               |
| AGTS   | Automated Ground Transportation System                             |
| AISC   | American Institute of Steel Construction                           |
| AISI   | American Iron and Steel Institute                                  |
| AITC   | American Institute of Timber Construction                          |
| AMCA   | Air Moving and Conditioning Association                            |
| AMRL   | AASHTO Materials Reference Laboratory                              |
| ANSI   | American National Standards Institute, Inc.                        |
| APA    | American Plywood Association                                       |
| APEN   | Air Pollution Emission Notes                                       |
| APWA   | American Public Works Association                                  |
| ARI    | Air Conditioning and Refrigeration Institute                       |

|        |                                                                           |
|--------|---------------------------------------------------------------------------|
| ASCE   | American Society of Civil Engineers                                       |
| ASHRAE | American Society of Heating, Refrigeration and Air Conditioning Engineers |
| ASME   | American Society of Mechanical Engineers                                  |
| ASNT   | American Society for Non-Destructive Testing                              |
| ASPE   | American Society of Plumbing Engineers                                    |
| ASSE   | American Society of Sanitary Engineering                                  |
| ASTM   | American Society for Testing and Materials                                |
| AWPA   | American Wood Preserver's Association                                     |
| AWS    | American Welding Society                                                  |
| AWWA   | American Water Works Association                                          |
| BID    | Building Inspection Division, Department of Public Works                  |
| CAR    | Corrective Action Report                                                  |
| CCD    | City and County of Denver                                                 |
| CCR    | Contractor Change Request                                                 |
| CCRL   | Cement Concrete Reference Laboratory                                      |
| CD     | Change Directive                                                          |
| CDOH   | Colorado Department of Highways or Colorado Department of Health          |
| CDOT   | Colorado Department of Transportation                                     |
| CMEC   | Concrete Materials Engineering Council                                    |
| CN     | Change Notice                                                             |
| CO     | Change Order                                                              |
| COE    | Corps of Engineers                                                        |
| CPM    | Critical Path Method                                                      |
| CR     | Change Request                                                            |
| CRSI   | Concrete Reinforcing Steel Institute                                      |
| CSI    | Construction Specifications Institute                                     |
| DBC    | Denver Building Code                                                      |

|       |                                                                          |
|-------|--------------------------------------------------------------------------|
| DFD   | Denver Fire Department                                                   |
| DIA   | Denver International Airport                                             |
| DOT   | United States Department of Transportation                               |
| DOR   | Designer of Record                                                       |
| DWB   | Denver Water Board                                                       |
| EEO   | Equal Employment Officer or Equal Employment Opportunity                 |
| EIS   | Environmental Impact Statement                                           |
| EPA   | Environmental Protection Agency                                          |
| FAA   | Federal Aviation Administration                                          |
| FCC   | Federal Communications Commission                                        |
| FHWA  | Federal Highway Administration                                           |
| FM    | Factory Mutual Association                                               |
| FS    | Federal Specifications (U.S. General Services Administration)            |
| GCC   | General Contract Conditions                                              |
| IAPMO | International Association of Plumbing and Mechanical Officials           |
| IBR   | Institute of Boiler and Radiator Manufacturer's                          |
| ICBO  | International Conference of Building Officials                           |
| ICEA  | Insulated Cable Engineers Association                                    |
| IEEE  | Institute of Electrical and Electronic Engineers                         |
| IES   | Illuminating Engineering Society                                         |
| ISA   | Instrument Society of America                                            |
| ITA   | Independent Testing Agency                                               |
| MIL   | Military Specifications (Naval Publications and Forms Center)            |
| MSS   | Manufacturers Standardization Society of the Valve and Fittings Industry |
| NAAB  | National Association of Air Balance                                      |
| NACE  | National Association of Corrosion Engineers                              |
| NBS   | National Bureau of Standards (now called National Institute of Standards |

and Technology)

|       |                                                                      |
|-------|----------------------------------------------------------------------|
| NCR   | Nonconformance Report                                                |
| NEC   | National Electric Code (NFPA 70)                                     |
| NECA  | National Electric Contractors Association                            |
| NEMA  | National Electrical Manufacturer's Association                       |
| NESC  | National Electrical Safety Code                                      |
| NFC   | National Fire Code (as published by NFPA)                            |
| NFPA  | National Fire Protection Association                                 |
| NICET | National Institute for the Certification of Engineering Technologies |
| NIST  | National Institute of Standards and Technology                       |
| NGS   | National Geological Survey                                           |
| NLMA  | National Lumber Manufacturers Association                            |
| NOAA  | National Oceanic and Atmospheric Administration                      |
| NRMCA | National Ready Mix Concrete Association                              |
| NTP   | Notice to Proceed                                                    |
| NVLAP | National Voluntary Laboratory Accreditation Program                  |
| OSHA  | Occupational Safety and Health Administration                        |
| PCA   | Portland Cement Association                                          |
| PCI   | Prestressed Concrete Institute                                       |
| PDM   | Precedent Diagram Method                                             |
| PS    | Product Standard of NIST (U.S. Department of Commerce)               |
| PM    | Project Manager (DIA)                                                |
| QA    | Quality Assurance                                                    |
| QC    | Quality Control                                                      |
| RAR   | Remedial Action Request                                              |
| RFI   | Request for Information                                              |
| SC    | Special Contract Condition                                           |

|        |                                                                    |
|--------|--------------------------------------------------------------------|
| SDI    | Steel Door Institute                                               |
| SMACNA | Sheet Metal and Air Conditioning Contractor's National Association |
| SSPWC  | Standard Specifications for Public Works Construction              |
| TCP    | Traffic Control Plan                                               |
| TSA    | Transportation Security Administration                             |
| UBC    | Uniform Building Code (published by ICBO)                          |
| UL     | Underwriters Laboratories, Inc.                                    |
| UMC    | Uniform Mechanical Code (published by ICBO)                        |
| UPC    | Uniform Plumbing Code (published by ICBO)                          |
| USC    | United States Code                                                 |
| WBS    | Work Breakdown Structure                                           |

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**PART 4 - MEASUREMENT**

**4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

**PART 5 - PAYMENT**

**5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01070**

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## SECTION 01091

### REFERENCE STANDARDS

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED

- A. This Section contains a summary of industry-accepted and recognized standards published by trade associations, government and institutional organizations which are referred to in the various Sections of these specifications or elsewhere in the contract documents.
- B. Standards listed herein are included in the contract documents by this reference and become a part of the contract documents to the same extent as though included in their entirety unless specific limitations are noted in the individual Specifications sections.
- C. Listings of reference standards include name and address of the organization publishing the standard, plus the full name and designator of each of the standards referenced herein.
- D. If a publication date or edition number is listed with the reference standard, that publication date or edition number shall apply; otherwise, the publication date or edition number in effect at the contract date shall apply.
- E. Inclusion of reference standards herein does not make the Project Manager an agent of the publishing agency, nor does it obligate the Project Manager to perform inspections required by or to enforce rules or regulations contained in the reference standards.

##### 1.02 REFERENCES

- A. RELATED DOCUMENTS: General Conditions, Special Conditions, and applicable provisions of Division 1 and Division 2 sections apply to this Section.

#### PART 2 - PRODUCTS (NOT USED)

#### PART 3 - EXECUTION

##### 3.01 SCHEDULE OF REFERENCE STANDARDS

- A. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO), 444 North Capitol Street, NW, Suite 249, Washington, DC 20090
  - AASHTO M 36 Corrugated Metal Pipe
  - AASHTO M216 Standard Specification for Lime for Soil Stabilization
  - AASHTO T26 Standard Method of Test for Water to be Used in Concrete
  - AASHTO T84 Specific Gravity and Absorption of Fine Aggregate
  - AASHTO T85 Specific Gravity and Absorption of Coarse Aggregate

AASHTO T103 Freeze-Thaw

AASHTO T219 Standard Methods of Testing Lime for Chemical Constituents and Particle Sizes

B. AMERICAN CONCRETE INSTITUTE (ACI) P.O. Box 19150, Redford Station, Detroit, MI 48219, (313) 372-9800

ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete

ACI 211.2 Standard Practice for Selecting Proportions for Structural Lightweight Concrete

ACI 301 Specifications for Structural Concrete for Buildings

ACI 304 Recommended Practices for Measuring, Mixing, Transporting and Placing Concrete

ACI 304.2R Placing Concrete by Pumping Methods

ACI 305R Hot Weather Concreting

ACI 306R Cold Weather Concreting

ACI 315 Details and Detailing of Concrete Reinforcement

ACI 318 Building Codes Requirements for Reinforced Concrete

(NOTE: Reference to ACI 318 may be limited to more stringent requirements of local building code)

C. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) 1916 Race Street, Philadelphia, PA 19103, (215) 299-5585

ASTM A 27 Mild to Medium Strength Carbon - Steel Casting for General Application

ASTM A 36 Structural Steel

ASTM A 47 Malleable Iron Castings

ASTM A 82 Specification for Steel Wire, Plain, for Concrete Reinforcement

ASTM A 123 Hot-dip Galvanizing

ASTMA 184 Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement

ASTM A 185 Specifications for Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement

ASTM A 283 Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes

|            |                                                                                          |
|------------|------------------------------------------------------------------------------------------|
|            | and Bars                                                                                 |
| ASTM A 615 | Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement        |
| ASTM A 706 | Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement               |
| ASTM C 25  | Method for Chemical Analysis of Limestone, Quicklime and Hydrated Lime                   |
| ASTM K 29  | Unit Weight of Aggregate                                                                 |
| ASTM C 31  | Methods of Making and Curing Concrete Test Specimens in the Field                        |
| ASTM C 33  | Specification for Concrete Aggregates                                                    |
| ASTM C 39  | Test Method for Compressive Strength of Cylindrical Concrete Specimens                   |
| ASTM C 42  | Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete                |
| ASTM C 76  | Reinforced Concrete Culvert, Storm Drain and Sewer Pipe                                  |
| ASTM C 88  | Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate                    |
| ASTM C 94  | Specification for Ready Mixed Concrete                                                   |
| ASTM C 109 | Mortar Bar Test for Cement                                                               |
| ASTM C 110 | Methods for Physical Testing of Quicklime, Hydrated Lime and Limestone                   |
| ASTM C 117 | Materials Finer than 75 mm (No. 200) Sieve in Mineral Aggregates by Washing              |
| ASTM C 131 | Resistance of Abrasions of Small Size Coarse Aggregate by Use of the Los Angeles Machine |
| ASTM C 136 | Method for Sieve Analysis of Fine and Coarse Aggregates                                  |
| ASTM C 138 | Unit Weight, Yield and Air Content of Concrete                                           |
| ASTM C 143 | Test Method for Slump of Portland Cement Concrete                                        |
| ASTM C 150 | Specification for Portland Cement                                                        |
| ASTM C 171 | Specification for Sheet Materials for Curing Concrete                                    |
| ASTM C 172 | Method of Sampling Fresh Concrete                                                        |

|               |                                                                                                                                                        |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| ASTM C 173    | Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method                                                                         |
| ASTM C 231    | Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method                                                                           |
| ASTM C 260    | Specification for Air Entraining Admixtures for Concrete                                                                                               |
| ASTM C 309    | Specification for Liquid Membrane-Forming Compounds for Curing Concrete                                                                                |
| ASTM C 443    | Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber Gaskets                                                                               |
| ASTM C 494    | Specification for Chemical Admixtures for Concrete                                                                                                     |
| ASTM C 595    | Blend Hydraulic Cements                                                                                                                                |
| ASTM C 618    | Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete                              |
| ASTM C 655    | Reinforced Concrete D Load Culvert, Storm Drain and Sewer Pipe                                                                                         |
| ASTM C 789    | Precast Reinforced Concrete Box Sections for Culverts, Storm Drains and Sewers                                                                         |
| ASTM C 803    | Test Method for Penetration Resistance of Hardened Concrete                                                                                            |
| ASTM C 805    | Test Method for Rebound Number of Hardened Concrete                                                                                                    |
| ASTM C 977    | Specification for Quicklime and Hydrated Lime for Soil Stabilization                                                                                   |
| ASTM D 75     | Sampling Aggregate                                                                                                                                     |
| ASTM D 422    | Test Method for Particle Size Analysis of Soils                                                                                                        |
| ASTM D 516-88 | Standard Test Method for Sulfate Ions in Water                                                                                                         |
| ASTM D 693    | Crushed Stone, Crushed Slag and Crushed Gravel for Dryer Water-Bound Macadam Base Courses and Bituminous Macadam Base and Surface Courses of Pavements |
| ASTM D 698    | Test Method for Moisture Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5-lb. Hammer and 12-Inch Drop                                  |
| ASTM D 751    | Burst Strength                                                                                                                                         |
| ASTM D 1556   | Test Method for Density of Soil in Place by the Sand-Cone Method                                                                                       |
| ASTM D 1557   | Test Method for Moisture Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb. Hammer and 18-Inch Drop                                   |
| ASTM D 1682   | Ultraviolet Resistance Grab Tensile Strength Grab Tensile Elongation                                                                                   |

Toughness

- |                |                                                                                                                               |
|----------------|-------------------------------------------------------------------------------------------------------------------------------|
| ASTM D 1751    | Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction                           |
| ASTM D 1752    | Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction    |
| ASTM D 2167    | Test Method for Density of Soil in Place by the Rubber-Balloon Method                                                         |
| ASTM D 2216    | Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock and Soil Aggregate Mixtures                     |
| ASTM D 2363-78 | Trapezoid Tear Strength                                                                                                       |
| ASTM D 2419    | Sand Equivalent Value of Soils and Fine Aggregate                                                                             |
| ASTM D 2487    | Test Method for Classification of Soils for Engineering Purposes                                                              |
| ASTM D 2922    | Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Method                                                 |
| ASTM D 3017    | Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)                       |
| ASTM D 3665    | Random Sampling of Paving Materials                                                                                           |
| ASTM D 4253    | Test Method for Maximum Index Density of Soils Using Vibratory Table                                                          |
| ASTM D 4318    | Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils                                                     |
| ASTM D 4397    | Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications                            |
| ASTM D 4546    | Test Method for One-Dimensional Swell or Settlement Potential of Cohesive Soils                                               |
| ASTM E 329     | Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction |
| ASTM F 477     | Elastomeric Seals (Gaskets) for Joining Plastic Pipe                                                                          |
| ASTM F 758     | Smooth-Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport and Similar Drainage                  |
- D. D.AMERICAN WELDING SOCIETY (AWS), 550 NW LeJeune Road, Miami, FL 33135AWS Code for Welding in Building Construction (Structural Welding Code).
- E. CONCRETE REINFORCING STEEL INSTITUTE (CRSI)933 N. Plum Grove Road, Schaumburg, IL 60195, (312) 490-1700
- Manual of Standard Practice

- F. COLORADO DEPARTMENT OF TRANSPORTATION (CDOT) Division of Administration,  
Office of Bid Plans, 4201 E. Arkansas Avenue, Denver, CO 80222

Standard Specifications for Road and Bridge Construction (latest edition) Colorado  
Standard Plans, M&S Standards

- G. FEDERAL HIGHWAY ADMINISTRATION (FHWA) Superintendent of Documents, US  
Government Printing Office, Washington DC, 20402

Manual of Uniform Traffic Control Devices (latest edition)

#### **PART 4 - MEASUREMENT**

##### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

#### **PART 5 - PAYMENT**

##### **5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section.

**END OF SECTION 01091**

## SECTION 01095

### DEFINITIONS AND CONVENTIONS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. This Section contains a list of definitions of words or phrases and grammatical or contextual conventions commonly used in these contract documents.

##### 1.02 REFERENCES

- A. Related Documents: General Conditions, Special Conditions, and applicable provisions of Technical Specifications Division 1 apply to this Section.

##### 1.03 DEFINITIONS

- A. Alphabetical Listing of Definitions
1. **As indicated:** Shown on the drawings by graphic indication, notes or schedules, or written in the specifications or elsewhere in the contract documents.
  2. **As directed, as approved, as requested:** Unless otherwise indicated, these terms imply "by the Project Manager" and require that an instruction be obtained by the Contractor from the Project Manager.
  3. **Concealed:** Embedded in masonry, concrete or other construction; installed in furred spaces; within double partitions or hung ceilings; in trenches; in crawl spaces or in enclosures.
  4. **Ensure:** To make certain in a way that eliminates the possibility of error.
  5. **Exposed:** Not installed underground or "concealed" as defined above.
  6. **Furnish or Provide:** To supply, install and connect complete and ready for safe and regular operation of particular work unless specifically otherwise noted.
  7. **Indicated, Shown, or Noted:** As depicted on drawings or specifications.
  8. **Install:** To erect, mount and connect complete with related accessories.
  9. **Or equal, or approved equal:** Refers to products which, in the opinion of the Project Manager, are similar in all respects to products specified by proprietary brand name. (Refer to Section 01630 for procedures for submittal of proposed substitutions.)
  10. **Rework:** To repair existing items or work required to be removed and replaced in order to accomplish the Work in accordance with the contract documents.
  11. **Related Work:** Includes, but not necessarily limited to, mentioned work associated with, or affected by, the work specified.
  12. **Reviewed, Satisfactory, Accepted, or Directed:** Assumes by or to the Project Manager.
  13. **Similar, or Equal:** Same in materials, weight, size, design, construction, capacity, performance and efficiency of specified product.
  14. **Supply:** To purchase, procure, acquire and deliver complete with related accessories.

15. **Unless Otherwise Indicated and Unless Otherwise Noted:** General note to perform work as indicated or shown on drawings or in specifications unless specifically directed otherwise elsewhere in the contract documents; may be abbreviated "U.O.N.", "U.O.I.", or "U.N.O."

#### 1.04 CONVENTIONS

##### A. Specifications Format

1. In order to standardize the location of information in the Contract Documents, the specifications generally are organized in one or more of the following formats:
  - a. The 16-Division "MASTERFORMAT" published by the Construction Specifications Institute.
  - b. The Standard Specifications for Road and Bridge Construction published by CDOT.
  - c. The alpha-numeric system as published by the FAA.

##### B. Organization of Drawings and Specifications

1. Organization of the specifications into divisions and sections, and arrangement or numbering of drawings is intended solely for the convenience of the Contractor in his responsibilities to divide the Work among subcontractors or to establish the extent of work to be performed by any trade.
2. Neither the Owner nor the Project Manager assume any liability arising out of jurisdictional issues or claims advanced by trade organizations or other interested parties based on the arrangement or organization of drawings or specifications.

##### C. Gender and Number

1. For convenience and uniformity, parties to the Contract, including the Owner, Contractor, and Project Manager, and their subcontractors, suppliers, installers, consultants or other interested parties are referred to throughout the contract documents as if masculine in gender and singular in number. Such reference is not intended to limit the meaning of the contract documents to the masculine gender or singular number.

##### D. Singular vs. Plural

1. Materials, products, equipment or other items of work referred to in the singular shall be construed as plural where applicable by the intent of the contract documents and shall not limit quantities to be provided by the Contractor.

##### E. Imperative Mood

1. Specifications and notes on the drawings or elsewhere in the contract documents are generally written in the imperative mood as instructions to the Contractor, whether the Contractor is specifically addressed or not.

##### F. References to Subcontractors or Trades

1. References to subcontractors, trades or other entities which are not parties to the contract shall be construed as meaning the Contractor whose responsibility it shall be to divide the Work among subcontractors or trades. Such references are used as a matter of convention, and are not intended to preclude or direct the Contractor's responsibility to divide the Work.



**G. Abbreviations**

1. A list of abbreviations used in the contract documents is included in Technical Specifications Section 01070; an abridged list of abbreviations used on the drawings is included with the drawings.
2. Abbreviations are believed to be those in general use in the construction industry. Contact the Project Manager for clarification of abbreviations for which the meaning is not clear.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**PART 4 - MEASUREMENT**

**4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

**PART 5 - PAYMENT**

**5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section.

**END OF SECTION 01095**

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## SECTION 01110

### CONSTRUCTION SAFETY

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED

- A. Work specified in this Section includes construction safety precautions and programs by the Contractor and the basis for reviews by the Project Manager.

##### 1.02 RESPONSIBILITY

- A. The General Conditions make it clear that all safety precautions during the construction process are the responsibility of the Contractor. The Contractor is responsible for the health and safety of his employees, agents, subcontractors and their employees, and other persons on the worksite; for the protection and preservation of the work and all materials and equipment to be incorporated therein; and for the worksite and the area surrounding the worksite. The Contractor shall take all necessary and reasonable precautions and actions to protect all such persons and property.
- B. This Section shall be interpreted in its broadest sense for the protection of persons and property by the Contractor and no action or omission by the Project Manager or his authorized representatives shall relieve the Contractor of any of its obligations and duties hereunder.

##### 1.03 SUBMITTAL

- A. Refer to Technical Specifications Section 01300 and 01340 for the process. A safety plan shall be submitted and approved under the general contract prior to commencing any work. If a Task Order is issued where the work is not covered by the approved safety plan then a revision to the plan specific for the work in the task order shall be resubmitted for approval. NOTE: NO PROGRESS PAYMENT SHALL BE APPROVED UNTIL THE SAFETY PLAN HAS BEEN ACCEPTED BY THE PROJECT MANAGER.

##### 1.04 PROJECT MANAGER'S REVIEW

- A. Provide a Contractor's Operational Safety Plan as described below and in Part 1 of Technical Specifications Section 01111.
- B. The Contractor shall provide six copies of its Operational Safety Program to the DIA Project Manager for review at least ten calendar days before on-site construction begins. The Contractor's program must meet, as a minimum, all applicable federal, state and local government requirements.
  - 1. The Contractor must, as part of the Contractor's safety program, submit six copies of the following information for acceptance by the DIA Project Manager prior to the commencement of construction activities. The Safety Plan must address all aspects listed below. If an item is not applicable, this must be noted in the Safety Plan.
    - a. Name of the Contractor's site safety representative.
    - b. If the Contractor is running multiple shifts or working more than 40 hours per week, the name of an assistant site safety representative who can act in the absence of the site safety representative.

- c. Twenty-four hours per day emergency phone numbers of Contractor site management to be used in case of injury or accident. Provide at least four contacts.
- d. The Contractor's method of ditching and trenching excavation to be used including how slopes will be stabilized with calculations showing the slope stability. The Contractor shall also show how material will be stored beside the excavation. Stored material will include the excavated and backfilled material.
- e. How injuries or accidents will be handled including samples of the forms used to report injuries or accidents.
- f. How employees will be handled who are unable to safely perform their duties, including how the Contractor will determine whether an employee is unable to safely perform his duties.
- g. How and when equipment will be checked to see that it is safe, that all safety guards are in place, and that the equipment is being used for its designed purpose and within its rated capacity.
- h. How and when all electric devices will be checked for proper grounding and insulation. Describe the methods that will be used to lock out electric systems that should not be energized.
- i. How trash and human organic waste will be disposed of.
- j. How snow and ice will be removed by the Contractor in his project area.
- k. How concrete forms will be anchored to ensure their stability, including calculations showing that the forms will safely hold the maximum construction loads.
- l. How flammable materials will be stored and handled, and how any spills will be cleaned up and removed for disposal.
- m. What system will be used to prevent fires and, if fires do occur, who will be trained to fight them. Also, what firefighting equipment will the Contractor have available and how will this equipment's condition be monitored.
- n. How materials will be received, unloaded, stored, moved and disposed of.
- o. How personnel working above ground level will be protected from falling.
- p. How people working beneath the construction work will be protected.
- q. What will be done to protect personnel in case of severe weather.
- r. How adequate lighting will be provided and monitored.
- s. How air quality will be monitored to ensure that chemical exposures are below established OSHA Permissible Exposure Limits. How employees will be protected if these limits are exceeded.
- t. How the safety of work platforms, man lifts, material lifts, ladders, shoring, scaffolding, etc. will be ensured relating to load capacity and the protection of personnel using or working around them.
- u. The type of personal protective equipment that will be used to protect employees from hazards.
- v. The type of safety training that will be provided to employees to inform them of safe work procedures.
- w. How audits and inspections will be performed to ensure compliance with the Safety Plan and applicable OSHA regulations.
- x. Procedures to ensure that welding and other hot work is performed safely.
- y. How compressed gases will be safely stored, handled and used.
- z. Methods to ensure that employees safely enter, work in, and exit confined spaces.

- aa. How the hazards of chemicals will be communicated to workers, including the use of material safety data sheets and chemical labels.
  - bb. Methods to ensure that forklifts and other powered industrial trucks are operated in a safe manner.
  - cc. How an effective hearing conservation program will be used to protect employees from high noise levels and prevent hearing loss.
  - dd. How employees will be protected from the effects of jet blast.
- C. Prior to the start of any work by a contractor or subcontractor employee, the Contractor shall provide the Project Manager with a list of its employees, subcontractor's employees and other personnel the Contractor has requested to work at Denver International Airport, who have signified in writing that they have been briefed on, or have read and understand, the Contractor's Safety Plan.

## **PART 2 - PRODUCTS**

### **2.01 CONTRACTOR'S SAFETY PLAN**

- A. Provide a Contractor's Safety Program as described in Part 1 of Technical Specifications Section 01110.

## **PART 3 - EXECUTION**

### **3.01 IMPLEMENT CONTRACTOR'S SAFETY PLAN**

- A. Implement the approved Contractor's Operational Safety Plan as described in Part 1 of this Technical Specifications Section 01110. Technical Specifications Section 01110.
- B. If the Contractor experiences lost time or an injury rate greater than 75 percent of the national average for all construction, the Contractor shall audit its safety procedures and submit a plan to reduce its rates.
- C. If at any time the lost time or injury rates experienced by the Contractor are 150 percent or more of the national average for construction, the Contractor shall immediately hire an independent safety professional who shall audit the Contractor's procedures and operations and make a report of changes that the Contractor should implement to reduce the rate including changing personnel.
  - 1. Six copies of this report shall be submitted to the DIA Project Manager.
  - 2. The Contractor shall immediately begin implementing the recommendations.
  - 3. A weekly report shall be submitted by the Contractor on the status of the implementation of the recommendations.
  - 4. Failure to comply with these requirements is a basis to withhold a portion of progress payments.

## **PART 4 - MEASUREMENT**

### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

## **PART 5 - PAYMENT**

**5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01110**

## SECTION 01111

### CONSTRUCTION SAFETY – AIRSIDE

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Work specified in this Section includes construction safety precautions and programs by the Contractor and the basis for reviews by the DIA Project Manager.

##### 1.02 RESPONSIBILITY

- A. The General Conditions make it clear that all safety precautions during the construction process are the responsibility of the Contractor. The Contractor is responsible for the health and safety of his employees, agents, subcontractors and their employees, and other persons on the worksite; for the protection and preservation of the work and all materials and equipment to be incorporated therein; and for the worksite and the area surrounding the worksite. The Contractor shall take all necessary and reasonable precautions and actions to protect all such persons and property.
- B. This Section shall be interpreted in its broadest sense for the protection of persons and property by the Contractor and no action or omission by the DIA Project Manager or his authorized representatives shall relieve the Contractor of any of its obligations and duties hereunder.

##### 1.03 REFERENCED TECHNICAL SPECIFICATIONS

- A. The following Technical Specifications sections are referenced in this Section:
  - 1. Section 01015 Security Requirements
  - 2. Section 01016 Vehicle and Equipment Permitting
  - 3. Section 01020 Utilities Interface
  - 4. Section 01112 Construction Safety and Phasing Plan

##### 1.04 SUBMITTAL

- A. Refer to Technical Specifications Section 01300 and 01340 for the submittal process. A safety plan shall be submitted and approved under the general contract prior to commencing any work. If a Task Order is issued where the work is not covered by the approved safety plan then a revision to the plan specific for the work in the task order shall be resubmitted for approval. NOTE: NO PROGRESS PAYMENT SHALL BE APPROVED UNTIL THE SAFETY PLAN HAS BEEN ACCEPTED BY THE PROJECT MANAGER.

##### 1.05 SAFETY PLAN COMPLIANCE DOCUMENT

- A. Scope: The Contractor's Safety Plan Compliance Document (SPCD) shall be developed and submitted by the contractor for the Project Manager's review and approval. The SPCD shall be developed according to the guidelines and requirements provided in Federal Advisory Circular No. 150/5370-2F and will describe how the contractor will comply with the requirements of the Construction Safety and Phasing Plan (CSPP). The SPCD shall cover

the actions of not only the construction personnel and equipment, but the actions of inspection personnel and airport staff for the duration of construction activities.

B. Definitions:

1. Approach Surface: A surface longitudinally centered on the extended runway centerline and extending outward and upward from either a runway threshold or 200 feet behind a threshold. This surface is needed to define where unobstructed airspace above the runway begins.
2. Notice To Airmen (NOTAM): A notice to the flying public (airmen) through FAA's NOTAM system. Normally initiated by message to the nearest FAA Flight Service Station. Issuance of the NOTAM will be coordinated through the DIA Project Manager and DIA Operations.
3. Object Free Area: A two-dimensional ground area surrounding runways, taxiways and taxi lanes which is clear of objects, except for objects whose location is fixed by function.
4. Safety Area: The surface adjacent to runways, taxiways, and taxi lanes over which aircraft and emergency vehicles should, in dry weather, be able to cross at normal operating speeds without incurring significant damage. A safety area is graded, drained, and compacted. It is free of any holes, trenches, mounds, or other significant surface variations or objects other than those that perform an essential aeronautical function. These objects, such as in-ground lighting fixtures and directional signage, should be of minimum practicable height and mass, and they must break away at ground level. Safety area dimensions are shown on the construction plan sheets.

C. Policy: Aviation safety is a primary consideration during airport construction. These activities shall be planned and scheduled to minimize disruption of normal aircraft activities. If the clearances and restrictions described in this plan cannot be maintained while construction is underway, action will be taken by the Contractor to perform work at night or during periods of minimal aircraft activity.

D. Safety Impacts: The Contractor shall take all necessary steps and precautions to mitigate the impact of hazardous conditions as they may relate to the Work. Potentially hazardous conditions which may occur during airport construction include, but are not limited to, the following:

1. Trenches, holes, or excavations on or adjacent to any active runway, taxiway, taxi lane, apron or related safety areas.
2. Unmarked/unlighted holes or excavations on or adjacent to any active runway, taxiway, taxi lane, apron or related safety areas.
3. Mounds or piles of earth, construction material, temporary structures, or other objects on or in the vicinity of any active runway, taxiway, taxi lane, apron or related safety, approach, or departure areas.
4. Pavement drop-offs which would cause, if crossed at normal operating speeds, damage to aircraft that normally use the airport. The maximum drop-off is 3 inches per FAA Advisory Circular 150/5300-13.
5. Vehicles or equipment (whether operating or idle) on any active runway, taxiway, taxi lane, apron or related safety, approach, or departure areas.
6. Vehicles, equipment, excavations, stockpiles, or other materials that could impinge upon NAVAID-critical areas and degrade or otherwise interfere with electronic



NAVAIDS or interfere with visual NAVAIDS facilities.

7. Unmarked utility, NAVAIDS, weather service, runway lighting, underground power or signal cables that could be damaged during construction.
8. Objects or activities anywhere on or in the vicinity of an airport which would be distracting, confusing, or alarming to pilots during aircraft operations.
9. Unflagged/unlighted low visibility items (such as tall cranes, backhoes, scrapers, dump trucks, rollers, compactors, dozers and the like) in the vicinity of an active runway, taxiway, taxi lane, apron or related safety, approach, or departure areas.
10. Dirt, debris, or other transient accumulations which temporarily obscure pavement markings or pavement edges, or derogate the visibility of runway or taxiway markings or lighting or of construction and maintenance areas.
11. Trash or other materials with foreign object damage (FOD) potential, whether on runways, taxiways, taxi lanes, aprons or in related safety areas.
12. Failure to control vehicle, human and large animal access to, and nonessential nonaeronautical activities on, open aircraft movement areas.
13. Failure to maintain radio communication between construction vehicles and air traffic control or other on-field communications facilities.
14. Construction activities or material which could hamper Aircraft Rescue and Fire Fighting (ARFF) vehicle access from ARFF stations to all parts of the runway/taxiway system, runway approach and departure areas, or aircraft parking locations.
15. Inadequate fencing or other marking to separate construction areas from open aircraft operating areas.
16. Bird attractions such as edibles (food scraps, etc.), trees, brush, other trash, grass/crop seeding, or ponded water on or near the airport.

E. Safety Requirements

1. General

- a. During performance of this contract, the airport runways, taxiways, taxi lanes, and aircraft parking aprons shall remain in use by aircraft to the maximum extent possible, consistent with continual safety. Aircraft use of areas near the Contractor's work will be controlled to minimize disturbance to the Contractor's operation. However, AIRCRAFT HAVE THE RIGHT OF WAY AT ALL TIMES. The Contractor shall not allow employees, subcontractors, suppliers, or any unauthorized persons to enter or remain in any airport area which would be hazardous to persons or to aircraft operations.
- b. Contractor personnel, airport staff and field inspectors directly involved in on-airport construction shall:
  - 1) Be aware of the types of conditions, safety problems, and/or hazards identified each day at the airport. To insure that all personnel are aware, daily meetings between management and supervisory personnel and their employees shall be scheduled prior to any work commencing on the shift.
  - 2) Inspect daily all work and/or storage areas for which the Contractor is responsible to be aware of current conditions.
  - 3) Promptly take all steps needed to remedy any unsafe or potentially unsafe condition. Coordinate with the DIA Project Manager to insure immediate corrective action is undertaken
- c. Before commencement of construction activity the Contractor, through

- coordination with the DIA Project Manager and DIA Operations, shall give notice using the NOTAM system of construction on the airfield. In addition, a NOTAM shall be issued for the completion of construction on the airfield.
2. Construction Area Marking: Temporary lighting, barricades, flagging, and flashers are required as shown on the plans. Flag lines, traffic cones, flashers, edge lights, and/or signs shall be used as necessary:
    - a. To clearly separate all construction from other parts of an air operations area
    - b. To identify isolated hazards, such as open manholes, excavations, areas under repair, stockpiled material, waste areas, etc.
    - c. Vehicle and pedestrian access routes used for airport construction shall be controlled to prevent any unauthorized entry of persons, vehicles or animals
    - d. Vehicle parking areas for Contractor employees shall be designated in advance to minimize traffic in open/active aircraft movement areas.
  3. Cables and Utilities
    - a. Special attention shall be given to preventing unscheduled interruption of utility services and facilities. The location of all cables and utilities shall be identified prior to construction activities.
    - b. There shall be coordination among the Contractor, the DIA Project Manager, DIA Operations, the FAA, the National Weather Service, utility companies, and any other appropriate entity or organization. NAVAIDS, weather service facilities, electric cables, and other utilities must be fully protected during the entire construction time.
    - c. Power, communication and control cables leading to and from any FAA NAVAIDS, weather service, and other facilities will be marked in the field by the appropriate individuals as identified in contract document Technical Specifications Section 01020, Utilities Interface, for the information of the Contractor before any work in their general vicinity is started. Thereafter, through the entire duration of construction, utilities shall be protected from any possible damage.
    - d. At the intersection of expansion joints and centerline lighting circuits on taxiways and runways, the electrical conduit may be within the 21" portion of the Portland cement concrete pavement. Coordination with the Project Manager's representative and the DIA Electrical Department is of utmost importance for both the scheduling of an outage and the removal of conductors while cutting the joint.
  4. Vehicle and Employee Identification
    - a. Contractor vehicles and equipment shall be flagged for high daytime visibility and if appropriate, lighted for nighttime operations. Vehicles which are not marked and lighted shall be escorted by a vehicle that is equipped with appropriate marking and lighting devices. Marking and lighting shall be in conformance with FAA AC 150/5210-5, current edition, or as outlined in Technical Specifications Section 01016, Vehicle and Equipment Permitting, of the contract documents.
    - b. The Contractor will be required to conform to the specific requirements as outlined in Technical Specifications Section 01015, Security Requirements, of the contract documents.
  5. Radio Communications
    - a. The Contractor's construction superintendent and flag personnel shall be required to coordinate directly with the DIA Project Manager or designated Representative. Only the DIA Project Manager or designated Representative shall monitor transceiver radios tuned to the frequency for communications with DIA Operations and B Tower Control. Radios shall be used to obtain the proper clearance in

regard to the movement of equipment, trucks, etc., on the airfield. Further, any unusual occurrences in the flight pattern of approaching or departing aircraft shall be acknowledged by all concerned so that operation of the airport and the construction work can be safely carried on at all times.

6. Haul Routes Crossing Active Aircraft Operation Areas
  - a. The Contractor shall provide a minimum of one broom truck to continuously clean the surface of the active taxiway, taxi lane or apron of any foreign object damage (FOD) or other objectionable debris that may result from hauling activities. Additional broom trucks may be required to expedite the cleanup process. Opening the taxiway, taxi lane or apron to aircraft operations shall only be approved after a visual inspection of the pavement surface by the DIA Airfield Operations Manager.
  - b. The Contractor shall not work within 160 ft. of the centerline of an active taxiway or 310 ft. of the centerline of an active runway without approval by the DIA Project Manager.
  - c. All construction equipment and vehicles shall be flagged for high daytime visibility and if appropriate, lighted for nighttime operations. Vehicles which are not marked and lighted shall be escorted by a vehicle that is equipped with appropriate marking and lighting devices. Marking and lighting shall be in conformance with FAA AC 150/5210-5, current edition.
  - d. All construction equipment, vehicles, personnel and supplies must be cleared from the taxiway safety area when directed by the DIA Project Manager or DIA Operations.
  - e. All Contractor and Subcontractor employees must be aware of the types of safety problems and hazards associated with aircraft operations and construction activities. Refer to paragraph 1.05.D of this Technical Specifications Section.

## PART 2 - PRODUCTS

### 2.01 CONTRACTOR'S OPERATIONAL SAFETY PLAN

- A. Provide a Contractor's Operational Safety Plan as described below and in Part 1 of this Technical Specifications Section 01111.
- B. The Contractor shall provide six copies of its Operational Safety Program to the DIA Project Manager for review at least ten calendar days before on-site construction begins. The Contractor's program must meet, as a minimum, all applicable federal, state and local government requirements.
  1. The Contractor must, as part of the Contractor's safety program, submit six copies of the following information for acceptance by the DIA Project Manager prior to the commencement of construction activities. **The Safety Plan must address all aspects listed below. If an item is not applicable, this must be noted in the Safety Plan.**
    - a. Name of the Contractor's site safety representative.
    - b. If the Contractor is running multiple shifts or working more than 40 hours per week, the name of an assistant site safety representative who can act in the absence of the site safety representative.
    - c. Twenty-four hours per day emergency phone numbers of Contractor site management to be used in case of injury or accident. Provide at least four contacts.
    - d. The Contractor's method of ditching and trenching excavation to be used including how slopes will be stabilized with calculations showing the slope stability. The

Contractor shall also show how material will be stored beside the excavation. Stored material will include the excavated and backfilled material.

- e. How injuries or accidents will be handled including samples of the forms used to report injuries or accidents.
- f. How employees will be handled who are unable to safely perform their duties, including how the Contractor will determine whether an employee is unable to safely perform his duties.
- g. How and when equipment will be checked to see that it is safe, that all safety guards are in place, and that the equipment is being used for its designed purpose and within its rated capacity.
- h. How and when all electric devices will be checked for proper grounding and insulation. Describe the methods that will be used to lock out electric systems that should not be energized.
- i. How trash and human organic waste will be disposed of.
- j. How snow and ice will be removed by the Contractor in his project area.
- k. How concrete forms will be anchored to ensure their stability, including calculations showing that the forms will safely hold the maximum construction loads.
- l. How flammable materials will be stored and handled, and how any spills will be cleaned up and removed for disposal.
- m. What system will be used to prevent fires and, if fires do occur, who will be trained to fight them. Also, what firefighting equipment will the Contractor have available and how will this equipment's condition be monitored.
- n. How materials will be received, unloaded, stored, moved and disposed of.
- o. How personnel working above ground level will be protected from falling.
- p. How people working beneath the construction work will be protected.
- q. What will be done to protect personnel in case of severe weather.
- r. How adequate lighting will be provided and monitored.
- s. How air quality will be monitored to ensure that chemical exposures are below established OSHA Permissible Exposure Limits. How employees will be protected if these limits are exceeded.
- t. How the safety of work platforms, man lifts, material lifts, ladders, shoring, scaffolding, etc. will be ensured relating to load capacity and the protection of personnel using or working around them.
- u. The type of personal protective equipment that will be used to protect employees from hazards.
- v. The type of safety training that will be provided to employees to inform them of safe work procedures.
- w. How audits and inspections will be performed to ensure compliance with the Safety Plan and applicable OSHA regulations.
- x. Procedures to ensure that welding and other hot work is performed safely.
- y. How compressed gases will be safely stored, handled and used.
- z. Methods to ensure that employees safely enter, work in, and exit confined spaces.
- aa. How the hazards of chemicals will be communicated to workers, including the use of material safety data sheets and chemical labels.
- bb. Methods to ensure that forklifts and other powered industrial trucks are operated in a safe manner.
- cc. How an effective hearing conservation program will be used to protect employees

from high noise levels and prevent hearing loss.

dd. How employees will be protected from the effects of jet blast.

- C. Prior to the start of any work by a Contractor or Subcontractor employee, the Contractor shall provide the DIA Project Manager with a list of its employees, subcontractor's employees and other personnel the Contractor has requested to work at Denver International Airport, who have signified in writing that they have been briefed on, or have read and understand, the Contractor's Safety Plan.

### **PART 3 - EXECUTION**

#### **3.01 IMPLEMENT CONTRACTOR'S OPERATIONAL SAFETY PLAN**

- A. Implement the approved Contractor's Operational Safety Plan as described in Parts 1 and 2 of this Technical Specifications Section 01111.
- B. If the Contractor experiences lost time or an injury rate greater than 75 percent of the national average for all construction, the Contractor shall audit its safety procedures and submit a plan to reduce its rates.
- C. If at any time the lost time or injury rates experienced by the Contractor are 150 percent or more of the national average for construction, the Contractor shall immediately hire an independent safety professional who shall audit the Contractor's procedures and operations and make a report of changes that the Contractor should implement to reduce the rate including changing personnel.
1. Six copies of this report shall be submitted to the DIA Project Manager.
  2. The Contractor shall immediately begin implementing the recommendations.
  3. A weekly report shall be submitted by the Contractor on the status of the implementation of the recommendations.
  4. Failure to comply with these requirements is a basis to withhold a portion of progress payments.

### **PART 4 - MEASUREMENT**

#### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

### **PART 5 - PAYMENT**

#### **5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01111**

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## SECTION 01112

### CONSTRUCTION SAFETY AND PHASING PLAN

#### PART 1 - GENERAL

The Construction Safety and Phasing Plan (CSPP) sets forth requirements for the project to ensure and maintain safety during periods of construction.

Guideline requirements for the CSPP are developed from Advisory Circular No. 150/5370-2F, FAR Part 139, and TSR 1542 except as herein modified, Rules and Regulations Governing the Denver Municipal Airport System— Traffic & 20 - Conduct of Persons Using the Denver Municipal Airport System, Project Specification Part II Sections 01111/ 01112, and Plan Sheets G1102-G1105, GC101-GC106, GC201-202, and GC701-702 (See Project Plans, Runway 8-26 Complex Lighting Rehabilitation).

The CSPP is a single document to be used by all personnel involved in the project. This CSPP covers the actions of not only the construction personnel and equipment, but also the actions of inspection personnel and airport staff. The contractor shall be required to draft and submit a Safety Plan Compliance Document (SPCD) to the Project Manager for review and approval describing how it will comply with the requirements of the CSPP and shall provide details that could not be determined before contract award. Details on drafting the SPCD are provided in the Project Specifications Part II Section 01111, Section 2.01.W of this specification, and contained within FAA Advisory Circular 150/5370-2F *Operational Safety on Airports During Construction*.

[http://www.faa.gov/regulations\\_policies/advisory\\_circulars/index.cfm/go/document.information/documentID/1019533](http://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1019533)

The CSPP has been developed to mitigate the adverse impacts of construction on aeronautical operations at the airport. Strict adherence to the provisions of the CSPP and airport approved SPCD by all personnel assigned to or visiting the construction site for the performance of this contract is mandatory. In the event contractor activities are not in conformance with the provisions of the CSPP or SPCD, the Contractor shall immediately cease those operations involved in the violation of the provisions of either of these documents, and conduct a safety meeting. The DIA Project Manager may direct the Contractor, in writing, to immediately cease those operations involved in the violation of the provisions of the construction safety and phasing plan. The Contractor shall not resume construction operations until appropriate action is taken as determined by the DIA Project Manager.

#### 1.01 SCOPE

##### **Runway 8-26 Complex Lighting Rehabilitation:**

Construction of the Runway 8-26 Complex Lighting Rehabilitation project will include the following components:

- Removal of and disposal of existing pavements (concrete and asphalt)
- Removal of taxiway and runway centerline and edge lights, touchdown zone lights, edge lights, transformers and electrical cable
- Installation of taxiway and runway centerline and edge lights, touchdown zone lights, edge lights, ductbanks, transformers, and electrical cable
- Installation of bond breaker fabric
- Portland Cement Concrete paving over cement-treated base course
- Installation of geotextile fabric
- Asphalt treated permeable base
- Manhole adjustment and drainage
- Asphalt paving over asphalt-treated permeable base course
- Vault modifications including procurement and installation of new regulators

- Construction of new CSS asphalt access roads over CDOT Class 6 base course
- Replacement of home run ductbank, airfield electrical cabling

## 1.02 RESPONSIBILITY

- A. The General Conditions state that the contractor shall, at all times, abide by the Construction Safety and Phasing Plan, Safety Plan Compliance Document and DIA security plan as specified in the contract. The primary goal of this plan is to protect the flying public and the integrity of the airport/aircraft operation area.
- B. The Contractor is responsible for the health and safety of his employees, agent's, subcontractors and their employees and other persons on the work site, for the protection and preservation of the work and all the materials and equipment to be incorporated therein, and for the work site and the area surrounding the work site. The Contractor shall take all necessary and reasonable precautions and actions to protect all such persons and property.
- C. This Section shall be interpreted, in its broadest sense, for the protection of people and property by the contractor. No action or omission by the DIA Project Manager or his authorized representatives shall relieve the Contractor of any of its obligations and duties hereunder.

## 1.03 SUBMITTAL

- A. Refer to Technical Specifications Section 01300 and 01340 for the process. The Contractor's SPCD, formatted as required per 2.01W of this specification, shall be submitted and approved under the general contract prior to commencing any work. If a Task Order is issued where the work is not covered by the approved safety plan then a revision to the plan specific for the work in the task order shall be resubmitted for approval. NOTE: NO PROGRESS PAYMENT SHALL BE APPROVED UNTIL THE SAFETY PLAN HAS BEEN ACCEPTED BY THE PROJECT MANAGER.

## 1.04 DIA PROJECT MANAGER'S REVIEW

- A. The Contractor shall provide six copies of its Work Plan (operational plan) and SPCD to the DIA Project Manager for review at least ten days before on-site construction begins. The Contractor's program must meet, as a minimum, all applicable federal, state and local government requirements.

## PART 2 - PRODUCTS

### 2.01 CONSTRUCTION SAFETY AND PHASING PLAN

#### A. Scope

1. This operational plan covers the actions of not only the construction personnel and equipment, but also the actions of inspection personnel and airport staff for the duration of construction activities.

#### B. Definitions:

1. Advisory Circulars: Documents produced by the FAA providing guidelines: Advisory Circulars are available at Internet address [www.faa.gov](http://www.faa.gov).

Mailing Address:



Federal Aviation Administration  
Flight Standards District Office  
26805 E 68th Ave  
Denver, CO 80249  
Ph: 303.799.7016

US Government Book Store  
1660 Wynkoop Street  
Denver, CO 80202  
Ph: 303.844.3964

2. Airport Traffic Control Tower (ATCT): The control tower or tower.
3. Aircraft Movement Area: (AMA): The restricted areas reserved specifically for aircraft and the arrival and departure operation of the airport; Runways, Taxiways, Ramps, Aprons, De-icing pads, Maintenance Facilities and the Transitional Surface controlled by DIA Operations and the FAA. There is no access to these areas without first acquiring approval from the Airport Operations Manager and clearance from ATCT. Specific procedures for this approval are outlined in the Security portion (pg.15-17) of this document.
4. Airport Operations Area: (AOA): Any area of the airport used or intended to be used for landing, takeoff, or AMA.
5. Apron: The area near the buildings where aircraft load / unload and are serviced, also referred to as the ramp or tarmac.
6. Approach Surface: A surface longitudinally centered on the extended runway centerline and extending outward and upward from either a runway threshold or 200 feet behind a threshold. This surface is needed to define where unobstructed airspace above it begins.
7. City and County of Denver (CCD)/Airport: The Aviation entity of the CCD responsible for management and control of DIA.
8. Contractor: The independent entity, chosen through the Bid Process and contracted with CCD/DIA, responsible for the completion of the contracts scope of work.
9. Denver International Airport (DIA): Located approximately 23 miles NE of downtown, comprising of 34,000 acres, 6 runways, a Terminal Building, 3 Concourses, and more than 1200 arrival/departure operations serving approximately 120,000 passenger customers daily.
10. Federal Aviation Administration (FAA): The federal agency that governs aviation, security and the related activities at civilian airports.
11. Foreign Objects and Debris (FOD): Foreign items found on the runways, taxiways and ramp areas that could cause damage to an aircraft or as an airborne object could cause injury to airport personnel. FOD also means Foreign Object Damage.

12. Navigational Aids (NAVAIDs): Visual or electronic devices, in the aircraft or on land, which provide vector guidance information or position data to aircraft.
13. NOTAMs: A notice to the flying public (airmen) through FAA's NOTAM system. Normally initiated by message to the nearest FAA Flight Service Station (FSS). Issuance of the NOTAM concerning this project will be coordinated through the Project Manager, coordinated with Airport Operations Manager.
14. Object Free Area (OFA): A two-dimensional ground area surrounding runways, taxiways and taxilanes that are clear of objects, except for objects whose location is fixed by function. Object free area dimensions are show on the survey control plan sheet.
15. Primary Surface Area: A zone extending 500 lineal feet out either direction from the centerline of the runway. All construction activity in this area will require the ILS NAVAIDs to be shut off. The contractor shall get approval from the Airport Operation Manager before accessing this area.
16. Safety Area: The surface adjacent to runways (RSA), taxiways (TSA), and taxilanes, over which aircraft and emergency vehicles should, in dry weather, be able to cross at normal operating speeds without incurring significant damage. A safety area is graded, drained, and compacted. It is free to any holes, trenches, humps, excavation or other significant surface variation or object, other than one, which must be there because of its essential aeronautical function. Such objects should be of minimum practicable height and mass. They must be frangible at ground level. Safety area dimensions are shown on the survey control plan sheet.
17. Secure Area: The area of the airport within the perimeter fencing, passenger sterile (screened) area, and secured facility exits separating landside and airside operations.
18. Transitional Surface: The surface extended outward and upward from behind or beyond the end of a Runway and beyond the Primary Surface Area defined as where the unobstructed airspace above it begins.

### **C. Policy**

1. Aviation Safety is a primary consideration during airport construction. These activities shall be planned and scheduled to minimize disruption of normal aircraft activities. If the clearances and restrictions described in this plan cannot be maintained while construction is underway, action will be taken to perform work in the off airport operation peak hours (between the hours of 11:00 PM and 6:00 AM) or during periods of minimal aircraft activity. All such scheduling will require Project Managers approval, and be at the discretion of Airport Operations.
2. This document provides information, to contractors, on the requirements and procedures for accident prevention, safety, security, and loss control during DIA's implementation of the Expansion and Capital Development Program. The Aviation Departments objective is to proceed forward with the project in a timely manner and achieve accident-free construction.
3. Nothing contained herein is intended to relieve any contractor or supplier of the obligations assumed by the general contractor under their contract with the Airport or as required by Federal Law, State Law, and authorities having local jurisdiction.

4. Safety and security must be an integral part of each job. Full participation, cooperation, and support are necessary to ensure the safety and health of all persons and property involved in the project.
5. The purpose of Limits, Marking, Flagging, Barricading, Lighting and Safety Regulations at airside construction areas is to delineate off-limit areas and prevent accidental intrusion into the unauthorized areas and Transitional Air Space by the Contractor's personnel, agents, suppliers, vehicles, materials, and equipment during the construction process. SUCH AN INTRUSION COULD EASILY RESULT IN A COLLISION WITH AN AIRCRAFT OR DISRUPT NAVAIDS CAUSING AN ERROR WHEN LANDING AN AIRCRAFT. IN EITHER EVENT, THE SITUATION COULD BE CATASTROPHIC IN BOTH LOSS OF LIFE AND PROPERTY.

#### **D. Coordination**

1. Airport Operators, or tenants conducting construction on their leased properties, should use pre-design, pre-bid, and preconstruction conferences to introduce the subject of airport operational safety during construction.
2. Operational safety should be a standing agenda item for discussion during progress meetings throughout the project.
3. Changes in the scope or duration of the project may necessitate revisions to the CSPP. Any change to the CSPP will require the review and approval by the airport operator and the FAA prior to implementation on the project.
4. Early coordination by the DIA Project Manager(s) with FAA ATO is required to schedule airway facility shutdowns and restarts. Relocation or adjustments to NAVAIDs, or changes to final grades in critical areas, may require an FAA flight inspection prior to restarting the facility. Flight inspections must be coordinated and scheduled well in advance of the intended facility restart. Flight inspections may require a reimbursable agreement between the airport operator and FAA ATO. Reimbursable agreements should be coordinated a minimum of 12 months prior to the start of construction. See "Notification of Construction Activities" Section for required FAA notification regarding FAA owned NAVAIDs
5. The contractor will be required to coordinate work so as to satisfy clearance requirements for arrival and departure of scheduled aircraft and maintain compliance with the FAA's Advisory Circular 150/5370-2F current edition, "Operational Safety on Airports during Construction". The Advisory Circular sets forth guidelines for maintaining desired levels of operational safety during construction. All construction personnel should become familiar with the contents of this Advisory Circular.
6. Potentially hazardous conditions, which may occur during airport construction, include, but are not limited to, the following:
  - a. Excavation adjacent to runways, taxiways, and aprons.
  - b. Mounds of earth, construction materials, temporary structures, and other obstacles near any open runway, taxiway, or taxilane; in the related object-free area and aircraft approach or departure areas/zones; or obstructing any sign or marking.
  - c. Runway resurfacing projects resulting in lips exceeding 3 inches (7.6cm) from pavement edges and ends.
  - d. Heavy equipment (stationary or mobile) operating or idle near AOA's, in runway approaches and departure areas, or in OFZs.
  - e. Equipment or material near NAVAIDs that may degrade or impair radiated signals and/or the monitoring of navigational and visual aids. Unauthorized or improper vehicle operations in localizer or glide slope critical areas, resulting in electronic interference and/or facility shutdown.
  - f. Tall and especially low-visibility units (i.e., equipment with slim profiles)—cranes,

- drills, and similar objects—located in critical areas, such as OFZs and approach zones.
- g. Improperly positioned or malfunctioning lights or unlighted airport hazards, such as holes or excavations, on any apron, open taxiway, or open taxiway or in a related safety, approach, or departure area.
  - h. Obstacles, loose pavement, trash, and other debris on or near AOA. Construction debris (gravel, sand, mud, paving materials, etc.) on airport pavements may result in aircraft propeller, turbine engine, or tire damage. Also, loose materials may blow about, potentially causing personal injury or equipment damage.
  - i. Inappropriate or poorly maintained fencing during construction intended to deter human and animal intrusions into the AOA. Fencing and other markings that are inadequate to separate construction areas from open AOAs create aviation hazards.
  - j. Improper or inadequate marking or lighting of runways (especially thresholds that have been displaced or runways that have been closed) and taxiways that could cause pilot confusion and provide a potential for a runway incursion. Inadequate or improper methods of marking, barricading, and lighting of temporarily closed portions of AOAs create aviation hazards.
  - k. Wildlife attractants—such as trash (food scraps not collected from construction personnel activity), grass seeds, or ponded water—on or near airports.
  - l. Obliterated or faded markings on active operational areas.
  - m. Misleading or malfunctioning obstruction lights. Unlighted or unmarked obstructions in the approach to any open runway pose aviation hazards.
  - n. Failure to issue, to update, or to cancel NOTAMs about airport or runway closures or other construction related airport conditions.
  - o. Failure to mark and identify utilities or power cables. Damage to utilities and power cables during construction activity can result in the loss of runway/taxiway lighting; loss of navigational, visual, or approach aids; disruption of weather reporting services; and/or loss of communications.
  - p. Restrictions of ARFF access from fire stations to the runway-taxiway system or airport buildings.
  - q. Lack of radio communications with construction vehicles in airport movement areas.
  - r. Objects, regardless of whether they are marked or flagged, or activities anywhere on or near an airport that could be distracting, confusing, or alarming to pilots during aircraft operations.
  - s. Water, snow, dirt, debris, or other contaminants that temporarily obscure or in any way reduce the visibility of runway/taxiway marking, lighting, and pavement edges. Any condition or factor that obscures or diminishes the visibility of areas under construction.
  - t. Spillage from vehicles (gasoline, diesel fuel, oil, etc.) on active pavement areas, such as runways, taxiways, ramps, and airport roadways.
  - u. Failure to maintain drainage system integrity during construction (e.g., no temporary drainage provided when working on a drainage system).
  - v. Failure to provide for proper electrical lockout and tagging procedures. At larger airports with multiple maintenance shifts/workers, construction contractors should make provisions for coordinating work on circuits.
  - w. Failure to control dust. Consider limiting the amount of area from which the contractor is allowed to strip turf and/or requiring the use of mitigative operations.
  - x. Exposed wiring that creates an electrocution or fire ignition hazard. Identify and secure wiring, and place it in conduit or bury it.

- y. Site burning, which can cause possible obscuration.
  - z. Construction work taking place outside of designated work areas and out of phase.
7. Safety area encroachments, improper ground vehicle operations, and unmarked or uncovered holes and trenches in the vicinity of aircraft operating surfaces are the three most recurring threats to airside safety during construction.
8. In the event of an aircraft emergency, the contractor's personnel and /or equipment may be required to immediately vacate the area. Notification will first come from the Airport Operations Manager via the operations radio being monitored by the contractor.

#### **E. Phasing**

1. The Work to be performed under this Contract is as described in the Contract Documents, Technical Specifications, and Drawing set. Construction phasing for this project has been coordinated with the Airport Project Manager, local Air Traffic personnel and airport users potentially affected. The sequenced construction phases established in this CSPP have been incorporated into the project design and are reflected in the contract drawings and specifications. Milestone locations described below are general in nature. The Contractor shall complete the Work within 90 consecutive calendar days from Notice to Proceed 2 (NTP2). The Contractor shall complete all Administrative and Mobilization activities within 60 Calendar Days from Notice to Proceed 1 (NTP1).
2. The Work to be performed under the contract is divided into the following Milestone Areas. Work included in Milestones listed below may include, but is not limited to the following: Grading, Demolition, Portland Cement Concrete (PCC) Paving, Jointing and Sealing, Asphalt Treated Permeable Base (ATPB), Asphalt Pavement, Airfield Electrical Lights/Cable/Transformers, Electrical Manhole Repairs, Utility Modifications, etc.
3. Milestone 1 – Administrative Work
  - a. Work shall begin immediately following NTP 1 and shall be completed 60 consecutive calendar days from NTP 1. (Day Time or Night Time Construction)
    - 1) Milestone 1 includes administrative efforts, submittal preparation and submission, mobilization, and preparation of the contractor's staging site. No runway or taxiway closures will be required for work in this milestone.
    - 2) Work during Milestone 1 can be completed both during the day and night.
4. Milestone 2 – Phase 1 Construction
  - a. Work shall begin immediately after Milestone 1 (Administrative Work), and shall be completed within 45 consecutive calendar days from start of Milestone 2. (Day or Night Time Construction).
    - 1) Milestone 2 requires closure of the Runway 8-26 Complex north of Taxiway Z for the duration of Phase 1.
    - 2) Work within Phase 1 will require the Contractor to use access routes on active airfield pavements. Contractor personnel will be required to obtain DIA security badges with Limited Access Route (LAR) driving privileges to work in this phase or be escorted by contractor personnel with LAR driving privileges.
    - 3) Contractor shall de-energize or cover taxiway edge lights that lead to or are within the closure area. Lights outside the closure are to remain active through the proper use of jumpers in conduit.
    - 4) Contractor shall cover all guidance signs that direct aircraft to a closed runway or taxiway.
    - 5) Work within Milestone 2 (Phase 1) can be completed both during the day and night.

5. Milestone 3 – Phase 2 Construction
  - a. It is anticipated that work on Taxiway K and the portions of Taxiway Z located east of Taxiway K (including the intersections with Taxiways L and M) will be completed during a series of 15 or less daytime closures. Work in this Phase 2 area will be completed concurrently with Phase 1. (Daytime Construction Only).
    - 1) Milestone 3 includes work within the Phase 2 limits.
    - 2) Work in this area will require daytime only closures of the taxiways and intersections indicated above. The contractor will be responsible for coordinating with the DIA Project Manager a minimum of 2 weeks in advance to coordinate requirements for the daytime closures. DIA escorts will coordinate with Airport Operations to place delineator cones as directed by DIA Airport Operations necessary to provide daytime only closures. The contractor is responsible for ensuring that work can be completed as necessary to reenergize all circuits in this area 1 hour prior to sunset each night.
    - 3) Work within this phased area will require the Contractor to use access routes on active airfield pavements. Contractor personnel will be required to obtain DIA security badges with Limited Access Route (LAR) driving privileges to work in this phase or be escorted by contractor personnel with LAR driving privileges.
    - 4) Work within Milestone 3 shall only be completed during the day.
6. Milestone 4 – Phase 3 Construction
  - a. Work shall begin immediately after Milestone 3 (Phase 2 work), and shall be completed within 15 consecutive calendar days from start of Milestone 4. Work in this Phase 3 area will be completed concurrently with Phase 1. (Day or Night Time Construction).
    - 1) Milestone 4 includes work within the Phase 3 limits. This work will require closure of Taxiway Z between Taxiways K and Z1.
    - 2) Work within this phased area will require the Contractor to use access routes on active airfield pavements. Contractor personnel will be required to obtain DIA security badges with Limited Access Route (LAR) driving privileges to work in this phase or be escorted by contractor personnel with LAR driving privileges.
    - 3) Contractor shall de-energize or cover taxiway edge lights that lead to or are within the closure area. Lights outside the closure are to remain active through the proper use of jumpers in conduit.
    - 4) Contractor shall cover all guidance signs that direct aircraft to a closed runway or taxiway.
    - 5) Work within this phased area will require the Contractor to use access routes on active airfield pavements. Contractor personnel will be required to obtain DIA security badges with Limited Access Route (LAR) driving privileges to work in this phase or be escorted by contractor personnel with LAR driving privileges.
    - 6) Work within Milestone 4 (Phase 3) can be completed both during the day and night.
7. Milestone 5 – Phase 4 Construction
  - a. It is anticipated that the remaining work on Taxiway Z (west of Taxiway Z1) will be completed during a series of 15 or less daytime closures and work in this area will be completed concurrently with Phase 1. (Daytime Construction Only).
    - 1) Milestone 5 includes work within the Phase 4 limits.

- 2) Work in this area will require daytime only closures of the Taxiway Z as indicated above. The contractor will be responsible for coordinating with the DIA Project Manager a minimum of 2 weeks in advance to coordinate requirements for the daytime closures. DIA escorts will coordinate with Airport Operations to place delineator cones as directed by DIA Airport Operations necessary to provide daytime only closures. The contractor is responsible for ensuring that work can be completed as necessary to reenergize all circuits in this area 1 hour prior to sunset each night.
  - 3) Work within this phased area will require the Contractor to use access routes on active airfield pavements. Contractor personnel will be required to obtain DIA security badges with Limited Access Route (LAR) driving privileges to work in this phase or be escorted by contractor personnel with LAR driving privileges.
  - 4) Work within Milestone 5 shall only be completed during the day.
8. Milestone 6 – Phase 5 Construction
- a. Work shall begin immediately after Milestone 2 has been completed, and shall be completed within 45 consecutive calendar days. (Daytime Construction Only).
    - 1) Milestone 2 includes work within the Phase 1 limits (Homerun Cable Installation between the East Vault and Electrical Manhole 03010).
    - 2) Work within this phased area will require the Contractor to use access routes on active airfield pavements. Contractor personnel will be required to obtain DIA security badges with Limited Access Route driving privileges to work in this phase.
    - 3) Contractor shall be responsible for coordinating with DIA to shut down all circuits within the manholes and ductbanks under construction during this phase including shutting down RGL circuits for other runways. Contractor to schedule closures with DIA Project Manager a minimum of 2 weeks prior to the closure, and provide any information requested by DIA to process NOTAMS regarding deactivation of any affected airfield circuitry during construction of this phase. The contractor is responsible for ensuring that work can be completed as necessary to reenergize all circuits in this area 1 hour prior to sunset each night.
    - 4) Work in the area adjacent to Taxiway EC will require an anticipated 1-2 daytime closures of Taxiway EC. The contractor will be responsible for coordinating with the DIA Project Manager a minimum of 2 weeks in advance to coordinate requirements for the daytime closures. DIA escorts will coordinate with Airport Operations to place delineator cones as directed by DIA Airport Operations necessary to provide daytime only closures. The contractor is responsible for ensuring that work can be completed as necessary to reenergize all circuits in this area 1 hour prior to sunset each night.
    - 5) Work within Milestone 6 (Phase 5) shall only be completed during the day.

| Milestone                                                 | NTP 1 & NTP 2<br>Start Milestone,<br>Consecutive Calendar<br>Days from NTP |             | Milestone Duration,<br>Consecutive Calendar<br>Days | NTP 1 & NTP 2<br>Complete Milestone,<br>Consecutive Calendar<br>Days from NTP |             |
|-----------------------------------------------------------|----------------------------------------------------------------------------|-------------|-----------------------------------------------------|-------------------------------------------------------------------------------|-------------|
|                                                           | NTP 1                                                                      | NTP 2       |                                                     | NTP 1                                                                         | NTP 2       |
| Milestone No. 1: Administrative and Mobilization          | Start on NTP 1 Date                                                        |             | 60                                                  | 60                                                                            |             |
| Milestone No. 2:<br>Completion of Phase 1<br>Construction | NTP 1<br>61                                                                | NTP 2<br>0  | 45                                                  | NTP 1<br>105                                                                  | NTP 2<br>45 |
| Milestone No. 3:<br>Completion of Phase 2<br>Construction | NTP 1<br>61                                                                | NTP 2<br>0  | 15                                                  | NTP 1<br>75                                                                   | NTP 2<br>15 |
| Milestone No. 4:<br>Completion of Phase 3<br>Construction | NTP 1<br>76                                                                | NTP 2<br>16 | 15                                                  | NTP 1<br>90                                                                   | NTP 2<br>30 |
| Milestone No. 5:<br>Completion of Phase 4<br>Construction | NTP 1<br>44                                                                | NTP 2<br>14 | 15                                                  | NTP 1<br>105                                                                  | NTP 2<br>45 |
| Milestone No. 6:<br>Completion of Phase 5<br>Construction | NTP 1<br>106                                                               | NTP 2<br>46 | 45                                                  | NTP 1<br>150                                                                  | NTP 2<br>90 |

**F. Areas and Operations Affected by Construction Activity**

Runway 8-26 and Taxiways R, R1, R2, R3, R4, R6, R7, R8, R9, EE, L, and M will be closed in the area north of Taxiway Z for 45 calendar days (Phase 1). Taxiway Z will be closed for 15 days between Taxiways K and Z1 (Phase 3). Taxiway Z will be closed in increments for daytime closures from the intersection of Taxiway G to Taxiway Z1 and from the intersection of Taxiway K to Taxiway M (phases 2 and 4). Refer to sheets GC101 through GC106 and GC201 through GC202.

**G. Navigation Aid (NAVAID) Protection**

1. Special consideration must be made for construction activities, materials/equipment storage, and vehicle parking near electronic Navigational Aids (NAVAIDS) because they may interfere with signals essential to air navigation, obstruct the line-of-sight from the ATCT, and/or limit access to the equipment and instruments for maintenance.

Runway 8-26 NAVAIDs equipment will be closed for the duration of the Phase 1 Runway 8-26 closure. Adjacent runway NAVAIDs equipment will remain functional and shall not be impacted.

**H. Security Requirements**

1. Airport Security:
  - a. Participant guidelines are outlined in Denver Municipal Airport System Rules and Regulations Part 20. A Contractor must be sponsored by an Air Carrier, Tenant or by the City and County of Denver. Once a Contractor Company has been sponsored they must designate an Authorizing Agent. Each Contractor (or Subcontractor) requiring access to the Restricted Area, Sterile Area, or Secured Area shall become a "Participant" in the Airport Security Program, and remain in good standing in order to retain Airport Security privileges.
  - b. The sponsorship establishes that a Contractor (including Subcontractors) has legitimate business at the Airport. All construction contractors must submit a Participant Sponsorship form signed by their sponsor. A company sponsoring a



- Participant shall immediately notify Airport Security when any sponsorship is terminated.
- c. A Sub-contractor Company working under its own entity must be sponsored by a Contractor Company. The Sub-contract Company must designate its own Authorizing Agent(s).
  - d. Each Participant shall designate an Authorizing Agent to ensure the Participant's compliance with the Airport Security Program and act as the point of contact between the Participant and Airport Security. The Authorizing Agent shall be designated in writing to Airport Security by the Participant.
  - e. The Authorizing Agent(s) is/are responsible for signing and verifying all information on the Denver International Airport Fingerprinting and Badge Applications. All submitted applications must be an original. It is the Authorizing Agent(s) responsibility to ensure that Airport Security maintains valid contact information. The Authorizing Agent must maintain a current and valid Airport Identification Badge.
  - f. The security status of the Airport is subject to change without notice. These security requirements are applicable to the current security status of the Airport. Should the security status of the Airport change at any time during the term of the Agreement, a written notice shall be issued to the Contractor detailing all applicable security modifications. The Contractor must take immediate steps to comply with those security modifications.
  - g. The Contractor shall return to the City, at Agreement completion or termination, or upon demand by the City, all access keys and Airport Id Badges issued to it by the City to Restricted Areas of the Airport. If the Contractor fails to return any such Airport Id Badge(s) or Airport Security Key(s) at the Agreement completion or termination or upon demand by the City, the Contractor shall be liable to the City for all the City's costs, including the City's labor costs for re-coring doors and any other work which is required to prevent compromise of the Airport security system. In order to collect such costs hereunder, the City may withhold funds in such amount from any amounts due and payable to the Contractor under the Agreement.
2. Airport ID Badge Requirements
- a. All individuals employed at the Airport with Restricted Area access, or working in the Terminal, Concourses, or Parking and Ground Transportation facilities, must obtain an Airport Identification (ID) Badge. Airport ID Badges will be issued by Airport Security and if deemed necessary by Airport Security, may require a deposit. All such identification badges shall be and remain the property of the Airport. The Airport ID Badge must be surrendered on demand to Airport Operations and/or a Contract Security Guard. An individual employed by more than one company, or changing employers, must obtain an Airport ID Badge for each company. Badge Color indicates general areas of authorization in relationship with direct support of an individual's job function. Badge Color does not determine access. The respective classes of Airport ID Badges, indicated by badge color and associated driving privilege icon, describe driving privileges in direct correlation with their job function.
  - b. The individual must complete a Denver International Airport Fingerprinting and Badge Application, on a form prepared and currently approved by Airport Security. Two valid forms of identification must be presented with the application, one of which must be government issued photo identification. The second form of identification must verify proof of citizenship (i.e., birth certificate or legal residency with work authorization). All information regarding the individual's name, age, gender, and other vital statistics on both forms of identification must be consistent

- and verifiable.
- c. A Denver International Airport Fingerprinting and Badge Application, Security Threat Assessment (STA) and Criminal History Record Check (CHRC) must be completed for each individual requesting an Airport Identification Badge. Denver International Airport Fingerprinting and Badge Application are available from the Airport Security Offices.
  - d. The individual must view a training film on Denver Municipal Airport System Rules and Regulations, as they pertain to overall security, and pass a corresponding test to assure understanding of the Rules and Regulations.
  - e. If the individual requests Driver Authorization, a valid driver's license must be presented and the individual must view a training film on Denver Municipal Airport System Rules and Regulations, as they pertain to overall Movement of Vehicles in the Restricted Area, and pass a corresponding test to assure understanding of the Rules and Regulations.
  - f. A construction orientation specific to the project must be conducted. A designated time for this session must be coordinated with Planning and Development and Airport Operations.
  - g. Every individual requesting an Airport Id Badge must complete a Criminal History Record Check (CHRC) and a Security Threat Assessment (STA) for unescorted access to the Restricted Area.
  - h. If an applicant has been convicted or found guilty by reason of insanity, or has been arrested for any felony and/or any of the disqualifying crimes and is awaiting judicial proceedings he/she may be ineligible to obtain an Airport Identification badge. A list of the disqualifying crimes may be found in 49 C.F.R. 1542.209.
  - i. Allow adequate time for processing of the Security Threat Assessments (STA) and Criminal History Record Check (CHRC).
  - j. A lost or stolen badge must be immediately reported to Airport Security. For a replacement badge a new Denver International Airport Fingerprinting and Badge Application must be completed and signed by the Company(s) Authorizing Agent. A non-refundable fee must be paid for a replacement badge.
  - k. If for any reason the Airport Identification Badge becomes inoperable or damaged, the Airport Identification Badge holder shall return that badge to Airport Security, and a replacement badge will be issued. A replacement fee may be assessed should the damage be attributable to the negligence of the employee who was issued the badge.
  - l. When an employee is terminated, the Contractor Company shall immediately notify Airport Security. This notification must be followed by the return of the badge and written confirmation of this information. The Contractor Company must recover badges from individuals whose employment at the Airport has been terminated. The Contractor Company shall notify Airport Security in writing, when a Subcontractor is no longer under their sponsorship. All Airport Identification Badges must be returned to Airport Security.
  - m. An employee possessing a valid Airport Identification Badge may escort other individuals into the Restricted Area under the conditions listed in the Rules and Regulations Section 20.
  - n. If the project is extended, the City and County Airport Project Manager must submit a new Sponsorship Form with a new expiration date. This can be accomplished thirty (30) calendar days prior to expiration of the Airport Identification Badge. An application revision must be completed for each employee still required on the project, if the badges have expired.
3. Background Checks
- a. Every individual requesting an Airport Id Badge must complete a Criminal History

- Record Check (CHRC) and a Security Threat Assessment (STA) for unescorted access to the Restricted Area.
- b. If an applicant has been convicted or found guilty by reason of insanity, or has been arrested for any felony and/or any of the disqualifying crimes and is awaiting judicial proceedings he/she may be ineligible to obtain an Airport Identification badge. A list of the disqualifying crimes may be found in 49 C.F.R. 1542.209.
4. Vehicles in the Restricted Area
- a. All Contractor Employees who are required to drive in the Restricted Area to perform their jobs are required to complete a training film on Denver Municipal Airport System Rules and Regulations, as they pertain to overall movement of vehicles in the Restricted Area, and pass a corresponding test to assure understanding of the Rules and Regulations.
  - b. All unescorted vehicles must display a current Denver International Airport Contractor Vehicle Permit. Contractor Vehicle Permits are available from Airport Security. An application form must be completed for each permit requested, and it must be signed by the Authorizing Agent. A permit is required for all vehicles driving into the Restricted Area and vehicle permits are not transferable.
  - c. The Contractor shall purchase and maintain in force a minimum of \$10,000,000, in combined single limit automobile insurance for bodily injury and property damage liability per accident or occurrence. Coverage must include a thirty (30) calendar day notice of cancellation to Airport Security. Prior to receiving a Contractor Vehicle Permit, the Contractor shall provide Airport Security with certificates of insurance evidencing the above coverage, which identify the City and County of Denver as additionally insured.

#### **I. Contractor Access**

1. The contractor will separate the construction area from the active taxiway and apron areas by placing barricades with red flashing lights as shown on the plans. Barricades and delineators shall be installed at locations shown on the plans just prior to the approved construction phase start date. In addition, temporary signage indicating "No Contractor Access" and delineators shall be installed at locations shown on the plans in an attempt to stop Contractor employees from entering the remaining taxiway object free areas.
2. No equipment or personnel may enter the open runways or taxiways adjacent to the project without the proper clearance, flagging, and/or escort.
  - a. DIA will close the Runways and Taxiways when any work activity, equipment and/or personnel are going to be within the Runway and Taxiway Safety and Object Free Areas.
    - 1) All lighting systems and signs in closed areas shall be de-energized. All lighting systems directing traffic to closed areas shall be de-energized.
    - 2) All signs in closed areas shall be de-energized and securely covered.
    - 3) All signs or portions of signs outside the closed area directing aircraft to closed areas shall be completely and securely covered. The methodology for covering the signs shall be coordinated with the DIA Project Manager and approved by Airport Operations.
  - b. The Contractor will submit a Closure Schedule to the Project Manager prior to starting the project for work known to require access in the Runway and Taxiway Safety and Object free areas.
  - c. The Contractor shall schedule no work in the Runway Safety Areas and Taxiway Object Free Areas without prior coordination with the Project Manager and approval from Airport Operations.

- d. Work within the Runway Safety Areas and Taxiway Object Free Areas adjacent to the project shall require the Runway and Taxiway to be closed to aircraft traffic for the duration of that work period.
  - e. No penetration shall be made into any Taxilane, Taxiway, or Runway Approach Surface without coordination with Project Manager and approval from Airport Operations.
3. The contractor's primary access for the project will be through Gate 4 located at the intersection of Queensberg Street and 99th Avenue. All personnel and materials accessing the airfield complex will move in and out of the AOA at this point.
- a. The Contractor employees and their subcontractor employees Privately Owned Vehicles (POVs) shall be parked at the contractor staging area or off airport property. Contractor employee and subcontractor POVs shall not enter the AOA.
  - b. The contractor will access a permanent DIA access gate throughout this project since the construction traffic is anticipated to be light. All contractor personnel will be required to obtain DIA badges and some contractor personnel will be required to obtain LAR driving privileges to act as drivers and escorts during the project. The contractor is expected to get all personnel badged during Milestone 1 (Administrative and Mobilization Phase).
  - c. The Contractor will submit a schedule to the Project Manager, 24 hours in advance, of any additional gate requirements, extraneous movement outside the Construction Area, or situations that would require additional clearances.
  - d. The contractor, it's employees and its subcontractors, vendors, suppliers, and all those vested in the project through the general contractor are to remain in the project area at all times. Movement on the AOA outside of the Construction Area Envelope is prohibited except when accessing the area or otherwise cleared.
4. All construction equipment and vehicles shall be marked as indicated in the Rules and Regulations Governing the Denver Municipal Airport System.
5. The Contractor shall stage all vehicles and equipment on the taxiway pavement, within the phase closure area, on the south edge of the runway complex beyond the runway hold bars when not in use. Contractor may stage slow moving equipment such as tracked equipment and steel drum rollers on or near runway pavements. Equipment stored on or near runway pavements shall be consolidated into a minimum number of groups, coned off with construction delineators, and lit with light carts at night.
6. Prior to start of construction, the contractor shall submit a Haul Plan to the DIA Project Manager, for approval by the FAA, and Airport Operations.
7. The contractor shall be responsible for maintaining all haul roads and access roads and completing rehabilitation work as necessary upon completion of the work.
8. The contractor shall establish controls to limit erosion per Technical Specification section 01566, *Environmental Controls*, and approved Stormwater Management Plan (SWMP).
9. The contractor shall limit the height of construction equipment to 50 feet in all project areas unless prior coordination with the Project Manager, an approved FAA form 7460-1, or approval from Airport Operations.
- a. The Contractor will assure that the equipment working on the site does not exceed the height limit, as specified.
  - b. Project Work Area: The 50 foot height was conservatively been selected and should be adequate for the anticipated construction equipment to be used within the project work limits.
10. The contractor shall install Lighted Flasher Barricades and Delineators at intervals identified on the plans. No person or equipment is allowed beyond the barriers without

- prior coordination with the DIA Project Manager and approval from the Manager of Airport Operations.
- a. The Contractor shall not block or restrict access to active Runways or Taxiways at any time.
  - b. If and when cleared for work activity outside the Construction Area, the Barricades shall be moved to the new limits and then re-established at the conclusion of the day's work session.
  - c. A lighted barricade will be established at any hole, trench, drop off, or Runway or Taxiway surface deviation within the OFA which exceeds 3" in depth.
11. The Contractor will be required to maintain aircraft operations on the open runways and taxiways at all times except as specified in the Contract and all closures shall be identified in the Construction Schedule and submitted to the DIA Project Manager and Airport Operations Manager prior to starting work on the project. A minimum of 160' (or as indicated on the plans), as applicable, of object free area from the taxiway centerline and a minimum of 305' (or as indicated on the plans), as applicable, of object free area from the runway centerline is required at all times when taxiways are open to aircraft operations. During SMGCS conditions, the Airport Operations Manager will call to have the construction area cleared of all personnel and will coordinate aircraft activities on the taxiways.
12. Flagger for Haul Roads and Gates will be CDOT certified. If on the AOA they will be DIA certified. All employees operating vehicles within the AOA must comply with all applicable rules and regulations listed in the Rules and Regulations Governing the Denver Municipal Airport System; see section VI.1.D for Driver Training requirements. Construction vehicles and personnel are restricted to the immediate work area specified by the contract for this project. At no time will vehicles or personnel enter portions of the secure AOA or Terminal Buildings that are outside the contract area unless permitted under the guidelines of Access Services or accompanied by an Airport approved escort.
- a. Communications: All Communications with DIA Operations shall be through the Airport Inspectors or Project Manager.
  - b. Crossings: If approved by the Airport Operations Manager, vehicle and pedestrian crossings of active taxiways and high-use or congested ramp areas may be permitted when the following provisions are met:
    - 1) The Airport Operations Manager is notified before any activity begins and when the activity ends every day.
    - 2) Airport Operations has coordinated the activity with Air Traffic Control and has advised the DIA Project Manager when to cross.
    - 3) An Airport Operations Manager is available to contact Air Traffic Control if there are any problems.
    - 4) All personnel must yield to all aircraft. Aircraft always have the right of way.
13. Haul Routes Crossing Active Aircraft Operation Areas:
- a. The Contractors shall provide a minimum of one vacuum truck to continuously clean the surface of all pavements of any foreign objects, debris, (FOD) or other objectionable materials that may result from hauling or other construction activities. Additional vacuum trucks may be required to expedite the cleanup process for landside haul routes.
  - b. **Opening the taxiway, taxilane, runway or apron to aircraft operations shall only be approved after a visual inspection of the pavement surface by DIA Airport Operations.**

- c. The Contractor shall provide at all times a flag person at each location as indicated on the plans or as directed by the DIA Project Manager. Flaggers will need to be equipped with radios and monitor communications with DIA Operations. Flaggers will control vehicular traffic only.
  - d. A contractor haul route in and around the Taxiways will not include the paved shoulders.
  - e. The contractor may not enter the Safety Area of an active Taxiway or Taxilane without prior coordination with the DIA Project Manager and final approval from the Airport Operations Manager. All construction equipment and vehicles shall be flagged for high daytime visibility and if appropriate, lighted for nighttime operations. Vehicles, which are not marked and lighted, shall be escorted by a vehicle that is equipped with the appropriate marking and lighting devices. Marking and lighting shall be in conformance with FAA AC 150/5210-5, current issue.
14. All construction equipment, vehicles, personnel and supplies must be cleared from the taxiway safety area when directed by the DIA Project Manager or Airport Operations Management. All Contractor and Subcontractor employees must be aware of the types of safety problems and hazards associated with aircraft operations and construction activities.
  15. During performance of this contract, the airport runways, taxiways, taxilanes, and aircraft parking aprons shall remain in use by aircraft to the maximum extent possible, CONSISTENT WITH CONTINUAL SAFETY. Aircraft use of areas near the contractor's work will be controlled to minimize disturbance to the contractor's operation. However, AIRCRAFT HAVE RIGHT OF WAY AT ALL TIMES. The contractor shall not allow employees, subcontractors, suppliers, or any other unauthorized persons or equipment to enter or remain in any airport area, which would be hazardous to others or to aircraft operations.
  16. Contractor personnel, airport staff and field inspectors directly involved in airport construction shall:
    - a. Be aware of the types of conditions, safety problems, and/or hazards identified each day at the airport. To insure that all personnel are aware, daily meetings between management and supervisory personnel and their employees shall be scheduled prior to any work commencing on the shift.
    - b. Inspect all work, and/or storage areas daily for which they are responsible to be aware of current conditions.
    - c. Promptly take all steps necessary to remedy any unsafe or potentially unsafe conditions discovered. Coordinate with the DIA Project Manager to ensure immediate corrective action is undertaken.
    - d. Before commencement of construction activity, the Airport Operations Manager, through coordination with the DIA Project Manager and the contractor, shall give notice using the NOTAM system of construction on the airport.
    - e. Construction Area Marking: Runway closed crosses, temporary lighting, barricades, delineators, and flagging are required as shown on the plans. Flaglines, delineators, edge lights, and/or signs shall be used as necessary:
      - 1) To clearly separate all construction from other parts of air operations area,
      - 2) To identify isolated hazards, such as open manholes, excavations, areas under repair, stockpiled material, waste areas, etc.
  17. Vehicle and pedestrian access routes used for airport construction shall be controlled to prevent any unauthorized entry of persons, vehicles or animals.
  18. Vehicle parking areas for contractor employees shall be designated in advance to minimize traffic in open/active aircraft movement areas.

19. Contractor vehicles and equipment shall be flagged for high daytime visibility and if appropriate, lighted for nighttime operations. Vehicles, which are not marked and lighted, shall be escorted by one that is equipped with appropriate marking and lighting devices. Marking and lighting shall be in conformance with FAA AC 150/5210-5, current edition, or as outlined in Section 01016 – Vehicle and Equipment Permitting of the contract documents.
20. The Contractor will be required to conform to the specific requirements as outlined in Section 01015 – Security Requirements of the contract documents.

**J. Wildlife Management**

1. Construction contractors must carefully control and continuously remove waste or loose materials that might attract wildlife. Contractor personnel must be aware of and avoid construction activities that can create wildlife hazards on airports. This includes the following:
  - a. Trash must be collected from construction personnel activity
  - b. Standing water
  - c. Tall grass
  - d. Lower quality seeds that attract birds
  - e. Poorly maintained fences and gates
  - f. Disruption of existing wildlife habitat

**K. Foreign Object Debris (FOD) Management**

1. Construction contractors must not leave or place FOD on or near active aircraft movement areas. Materials capable of creating FOD must be continuously removed during the construction project and prior to opening any pavement surfaces. A vacuum sweeper will be used to clean the affected pavement surfaces, especially in areas where haul routes cross active taxiway pavements, to ensure all material and FOD are removed from the work site.

**L. Hazardous Materials (HAZMAT) Management**

1. Contractors operating construction vehicles and equipment on the airport must be prepared to expeditiously contain and clean-up spills resulting from fuel or hydraulic fluid leaks.

**M. Notifications of Construction Activities**

1. Airport Phone Numbers
  - a. Fire, Rescue: Operations Communications Center: 303.342.4200
  - b. Police: Denver Police Dept (dispatch): 303.342.4211
  - c. Information and Compliance - Construction Office  
Project Manager 303.342.2652
  - d. Access Services:  
ID Badging: 303.342.4300  
Airport Security: 4307  
Vehicle Permits: 4308  
Driver Qualification: 4310
2. The Contractor shall work with the DIA Project Manager regarding the construction schedule and planned activities which may require airfield pavement closures or potentially hazardous situations. The DIA Project Manager will work with airport operator staff to initiate or cancel NOTAMs. The airport operator must coordinate the issuance, maintenance, and cancellation of NOTAMs about airport conditions resulting

from construction activities with tenants and the local air traffic facility (control tower, approach control, or air traffic control center), and must provide information on closed or hazardous conditions on airport movement areas to the FAA Flight Service Station (FSS) so it can issue a NOTAM. The airport operator must file and maintain a list of authorized representatives with the FSS. Refer to AC 150/5200-28, Notices to Airmen (NOTAMs) on shutdown or irregular operation of FAA owned facilities. Any person having reason to believe that a NOTAM is missing, incomplete, or inaccurate must notify the airport operator.

3. Direct coordination between the Contractor and the DIA Project Manager will be required to foresee closures or other hazardous conditions resulting from construction activities. This information will be discussed during the weekly progress meetings.
4. This CSPP requires that the contractor notify Airport Operations in advance of any required utility shutdown or disruption, and hazardous materials on the airport.
5. In project areas where planned closures or placement of barricades will redirect, or partially interfere with ARFF operations, DIA Airport Operations will inform the ARFF personnel and the ARFF personnel will conduct practice runs with each ARFF shift after the barricades have been installed.
6. No part of this project has been designed to penetrate the Part 77 surfaces during or after construction. The FAA shall be notified if any proposed construction or alteration of objects that affect navigable airspace, as defined in Part 77. This includes construction equipment, batch plants, material stockpiles, and proposed parking areas for this equipment (i.e. cranes, graders, other equipment) on airports. FAA Form 7460-1, Notice of Proposed Construction or Alteration, can be used for this purpose and submitted to the appropriate FAA Airports or Regional or District Office. Further guidance is available on the FAA website at [oeaaa.faa.gov](http://oeaaa.faa.gov).
7. With some exceptions, Title 14 CFR Part 157, Notice of Construction, Alteration, Activation, and Deactivation of Airports, requires that the airport operator notify the FAA in writing whenever a non-Federally funded project involves the construction of a new airport; the construction, realigning, altering, activating, or abandoning of a runway, landing strip, or associated taxiway; or the deactivation or abandoning of an entire airport. Notification involves submitting an FAA Form 7480-1, Notice of Landing Area Proposal, to the nearest FAA Airports Regional or District Office.
8. For emergency (short notice) notification about impacts to both airport owned and FAA owned NAVAIDs, contact 866-432-2622.
  - a. Airport owned/FAA maintained. If construction operations require a shutdown of more than 24 hours, or more than 4 hours daily on consecutive days, of a NAVAID owned by the airport but maintained by the FAA, provide a 45-day minimum notice to FAA ATO/Technical Operations prior to facility shutdown.
  - b. FAA owned.
    - 1) General. The airport operator must notify the appropriate FAA ATO Service Area Planning and Requirements (P&R) Group a minimum of 45 days prior to implementing an event that causes impacts to NAVAIDs. (Impacts to FAA equipment covered by a Reimbursable Agreement (RA) do not have to be reported by the airport operator.)
    - 2) Coordinate work for an FAA owned NAVAID shutdown with the local FAA ATO/Technical Operations office, including any necessary reimbursable agreements and flight checks. Detail procedures that address unanticipated utility outages and cable cuts that could impact FAA NAVAIDs. In addition, provide seven days notice to schedule the actual shutdown.



**N. Inspection Requirements**

1. Daily inspections are required to ensure conformance with the CSPP.
2. A final inspection with the airport, the Contractor, and the FAA shall take place when the project has reached substantial completion.

**O. Underground Utilities**

1. Special attention should be given to preventing unscheduled interruption of utility services and facilities. The location of all cables and utilities should be identified prior to construction activities.
  - a. The Contractor shall coordinate with the DIA Project Manager, DIA Operations, FAA, National Weather Service, utility companies, and any other appropriate entity or organization as necessary to locate and identify all utilities in the project area where demolition or excavation is to occur prior to demolition or digging operations. NAVAIDS, Weather Service facilities, electric cables, and other utilities must be fully protected during the entire construction time.
  - b. Power, communication and control cables leading to and from any FAA NAVAIDS, Weather Service, and other facilities will be marked in the field by the appropriate individuals as identified in Section 01020 – Utilities Interface of the contract documents for the information of the Contractor before any work in their general vicinity is started. Thereafter, through the entire duration of construction, they shall be protected from any possible damage, including crossing with unauthorized equipment.

**P. Penalties**

1. Any employer not regulated under 49 C.F.R. Part 1544, Aircraft Operator, will be responsible for payment or reimbursement to the City & County of Denver of any Civil Penalties imposed by the Transportation Security Administration (TSA) for individual security violations by their employees for violations under 49 C.F.R. Part 1542.
2. An employee may be personally subject to Civil Penalties imposed by the Transportation Security Administration (TSA) for individual security violations they commit under 49 C.F.R Part 1542.
3. Each individual who is issued an Airport ID Badge shall comply with all Security Advisories, Denver Municipal Airport System Rules and Regulations, the Manager's Directives, and DIA Standard Policies and Procedures regarding Airport Safety, Security, and Operations. The failure of any individual to comply with such Security Advisories, rules and directives will result in the issuance of a Violation Notice and may result in the assessment of a Federal Civil Penalty and/or the denial, suspension, or revocation of Airport ID Badges.
4. No individual to whom an Airport ID Badge or Security Key(s) (including Intellikey(s)) has been issued shall intentionally perform any of the following acts as described in Denver Municipal Airport System Rules and Regulations Part 20.04-16. The intentional commission of any such acts, due to their critical negative effect on the safety and security of Airport employees and the traveling public, is reason for immediate confiscation and suspension (and possible permanent revocation) of the Airport ID Badge, issuance of a Violation Notice, and a Violation Notice Hearing in accordance with Section 20.04-8.

Denver International Airport  
Airport Security  
8500 Pena Blvd #451  
Denver, CO 80249  
Office: 303-342-4300/Fax: 303-342-4319

**Q. Special Conditions**

1. Runway 8-26 and Taxiways R, R1, R2, R3, R4, R6, R7, R8, R9, EE, L, and M will be closed in the area north of Taxiway Z for 45 calendar days (Phase 1). Taxiway Z will be closed for 15 days between Taxiways K and Z1 (Phase 3). Taxiway Z will be closed in increments for daytime closures from the intersection of Taxiway G to Taxiway Z1 and from the intersection of Taxiway K to Taxiway M (Phases 2 and 4).

**R. Runway and Taxiway Visual Aids**

1. General. All closed airfield pavement areas associated with this project will be barricaded as shown in the project phasing drawings. All runway and taxiway centerline, edge lights, and signage leading traffic into the closed areas will be turned off or covered as shown in the electrical phasing drawings. Barricades will be placed at the taxiway/taxiway intersections to denote closed taxiways.

**S. Marking and Signs for Access Routes**

1. See Section H "Contractor Access"

**T. Hazard Marking and Lighting**

1. The proposed construction areas and phases will be completely shut down to aircraft traffic through the use of barricades and lighting and sign outages as described above and in the phasing drawings.
2. Barricades will be utilized at appropriate phase limits, installed per phase requirements as shown in sheets GC101 through GC106, in order to delineate to both the Contractor's personnel and the airport user the physical limits of the project work site currently under construction. Barricades shall also be placed across closed taxiway pavement surfaces, spanning from the outside edge of the shoulder to the outside edge of the opposite shoulder to indicate that that airfield pavement is closed to aircraft traffic. All barricades will contain red steady burning or flashing lights and will be continuously placed with no spaces.

**U. Protection**

1. No construction or excavation will take place within an active Runway Safety Area and no request for modification of Runway Safety Area during construction will be necessary.
2. No construction or excavation will take place within an active Runway Object Free Area and no request for modification of Runway Object Free Area during construction will be necessary.
3. No construction or excavation will take place within an active Taxiway Safety Area and a request for modification of Taxiway Safety Area during construction will be necessary.
4. No construction or excavation will take place within an active Taxiway Object Free Area and a request for modification of Taxiway Object Free Area during construction will be necessary.
5. Construction equipment and vehicles will be limited to less than 50 feet in height within the project work limits.
6. It is not anticipated that any construction or excavation will take place within active Runway Approach and Departure Areas and Clearways will be necessary.

**V. Other Limitations on Construction**

1. Prohibitions
  - a. Equipment height limited to 50 feet within project work limits.
  - b. No use of open flame welding or torches unless fire safety precautions are provided and the airport operator has approved their use
  - c. No use of electrical blasting caps or other explosives on or within 1,000 ft of the airport property
  - d. No use of flare pots within the AOA
2. Restrictions
  - a. See phasing information on phasing restrictions.

**W. Contractor's Safety Plan Compliance Document (SPCD)**

1. The Contractor is responsible for developing and providing a Safety Plan Compliance Document (SPCD) as described in FAA AC 150/5300-2F and in Part 1 of Technical Specifications Section 01111. The Contractor is required to comply with the Construction Safety and Phasing Plan and their Safety Plan Compliance Document.
2. The Contractor shall provide six copies of its SCPD to the DIA Project Manager for review at least ten days before on-site construction begins. The Contractor's program must meet as a minimum all applicable federal, state and local government requirements.
3. The Contractor must, as part of the Contractor's Work Plan, submit six copies of the following information for review and acceptance by the DIA Project Manager prior to construction:
  - a. Name of the Contractor's site safety representative.
  - b. If the Contractor is running multiple shifts or working more than 40 hours per week, the name of an assistant Contractor's safety representative who can act in the absence of the site safety representative.
  - c. Name of the Contractor's Construction Safety and Phasing Plan (CSPP) and Safety Plan Compliance Document (SPCD) representative and alternates (if different than the site safety representative) who will be on-site at all times construction activities are taking place. The representative will be responsible for monitoring compliance with the CSPP and SPCD.
  - d. Methodology of familiarizing all Contractor and subcontractor personnel with the safety procedures and regulations on the airport. Provide a point of contact and alternate who will coordinate an immediate response to correct any construction-related activity that may adversely affect the operational safety of the airport. The point of contact or alternate must be available to supply 24-hour coverage.
  - e. Inspection plan to conduct inspections sufficiently frequently to ensure construction personnel comply with the CSPP and SPCD and that there are no altered construction activities that could create potential safety hazards.
  - f. Methods of restricting movement of construction vehicles and personnel to permitted construction areas by flagging, barricading, erecting temporary fencing, or providing escorts, as appropriate and as specified in the CSPP and SPCD.
  - g. Twenty-four hours per day emergency phone numbers of Contractor site management to be used in case of injury or accident. Provide at least four contacts.
  - h. The Contractor's method of ditching and trenching excavation to be used including how slopes will be stabilized with calculations showing the slope stability. The Contractor shall also show how material will be stored beside the excavation.

- Stored material will include the excavated and backfilled material.
- i. How injuries or accidents will be handled including samples of the forms used to report injuries or accidents.
  - j. How employees will be handled who are unable to safely perform their duties, including how the Contractor will determine whether an employee is unable to safely perform his duties.
  - k. How and when equipment will be checked to see that it is safe, that all safety guards are in place and that the equipment is being used for its designed purpose and within its rated capacity.
  - l. How and when all electric devices will be checked for proper grounding and insulation. What system will be used to lock out electric systems that should not be energized?
  - m. How trash and human organic waste will be disposed.
  - n. How snow and ice will be removed from the project area.
  - o. How concrete forms will be anchored to ensure their stability, including calculations showing that the forms will safely hold the maximum construction loads.
  - p. How flammable materials will be stored and handled, and how any spills will be cleaned up and removed for disposal.
  - q. What system will be used to prevent fires, and if fires do occur who will be trained to fight them. Also what firefighting equipment will the Contractor have available and how will this equipment's condition be monitored.
  - r. How materials will be received, unloaded, stored, moved and disposed of.
  - s. How personnel working above ground level will be protected from falling.
  - t. How people working underneath work will be protected.
  - u. What will be done to protect personnel in case of severe weather?
  - v. How adequate lighting will be provided and monitored.
  - w. How air quality will be monitored and personnel removed or protected from air that is hazardous for humans.
  - x. How the safety of work platforms, man lifts, material lifts, ladders, shoring, scaffolding, etc. will be ensured relating to load capacity and the protection of personnel using or working around them.
  - y. How employees will be protected from the effects of jet blast.
4. The Contractor shall provide complete copies of its Hazard Communication Program to the DIA Project Manager for review and acceptance at least 30 days before on-site construction begins that involves any hazardous material.
  5. The DIA Project Manager will use the OSHA regulations as the framework for reviewing the Contractor's construction safety programs.
  6. Prior to the start of any work by a contractor or subcontractor employee, the Contractor shall provide the DIA Project Manager with a list of its employees, subcontractor's employees and other personnel the Contractor has requested to work at Denver International Airport, who have signified in writing that they have been briefed on, or have read and understand, the Contractor's Safety Plan.
  7. Implement the approved Contractor's SPCD as described in Part 1 of Technical Specifications 01111. If the Contractor experiences a lost time or injury rate greater than 75 percent of the national average for all construction, the Contractor shall audit its safety procedures and submit a plan to reduce its rates. If at any time the lost time or injury rates experienced by the Contractor is 150 percent or more of the national average for construction the Contractor shall immediately hire an independent safety professional who shall audit the Contractor's procedures and operations and make a

report of changes that the Contractor should implement to reduce the rate including changing personnel. This report shall be submitted to the DIA Project Manager. The Contractor shall immediately begin implementing the recommendations. A weekly report shall be submitted by the Contractor on the status of the implementations of the recommendations. Failure to comply with these requirements is a basis to withhold a portion of progress payments.

**PART 3 - (NOT USED)**

**PART 4 - (NOT USED)**

**PART 5 - MEASUREMENT**

**5.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

**PART 6 - PAYMENT**

**6.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01112**

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## SECTION 01200

### PROJECT MEETINGS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Work specified in this Section requires the Contractor's superintendent and Quality Control representative to attend meetings scheduled by the City for the collection and dissemination of information related to the subject contract.
- B. The Project Manager will prepare the minutes of each meeting and distribute them to each of the participants.

##### 1.02 OTHER MEETINGS

- A. The Contractor will be advised of times, dates and places of contract meetings.

#### PART 2 - PRODUCTS (NOT USED)

#### PART 3 - EXECUTION

##### 3.01 PRECONSTRUCTION MEETING

- A. A Preconstruction Meeting will be scheduled by the City after the Contract has been signed by all parties. The purpose of this meeting is to introduce the City's Representatives to their counterparts in the Contractor's organization and to establish lines of communication between these representatives and outline some contract requirements. The Contractor's Superintendent and Quality Control Representative(s) shall attend this meeting.
- B. The Project Manager will distribute a notice of this meeting, along with an agenda of the subjects to be addressed.
- C. The Project Manager will explain and discuss the responsibilities and authorities of the City, the Designer, and the Project Manager's organization.
- D. The Project Manager will provide highlights of the following information at this meeting:
  - 1. Equal Employment Opportunity (EEO), Minority Business Enterprise (MBE) and Women Business Enterprise (WBE) requirements.
  - 2. Insurance, laws, codes, traffic regulations and permit requirements of public agencies and their regulations.
  - 3. Procedures for processing change orders.
  - 4. Procedures for submitting shop and working drawings, product data and samples.
  - 5. Monthly pay estimate cutoff dates.
  - 6. Payment procedures.
  - 7. Request for information procedures.
  - 8. Communication procedures.
  - 9. Contractor-required Daily Report showing the quantitative progress of work, the use of

men, material and equipment, problems, potential delays, weather, shift, down equipment, material and equipment received and information received from the City. Daily reports will be submitted to the Project Manager within 48 hours of start of work. Daily Reports are required every day, including weekends and holidays.

10. Scheduling and coordination requirements.
  11. Quality control/assurance procedures.
  12. Environmental requirements and permits.
  13. As-built documents.
  14. Project closeout requirements.
- E. The Contractor will introduce the Contractor's representatives and briefly describe each person's responsibilities. The Contractor will provide the following:
1. A list of all subcontractors.
  2. Office, storage areas and construction area layouts, along with temporary easements.
  3. Safety, first aid, emergency actions and security procedures including the name of the Contractor's insurance company.
  4. 60 day preliminary schedule.
  5. Sequence of Work.
  6. Construction methods and general worksite layout and haul plan.
  7. Housekeeping procedures. Include a written plan for dealing with and preventing FOD (Foreign Object Damage).
  8. The Contractor's general erosion and sedimentation control plans, noise, hazardous material, air and water pollution control plans and Quality Control Plan.
  9. Coordination and notification for utility work.
  10. The Contractor's procedures to coordinate its work with the work of other contractors and its procedures for sharing access to the worksite.
  11. Deliveries and priorities of major equipment.
  12. Submittal Schedule
- F. Explanations provided by the City will not amend, supersede or alter the terms or meaning of any contract document, and the Contractor shall not claim reliance on such explanations as a defense to any breach or failure by the Contractor to perform as specified in the contract.

### **3.02 CONSTRUCTION PROGRESS MEETINGS**

- A. Progress meetings will be scheduled weekly and more often as necessary by the Project Manager to promote the competent and timely execution of the contract.
- B. The meetings will be held at the worksite or at a location selected by the Project Manager. Meetings will be chaired by the Project Manager or the Project Manager's representative.
- C. The Contractor's personnel, as listed in Technical Specification Section 01200, 3.01.A, shall attend unless otherwise agreed by the Project Manager.



- D. The Project Manager will be responsible for publishing minutes of the meetings.
- E. At a minimum, the following items will be addressed at each meeting. The items addressed in the meeting do not waive notification or submittal requirements as required elsewhere in the contract.
  - 1. Safety: Contractor shall report any safety issues
  - 2. Quality Control
    - a. The Contractor's Quality Control representative shall present and review all RAR's, CCR's, and NCR's issued and the status of each item.
    - b. The Contractor's Quality Control Representative shall present and discuss the Independent Testing Agency weekly test report and/or testing schedule.
    - c. The Contractor's Quality Control representative shall report on inspections by other agencies and any follow-up activity required.
    - d. The Project Manager will present and discuss issues regarding quality control.
  - 3. Quality Assurance
    - a. The Project Manager will present and discuss issues regarding quality assurance.
  - 4. Design activities: open discussion
  - 5. Shop drawings/submittals
    - a. The Contractor shall provide four copies of and review the Contractor's submittal schedule and provide any updated information and/or changes to the schedule.
    - b. The Contractor shall provide information on the status of submittals requiring re-submittal.
    - c. The Contractor shall review any accepted submittals that the Contractor plans to re-submit with changes.
  - 6. Construction activities: Open discussion to include coordination items with other Contractors and or agencies.
  - 7. Schedule
    - a. The Contractor shall provide to the Project Manager four copies of the Contractor's three week look-ahead schedule and review at the meeting the items on the schedule. The schedule shall be in bar chart format based on the approved CPM, and shall include dates of testing activities, anticipated dates of inspection by DIA and other agencies, items in progress, percentage of completion of items, responsible subcontractor for the items.

#### **PART 4 - MEASUREMENT**

##### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

#### **PART 5 - PAYMENT**

##### **5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable multiplier or work request bid item.

#### **END OF SECTION 01200**

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## SECTION 01300

### SUBMITTALS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Work specified in this Section summarizes the requirements for the submittal of documents to the City that are defined in these Specifications. It also describes the procedures for "supplemental" submittals.

#### PART 2 - PRODUCTS

##### 2.01 SUBMITTAL SCHEDULE

- A. The Contractor shall provide a submittal schedule within 14 days after Notice to Proceed. The Submittal Schedule shall be directly related to the CPM schedule, shall identify all the submittals, and shall include the following information for each submittal item:
  - 1. Specification section, contract article, or special condition
  - 2. Specification Subparagraph
  - 3. Item description
  - 4. Date the submittal shall be submitted
  - 5. Name of subcontractor or supplier
- B. The submittal schedule shall be updated every two weeks by the Contractor and submitted with the progress payment request.
- C. One electronic submittal submitted on a single CD-ROM or DVD-ROM, or loaded into a Project Management program as required by the PM.

##### 2.02 ELECTRONIC SUBMITTALS

- A. All submittals shall be delivered to the DIA Project Manager in electronic format. The Contractor shall procure for their use during the duration of the project and closeout, a color copier/scanner capable of scanning color documents in order for them to be electronically submitted or otherwise transmitted as required in color.
  - 1. Acceptable electronic formats
    - a. Adobe Acrobat 8.0 or newer. All files shall be fully compatible with Adobe Acrobat 8.0. File shall have no security and bookmark every applicable submittal. All pages shall be completely legible and oriented to correct reading view.
  - 2. Formats are acceptable only with written permission of the project manager or required by individual spec sections:
    - a. Microsoft Office 2007 or newer. All files shall be fully compatible with Microsoft Office 2007.
    - b. AutoDesk AutoCAD 2007 or newer. All files shall be fully compatible with AutoDesk AutoCAD 2007.

- 1) AutoCAD files shall be self contained with no external x-references.
- c. Other files pre-approved by the DIA Project Manager.
3. Electronic file names: Each electronic document shall have a unique file name. File name convention shall be as follows: CEXXXX-AAA-BBBBB-CCCRZ
  - a. XXXXX = DIA contract number
  - b. AAA = sequential submittal number starting at 001.
  - c.BBBBB = specification section containing submittal requirements
  - d. CCC = sequential specification submittal number starting at 001.
  - e. RZ = sequential revision number. RZ not required on initial submittals.
  - f. Example A: "CE52006-005-01370-002", five submittals have been logged overall with two submittals made to specification section 01370.
  - g. Example B: "CE52006-009-01370-002R3, nine submittals made overall and three revisions to submittal 01370-002.

### **2.03 SUBMITTAL FORMAT – DRAWINGS**

- A. Consultant shall submit drawing data at each submittal to the City in both CADD and GIS formats including all attribute information. GIS/CADD drawing submittals shall adhere to the standards set forth in document Design Standards Manual 12 Chapter 7 CADD-GIS Data Submittal Requirements.

### **2.04 SUBMITTAL FORMAT - BUILDING INFORMATION MANAGEMENT (REVIT)**

- A. Consultant shall adhere to the standards set forth in document Design Standards Manual 12 Chapter 4 BIM.

### **2.05 INITIAL SUBMITTAL**

- A. Each submittal document shall include a title block showing the following information:
  1. Date of submittal and revision dates.
  2. Contract title and number.
  3. The names of Contractor, subcontractor, supplier, manufacturer and when applicable, the seal and signature of an engineer registered in the State of Colorado, for the involved discipline.
  4. Identification of product by description, model number, style number or lot number.
  5. Subject identification by contract drawing or specification reference.
- B. On each submitted drawing, include a blank space on each sheet, three inches by four inches, in the lower right corner, just above the title block, in which the City or the Designer of Record may indicate the action taken.
- C. Make submissions sufficiently in advance so that the City review may be completed not less than 30 days before Work represented by those submittals is scheduled to be performed.
- D. Allow a minimum cycle of 30 days for review of each submittal by the City.
- E. Accompany submittal documents with DIA transmittal form CM-30 (refer to Technical Specification Section 01999) that shall contain the following information:

1. Contractor's name, address and telephone number.
  2. Submittal number and date.
  3. Contract title and number.
  4. Supplier's, manufacturer's or subcontractor's name, address and telephone number.
  5. Identification of variations from contract documents.
  6. Contractor's stamp and signature certifying his review.
  7. Identification of submittal:
    - a. If the submittal is being made on a General Condition or Special Condition, reference the General or Special Condition number.
    - b. If the submittal is being made under a specification section, reference the specification number, paragraph number and subparagraph number.
    - c. If the submittal is being made under a drawing, reference the drawing(s) number and subnumber.
- F. The Contractor shall at the time of submission describe variations from the contract documents in writing, separate from the submittal document. If the Project Manager approves any such variations, an appropriate contract change order shall be issued except that, if the variation is minor and does not involve a change in price or in time of performance, a modification need not be issued. If a submission contains variations and the variation column is not marked on the transmittal form, it will not be considered for review and acceptance. Along with marking the transmittal as a variation, a description must be included which outlines all the differences including maintenance and utility services along with any cost savings from an item not containing the variation.
- G. Changes in accepted submittal documents will not be permitted unless those changes have been accepted, in writing, by the City.
- H. The form and quality of submittal documents shall comply with Technical Specifications Section 01340.

## **2.06 SUPPLEMENTAL SUBMITTALS**

- A. Supplemental submittal documents initiated by the Contractor for consideration of corrective procedures shall contain sufficient data for review. Make supplemental submittals in the same manner as initial submittals with the appropriate primary transmittal referenced.

## **2.07 BUY AMERICAN REQUIREMENTS**

- A. The Contractor shall provide as part of their submittal documentation from the manufacturer that steel and manufactured products to be supplied for this project are in accordance with the Buy American Act requirements, as specified on F01. Some products, such as electrical equipment and materials listed in FAA AC 150/5345-53, may not be in compliance with the Buy American Act criteria and will not be accepted for use unless the Buy American Act criteria is met.

The documentation must state that the product is manufactured in the U.S. along with the physical address of the manufacturing facility and that all components are manufactured in the U.S. in order to be 100% American made. The products must be at least 60% made in America to be accepted, if the product is less than 100% but greater than 60% then the

percentage of costs must be broken down to show those made in American and those of non- American origin. In all cases, the final manufacturing of the product must be in the U.S..

### **PART 3 - EXECUTION**

#### **3.01 CONTRACTOR'S REVIEW**

- A. The Contractor shall review submittal documents, stamp and sign as reviewed and approved as complying with contract documents prior to submission to the City.

#### **3.02 CITY REVIEW**

- A. Submittal documents will be reviewed by the City, the designer and the Project Manager for conformance to requirements of the contract drawings and specifications. Review of a separate item will not constitute review of an assembly in which the item functions. The City will withhold approval of submittals that depend on other submittals not yet submitted. Review and acceptance will not relieve the Contractor from his responsibility for accuracy of submittals, for conformity of submittal document to requirements of contract drawings and specifications, for compatibility of described product with contiguous products and the rest of the system, or for protection and completion of the contract in accordance with the contract drawings and specifications.
- B. The City, the designer, and/or the Project Manager will review the submittal documents for general conformance with the contract documents and mark the Action Code, sign and date the transmittal.
- C. The Action Codes have the following meanings:
  - 1. **A - ACCEPTED** is an approval, and means that the illustration and description appears to conform to the respective requirements of the contract documents.
  - 2. **B - ACCEPTED AS NOTED** is an approval, and means that the illustration and description will conform to the respective requirements of the contract documents after changes in recognition of the reviewer's comments. Submittals so marked need not be resubmitted.
  - 3. **C - REVISE AND RESUBMIT** means that the submittal is unacceptable and must be revised and resubmitted.
  - 4. **E - NOT ACCEPTED** means that the submittal is not approved and that a new submittal in accordance with the contract documents shall be made.
  - 5. **F - RECEIPT ACKNOWLEDGED**, means an item is received by the Project Manager but no review was made. This mark is for use in resubmitting items that were previously Accepted as Noted and the Contractor has incorporated the notes and wants the Project Managers' staff to have the same material that the Contractor's field staff is using.

#### **3.03 CONTRACTOR'S RESPONSIBILITIES**

- A. Coordinate each submittal document with the requirements of the Work; place particular emphasis upon ensuring that each submittal of one trade is compatible with other submittals of that trade and submittals of other trades including producing as needed drawings showing the relationship of the work of different trades.

- B. Contractor's responsibility for errors and omissions in submittal documents and associated calculations is not relieved by the City's review, correction and acceptance of submittals.
- C. Contractor's liability to the City, in case of variations in the submittal document from the requirements of the contract documents, is not relieved by the City's review and acceptance of submittals containing variations unless the City expressly approves the deviation in writing, in which the City describes the variation.
- D. The Contractor shall maintain a file of all approved submittal documents at the worksite. The complete file of approved submittal documents shall be turned over to the City with the as-built documents at the end of the job.
- E. Schedule impact due to resubmittal requirements is the responsibility of the Contractor.

**PART 4 - MEASUREMENT**

**4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

**PART 5 - PAYMENT**

**5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01300**

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## SECTION 01305

### PROJECT MANAGEMENT - CONTROLS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Work specified in this Section summarizes the requirements for the submittal of documents to the City that are defined in these Specifications.

#### PART 2 - PRODUCTS

##### 2.01 DOCUMENT SUBMITTAL PROCESS

- A. All Submittals, Applications for Payment, Requests for Information, Correspondence, Change Requests, pricing proposals, and settlement agreements shall be recorded and submitted using the Primavera Contract Manager program
  - 1. The Contractor shall complete and submit the application form to receive the Primavera Contract Manager (PCM) access at the time of Contract award.
  - 2. DIA will connect the software to the DIA intranet project site and train the Contractor's staff on the use of the PCM program.
  - 3. The Contractor shall provide the minimum computer hardware and software system capable of performing the listed programs below as applicable to the project, which includes the following, at a minimum.
    - a. Internet connection and all necessary high speed connection to perform all activities indicated in this contract.
    - b. Professional Adobe Acrobat X.
    - c. Internet Explorer 8 or better.
    - d. Microsoft Office. All files shall be fully compatible with Microsoft Office.
    - e. Java 1.7 update 5.
    - f. Other files per-approved by the DIA Project Manager of as required by the DIA-BIM Execution Plan in Manual 12 Chapter 4.3.2.
    - g. Revit 2012.

#### PART 3 - MEASUREMENT

##### 3.01 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

## **PART 4 - PAYMENT**

### **4.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

## SECTION 01310

### SCHEDULE (LONG-DURATION PROJECT)

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. This Section specifies the preparation of a preliminary schedule, construction schedule, related narratives and monthly progress reports, all encompassing complete performance of contract requirements.
- B. The Contractor shall schedule and coordinate the work of all of its subcontractors and suppliers including their use of the worksite. The Contractor shall keep the subcontractors and suppliers informed of the project construction schedule to enable the subcontractors and suppliers to plan and perform their work properly.
- C. The Contractor shall, in accordance with the requirements of the technical specifications, submit a construction schedule that shall provide for the expeditious and practicable execution of the Work.
- D. The construction schedule for the performance of the Work shall be a Critical Path Method (CPM) system in bar chart format, unless an alternate system is specifically identified in the technical specifications, with reasonable detail including a time scaled network and computer printout as more fully detailed in the technical specifications.
- E. Float or slack is defined as the amount of time between the early start date and the late start date or the early finish date and the late finish date of any activities in the schedule. Float or slack is not time for the exclusive use or benefit of either the Contractor or the City.
- F. The Contractor shall submit a monthly progress report and schedule update in accordance with the scheduling provisions of the technical specifications.
- G. The Contractor shall complete the Work within the contract time and in accordance with the most recent schedule submittal that has been approved in writing by the Project Manager.

##### 1.02 PLANNING

- A. The schedule shall show the total contract time, including project milestones, as indicated in the Special Conditions or elsewhere in the contract documents.
- B. The Contractor shall prepare a work plan to complete the work within the contract time and complete those portions of work relating to each milestone date and other contract requirements. The Contractor shall generate a computerized Critical Path Method (CPM) schedule for the Work utilizing the Precedence Diagram Method (PDM) in Gantt Chart view. The computerized format shall be compatible with the City's Primavera system (Primavera Contractor, Primavera 3.1 or Primavera P6 or later). The Schedule shall be submitted to the Project Manager electronically in PDF format and on a CD in a dynamic format which will allow review and manipulation of any part of the schedule. The schedule activities shall be resource loaded showing labor man hours, major construction equipment by type, and value of the work. The value of the work shall summarize each pay item shown in the Schedule of Values and balance to their amount.

- C. In addition to the construction activities the schedule shall include activities for furnishing materials and equipment and vendor shop drawing preparation. The construction schedule, a supporting narrative, and overall progress curve shall be submitted for approval within 30 days after Notice to Proceed. The overall progress curve will indicate planned progress monthly from start to finish of the project. The progress curve will be updated monthly with actual progress. Within 30 days the City will respond with approval or direction to revise and resubmit within ten days. Failure of the Contractor to have a construction schedule approved by the City will be considered cause for withholding progress payment(s).
- D. To the extent that the construction schedule or any revisions thereof contains anything not jointly agreed upon in writing, or fails to show anything jointly agreed upon in writing, it shall not be considered to have the approval of the City. Failure to include any work item required for performance of this contract shall not excuse the Contractor from completing all work within applicable completion dates, regardless of the City's approval of the schedule.
- E. Failure of the Contractor to comply with this Section will be considered cause for withholding progress payment(s) or termination for default.

### **1.03 SUBMITTALS**

- A. Refer to Technical Specifications Section 01300 for submittal procedures. Submit the following as indicated:
  - 1. Preliminary schedule (with narrative) at Preconstruction Meeting
  - 2. Construction schedule (with narrative and progress curve)
  - 3. Monthly progress report (with narrative and updated progress curve)
  - 4. Construction schedule change request (as needed)
  - 5. As built construction schedule.

## **PART 2 - PRODUCT**

### **2.01 PLOT AND REPORT FORMAT**

- A. Preliminary and Construction Schedule formats shall contain a title block with a minimum 18-point font showing:
  - 1. Contractor's name
  - 2. Contract number and title
  - 3. Data date
  - 4. Symbol definitions
- B. Schedules shall contain a time line at the top.
- C. The Activity Table (Layout) shall include at a minimum the following columns:
  - 1. Activity ID
  - 2. Activity Name
  - 3. Original Duration
  - 4. Schedule % Complete

5. Start
  6. Finish
  7. Total Float
- D. A report shall accompany all schedules containing a list of all approved changes to the original approved (baseline) schedule.
- E. Reports shall be submitted electronically in PDF format, or as directed by the Project Manager.

### **PART 3 - EXECUTION**

#### **3.01 PRELIMINARY SCHEDULE**

- A. The Contractor shall prepare a preliminary schedule covering the first 60 calendar days of the contract. This preliminary schedule shall be submitted at the Preconstruction Meeting and shall be accompanied by a narrative description of the work plan. Within 14 days, the City will respond with acceptance or direction to revise and resubmit within ten days.
- B. The preliminary schedule shall show all significant work tasks that occur in the first 60 days, including planning, mobilization, shop submittals and approval time, procurement, fabrication and construction. It shall identify work items or milestones that affect or are affected by the City, other Contractor's work, utilities and other third parties and it shall list major data submittals required by the contract.
- C. The preliminary schedule shall accompanied by a narrative describing the Contractor's approach to mobilization, procurement and construction during the first 60 days. The narrative shall elaborate on the basis of durations, production rates, and major equipment to be used, and shall identify all major assumptions used to develop the schedule.
- D. In lieu of the Preliminary Schedule the Contractor may at his own discretion submit the Construction Schedule at the Preconstruction Meeting. If the Construction Schedule is submitted in lieu of the Preliminary Schedule, the City will respond within 30 days with acceptance or direction to revise and resubmit within 10 days.

#### **3.02 CONSTRUCTION SCHEDULE**

- A. The construction schedule shall be a computerized CPM schedule utilizing the PDM formatted in Gantt Chart View that includes:
1. Work items identified in a Work Breakdown Structure (WBS) format that corresponds with the technical specifications.
  2. The order, sequence and interdependence of all significant work items including construction procurement, fabrication, testing, startup and inspection, and delivery of critical or special materials and equipment, submittals and approvals of critical samples, shop drawings, procedures or other documents that could have a schedule impact.
  3. Work items by the City, other Contractors, utilities and other third parties that may affect or be affected by Contractor's activities.
  4. Proper referencing of all work items to identify applicable subcontractors or other performing parties.
  5. Work item durations shall not exceed 20 working days. No more than 25 percent of the

- work item may be on the critical path.
6. Work items shall be resource loaded to show the direct craft manhours estimated to perform the work including work by subcontractors and the value of the work.
  7. A narrative that explains the basis for the Contractor's determination of construction logic. It shall include estimated quantities and production rates, hours per shift, work days per week, and types, number and capacities of major construction equipment to be used and whether the Contractor plans to work weekends or holidays.
- B. The construction schedule shall be prepared to include the data for the total contract duration and the critical path shall be identified, including critical paths for interim completion dates. Scheduled start or completion dates imposed on the schedule by the Contractor shall be consistent with contract milestone dates. Milestone events shall be the schedule dates specified in the Special Conditions and shall be prominently identified and connected to the appropriate work item, denoting its start or completion. Work items related to any interim milestone shall be coded for that milestone.
- C. The Contractor shall submit the following documents to the City upon completion of preparation of the construction schedule:
1. A time phased CPM schedule utilizing the PDM showing all logic ties and the Gantt Chart view on a CD and an electronic copy in PDF format.
  2. A physical progress curve showing either manpower or other appropriate key contract items derived from the construction schedule approved by the project manager and against which physical progress performance will be measured for schedule and payment purposes. The physical progress curve will indicate planned progress monthly from start to finish of the project.
  3. The narrative described in Technical Specifications Section 01310-3.02.A.7.

### 3.03 PROGRESS REPORTING

- A. The Contractor shall submit a monthly progress report at the end of each month following the Notice to Proceed. At the end of each month, the Contractor and Project Manager shall agree on the progress of the work and the Contractor shall update the construction schedule accordingly. The updated construction schedule is a prerequisite to the submittal of the Contractor's application for progress payment. The schedule shall be made in accordance with Technical Specifications Section 01310-3.02. This review does not constitute an approval of the construction schedule and shall not be used for the purposes of modifying the initially approved construction schedule.
- B. The Contractor shall submit the monthly progress report consisting of a written narrative, an updated schedule and a physical progress curve. This report will be reviewed in a meeting between the Contractor and Project Manager.
1. The narrative report shall describe overall progress of the work, provide a critical path analysis, discuss significant problems with proposed corrective action, and show the status of major changes and any other changes in sequence of the work.
  2. A Gantt chart schedule shall be provided showing the Contractor's completion status (progress) on each work item along with logic ties and formats described in Technical Specifications Section 01310-3.02.C.1.
  3. The physical progress curve shall be updated to show actual progress.

- C. If the latest completion time for any work item does not fall within the time allowed by the construction schedule, the sequence of work and/or duration shall be revised by the Contractor through concurrent operations, additional manpower, additional shifts or overtime, additional equipment, or alternative construction methods until the schedule produced indicates that all significant contract completion dates, occupancy dates and milestones will be met. No additional costs will be allowed if such expediting measures are necessary to meet the agreed completion date or dates except as provided elsewhere in the contract documents.

### 3.04 SCHEDULE CHANGES

- A. The Contractor's request for construction schedule changes shall be made on the latest approved construction schedule and shall be accompanied by a narrative description and justification for the change and shall be submitted in accordance with the General Conditions Title 1105 on changes in time. Minor revisions submitted at monthly progress review meetings are not considered as changes in this context.
- B. The construction schedule may be changed when one or more of the following occur:
  - 1. When a change order significantly affects the contract completion date or sequence of work items.
  - 2. When the Contractor elects to change the sequence or duration of work items affecting the critical path.
  - 3. When the City directs a change that affects a milestone date(s) specified in the Special Conditions or alters the length of a critical path.
- C. If, after submitting a request for change to the construction schedule, the Project Manager does not agree with the request, the Project Manager will schedule a meeting with the Contractor to discuss the differences. If a settlement cannot be reached on the change in the construction schedule or if the Contractor has failed to submit revisions to the network, the Project Manager has the option of providing suggested logic and/or duration times in all subsequent updating reports. The suggested logic and/or duration times will remain in effect until the change in the construction schedule is settled or until the logic and duration are superseded.
  - 1. If the Contractor has any objections to the data furnished by the Project Manager, he shall advise the Project Manager within ten days in writing, fully supporting the objections with a counterplan. The revisions suggested by the Project Manager shall be used for updating reports until the Project Manager approves the counterplan.
  - 2. If the Contractor does not submit a counterplan and data within ten days after the date of the Project Manager's suggested logic, the Contractor is deemed to have concurred with the Project Manager's suggested logic/duration time changes. The Project Manager's plan will be the basis of negotiations for any adjustment of the time and cost for performance of the Work.

### 3.05 CONTRACT EXTENSIONS

- A. If the Contractor is granted an extension of time for completion of any milestone or contract completion date under the provisions of the contract, the determination of the total number of extended days will be based upon the current analysis of the schedule and upon all data relevant to the extension. Such data shall be incorporated in the next monthly update of the schedule.

- B. The Contractor acknowledges and agrees that delays in work items which, according to schedule analysis, do not affect any milestone dates or the contract completion date shown on the CPM network at the time of the delay will not be the basis for a contract extension.

### **3.06 AS-BUILT CONSTRUCTION SCHEDULE**

- A. After all contract work items are complete, the Contractor shall submit an as built construction schedule showing actual start and finish dates for all work items and milestones.

## **PART 4 - MEASUREMENT**

### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

## **PART 5 - PAYMENT**

### **5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01310 (LP)**



## SECTION 01340

### SHOP AND WORKING DRAWINGS, PRODUCT DATA AND SAMPLES

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Work specified in this Section consists of preparing and submitting shop and working drawings, product data, samples and record documents required by other technical specifications sections.
  - 1. The Contractor shall submit all shop drawings, working drawings, product data and samples, as defined in Title 1 of the General Conditions, to the Project Manager in accordance with the requirements in the technical specifications. The Project Manager will return one copy of the shop drawings, working drawings and product data to the Contractor with a written transmittal within the time periods noted in the technical specifications.
- B. The Contractor shall not submit as shop drawings copies or reproductions of drawings issued to the Contractor by DIA.

##### 1.02 SUBMITTALS

- A. Refer to Technical Specifications Section 01300 for submittal procedures.
- B. All submittals shall be delivered to the DIA Project Manager in electronic format. All submittals must be of a consistent format (all Acrobat or all Word, etc). No combination of electronic file types will be allowed unless required by a specific specification section..
  - 1. Acceptable electronic formats
    - a. Adobe Acrobat 8.0 or newer. All files shall be fully compatible with Adobe Acrobat 8.0
    - b. Microsoft Office 2007 or newer. All files shall be fully compatible with Microsoft Office 2007.
    - c. AutoDesk AutoCAD 2007 or newer. All files shall be fully compatible with AutoDesk AutoCAD 2007.
      - 1) AutoCAD files shall be self contained with no external x-references.
    - d. Other files pre-approved by the DIA Project Manager
  - 2. Adobe Acrobat Requirements:
    - a. Drawings shall have security set to “No Security”. Commenting, printing, adding photos, form fields and document signing must be allowed.
    - b. PDF submittals shall be one continuous file. No external links are allowed.
    - c. All individual components of submittals shall be bookmarked inside the PDF file.
    - d. All original documents shall be directly converted from the original electronic format to PDF. Scanning of files shall only be allowed by the DIA Project Manager when the original electronic information is not obtainable.
    - e. Failure to comply with these requirements will result in a return of file to the Contractor for immediate revision.
  - 3. Electronic files submitted shall correspond with DIA File Control Numbering System available from the DIA Project Manager. All files shall contain the prefix

**CEXXXX.14.02.submittalnumber.specsection.item.revision.**

- a. SUBMITTALNUMBER attribute shall be obtained from the DIA Project Manager.
- b. SPECSECTION attribute shall be a five digit number corresponding to the specification section requiring submitted data.
- c. ITEM attribute will be a two digit number designating the corresponding submittal item number.
- d. REVISION attribute will be for revised and resubmitted submittals, an "R" followed by a number (IE: R3).

**C. Quantities**

1. One DVD-ROM or CD-ROM containing electronic files of each shop or working drawing.
2. One DVD-ROM or CD-ROM containing electronic files of manufacturer's standard schematic drawings.
3. One DVD-ROM or CD-ROM containing electronic files of manufacturer's calculations and manufacturer's standard data.
4. One DVD-ROM or CD-ROM containing electronic files of manufacturer's printed installation, erection, application and placing instructions.
5. Nine samples of each item specified in the various specification sections, unless otherwise specified.
6. One DVD-ROM or CD-ROM containing electronic files of inspection, test reports and certificates of compliance.
7. Note: If manufacturer's printed information is in color, all copies of submittals must be in color.

**D. Review**

1. Submittal review comments by the City will be in electronic form and incorporated into the electronic submittal file.
2. Resubmittals of electronic documents shall modify the original electronic file with new information and include the City's comments with appropriate responses and additional information.

**1.03 CHANGES**

- A. Changes in products for which shop or working drawings, product data or samples have been submitted will not be permitted unless those changes have been accepted and approved in writing by the Deputy Manager of Aviation as provided in Technical Specifications Section 01630.

**1.04 QUALITY CONTROL**

- A. Shop drawings and record documents shall be prepared to a high standard of quality such as that set forth in MIL STD 100, ANSI Standard Drafting Manual Y14 or other equivalent specification defining equal drafting quality for microfilming.

**PART 2 - PRODUCTS**

**2.01 SHOP AND WORKING DRAWINGS**

- A. Prepare shop and working drawings on a reproducible sepia sheet size of 24 x 36 inches to a scale large enough to easily depict and annotate each of the various items.
- B. Include the following as they apply to the subject:
  - 1. Contract title, work order and number.
  - 2. Respective contract drawing numbers.
  - 3. Applicable specification section numbers.
  - 4. Relation to adjacent structure or materials.
  - 5. Field dimensions clearly identified as such.
  - 6. Applicable standards such as ASTM or Federal Specification number, FAA, AASHTO and pertinent authority specifications or standards.
  - 7. Identification of deviations from the contract drawings and specifications.
  - 8. Drawing name, number and revision.
  - 9. Contractor's stamp, initialed or signed, certifying:
    - a. Verification of field measurements.
    - b. Review of submittals for compliance with contract requirements.
    - c. Compatibility of the Work shown thereon with that of affected trades.
  - 10. Blank space on each sheet per Technical Specifications Section 01300, paragraph 2.02.B.
- C. Drawings of equipment and other items that contain multiple parts shall include exploded views showing the relationship of parts and the description of the parts into the smallest units that may be purchased or serviced.

## 2.02 PRODUCT DATA

- A. Modify manufacturer's standard and/or schematic drawings to delete information which is not applicable to the contract. Supplement standard information with additional information applicable to this contract.
- B. Modify manufacturer's standard(s), diagrams, schedules, performance charts, illustrations, calculations and other descriptive data to delete information which is not applicable to the contract. Indicate dimensions, clearances, performance characteristics and capacities. Include with the submittal electrical, plumbing, HVAC and any other diagrams, as applicable.
- C. Modify erection, application and placing instructions to delete information that is not applicable to the contract or work order.
- D. Include the following:
  - 1. Contract title, work order and number
  - 2. Respective contract drawing numbers
  - 3. Applicable contract technical specification section numbers
  - 4. Applicable standards such as ASTM or Federal Specification number, FAA, AASHTO and pertinent authority specification or standards
  - 5. Identification of deviations from the contract drawings and specifications

6. Contractor's stamp, initialed or signed, certifying:
  - a. Dimensional compatibility of the product with the space in which it is intended to be used
  - b. Review of submittals for compliance with contract requirements
  - c. Compatibility of the product with other products with which it is to perform or which will be next to it.
  - d. The products electrical, plumbing, control and HVAC requirements conform to contract documents and the necessary utilities are provided for in the contract documents.
- E. Certificates of compliance shall be submitted for all products, assemblies, and bulk materials.
  1. Exceptions: Certified Airport Lighting Equipment listed in FAA Advisory Circular No. 150/5345-53, latest version, *Airport Lighting Equipment Certification Program*.

The certificate of compliance shall:

    - a. State that the product complies with the respective specification and contract drawing requirements
    - b. Be accompanied by a certified copy of test results pertaining to the product
    - c. Show the submittals date, Contractor's name and address, contract title and number, product represented and its location in the contract, producer's name, product trade name and catalog number, place of product origin, test date, testing organization's name and address, quantity of the product to be furnished and related contract drawing and specification section numbers
    - d. Be signed by an officer or another authorized representative of the producer and notarized
    - e. Submit one electronic copy.
    - f. Be received by the City not later than 30 days before the acceptance is needed of the products for ordering.

## 2.03 SAMPLES

- A. Submit samples of sizes and quantities to clearly illustrate full color range and functional characteristics of products and materials including attachment devices.
- B. Erect field samples and mock ups at the worksite as specified in the several technical specifications sections and at locations acceptable to the Project Manager. All field samples shall be erected in a location that will be readily visible throughout the life of the contract to allow comparison of the work as it progresses to the field sample.
- C. The Contractor shall verify, through appropriate inspections and tests, that the samples submitted meet the specifications and shall provide inspection and test data with the samples. The review and comments on the sample shall not relieve the Contractor of his responsibility for completion of the contract.
- D. Show the following information:
  1. Contract title and number
  2. Respective contract drawing numbers
  3. Applicable technical specification section numbers

4. Applicable standards such as ASTM or Federal Specification number
5. Identification of deviations from the contract drawings and specifications
6. Contractor's stamp, initialed or signed, certifying:
  - a. Dimensional compatibility of the product with the space in which it is intended to be used
  - b. Review of submittals for compliance with contract requirements
  - c. Compatibility of the product with other products with which it is to perform or which will be next to it
7. If multiple samples are submitted and the Project Manager is requested to make a choice, each sample shall have a unique identification number attached to it so the returned transmittal can state the identification number of the accepted sample and the Contractor will know which one it is.

### **PART 3 - EXECUTION**

#### **3.01 CONTRACTOR RESPONSIBILITIES**

- A. Reference requirements of General Conditions Article 405.
- B. Verify field measurements, catalog numbers and similar data.
- C. The Contractor shall not start work for which submittals are required until a transmittal has been received by the Contractor showing acceptance or acceptance as noted by the Project Manager.
- D. Before making submittals ensure that products will be available in the quantities and at the times required by the contract.
- E. Submit final, corrected, reproducible sepias of contract and shop and working drawings showing the Work as actually installed, placed, erected and applied. Refer to Technical Specification Section 01700, Contract Closeout.

#### **3.02 REVIEW BY THE CITY**

- A. One electronic copy of the marked-up shop and working drawing and one electronic copy of the product data will be returned to the Contractor by the Project Manager. Only the transmittal form, appropriately marked, will be returned on sample submittals.
- B. Contractor's responsibility for errors and omissions in submittals for compatibility will not be reduced, waived or otherwise limited by the review and acceptance of submittals by the City.

### **PART 4 - MEASUREMENT**

#### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

### **PART 5 - PAYMENT**

#### **5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work

described in this Section shall be included in the applicable multiplier for the division under which the work falls.

**END OF SECTION 01340**

## SECTION 01370

### SCHEDULE OF VALUES

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Work specified in this Section consists of preparing and submitting the Schedule of Values (“Schedule”) as referenced in the General Conditions. The Schedule will be built upon a breakdown of the Work using specification sections and milestones. The Work also includes the preparing and submitting of updated copies of the Schedule if the Schedule is affected by change orders.
- B. A Schedule of Stored Material is a detailed cost breakdown for permanent materials that will be temporarily stored prior to their being installed and for which the Contractor seeks partial payments. The Schedule of Stored Material will be incorporated as a part of the Schedule of Values.
- C. Within 14 calendar days of issuance of the Notice to Proceed, the Contractor shall submit the Schedule of Values including the Schedule of Stored Material if applicable. The Schedule of Values and Schedule of Stored Material used to prepare the work/cost breakdown for the Schedule will be used for the Contractor’s billings.
- D. Any contract allowances shall be included in the Schedule. Expenditure of allowances shall be done through the use of the Allowance Authorization form. Use of this form does not increase or decrease the contract value.

##### 1.02 RELATED DOCUMENTS

- A. General Contract Conditions, Title 9 Compensation
- B. Technical Specifications Section 01300 Submittals
- C. Technical Specifications Section 01340 Shop and Working Drawings, Product Data and Samples
- D. Technical Specifications Section 01999 Standard Forms

##### 1.03 SUBMITTAL

- A. The Schedule shall be submitted in a format approved by the Project Manager.
- B. The Schedule shall identify each item of work. Work items in the Schedule shall represent all work and shall be referenced with the Technical Specifications section numbers, specification subparagraph, specification section title and the bid item number used for the Schedule of Prices and Quantities when applicable. The Schedule shall address the subcontractor, fabricator or supplier furnishing the materials and or labor for each work item.
- C. Upon request by the City, the Contractor shall support values given with the data which will substantiate the correctness of the values.

- D. The Schedule will be utilized only as a basis for review of the Contractor's application for progress payment.

#### **1.04 REVIEW AND RESUBMITTAL**

- A. If review by the City indicates that changes to the Schedule are required, the Contractor shall revise and resubmit the Schedule.

### **PART 2 - PRODUCTS (NOT USED)**

### **PART 3 - EXECUTION**

#### **3.01 PREPARING SCHEDULE OF VALUES**

- A. Breakdown of the items used in the Schedule shall include costs as follows:
  1. Delivered cost of product with applicable taxes paid
  2. Total installation cost with overhead and profit
  3. Breakdown costs of each lump sum item with a list of products and major operations for which the Contractor seeks to receive progress payments to recover his costs for that bid item
  4. Each unit price item as listed in the bid Schedule of Prices and Quantities shall list products and major operations for which the Contractor seeks to receive progress payments for that bid item.

#### **3.02 PREPARING SCHEDULE OF STORED MATERIAL**

- A. The Contractor shall submit with the Schedule an indication of whether products will be stored on or off the worksite. The Schedule of Stored Material shall show quantities and types of products that will be stored.
- B. Material allowances consist of only the net cost of the product, the cost of delivery and unloading at the storage site, the cost of applicable sales taxes and all discounts.
- C. In no case will the cost paid for a permanent material be greater than 90 percent of the contract price for the work in which they are included.

#### **3.03 PAYMENT FOR STORED MATERIALS**

- A. Only materials that are described in the specifications and on the drawings will be considered permanent materials. Permanent materials are materials that will be left in the work after the contract is completed.
- B. Nothing in these specifications shall be interpreted as requiring the City to pay for stored materials. The Project Manager shall decide on a case-by-case basis whether stored materials shall be paid for. No payment will be made for stored materials which have not been submitted and accepted.
- C. The Contractor must, at all times, store permanent materials in accordance with manufacturer's recommendations. Any material not properly stored will not be paid for. Amounts will be deducted from payments for any stored permanent material previously paid for and subsequently found to be improperly stored or not present, based upon a physical inventory of stored permanent material.



- D. Only the neat line quantity of material needed for the finished product may be paid for.
- E. All requests for stored permanent material payment must be accompanied by paid invoices clearly showing the quantity of permanent material, the type of permanent material and discounts or rebates and the net amount paid to the supplier along with a certificate stating that the permanent material is free of any liens or judgments preventing its use by the City.
- F. If the permanent material is stored outside the Denver area the Contractor must pay for the City representative's transportation and lodging to see the stored material as needed. Acceptable lodgings must, as a minimum, have a Mobil Travel Guide Rating Criteria® rating of Two-Star or the American Automobile Association Lodging Listing Requirements & Diamond Rating Guidelines® rating of Two Diamonds. The minimum transportation shall be by regularly scheduled commercial air carrier at coach rates. The Project Manager will determine if an overnight stay is required.
- G. All permanent material stored off site, for which payment is being requested must be insured and stored in bonded, insured warehouses.
- H. Any permanent material on which payment is requested must be in such a form that it cannot be used on work other than this contract, or stored in a manner acceptable to the Project Manager to ensure that the permanent material cannot be used on work other than this contract.

### **3.04 ALLOWANCE AUTHORIZATION AND PAYMENT**

- A. Contractor shall request written approval for expenditure of any contract allowances PRIOR TO performing the Work involved. List work to be performed and estimated cost in the requesting correspondence.
- B. Original copies of all invoices and receipts must be submitted with the Allowance Authorization as part of the request for payment.
- C. Using the format provided by the City, the Contractor's request for payment of all contract allowances shall be included in the Schedule of Values.

## **PART 4 - MEASUREMENT**

### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

## **PART 5 - PAYMENT**

### **5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01370**

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## SECTION 01380

### CONSTRUCTION PHOTOGRAPHS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Work specified in this Section consists of photographing construction and of submitting photographic prints. In digital format.

##### 1.02 QUALITY CONTROL

- A. Provide digital photographs with sharp and clearly shown details.

##### 1.03 SUBMITTALS

- A. Refer to Division 1, Technical Specifications Section 01300 for submittal procedures.
- B. Submit digital photographs of such quality that when printed in an 8x10 inch format, prints will be sharp and clear.
- C. Photographs shall be submitted to the Project Manager weekly, or as otherwise indicated, to show the progress of work. Photos shall be submitted on CDROM or DVDROM. Label CD/DVD and case with the contract name and number, photograph numbers, date of photos, and name of photographer or Photography Company. Include a map showing the location where each photograph was taken and the direction of the photograph to coincide with the numbers on the photographs.
- D. The Contractor shall provide the DIA Project Manager, within fifteen (15) days from Notice to Proceed (NTP), a 10.1 mp Nikon Cool Pix P80, or other model approved by DIA Project Manager, digital camera with date and time stamp function, including all standard specifications, or equal as approved by the DIA Project Manager. The following additional accessories shall be provided:
  - One (1) spare Li-ion battery, number EN-EL5 (or equivalent for model of camera supplied), one (1) camera carrying case, two (2) each 4 GB SD memory cards (or memory compatible for camera supplied). The City will take possession of the camera and accessories.

#### PART 2 - PRODUCTS

##### 2.01 PHOTOGRAPHS

- A. Provide commercial quality, digital color photographs in PDF format. PDF file shall be security-free, bookmarked by date with all photos rotated to the correct orientation. Identify the following information on each photograph on the lower right corner.
  - 1. Project title and number
  - 2. Subject description (include work order number or change order number if applicable)
  - 3. Station point of camera and direction of view. Include letter size diagram of project indicating Station point

4. Date taken
5. Name of Contractor.
6. Photograph number

### **PART 3 - EXECUTION**

#### **3.01 TIMES FOR PHOTOGRAPHY**

- A. Photograph the worksite each week or as directed by the Project Manager.
- B. Location of views and time of photography will be as required by the Project Manager.
- C. Number photographs in sequence, beginning with the number one and locate them on a key map, including an arrow to show the camera's line of site.
- D. Photograph the worksite within five days of the date of Notice to Proceed. Include the proposed haul route showing existing damage if any.
- E. A minimum of 24 different locations shall be required to clearly depict the various properties of the worksite.
- F. After construction operations have been initiated at the worksite, and until completion and acceptance of the Work, make the following photographs:
  1. Photograph the area around the Work at eight (8) locations or number of locations directed by DIA Project Manager.
  2. Photograph the area inside the Work at sixteen (16) locations or number of locations directed by DIA Project Manager.
- G. The location of views to be photographed, the day and time of photographing will be as required by the Project Manager.

### **PART 4 - MEASUREMENT**

#### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

### **PART 5 - PAYMENT**

#### **5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this section. The cost of the work described in this section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01380**

## SECTION 01401

### INDEPENDENT TESTING AGENCY

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Contractor shall employ the services of an Independent Testing Agency (ITA). This Section identifies the requirements for the Contractor to employ an Independent Testing Agency and identifies the required activities of the Independent Testing Agency.
- B. Laboratory and field testing requirements to be conducted by the ITA for materials and construction on this project are included in the appropriate technical specifications. Where the technical specifications reference the CDOT Standard Specifications for Road and Bridge Construction, the references shall also mean CDOT Field Materials Manual for schedule of tests unless otherwise stated. As a minimum the ITA described in this section shall perform all applicable tests listed in the manual including the independent assurance sampling and testing. In the event of such a conflict between the schedule and a specification in these technical provisions, the more comprehensive testing shall govern unless otherwise noted.
- C. Inspections and tests conducted by the ITA shall not in any way relieve the Contractor of his responsibility and obligation to meet all specifications and referenced standards. Employment of the ITA does not relieve the Contractor of providing the required Quality Control program.
- D. When inspections or tests by the ITA prove that the item or material does not meet all applicable specifications and requirements, the cost incurred for the re-testing or re-inspection shall be borne by the Contractor (see paragraph 5.01 of this Technical Specifications Section).
- E. Samples will only be considered if taken at random. The Contractor shall permit representatives of the City to witness the selection of samples. Inspection or tests of items or materials that fail shall be sufficient cause to terminate further inspections/tests of the same brand, make or source of that product.
- F. The Contractor is obligated to correct any item deemed deficient at no additional cost to DIA.

##### 1.02 RELATED DOCUMENTS

- A. ASTM C 1077 - Standard Practices for Laboratory Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
- B. ASTM D 3666 – Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
- C. ASTM D 3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
- D. ASTM E 329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing

- E. ASTM E 543 - Specification for Agencies Performing Nondestructive Testing.
- F. Standard testing practices for other disciplines.

### 1.03 SUBMITTALS

- A. All submittals shall comply with requirements of Technical Specifications Sections 01300 and 01340 for submittal requirements.

### 1.04 CONTRACTOR SUBMITTAL OF PROPOSED TESTING AGENCIES

- A. The Contractor shall employ the services of an Independent Testing Agency (ITA) that has been accredited by AASHTO or CCRL or an approved equal to perform the test(s) required in the contract. The ITA may also provide technicians to perform the required inspections. However, inspection and testing cannot be performed simultaneously by the same technician. The Contractor shall receive written acceptance from the Project Manager of the Independent Testing Agency prior to any permanent work being installed or tested.
- B. The Contractor shall not submit for acceptance to the DIA Project Manager any testing agency or laboratory utilized in the design or construction document preparation or presently employed by DIA as part of DIA Quality Assurance.
- C. For consideration of acceptance, the Contractor shall submit to the DIA Project Manager the following items received from the ITA:
  - 1. Affidavit of current accreditation from a national certification and/or accreditation program.
  - 2. Evidence that the ITA Laboratory is accredited to perform the testing required in the Technical Specifications.
  - 3. Resumes and evidence of professional engineer registration and licensing in the State of Colorado for the personnel reviewing and signing test reports.
  - 4. Resumes and current certifications verifying that ITA management and supervisory personnel, laboratory staff, field testing technicians, and inspecting technicians are qualified in accordance with ASTM C 1077, D 3666, D 3740, and E 329 requirements to perform the work. NICET, ACI, WAQTC, LabCAT, CDOT, NRMCA, PCA, AWS, ASNT certifications or a degree in a related engineering field with construction field experience can demonstrate qualifications. A list summarizing all management, supervisory, laboratory, field testing, and inspection personnel assigned to the project including the testing and/or inspection each individual will be performing, certifications held by each individual, and the expiration date of each certification.
  - 5. A matrix indicating each technical specification section, paragraph, quantity and type of sampling and/or testing required.
  - 6. Copies of all laboratory, field testing, and inspection report forms.

### 1.05 SUBMITTAL OF REPORTS

- A. Test results shall be submitted by the Contractor to the DIA Project Manager after completion of inspections/tests by the ITA and prior to incorporation of the item(s) into the Work unless the test or inspection must be done during or after installation.

All field test results including but not limited to fresh concrete properties and in-place

moisture-density shall be reported in legible draft form to the DIA Inspection immediately at the test site. Any failing test shall be reported separately to the DIA Inspector or DIA Project Manager within 2 hours after the discovery. The draft test results shall also be attached to the Daily Quality Control Inspection Report (reference Technical Specifications Section 01400, paragraph 1.02.D) and transmitted to the DIA Project Manager on the next work day.

- B. Typed test reports shall be provided to the DIA Project Manager as specified in paragraph 1.06 Weekly Reports. The test reports shall be numbered sequentially in chronological order. Individual tests shall be numbered sequentially. The reports and tests shall also be organized per specification section. All test results must be reviewed and signed by a registered licensed engineer in the State of Colorado. The signature represents that the test procedures used are in strict conformance with the applicable testing standard, the calculated data are true and accurate, the tools and equipment used were in calibration, the sample was not contaminated and the persons running the test were qualified.
- C. Test results for P-152 and P-209 shall be reported on the attached FAA Appendix 10 and included in the Weekly Report. Upon completion of the project an electronic copy in the original Word format shall be submitted to the Project Manager.
- D. Reports of inspections and test activities are record documents and shall be maintained in a manner that provides integrity of item identification, acceptability and traceability. Reports shall identify the following:
  - 1. Contractor's name
  - 2. DIA Contract number and title
  - 3. Independent Testing Agency name
  - 4. Name of item(s) inspected/tested including a physical description and, as applicable, model and make
  - 5. Quantity of items
  - 6. Inspection/test procedure used. If national standards are used, any deviation from these standards
  - 7. Date the sample was taken and the date the test was made
  - 8. Location (by coordinates, building grid or station number) of where tests and/or samplings were performed including environmental condition where applicable. Include plan drawing indicating location of test and work item sampled or tested
  - 9. Name of inspector/tester
  - 10. In the event the testing or sampling is a re-test or re-sampling, reference the previous respective testing or sampling report
  - 11. Specified requirements in the contract that the item must meet. Include reference to technical specification section and paragraphs
  - 12. Acceptability
  - 13. Deviations/nonconformance
  - 14. Corrective action
  - 15. Evaluation of results
  - 16. All information required for the specific test as specified in the applicable ASTM standard

17. Signature of authorized evaluator.

### **1.06 WEEKLY SUMMARY REPORTS**

- A. The ITA and Quality Control Manager shall prepare and submit to the DIA Project Manager a weekly summary report each week which summarizes by specification section all work activities and results for the quality control tests and inspections conducted during that period. The weekly summary report shall be submitted within two (2) weeks from the end of the reporting period. At a minimum, the weekly summary report shall identify all inspections, test types, test locations, testers, test results, specifications, whether the test passed or failed, quantity of materials placed and the number of tests performed for each material, and the material supplier, installer and Contractor. Re-tests shall be identified in a fashion that easily correlates to the failing test. Any failed tests that have not been corrected when the report is published shall be highlighted and noted in the cover letter of the report. The ITA shall identify costs of re-testing or additional site visits required due to scheduling changes by the Contractor. A current Corrective Action Report log (CAR) shall also be included in the weekly summary report.
- B. The weekly report shall be submitted per Technical Specifications Sections 01300 and 01340 requirements.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.01 REMOVAL OF NONCONFORMING MATERIAL**

- A. The Contractor is obligated to correct or remove nonconforming materials, whether in place or not. If necessary, the DIA Project Manager will send written notification to the Contractor to correct or remove the defective materials from the project. If the Contractor fails to respond, the DIA Project Manager may order correction, removal and/or replacement of defective materials by others, in which case the Contractor shall bear all costs incurred by such actions.

### **3.02 PERFORMANCE**

- A. If the DIA Project Manager determines that the ITA or its personnel are not effectively enforcing or performing the testing and documentation requirements specified in the contract, the DIA Project Manager will, in writing, require the Contractor to remove and replace ITA or such personnel at no cost to DIA.

### **3.03 CONTROL OF MEASURING AND TEST EQUIPMENT**

- A. The ITA shall select measuring and test equipment in such a manner as to provide proper type, range, accuracy, calibration and tolerance for determining compliance with specified requirements. Measuring and test devices shall be calibrated, adjusted and maintained at prescribed intervals prior to use based upon equipment stability and other conditions affecting measurement. Provisions shall be made for the proper handling and storage of equipment. Calibration shall be accomplished using certified standards that have a known traceable relationship to the National Institute of Standards and Technology. Every calibrated measuring and test device shall show the current status, date of last calibration and the due date for the next calibration. Calibration records shall be maintained onsite as quality records and shall be made available for inspection upon the Project Manager's request.



**PART 4 - METHOD OF MEASUREMENT**

**4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under the Section.

**PART 5 - PAYMENT**

**5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item. If the City is required to re-inspect work because the previous inspection showed that the work was defective or not in conformance, the Deputy Manager or his authorized representative may deduct from the contract value the cost of re-inspection at the rate of \$100.00 per man-hour.

**END OF SECTION 01401**

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**ACCEPTANCE TESTS**

AIRPORTS:

AIP PROJECT NO:

P-152, 154, 155, 208, & P-209 DENSITY TESTS SUMMARY

| DATE | LOT/SAMPLE NUMBER | * MOISTURE<br>CONTENT (%) | OPT<br>MOISTURE (%) | MINIMUM<br>Density (%)<br>SPECIFIED | ACTUAL<br>Density (%) | REMARKS |
|------|-------------------|---------------------------|---------------------|-------------------------------------|-----------------------|---------|
|      |                   |                           |                     |                                     |                       |         |
|      |                   |                           |                     |                                     |                       |         |
|      |                   |                           |                     |                                     |                       |         |
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|      |                   |                           |                     |                                     |                       |         |
|      |                   |                           |                     |                                     |                       |         |
|      |                   |                           |                     |                                     |                       |         |

\*For expansive clays only (PI > 12)

NOTE: Retests must be identified and cross - referenced to original failed test.

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1 **SECTION 01403**

2 **CONTRACTOR QUALITY CONTROL PROGRAM**

3 **PART 1 - GENERAL**

4 **1.01 DESCRIPTION**

5 A. The Contractor shall establish, provide and maintain an effective Quality Control Program  
6 that details the methods and procedures that will be taken to ensure that all materials and  
7 completed construction required by this contract conform to contract plans, technical  
8 specifications and any other requirements, whether manufactured by the Contractor or  
9 procured from subcontractors or vendors. Although guidelines are established and certain  
10 minimum requirements are specified herein and elsewhere in the contract technical  
11 specifications, the Contractor shall assume full responsibility for accomplishing the stated  
12 purpose.

13 **1.02 LEVEL OF CONTROL**

14 A. The intent of this section is to enable the Contractor to establish a necessary level of control  
15 that will:

- 16 1. Adequately provide for the production of acceptable quality materials
- 17 2. Provide sufficient information to ensure both the Contractor and the DIA Project  
18 Manager that the specification requirements are being met
- 19 3. Allow the Contractor as much latitude as possible to develop his or her own standards  
20 of control.

21 **1.03 REQUIREMENTS**

22 A. The Contractor shall be prepared to discuss, at the Preconstruction Conference, his/her  
23 understanding of the quality control requirements. A written Quality Control Plan shall be  
24 submitted to the DIA Project Manager no later than ten (10) days after the notice to  
25 proceed. The Contractor shall not begin any construction, production or off-site fabrication  
26 of materials to be incorporated into the completed work until the Quality Control Plan has  
27 been reviewed and approved by the DIA Project Manager. No partial payment will be made  
28 for work or materials subject to specific quality control requirements until the Quality Control  
29 Plan has been reviewed and approved by the DIA Project Manager.

30 B. The quality control requirements contained in this section and elsewhere in the contract  
31 technical specifications are in addition to and separate from the acceptance testing  
32 requirements. Certain acceptance testing requirements as noted in the Technical  
33 Specifications are also the responsibility of the Contractor.

34 **PART 2 - PRODUCTS (NOT USED)**

35 **PART 3 - EXECUTION**

36 **3.01 QUALITY CONTROL PROGRAM**

37 A. GENERAL DESCRIPTION. The Contractor shall establish a Quality Control Program to  
38 perform inspection and testing of all items of work required by the technical specifications,  
39 including those performed by subcontractors. This Quality Control Program shall ensure  
40 conformance to applicable specifications and plans with respect to materials, workmanship,  
41 construction, finish, and functional performance. The Quality Control Program shall be  
42 effective for control of all construction work performed under this contract and shall  
43 specifically include surveillance and tests required by the technical specifications in addition

44 to other requirements of this section and any other activities deemed necessary by the  
45 Contractor to establish an effective level of quality control.

46 B. QUALITY CONTROL PLAN. The following Quality Control Plan shall be submitted within  
47 ten (10) days of receiving the Administrative NTP in a word or excel format that can easily  
48 be copied and pasted into the FAA Management Plan. The Contractor shall describe the  
49 Quality Control Program in a written plan. The Quality Control Plan shall provide a general  
50 description of quality control monitoring to be performed for each technical specification  
51 divisions requirements until final acceptance by DIA.

52 Address and establish controls and documentation to ensure that items or materials that  
53 have been accepted through receiving inspection are used or installed. Identification and  
54 traceability shall be provided throughout all inspections, test activities and records. For  
55 stored items, provisions shall be made for the control of the item/material identification,  
56 consistent with the expected duration and type of storage.

57 Describe the methodology of monitoring, testing and exercising of all equipment, valves  
58 and/or assemblies to ensure the Work installed is in proper working order.

59 In addition, the Quality Control Program Plan shall be organized to address, as a minimum,  
60 the following items.

- 61 1. Quality control organization and personnel
- 62 2. Inspection requirements
- 63 3. Quality control testing plan
- 64 4. Documentation of quality control activities
- 65 5. Requirements for corrective action when quality control and/or acceptance criteria are  
66 not met.

67 C. The Contractor is encouraged to add any additional elements to the Quality Control Plan  
68 that he/she deems necessary to adequately control all production and/or construction  
69 processes required by this contract.

### 70 3.02 QUALITY CONTROL ORGANIZATION

71 A. The Contractor's Quality Control Program shall be implemented by the establishment of a  
72 separate quality control organization. An organizational chart shall be developed to show  
73 all quality control personnel and how these personnel integrate with other  
74 management/production and construction functions and personnel.

75 1. The organizational chart shall identify all quality control staff by name and function and  
76 shall indicate the total staff required to implement all elements of the Quality Control  
77 Program, including inspection and testing for each item or work. If necessary,  
78 different technicians can be utilized for specific inspection and testing functions for  
79 different items of work. All personnel used for implementation of all or part of the  
80 Quality Control Program shall be subject to the qualification requirements of  
81 paragraph 3.02 B. The organizational chart shall indicate which personnel are  
82 Contractor employees and which are provided by an outside organization.

83 B. The quality control organization shall consist of the following minimum personnel:

- 84 1. PROGRAM ADMINISTRATOR
  - 85 a. The Quality Control Program shall be administrated by a Quality Control  
86 Manager. The Quality Control Manager shall be a full-time employee of the  
87 Contractor or a consultant engaged by the Contractor. The Quality Control  
88 Manager shall have a minimum of 5 years of experience in airport and/or  
89 highway construction and shall have had prior quality control experience on a

- 90 project of comparable size and scope as this contract.
- 91 b. Additional qualifications for the Quality Control Manager shall include the
- 92 following requirements:
- 93 1) A licensed professional engineer with 5 years of airport or highway grading
- 94 and drainage paving, field and laboratory testing, and quality control
- 95 experience acceptable to the DIA Project Manager; or
- 96 2) An individual with 5 years of airport or highway grading and drainage
- 97 paving, field and laboratory testing, and quality control experience with a
- 98 B.S. degree in Civil Engineering, Civil Engineering Technology or
- 99 Construction acceptable to the DIA Project Manager; or
- 100 3) A technician certified at Level III or IV by the National Institute for
- 101 Certification in Engineering Technologies (NICET) for Construction
- 102 Materials, Highway Materials, Highway Construction or other applicable
- 103 fields with 5 years of highway and/or airport paving experience acceptable
- 104 to the DIA Project Manager; or
- 105 4) A NICET certified engineering technician in Civil Engineering Technology
- 106 with 5 years of highway and/or airport paving experience acceptable to the
- 107 DIA Project Manager.
- 108 5) A current resume including the individual's experience and qualifications;
- 109 6) Copy of current PE registration and/or all applicable certifications;
- 110 7) Four references for work on projects completed within past five (5) years
- 111 (names, current organization, and telephone number)
- 112 c. The Quality Control Manager shall have full authority to institute any and all
- 113 actions necessary for the successful implementation of the Quality Control
- 114 Program to ensure compliance with the contract plans and technical
- 115 specifications. The Program Administrator shall report directly to a responsible
- 116 officer of the construction firm. The Program Administrator shall be on-site for
- 117 a minimum of 40 hours per week during all production and shall be released
- 118 from full-time duties only after written permission from the DIA Project
- 119 Manager.
- 120 2. ELECTRICAL QUALITY CONTROL MANAGER. Depending on the project's scope of
- 121 work, the Contractor shall provide a dedicated, full-time Electrical Quality Control
- 122 Manager. The Electrical Quality Control Manager shall have no other responsibilities
- 123 other than overall electrical quality control. The Electrical Quality Control Manager
- 124 shall be a master electrician with a minimum of 5 years electrical airfield construction
- 125 experience at a commercial carrier airport. The Electrical Quality Control Manager
- 126 shall be a Certified Senior Technician—Level IV as recognized by the National
- 127 Electrical Testing Association (NETA).
- 128 3. QUALITY CONTROL INSPECTION TECHNICIANS. A sufficient number of Quality
- 129 Control Inspection Technicians necessary to adequately implement the Quality Control
- 130 Program shall be provided. The Quality Control Inspection Technicians shall have the
- 131 authority to bring the Work into conformance with contract requirements including
- 132 stopping non-conforming work in progress. A document signed by an officer of the
- 133 Contractor shall convey and acknowledge the Inspector's authority. Inspection
- 134 personnel shall be engineers, engineering technicians, or experienced craftsman with
- 135 the following qualifications:
- 136 a. Engineer-in-training with 2 years of airport/highway grading experience
- 137 acceptable to the DIA Project Manager or
- 138 b. An individual with 3 years of highway and/or airport grading experience
- 139 acceptable to the DIA Project Manager, with a Bachelor of Science degree in
- 140 Civil Engineering, Civil Engineering Technology or Construction or
- 141 c. Construction Materials Technician certified at Level II by the National Institute
- 142 for Certification in Engineering Technologies (NICET) or
- 143 d. Highway Materials Technician certified at Level II by NICET or
- 144 e. Highway Construction Technician certified at Level II by NICET or

- 145 f. Electrical Construction Technician at Level III certification by NETA.  
146 g. The Quality Control Inspection Technicians shall report directly to the Program  
147 Administrator and shall perform the following functions:  
148 1) Inspection of all materials, construction, plant and equipment for  
149 conformance to the technical specifications, and as required by paragraph  
150 3.03 below  
151 2) Performance of all quality control tests as required by the technical  
152 specifications and paragraph ~~3.06~~ 3.04 below.  
153 h. Certification at an equivalent level by a state or nationally recognized  
154 organization will be acceptable in lieu of NICET certification.
- 155 4. QUALITY CONTROL TESTING TECHNICIANS. The Independent Testing Agency  
156 (ITA) shall provide a sufficient number of Quality Control Laboratory and Field  
157 Technicians necessary to adequately implement the Quality Control Program and  
158 provide the required testing. These personnel shall meet the requirements of ASTM C  
159 1077, D 3740, and D 3666 for the work performed.
- 160 C. STAFFING LEVELS. The Contractor shall provide sufficient qualified quality control  
161 personnel to monitor each work activity at all times. Where material is being produced in a  
162 plant for incorporation into the work, separate plant and field testing technicians shall be  
163 provided at each plant and field placement location. The scheduling and coordinating of all  
164 inspection and testing must match the type and pace of work activity. The Quality Control  
165 Plan shall state where different technicians will be required for different work elements.
- 166 D. SUPPLIERS AND SUBCONTRACTORS. The Quality Control Plan shall include a list of  
167 suppliers and subcontractors. The list shall include items to be supplied by each supplier  
168 and/or subcontractor and shall identify work to be performed by each subcontractor. The list  
169 shall be updated and submitted as required.
- 170 E. EMERGENCY CONTACT INFORMATION. Provide the name, company, title, work phone  
171 number, home phone number, and other means of contact for at least 4 individuals. The  
172 individuals can be associated with production and/or quality control. The Emergency  
173 Contact list shall be revised in the event there is any change in any of the information and  
174 forwarded to the DIA Project Manager and DIA Maintenance Control (303-342-2800). The  
175 Emergency Contact list shall also include the project number, title and date of issue.

176 **3.03 INSPECTION REQUIREMENTS.**

- 177 A. The Contractor shall utilize the following six-point inspection plan to ensure the  
178 conformance of the Work performed by the Contractor meets the requirements of the  
179 contract drawings and specifications, the referenced codes and standards and the approved  
180 submittals:
- 181 1. PREWORK COORDINATION. Prior to the start of construction work on the contract  
182 and prior to the start of work under each separate specification section and prior to the  
183 start of work where a change in a construction operation is contemplated by the  
184 Contractor and prior to a new subcontractor starting work, a coordination meeting will  
185 be held with the Contractor's Program Administrator, Project Manager,  
186 Superintendent, Foreman, Safety representative, Quality Control Inspector(s), ITA  
187 representative, and the DIA Project Manager, DIA Inspector(s), and DIA Quality  
188 Assurance Laboratory representative. Supervisory, Safety, and Quality Control  
189 representatives of all applicable subcontractors will also attend. The Contractor's  
190 Program Administrator will chair the meeting and shall distribute the proposed meeting  
191 agenda 48 hours prior to the meeting. Upon completion of the meeting, minutes  
192 including any revisions to the agenda shall be distributed within 24 hours.
- 193 2. The purpose of the meeting is to ensure that the Contractor's personnel have no  
194 misunderstandings regarding their safety and quality procedures as well as the  
195 technical requirements of the contract. The following items shall be submitted to the



- 196 DIA Project Manager no less than 72 hrs prior to the meeting and shall be presented  
197 and reviewed by the Contractor at the meeting held no less than 48 hrs prior to start of  
198 work:
- 199 a. Contract requirements and specifications
  - 200 b. Shop drawings, certifications, submittals and as-built drawings that apply
  - 201 c. Testing and inspection program and procedures
  - 202 d. Contractor's Quality Control Program
  - 203 e. Familiarity and proficiency of the Contractor's and subcontractor's workforce to
  - 204 perform the operation to required workmanship standards including
  - 205 certifications of installers
  - 206 f. Safety and environmental precautions to be observed
  - 207 g. Any other preparatory steps dependent upon the particular operation
  - 208 h. The Contractor's means and methods for performing the Work.
- 209 3. INITIAL INSPECTION. Upon completion of a representative sample of a given feature  
210 of the Work and no later than two weeks after the start of a new or changed operation,  
211 the DIA Project Manager or his/hers designated representative will meet with the  
212 Contractor's Quality Control representative and applicable subcontractor's supervisor  
213 and their Quality Control representatives to check the following items, as a minimum:
- 214 a. Workmanship to established quality standards
  - 215 b. Conformance to contract drawings, specifications and the accepted shop  
216 drawings
  - 217 c. Adequacy of materials and articles utilized
  - 218 d. Results of inspection and testing methods
  - 219 e. Adequacy of as-built drawings maintained daily.
  - 220 f. Once accepted, the representative sample will become the physical baseline by  
221 which ongoing work is compared for quality and acceptability. To the maximum  
222 practical extent, approved representative samples of work elements shall  
223 remain visible until all work in the appropriate category is complete. Acceptance  
224 of a sample does not waive or alter any contract requirements or show  
225 acceptance of any deviation from the contract not approved in writing by the  
226 DIA Project Manager. The Contractor's Quality Control representative shall  
227 chair, prepare and distribute minutes of Quality Control meetings. Meeting  
228 minutes shall be distributed within 24 hours of the meeting.
- 229 4. FOLLOW-UP INSPECTION. The Contractor's Quality Control representative will  
230 monitor the work to review the continuing conformance of the work to the  
231 workmanship standards established during the preparatory and initial inspections.
- 232 5. COMPLETION INSPECTION. Forty-eight hours prior to the completion of an item or  
233 segment of work and prior to covering up any work, the Contractor will notify the DIA  
234 Project Manager who will verify that the segment of work is substantially complete, all  
235 inspections and tests have been completed and the results are acceptable. The  
236 purpose of this inspection is to allow further corrective work upon, or integral to, the  
237 completed segment of work. THIS IS NOT AN ACCEPTANCE INSPECTION. If any  
238 items are determined to be deficient, need correction or are non-conforming, a  
239 deficiency list will be prepared and issued to the respective Contractor for correction,  
240 repair or replacement of any deficient or non-conforming items. The DIA Project  
241 Manager and Contractor's Quality Control representative will verify the correction of  
242 the deficient and/or non-conforming items prior to the start of the next operation.
- 243 6. PRE-FINAL ACCEPTANCE INSPECTION. Prior to requesting a Pre-final Acceptance  
244 Inspection by DIA, all work and operational systems to be inspected shall be  
245 satisfactorily completed and tested by the Contractor. The Contractor's written  
246 request for this inspection shall be made 72 hours in advance. With the request shall  
247 come a list of any known deficiencies (punch list) and the time frame in which they will  
248 be corrected. If the list is too large or contains too many significant items, in the

249 opinion of the DIA Project Manager, no inspection will be held due to the  
250 incompleteness of the work.

251 a. The DIA Project Manager will schedule the Pre-final Acceptance Inspection and  
252 will add to the punch list deficient items discovered during the inspection. If  
253 during the inspection the list becomes too large or too many significant items  
254 are on the list, the inspection will be canceled. After the inspection is  
255 completed, the deficiency list will be transmitted to the Contractor for correction  
256 of the deficient items.

257 7. FINAL ACCEPTANCE INSPECTION. After the Contractor has completed all items on  
258 the deficiency list (generated from the Pre-final Acceptance Inspection) he shall  
259 request a Final Acceptance Inspection. The request shall be made in writing at least  
260 72 hours in advance of the inspection. All areas must be cleaned and ready for  
261 turnover prior to this inspection. The DIA Project Manager, the design consultant, a  
262 representative of the funding agency (if applicable) and other interested parties will  
263 inspect the subject Work to ensure that all deficiencies have been satisfactorily  
264 attended to and that no new deficiencies have appeared and that all systems are  
265 completely functional. Any outstanding or additional deficient items will be noted and  
266 handled per the requirements of the Pre-final Acceptance Inspection noted above until  
267 the Work is acceptable to the DIA Project Manager.

#### 268 3.04 QUALITY CONTROL TESTING PLAN.

269 A. As a part of the overall Quality Control Program, the Contractor shall implement a quality  
270 control testing plan as required by the technical specifications. The testing plan shall  
271 include the minimum tests and test frequencies required by each technical specification  
272 item as well as any additional quality control tests that the Contractor deems necessary to  
273 adequately control production and/or construction processes.

274 B. The testing plan can be developed in a spreadsheet fashion and shall, as a minimum,  
275 include the following:

- 276 1. Specification item number (e.g., P-401)
- 277 2. Item description (e.g., Plan Mix Bituminous Pavements)
- 278 3. Test type (e.g., gradation, grade, asphalt content)
- 279 4. Test standard (e.g., ASTM or AASHTO test number, as applicable)
- 280 5. Test frequency (e.g., as required by technical specifications or minimum frequency  
281 when requirements are not stated)
- 282 6. Responsibility (e.g., plant technician)
- 283 7. Control requirements (e.g., target, permissible deviations).

284 C. The testing plan shall contain a statistically based procedure of random sampling for  
285 acquiring test samples in accordance with ASTM D 3665. The DIA Project Manager shall  
286 be provided the opportunity to witness quality control sampling and testing.

287 D. All quality control test results shall be documented by the Contractor as required by  
288 paragraph ~~3.07~~ 3.05 below.

#### 289 3.05 DOCUMENTATION.

290 A. The Contractor shall maintain current quality control records of all inspections and tests  
291 performed. These records shall include factual evidence that the required inspections or  
292 tests have been performed, including type and number of inspections or tests involved;  
293 results of inspections or tests; nature of defects, deviations, causes for rejection, etc.;  
294 proposed remedial action; and corrective actions taken.

- 295 B. These records must cover both conforming and defective or deficient features and must  
296 include a statement that all supplies and materials incorporated in the work are in full  
297 compliance with the terms of the contract. Legible copies of these records shall be  
298 furnished to the DIA Project Manager daily. The records shall cover all work placed  
299 subsequent to the previously furnished records and shall be verified and signed by the  
300 Contractor's Program Manager.
- 301 C. Specific Contractor quality control records required for the contract shall include, but are not  
302 necessarily limited to, the following records:
- 303 D. Certificates of compliance shall be submitted 30 days prior to the product's incorporation  
304 into the work.
- 305 E. Quality Control Charts for materials shall be established as required by the individual  
306 Technical Specification Sections.
- 307 F. Daily Foreman Report. The Foreman shall report daily construction activities using the  
308 Daily Foreman Report form QCP-1 as included in Specification Section 01999. The reports  
309 shall be completed in their entirety and shall as a minimum include the following:
- 310 1. Daily activities
- 311 2. Quantities of material placed and completed
- 312 3. Weather
- 313 4. Safety issues
- 314 5. Personnel
- 315 6. Equipment on site with time used
- 316 7. Equipment under repair
- 317 8. Work delays
- 318 9. Possible delays
- 319 10. Materials delivered.
- 320 11. The reports shall be signed by the responsible foreman and Contractor  
321 Superintendent. The DIA Project Manager shall be provided a copy of each daily  
322 construction report on the work day following the day of record.
- 323 G. Daily Quality Control Inspection Reports. Each Contractor Quality Control Inspection  
324 Technician shall maintain a daily log of all inspections performed for both Contractor and  
325 subcontractor operations on forms QCP-2 and QCP-2-2 included in Technical  
326 Specifications Section 01999. The reports shall be completed in their entirety, shall provide  
327 factual evidence that continuous quality control inspections have been performed and shall,  
328 as a minimum, include the following:
- 329 1. Technical specification item number and description
- 330 2. Compliance with approved submittals
- 331 3. Proper storage of materials and equipment
- 332 4. Adherence to plans and technical specifications
- 333 5. Review of quality control tests
- 334 6. Compliance of quality control testing frequencies.
- 335 7. Identify inspections conducted, results of inspections, location and nature of defects  
336 found, causes for rejection, remedial or corrective actions taken or proposed.
- 337 8. The reports shall be signed by the responsible Quality Control Inspection Technician

338 and the Program Administrator. The DIA Project Manager shall be provided a copy of  
339 each report on the workday following the day of record.

340 H. Test Reports. The Contractor shall be responsible for establishing a system which will  
341 record all quality control test results. Daily test reports shall document the following  
342 information:

- 343 1. Technical specification item number and description
- 344 2. Test designation
- 345 3. Location
- 346 4. Date of test
- 347 5. Control requirements
- 348 6. Test results
- 349 7. Causes for rejection
- 350 8. Recommended remedial actions
- 351 9. Retests.
- 352 10. Fresh concrete properties tests and in-place moisture-density tests shall be reported  
353 in legible draft form to the DIA Inspector immediately at the test site. Any failing test  
354 shall be reported separately to a DIA Inspector or the DIA Project Manager within 2  
355 hours after the discovery.

356 Test results from each day's work period shall be transmitted to the DIA Project  
357 Manager on the next work day. These initial daily test reports shall be signed by the  
358 responsible Quality Control Technician and the Program Administrator.

359 Typed final laboratory and field tests shall be provided to the DIA Project Manager as  
360 specified in 3.05, I. Weekly Summary Reports.

361 I. Weekly Summary Reports.

- 362 1. Typed final laboratory and field test reports summarizing the activities and results for  
363 the quality control tests and inspections for each week shall be prepared by the ITA  
364 and submitted to the Project Manager. The weekly summary report shall meet the  
365 requirements of Section 01401, 1.05C. and 1.06 and be submitted within two (2)  
366 weeks from the end of the reporting period. At a minimum, the weekly summary report  
367 shall identify all test types, test locations, testers, test results, worksheets showing all  
368 calculations used, specifications, whether the test passed or failed, quantity of  
369 materials placed and the number of tests performed for each material, the material  
370 supplier, installer, and Contractor. Retests shall be identified in a fashion that easily  
371 correlates to the failing test. Any failed tests that have not been corrected when the  
372 report is published shall be highlighted and noted in the cover letter of the report. The  
373 ITA shall identify costs of re-testing or additional site visits required due to scheduling  
374 changes by the Contractor. A current Correction Action Report (CAR) log shall also be  
375 included in the weekly summary report.
- 376 2. The weekly summary report shall be submitted per technical Specifications Sections  
377 01300 and 01340 requirements.

### 378 3.06 CORRECTIVE ACTION REQUIREMENTS

379 A. The Quality Control Plan shall indicate the appropriate action to be taken when a process is  
380 deemed, or believed, to be out of control (out of tolerance) and detail what action will be  
381 taken to bring the process under control. The requirements for corrective action shall  
382 include both general requirements for operation of the Quality Control Program as a whole,  
383 and for individual items of work contained in the technical specifications.

- 384 B. The Quality Control Plan shall detail how the results of quality control inspections and tests  
385 will be used for determining the need for corrective action and shall contain clear sets of  
386 rules to gauge when a process is out of control and the type of correction to be taken to  
387 regain process control.
- 388 C. When applicable or required by the technical specifications, the Contractor shall establish  
389 and utilize statistical quality control charts for individual quality control tests. The  
390 requirements for corrective action shall be linked to the control charts.

391 **3.07 SURVEILLANCE BY THE DIA PROJECT MANAGER**

- 392 A. All items of material and equipment shall be subject to surveillance by the DIA Project  
393 Manager at the point of production, manufacture or shipment to determine if the Contractor,  
394 producer, manufacturer or shipper maintains an adequate quality control system in  
395 conformance with the requirements detailed herein and the applicable technical  
396 specifications and plans. In addition, all items of materials, equipment and work in place  
397 shall be subject to surveillance by the DIA Project Manager at the site for the same  
398 purpose.
- 399 B. Surveillance by the DIA Project Manager does not relieve the Contractor of performing  
400 quality control inspections of either on-site or off-site Contractor's or subcontractor's work.

401 **3.08 NONCOMPLIANCE**

- 402 A. The DIA Project Manager will notify the Contractor of any noncompliance with any of the  
403 foregoing requirements. The Contractor shall, after receipt of such notice, immediately take  
404 corrective action. Any notice, when delivered by the DIA Project Manager or his/her  
405 authorized representative to the Contractor or his/her authorized representative at the site  
406 of the work, shall be considered sufficient notice.
- 407 B. In cases where quality control activities do not comply with either the Contractor's Quality  
408 Control Program or the contract provisions, or where the Contractor fails to properly operate  
409 and maintain an effective Quality Control Program, as determined by the DIA Project  
410 Manager, the DIA Project Manager may:
- 411 1. Order the Contractor to replace ineffective or unqualified quality control personnel or  
412 subcontractors
  - 413 2. Order the Contractor to stop operations until appropriate corrective actions are taken.

414  
415 **PART 4 - MEASUREMENT**

416 **4.01 METHOD OF MEASUREMENT**

- 417 A. No separate measurement shall be made for work under this Section.

418  
419 **PART 5 - PAYMENT**

420 **5.01 METHOD OF PAYMENT**

- 421 A. No separate payment will be made for work under this Section. The cost of the work  
422 described in this Section shall be included in the applicable unit price item, work order or  
423 lump sum bid item.

424 **END OF SECTION 01403**

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## SECTION 01404

### DIA QUALITY ASSURANCE FOR FAA FUNDED PROJECTS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. This Section identifies Denver International Airport inspection activities to be performed by inspectors employed by Denver International Airport and working under the direction of the Project Manager.
- B. Inspection and tests, conducted by persons or agencies other than the Contractor, shall not in any way relieve the Contractor of his responsibility and obligation to meet all specifications and the referenced standards.
- C. The inspection and approval of work by other agencies above does not constitute inspection or acceptance of work required by Denver International Airport. Technical specifications may contain requirements more stringent than Denver Building Inspection Division or other code agency requirements. The City will perform all acceptance testing.
- D. The City will employ the services of a testing agency (TA) which will perform all acceptance testing.
- E. Laboratory and field testing requirements to be conducted by the TA for materials and construction on this project are included in the appropriate technical specifications. Where the technical specifications reference the CDOT Standard Specifications for Road and Bridge Construction, the references shall also mean CDOT Field Materials Manual for schedule of tests unless otherwise stated. As a minimum the TA described in this section shall perform all applicable tests including the sampling and acceptance testing. In the event of such a conflict between the schedule and a specification in these technical provisions, the more comprehensive testing shall govern unless otherwise noted.
- F. Inspections and tests conducted by the TA shall not in any way relieve the Contractor of his responsibility and obligation to meet all specifications and referenced standards. Employment of the City's TA does not relieve the Contractor of providing the required Quality Control program.
- G. When inspections or tests by the TA prove that the item or material does not meet all applicable specifications and requirements, the cost incurred for the re-testing or re-inspection shall be borne by the Contractor.
- H. Samples will only be considered if taken at random.
- I. The Contractor is obligated to correct any item deemed deficient at no additional cost to the City.

##### 1.02 RELATED DOCUMENTS\

- A. Technical Specifications Section 01403 – “Contractor Quality Control Program”
- B. General Conditions Article 15, Section 1701 – “Construction Inspection by the City”

- C. General Conditions Article 15, Section 1702 – “Authority of Inspectors”
- D. General Conditions Article 15, Section 1703 – “Defects – Uncovering Work”
- E. General Conditions Article 15, Section 1704 – “Observable Defects”
- F. General Conditions Article 15, Section 1705 – “Latent Defects”
- G. General Conditions Article 15, Section 1706 – “Removal of Defective Materials and Work”.
- H. ASTM C 1077 Standard Practices for Laboratory Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
- I. ASTM D 3740 Evaluation of Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
- J. ASTM E 329 Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction
- K. ASTM E 543 Determining the Qualifications of Nondestructive Testing Agencies.
- L. ASTM E 548 Generic Criteria for Use in Evaluation of Testing and Inspection Agencies.
- M. Standard testing practices for other disciplines.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.01 MANUFACTURING AND FABRICATION INSPECTIONS**

- A. The Project Manager may elect to perform additional inspections and/or tests at the place of manufacture, the shipping point or at the destination to verify conformance to applicable specifications. Inspections and tests performed by the City shall not relieve the Contractor from the responsibility to meet the specifications, nor shall such inspections/tests be considered to be a guarantee for acceptance of materials that will be delivered at a later time.
- B. The Project Manager or his authorized representative may inspect at its source any material or assembly to be used in the Work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the Work and to obtain samples for testing and further inspection.
  - 1. Should the Project Manager conduct plant inspections the following conditions shall exist:
    - a. The Project Manager shall have the cooperation and assistance of the Contractor and the producer with whom the Contractor has contracted for materials.
    - b. The Project Manager shall have full access during scheduled production or warehousing working hours to parts of the plant that are concerned with the manufacture, production, storage or shipping of materials being furnished.
    - c. The Contractor shall arrange for adequate office or working space that can reasonably be needed for conducting a plant inspection. Office or working space shall be conveniently located with respect to the plant and/or warehouse as required by the Project Manager.



- C. It is understood and agreed that the City shall have the right to re-test at the Owner's expense any materials which have been tested and accepted at the source of supply after it has been delivered to the site.

### 3.02 PERFORMANCE

- A. If the Project Manager determines that the Contractor's Quality Control Program Administrator or any of his support personnel are not effectively enforcing or performing the requirements specified in the Contract, the Project Manager will issue a Non-Conforming Report (NCR) on the specific issue found to be in nonconformance with the Contract requirements. The Contractor may be required to remove and replace such individuals at no cost to the Owner.

### 3.03 INSPECTIONS AND TESTS

- A. It is understood and agreed that the City shall have the right to take samples and perform acceptance testing of samples at different intervals or at intervals concurrent to the Contractor's testing program. The Contractor shall be issued a Nonconformance Report or a Remedial Action Request in the event the City's acceptance tests fail.
- B. Materials accepted on the basis of a certificate of compliance may be sampled and inspected/tested by the City or the designer of record at any time. The fact that the materials were accepted on the basis of such certification shall not relieve the Contractor of his responsibility to use materials which conform to the specifications.
- C. City inspection shall include but not be limited to Initial Inspection, Follow-up Inspection, Completion Inspection, Pre-Final Acceptance Inspection, and Final Acceptance Inspection. The Contractor shall comply with the requirements of these inspections as identified in Technical Specifications Section 01403.

### 3.04 NONCONFORMING WORK AND MATERIALS

- A. Remedial Action Request (RAR)
  - 1. The Project Manager will document remedial action that cannot be taken immediately (the same day) by issuing a Remedial Action Request form to the Contractor. Remedial Action Requests are appropriate when the affected element of work is in-progress and discrepancies can be rectified as the work proceeds. RAR's shall be written when work can be brought back into conformance with the contract documents.
  - 2. When issued, a Remedial Action Request will preclude payment for elements noted and will remain in effect until corrective actions have been submitted, approved and performed.
  - 3. Upon satisfactory completion of the remedial action, the Contractor shall transmit the RAR form with the Contractor's statement of action taken (including any applicable test results) to the Project Manager. The Project Manager will perform a follow-up inspection to verify the RAR has been satisfactorily completed. The RAR then will be closed.
- B. Non-Conformance Report (NCR)
  - 1. A non-conformance report will be issued to the Contractor by the Project Manager whenever there are violations of the terms of the contract which cannot be immediately brought back into conformance, including materials received and/or items of the work

found to be in nonconformance with contract requirements. When issued, a nonconformance report will preclude payment for elements noted and will remain in effect until corrective actions have been submitted, approved and performed.

2. The nonconformance report form will describe the nature and extent of nonconforming elements and will include space for the Contractor's corrective action proposal, the designer of record's review of the Contractor's proposal, reinspection and/or verification of approved corrective rework, and a space for the Project Manager's disposition of the nonconformance matter. Copies of the Nonconformance Report, at each step of its processing (i.e., initial issuance to Contractor through final disposition), will be sent to the Project Manager.
  3. The disposition of nonconforming items/materials will be made by the Project Manager.
- C. Removal of nonconforming material
1. The Contractor is obligated to correct or remove nonconforming materials, whether in place or not. If necessary, the Project Manager will send written notification to the Contractor to correct or remove the defective materials from the project. If the Contractor fails to respond, the Project Manager may order correction and removal and/or replacement of defective materials by others, in which case the Contractor shall bear all costs incurred by such actions.

#### **PART 4 - MEASUREMENT**

##### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement will be made for work under this Section.

#### **PART 5 - PAYMENT**

##### **5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section.

**END OF SECTION 01404**

## SECTION 01410

### CUTTING AND PATCHING

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Reference General Contract Conditions, GC 315.
- B. Reference Technical Specifications, Section 01411.

##### 1.02 DEFINITIONS

- A. Cutting: Removal of existing construction to permit installation of or to perform other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

##### 1.03 SUBMITTALS

- A. Refer to Technical Specifications Sections 01300 and 01340 for submittal procedures.
- B. Cutting and Patching Proposal: Submit a proposal describing procedures at least 30 calendar days before the time cutting and patching will be performed, requesting approval to proceed. Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work. The proposal shall include the following information:
  - 1. Identification of the contract and the Contractor's name.
  - 2. Description of proposed work:
    - a. Scope of cutting, patching, alteration or excavation
    - b. The necessity for cutting or alteration
    - c. Drawing showing location of the requested cutting or alteration, along with radar or x-ray report.
    - d. Trades that will execute the work
    - e. Products proposed to be used
    - f. Extent of refinishing to be done
    - g. Alternatives to cutting and patching
  - 3. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
  - 4. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
  - 5. Proposed Dust Control and Noise Control Measures: Submit a statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.

6. Effect on the work and other surrounding work or on structural or weatherproof integrity of project
7. Written concurrence of each contractor or entity whose work will be affected.
8. Cost proposal, when applicable

#### 1.04 QUALITY CONTROL

- A. Operational Elements: Do not cut and patch the following operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance, decreased operational life or safety unless approved by the Project Manager:
  1. Primary operational systems and equipment
  2. Air or smoke barriers
  3. Fire protection systems
  4. Control systems
  5. Communication systems
  6. Conveying systems
  7. Electrical wiring systems
  8. Operating systems of special construction as described in Division 13 and 16
  9. HVAC systems.
- B. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or those results in increased maintenance, decreased operational life or safety unless approved by the Project Manager:
  1. Water, moisture or vapor barriers
  2. Membranes and flashings
  3. Exterior curtain wall construction
  4. Equipment supports
  5. Piping, ductwork, vessels and equipment
  6. Noise control and vibration control elements and systems
  7. Stud walls.
- C. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in DIA's sole opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactorily manner.
  1. If possible, retain the original installer or fabricator to cut and patch exposed Work listed below. If it is impossible to engage the original installer or fabricator, engage another recognized, experienced and specialized firm as approved by the Project Manager:
    - a. Processed concrete finishes
    - b. Stonework and stone masonry

- c. Ornamental metal
  - d. Matched-veneer woodwork
  - e. Preformed metal panels
  - f. Firestopping
  - g. Window wall systems
  - h. Terrazzo
  - i. Wall coverings
  - j. HVAC enclosures, cabinets or covers,.
- D. Cutting and Patching Conference: Before proceeding, meet at the Project site with all parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

## 1.05 WARRANTY

- A. Existing Warranties: Remove, replace, patch and repair materials and surfaces cut or damaged during cutting and patching operations by methods and with materials so as not to void existing warranties.
- 1. If possible, retain the original installer or fabricator to patch the exposed Work listed below that is damaged during selective demolition. If it is impossible to engage the original installer or fabricator, engage another recognized, experienced and specialized firm as approved by the Project Manager:
    - a. Ornamental metal
    - b. Preformed metal panels
    - c. Firestopping
    - d. Terrazzo
    - e. ProCoat paint finishes
    - f. Granite flooring
    - g. Wall coverings
    - h. HVAC enclosures, cabinets or covers.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. General: All patching material shall be of the type specified for the material being patched. Comply with requirements specified in other Sections of these Technical Specifications.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
- 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials as approved by the Project Manager.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are

to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Immediately notify the Project Manager, in writing, of unsuitable, unsafe or unsatisfactory conditions.
3. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.
4. Proceed with patching only after construction operations requiring cutting are complete and inspected by the Project Manager.

### 3.02 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut to ensure structural value or integrity.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where existing services are required to be removed, relocated or abandoned, bypass such services before cutting to avoid (or minimize) interruption of services to occupied areas.

### 3.03 POLLUTION CONTROLS

- A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
  1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions such as ice, flooding and pollution.
  2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosures. Vacuum carpeted areas.
- B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- C. Cleaning: Clean adjacent structures and improvements of dust, dirt and debris caused by selective demolition operations. Return adjacent areas to the condition existing before selective demolition operations began.

### 3.04 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Execute cutting and demolition by methods that will prevent damage to other work and will provide a proper surface to receive patching.
  1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their

- original condition.
2. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerance and finishes.
  3. Restore work that has been cut or removed; install new products to provide complete work in accordance with requirements of the contract documents.
  4. Fit work airtight and fire safe to pipes, sleeves, ducts, conduit and other penetrations through surfaces as required by the contract documents.
- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and other similar operations, including excavation, using methods least likely to damage elements retained to adjoining construction. If possible review proposed procedures with original installer and comply with original installer's written recommendations.
1. In general, use ground fault hand or small power tools designed( to short if metal is hit) for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to the size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  3. Concrete: Use a cutting machine such as an abrasive saw or a diamond-core drill.
  4. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Technical Specifications.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
  2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing. For continuous surfaces, refinish entire unit to the nearest break line. For an assembly, refinish entire unit.
  3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs on a painted surface, apply primer and intermediate paint coats over the patch and apply the final coat over the entire unbroken surface containing the patch. Provide additional coats until the patch blends with adjacent surfaces.
  4. Ceilings: Patch, repair or re-hang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
- D. Fire Rated Construction: Where rated elements are cut, reconstruct to approved designs to provide original fire rating.

### 3.05 CORE DRILLING

- A. The Contractor shall execute a minimum of x-rays or ground penetrating radar at each location planned for core drilling prior to submittal to the Project Manager and to utility representatives for approval for core drilling. The request for approval shall be submitted seven days in advance of the planned activity. The request for approval shall indicate on the x-ray or radar information regarding alternate locations or core drilling to avoid structural members and any embedded conduit. Embedded conduit may be metallic or plastic. The x-ray or radar system shall be capable of detecting both types of conduit.
- B. Core drilled “cores” and the core-drilled opening shall be inspected by DIA Project Manager representatives prior to installation of any systems in new openings.
- C. X-ray activities may not be performed during hours of activity or occupancy in the area of the x-ray system. The Contractor shall provide all manpower and barriers required to secure the areas affected by x-ray activities.

**PART 4 - MEASUREMENT**

**4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

**PART 5 - PAYMENT**

**5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable multiplier for the division under which the work falls.

**END OF SECTION 01410**



## SECTION 01500

### TEMPORARY FACILITIES

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Work specified in this Section consists of furnishing, installing, operating, maintaining and removing temporary construction barriers, enclosures and field facilities including the Contractor's construction offices, staging areas, yards, storage areas, electrical power, telephone, water, fire protection and sanitary service.
- B. Construction Offices, Construction Yards and Storage Areas
1. The Contractor's offices, construction yards laydown and storage areas shall be located as shown on the contract drawings and/or as designated by the Project Manager. All construction offices, staging areas and material storage areas are to occur within these areas.
  2. Any activity that is expected to result in disturbance of the ground surface equal to or greater than one acre or part of a larger project that is expected to disturb equal to or greater than one acre, is required to be identified in the Construction Activities Stormwater Management Plan (CASMP) and/or Stormwater Management Plan (SWMP). These areas include, but are not limited to, laydowns, borrow areas, stockpiles, and storage areas regardless of the location.
  3. All areas of ground disturbance are required to be stabilized in accordance with State, local, and airport rules and regulations prior to permit termination and/or closure of the contract.
  4. The Contractor shall restore any area on DIA property that becomes contaminated as a result of its operations in accordance with Airport Rule and Regulation 180. Restoration shall be either to applicable standards under Federal and State law or to such other level as may be required by the Manager of Aviation, at the Manager's sole discretion.
  5. All temporary facility sites must be inspected prior to contract closeout. The DIA Project Manager or authorized representative shall conduct an inspection of contractor areas used during the life of the project. These areas include but are not limited to, staging areas, laydown areas, borrow areas, and contractor yards and offices. The DIA PM will ensure these areas have been properly stabilized in accordance with DIA Rules and Regulations and restored to the condition in which the City initially provided to the Contractor. A representative from DIA Environmental Services shall be present during the final walk through.
  6. Contractor materials shall be managed in accordance with applicable Environmental Regulations.
  7. Temporary facilities which the Contractor desires to locate in secondary laydown and staging areas adjacent to the Work or within the project limits are subject to approval by the Project Manager. If approved, these areas must also be included in the CASMP and/or SWMP.
  8. Access to and security of the Contractor's construction offices, yard, temporary facilities and storage areas shall be as shown on the Contract Drawings or as specified in the contract Special Conditions.

9. Contractor Field Office
  - a. The Contractor shall acquire all necessary permits for installation and construction work related to the Contractor's field office and fencing.
  - b. The Contractor shall provide, as part of his on-site field office, a conference room for weekly meetings. Minimum size to accommodate 15 people with the currently approved schedule posted on a wall. The conference room shall have one available telephone.
  - c. Jack the mobile office unit off its wheels and provide support. Enclose the underside of the trailer with weatherproof skirting.
  - d. Install tie downs in compliance with code.
  - e. Provide access to the field office and easily accessible space for parking six full size passenger automobiles as a minimum. Grade the field office site, access roadway and parking area for drainage, and surface with gravel paving or crushed stone.
  - f. Water and sewer lines to the field office, if installed, shall be installed so they will not freeze.
  
- C. Electrical Service
  1. Provide lighting and power for field offices, storage facilities and other construction facilities and areas.
  2. Provide power centers for electrically operated and controlled construction facilities including tools, equipment, testing equipment, interior construction lighting, heating, cooling and ventilation equipment.
  3. Provide night security lighting at secured areas within construction limits at offices, storage facilities, temporary facilities and excavated areas.
  4. Provide battery operated or equivalent emergency lighting facilities at construction areas where normal light failures would cause employees to be subjected to hazardous conditions. Test such facilities monthly and maintain a record of these tests for the Project Manager's review.
  5. Bear all costs of temporary electric and water service permits, fees and deposits required by the governing authorities, and connection charges and temporary easements including installation, maintenance and removal of equipment.
  
- D. Telephone Service
  1. The Contractor shall furnish, install and maintain at least two telephones in his main field office. These phones shall be manned at all times by the Contractor's personnel or by an answering machine.
  2. The Contractor shall supply one separate facsimile line for facsimile equipment.
  
- E. Water Service
  1. The Contractor shall make all connections and extensions required and shall make use of water in direct support of the Work. The Contractor shall install an approved Water Department tap at the City's water source prior to obtaining any water. The Contractor shall arrange and pay for its supply/distribution system from the City's point of connection. The location and alignment of the Contractor's temporary supply/distribution system must be approved by the Project Manager prior to its installation. The Contractor shall leave in place all above ground and underground water distribution facilities unless otherwise directed by the Project Manager.

2. The Contractor shall not use in place fire hydrants or standpipes as sources for construction water or potable water.

F. Fire Protection

1. Furnish, install and maintain temporary portable fire protection equipment throughout the construction period at all buildings (including the project site), maintenance shops, and fuel storage on all large construction equipment and at the location of any flammable materials or construction materials.

G. Sanitary Service

1. Furnish, install and maintain temporary sanitary facilities and services throughout the construction period.
2. Ensure that separate or single user toilets shall be provided to ensure privacy between the sexes.
3. Provide general washing facilities adequate for the number of employees.
4. Provide special washing facilities adequate for the number of employees engaged in the application of paints, coating and other volatile or hazardous materials.

**1.02 QUALITY CONTROL**

- A. Provide products for, and the execution of, the Work of this Section that will satisfy the requirements of the NEC, OSHA and local codes. Provide products that satisfy requirements of NEMA and are UL listed.

**1.03 SUBMITTALS**

- A. Refer to Technical Specifications Sections 01300 and 01340 for submittal procedures.
- B. Submit a shop drawing within five days of the Notice to Proceed that shows the following:
  1. Temporary facilities equipment and materials (include manufacturer's literature)
  2. Details and layout of temporary installations including fences, roads, parking, buildings, storage areas and drainage plans.
  3. Lighting plan showing temporary lighting facilities, electrical service panel location, electrical circuit diagram and anticipated light level on the working roadway, pathway or construction surface.
  4. As-built description of any temporary underground utilities referenced to the Airport grid and benchmark system within five days of completion of the installation.

**PART 2 - PRODUCTS**

**2.01 ELECTRICAL SERVICE**

- A. Provide temporary power and lighting equipment consisting of fixtures, transformers, panel boards, groundings, lamps, switches, poles, conduits and wiring sized and capable of continuous service and having adequate capacity to ensure a complete operating system. Comply with NEMA.
- B. Provide temporary extension cords to supply tools not longer than 200 feet, except that additional length may be used if equipment will be grounded within 200 feet of tool or power.

- C. Portable power generators shall be grounded.

## **2.02 TELEPHONE SERVICE**

- A. Provide equipment that is compatible with that of Centurylink Communications Company and the telephone exchange to which the Contractor connects.

## **2.03 DRINKING WATER SERVICE**

- A. Provide sanitary materials and equipment that satisfies the requirements of codes and regulations pertaining to temporary water systems. Bottled products may be used if those products comply with codes. Clearly label portable containers having a dispensing tap and used only for drinking water. Provide single service disposable cups and a sanitary container for dispensing cups. A trash receptacle shall be provided and maintained beside each portable water supply.

## **2.04 FIRE PROTECTION**

- A. Fire extinguishers shall be UL rated and shall comply with the Uniform Fire Code.

## **2.05 SANITARY SERVICE**

- A. Provide materials and equipment adequate for the intended purposes, which will neither create unsanitary conditions nor violate the codes applicable to temporary sanitary facilities. Enclosures for toilet and washing facilities shall be weatherproof, sight proof, ventilated and sturdy.
- B. Provide portable type toilet facilities that satisfy the requirements of OSHA.
- C. Provide washing facilities as needed. Furnish soap, single-service paper towels, towel dispenser and towel receptacle. If paints, coatings and other volatile or hazardous materials injurious to humans will be applied as part of the contract, provide washing facilities with warm water of approximately 120 degrees F.

## **PART 3 - EXECUTION**

### **3.01 ELECTRICAL SERVICE**

- A. The approximate location of primary power lines is shown on the Construction Drawings. The Contractor shall locate electrical service where it will not interfere with equipment, storage spaces, traffic, and prosecution of the Work or the work of others. Installation shall present a neat and orderly appearance and shall be structurally sound. Maintain service in a manner that will ensure continuous electrical service and safe working conditions.

### **3.02 TELEPHONE SERVICE**

- A. Install temporary telephone service in a neat and orderly manner and make structurally and electrically sound to ensure continuous service. Modify, relocate and extend as work progress requires. Place conduit and cable where those products will not interfere with traffic, work areas, materials, handling equipment, storage areas and the work of other contractors. Service lines may be aerial.

### **3.03 WATER SERVICE**

- A. Install the systems in a neat and orderly manner. Make them structurally and mechanically sound. Provide continuous service. Modify, relocate and extend the systems as the work progresses.
- B. Locate systems where they will be convenient to work stations, sanitary facilities and first aid station but will not interfere with traffic, work areas, materials handling equipment, storage areas or the work of other contractors.
- C. Provide sanitary bubbler drinking fountains if potable water service is available. Disinfect water piping before using for the potable water service.
- D. Install vacuum breakers, backflow preventers and similar devices in a manner and location which will prevent temporary water from returning to the water mains.
- E. Do not incorporate any part of temporary water distribution system into the permanent water distribution system.

### **3.04 FIRE PROTECTION**

- A. Install products in conformance with the requirements of the applicable Denver Fire Department and OSHA regulations.
  - 1. Provide functional fire extinguishers that are clearly identified for fire and an accessible supply of water during the period of construction. These fire extinguishers shall remain in place until permanent fire protection systems are functional.
  - 2. Furnish not less than one 20-pound fire extinguisher, type 2A-20ABC within ten feet of cutting and welding operations.
  - 3. Provide 20-pound fire extinguishers, type 2A-20ABC no further then 100 feet apart in buildings.
  - 4. Provide not less than one 20-pound fire extinguisher, type 2A-20ABC on any equipment of 75 horsepower or more.
- B. Instruct construction personnel as to location and use of temporary fire protection equipment.
- C. Fire extinguishers shall be located for easy access. Their location shall be clearly marked so that they can be seen at least 75 feet away.

### **3.05 SANITARY SERVICE**

- A. Place temporary sanitary (and washing) facilities in a neat and orderly manner within the limits of the work and convenient to the work stations. Make these facilities structurally and mechanically sound. Modify, relocate and extend the facilities as required by progress of the work.
- B. Service toilets at those time intervals which will minimize the accumulation of wastes and prevent creation of unsanitary conditions, but not less than once a week.
- C. The waste from the sanitary and wash facilities shall be disposed of in accordance with all applicable rules, regulations and laws and with the least environmental impact.

### **3.06 FENCING**

- A. Contact all utility service companies prior to planning fence location and post locations for certification of current utilities. Locate pothole posts planned within 5 feet of known utilities. Submit fencing plan and typical details to DIA Project Manager at least seven days before planned execution for review and acceptance.

### **3.07 SIGNAGE**

- A. Contractor shall not provide any signage for temporary facilities without prior approval from the DIA Project Manager.

### **3.08 TEMPORARY FACILITIES AS-BUILT DRAWINGS**

- A. Provide as-built drawings showing vertical and horizontal location. The location of all regulating and shut off devices along with all branches shall be shown. The as-built drawings shall be based upon the DIA grid coordinate system and benchmark. As-built drawings shall be furnished within 48 hours prior to the Contractor's request for turning on services.

### **3.09 REMOVAL**

- A. The Contractor shall locate all temporary facilities including the underground utilities so they can be completely removed without damaging permanent work or the worksite of other contractors.
- B. The Contractor shall remove all temporary facilities, including all underground utilities, and restore the site to the condition in which the City initially provided it to the Contractor.
- C. The Contractor shall stabilize all areas of disturbance in accordance with State, local, and airport rules and regulations.
- D. In accordance with Part 1, an inspection of temporary facilities used by the Contractor is required prior to contract close out.

## **PART 4 - MEASUREMENT**

### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

## **PART 5 - PAYMENT**

### **5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01500**

## SECTION 01505

### MOBILIZATION

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Work specified in this Section consists of preparatory work and operations including, but not limited to, those necessary for the movement of personnel, equipment, supplies and incidentals to the worksite; for the establishment of all offices, buildings and other facilities necessary for work on the project; and for all other work and operations which must be performed or costs incurred prior to beginning work on the various contract items on the worksite.

##### 1.02 SUBMITTALS

- A. Refer to Technical Specifications Sections 01300 and 01340 for submittal procedures.
- B. Submit a Mobilization Schedule 15 days prior to first billing for mobilization.

##### 1.03 DELIVERY

- A. Delivery to the worksite of construction tools, equipment, materials and supplies shall be accomplished in conformance with local governing regulations.

#### PART 2 - PRODUCTS

##### 2.01 PRODUCTS

- A. Provide construction tools, equipment, materials and supplies of the type and quantities that will facilitate the timely execution of the Work.

#### PART 3 - EXECUTION

##### 3.01 EXECUTION AND REMOVAL

- A. Provide personnel, products, construction materials, equipment, tools and supplies at the worksite at the time they are scheduled to be installed or utilized.
- B. Upon completion of the Work, remove construction tools, apparatus, equipment, unused materials and supplies, plant, and personnel from the jobsite.

#### PART 4 - MEASUREMENT

##### 4.01 METHOD OF MEASUREMENT

- A. Refer to Appendix A for Method of Measurement.

#### PART 5 - PAYMENT

##### 5.01 METHOD OF PAYMENT

- A. Refer to Appendix A for Method of Payment.

**END OF SECTION 01505**

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## SECTION 01566

### ENVIRONMENTAL CONTROLS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Work specified in this Section consists of avoiding or mitigating adverse environmental impacts caused by construction activities in the areas of air quality, water quality, hazardous and non-hazardous solid waste, natural resources, and noise pollution. Reference the General Contract Conditions 806 (Protection of Drainageways), 807 (Protection of Environment), 808 (Hazardous and Explosive Materials or Substances), and 809 (Archeological and Historical Discoveries).
1. The Contractor, in conducting any activity on airport property or in conducting work for an airport project not on airport property, shall comply with all applicable airport, local, state, and federal rules, regulations, statutes, laws, and orders (“Environmental Requirements”). In addition, these Environmental Requirements include applicable Environmental Guidelines developed for DIA’s Environmental Management System (EMS), as summarized in the airport’s Rules and Regulations Part 180 (Environmental Management), which can be located on the airport’s website at: <http://business.flydenver.com/info/research/rules/index.htm> . Information on DIA’s EMS as well as current versions of DIA’s Environmental Guidelines and Environmental Policy are also located on the airport’s website at: <http://business.flydenver.com/info/research/rules/index.htm> . These Environmental Requirements address, but are not limited to, requirements regarding the management of hazardous materials, petroleum products, solid waste, or any other substance; the National Environmental Policy Act (NEPA); and water quality and air quality regulations. Each entity, including subcontractors and subconsultants providing products, goods, and/or services on behalf of DIA, must be aware of the DIA Environmental Policy, the significant environmental aspects for DIA, and which of these aspects are relevant to the activities conducted by the entity.
  2. The Contractor shall comply with all Environmental Requirements and accept responsibility for compliance with all environmental quality standards, limitations and permit requirements promulgated there under. The Contractor shall obtain all environmental permits required for implementation of the project. Failure of these specifications to specifically mention any Environmental Requirement does not relieve the Contractor from compliance.
  3. If the City, as owner, is determined by any federal, state or local government agency, department, board or commission, or in any judicial proceeding to have violated any such environmental protection rules, laws or regulations as a result of Contractor's acts or omissions, the Contractor agrees to indemnify and hold harmless the City from any and all prosecutions, payment of any and all fines or penalties, and the cost of abatement and remediation, except that the Contractor shall not be required under General Contract Condition 807, to indemnify the City from any amounts which are attributable to the negligence of the City.
  4. Work shall not commence on any project until all FAA approvals have been received, applicable permits have been issued and signed by permittee, and all inspection requirements have been satisfied in accordance with State and local permitting requirements.

##### 1.02 SUBMITTALS

- A. Refer to Technical Specifications Sections 01300 (Submittals) and 01340 (Shop and Working Drawings, Product Data and Samples) for procedures.
- B. Within 10 days after Notice to Proceed on a task order, the Contractor shall submit the following if applicable, unless waived by the DIA Project Manager:
1. Submittals pertaining to water quality management:
    - a. Copy of the application completed for the City and County of Denver Construction Activities Stormwater Discharge Permit (CASDP) and the CASDP issued for the project by the Denver Department of Public Works. This submittal consists of three items: the Authorization to Discharge, the Sewer Use & Drainage Permit, and the approved Construction Activities Stormwater Management Plan (CASMP).
      - 1) Revisions or amendments to the CASMP by the Contractor. At the completion of the project, after final stabilization has been achieved and accepted in accordance with CASDP requirements, the Contractor shall submit a copy of the CASDP Inactivation Request.
    - b. Copy of the certification issued by the Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Division (WQCD) under the Colorado Discharge Permit System (CDPS) for discharges associated with construction activities and/or industrial activities. Before obtaining this permit, the Contractor shall submit a **draft** permit application and the final permit application for DIA review and approval PRIOR to submittal to CDPHE. The Contractor need not submit copies of the general permits or the general permit rationales.
      - 1) At the completion of the project, after final stabilization has been achieved and accepted in accordance with the State of Colorado CDPS requirements, the Contractor shall submit a copy of the CDPS Inactivation Notice or Notice of Termination.
    - c. Copy of the certification issued by the State of Colorado CDPS under its General Permit for Construction Dewatering Activities. Before obtaining this permit, the Contractor shall submit a **draft** permit application and the final permit application for DIA review and approval PRIOR to submittal to CDPHE. The Contractor need not submit a copy of the general permit or the general permit rationale.
      - 1) At the completion of the project, the Contractor shall submit a copy of the CDPS Notice of Termination.
    - d. Copies of any certification issued by the State of Colorado under its Industrial Permitting for minimal discharges of process wastewater. Before obtaining a permit, the Contractor shall submit a **draft** permit application and the final permit application for DIA review and approval PRIOR to submittal to CDPHE. The Contractor need not submit a copy of the issued permit or the permit rationale.
      - 1) The Contractor shall submit copies of Discharge Monitoring Reports (DMRs) and at completion of the project, the CDPS Notice of Termination.
    - e. A copy of the well permit from the state Division of Water Resources for every new well that diverts or for the monitoring of groundwater.
    - f. A copy of the Notice of Intent for any borehole structure filed with the state Division of Water Resources.
  2. Submittals pertaining to sewage holding tanks associated with buildings and trailers. For purposes of this Section 01566, the generic term “sewage holding tank” means “individual sewage disposal system (ISDS)”, “privy vault”, “septic tank”, or “septic system”.
    - a. Copy of the permit application for a sewage holding tank.
    - b. Copy of the Sewer Use & Drainage Permit issued by the Denver Department of Public Works.

- c. Copy of the ISDS permit issued by the Denver Department of Environmental Health.
3. Submittals pertaining to air quality management:
  - a. Copy of any permit issued by the CDPHE Air Pollution Control Division (APCD). Before obtaining a permit, the Contractor shall submit a **draft** permit application and the final permit application for DIA review and approval PRIOR to submittal to CDPHE.
    1. In cases where the City has already obtained a dust control permit, the Contractor shall submit a copy of the paperwork transferring the permit over to the Contractor's company name and a copy of the transferred permit.
  - b. Dust control plan. For projects where the State of Colorado requires a dust control permit, this submittal is waived. This plan must address appropriate control measures that the Contractor will employ to minimize the release of fugitive dust from the site. In addition, the Contractor must comply with the requirements in Section 3.01 below.
  - c. Copies of the Notices of Relocation.
4. Submittals pertaining to storage tanks and containers:
  - a. Copy of the permit issued by the State of Colorado, Department of Labor and Employment, Division of Oil and Public Safety, for installation of petroleum (or other regulated substances) storage tanks located on airport property and used for the project.
  - b. Copy of permits issued by the Denver Fire Department for storage tank installations, storage tank removals, and hazardous materials use/storage.
  - c. Copy of Spill Prevention, Control, and Countermeasure (SPCC) Plan for petroleum storage tanks and containers with capacity of 55 gallons of oil or greater located on airport property and used for the project.
5. Waste Management Plan. This submittal may be waived if DIA Environmental Services, upon consultation with the DIA Project Manager, deems it unnecessary to require such plan. When required, this plan must include, at a minimum, waste management measures listed in Paragraph 3.05.I. below. Because this plan may be required at any point during the project, the Contractor should anticipate making this submittal in its contract bid or proposal.
6. Copies of any other plans, permits, permit applications, correspondence with regulatory agencies (including violations), waste manifests, results of laboratory analyses, or other environmental documentation required for the project not previously identified.

### 1.03 RELATED DOCUMENTS

- A. Code of Federal Regulations (CFR) Publications (including but not limited to):
  1. 33 CFR 323 - Permits for discharges of dredged or fill materials into waters of the United States
  2. 40 CFR - Protection of Environment
  3. 49 CFR 171-180 Hazardous Material Transportation Regulations
- B. Colorado Revised Statutes (including but not limited to):
  1. Water Quality Control, Title 25, Article 8

2. Air Quality Control, Title 25, Article 7
  3. Hazardous Waste, Title 25, Article 15
  4. Noise Abatement, Title 25, Article 12
  5. Petroleum Storage Tanks, Title 8, Article 20.5
  6. Liquefied Petroleum Gas (LPG) Storage Tanks, Title 8, Article 20
  7. Solid waste regulations
- C. City and County of Denver Executive Orders (including but not limited to)
1. Executive Order No. 115
  2. Executive Order No. 123
- D. Denver Revised Municipal Code, Title II, Sections 48-44 and 48-93
- E. City and County of Denver Construction Sites Program
- F. City and County of Denver Construction Activities Stormwater Management Plans Information Guide
- G. Any other applicable rules, regulations, ordinances, and guidance must be followed as applicable.

## PART 2 - PRODUCTS

### 2.01 PRODUCTS

- A. Products required for the work shall meet all Environmental Requirements.
- B. At a minimum, products for erosion and sediment control must conform to the technical requirements contained in the *City and County of Denver's Construction Activities Stormwater Management Plan Information Guide* and the current version of the Urban Drainage and Flood Control District's *Urban Storm Drainage Criteria Manual, Volume 3: Best Management Practices*. These documents are posted at <http://www.denvergov.org/Portals/528/documents/DftGuide452007.pdf> and [http://www.udfcd.org/downloads/down\\_critmanual.htm](http://www.udfcd.org/downloads/down_critmanual.htm) respectively.

## PART 3 - EXECUTION

### 3.01 AIR POLLUTION CONTROLS

- A. The Contractor shall use appropriate control measures to comply with applicable air quality permit requirements. Additionally, the Contractor must be aware of the following procedures and techniques while conducting construction activities on DIA property. NOTE: Application of dust control measures should be discussed in the Dust Control Plan.
1. Apply water as needed to the construction site haul roads, disturbed surface areas and public access roads as needed to suppress dust. The use of chemical stabilizer can be requested by the Contractor. The type of stabilizer to be used and locations of use must be included in the Dust Control Plan, which must be approved by the DIA PM prior to application.

2. The Contractor shall suspend all earthmoving activities if wind speed exceeds 30 mph. For purposes of this Section 01566, the generic term “earthmoving” means clearing, grubbing, excavation, topsoil removal, backfilling, embankment work, grading, trenching, drilling, and installation of borings. Contractors are expected to check wind speeds with the airport’s ramp tower to demonstrate compliance with this requirement. In addition, the project may be shut down if two of three of the Runway Visual Range (RVR) instruments read visibility of 2,400 feet or less. The instruments are used by FAA Control Tower personnel to ensure safe aircraft operations. Costs for shutdowns due to wind velocities or RVR readings shall not be grounds for delay or extra cost claims.

- B. Burning of materials is strictly prohibited on DIA property.

### 3.02 WATER POLLUTION CONTROLS

- A. The Contractor shall conduct construction activities in accordance with all applicable permit requirements. In addition, the Contractor shall comply with the following procedures and requirements while conducting activities on DIA property.
  1. Water encountered during construction cannot be discharged to the stormwater system or placed onto the ground surface without a permit AND prior written approval by the DIA Project Manager. If groundwater or stormwater is anticipated to be encountered and the Contractor desires to discharge it to the stormwater system or onto the ground surface, then the Contractor must obtain an appropriate CDPS discharge permit in advance of the discharge unless this activity is specifically authorized under the CDPS Construction Stormwater Permit.
  2. If water is encountered and the Contractor desires to discharge these waters to the sanitary sewer system, then the Contractor must obtain approval from DIA Environmental Services in advance of the discharge.
  3. The Contractor shall ensure that stormwater that comes in contact with storage areas does not become impacted and discharged to the stormwater sewer system or to an impervious surface. Furthermore, any materials in storage areas shall not be stored directly on the ground (refer to DIA Technical Specification 16642 for Cathodic Protection Requirements).
  4. The Contractor shall not operate any valves, sluice gates or other drainage appurtenances related to any DIA sewer system without the prior approval of both the DIA Project Manager and DIA Environmental Services. Any violation of this directive may result in the payment of a financial penalty by the Contractor if the State of Colorado assesses such a penalty.

### 3.03 EROSION CONTROL AND SEDIMENTATION CONTROL

- A. This work consists of constructing, installing, maintaining and removing, if required, temporary and permanent control measures during the life of the contract (and possibly afterward) until the Contractor achieves final stabilization of the site to prevent or minimize erosion, sedimentation, and pollution of any state waters in accordance with all Environmental Requirements.
- B. The Contractor is responsible for compliance with all requirements in accordance with the CASDP, the City and County of Denver Construction Sites Program, the approved CASMP, and CDPS issued permits.

- C. Temporary facilities, including but not limited to, storage areas, laydowns, borrow areas, and contractor offices and work yards shall be managed in accordance with DIA Technical Specification 01500 for Temporary Facilities.
- D. Clean soil fill may be stockpiled in any area that has been previously approved and signed off by the DIA Section Manager of Construction, Design and Planning, and Environmental Services. Soil stockpiles are considered a potential pollutant source and must be addressed in the CASMP and/or SWMP.
- E. Make immediately available, upon the DIA PM's request, all labor, material and equipment judged appropriate by the Project Manager to maintain suitable erosion and sediment control features. These actions requested by the DIA PM take precedence over all other aspects of project construction that have need of the same labor, material and equipment, except those aspects required to prevent loss of life or severe property damage.

### 3.04 CONSTRUCTION OF CONTROL MEASURES FOR EROSION AND SEDIMENTATION

- A. The Contractor must install control measures in accordance with the most recent version of the Urban Drainage and Flood Control District's Urban Storm Drainage Criteria Manual, Volume 3: Best Management Practices and the City and County of Denver's Construction Activities Stormwater Management Plan information Guide. These documents are posted at: [http://www.udfcd.org/downloads/down\\_critmanual.htm](http://www.udfcd.org/downloads/down_critmanual.htm) and <http://www.denvergov.org/Portals/528/documents/DftGuide452007.pdf> respectively. Deviations from these two documents are allowed with written consent from the City and County of Denver NPDES Inspector.

### 3.05 SOLID WASTE MANAGEMENT

- A. This paragraph applies to solid waste. Solid waste is defined at 40 CFR 261.2 and includes all putrescible and nonputrescible solid, semisolid and liquid wastes, but does not include hazardous waste which is treated as a separate subset of solid waste. Hazardous waste is defined at 40 CFR 261.3, and 6 CCR 1007-2 as a solid, a liquid, or a contained gaseous material that is no longer used or that no longer serves the purpose for which it was produced and meets the definitions of the regulations. Certain types of non-hazardous solid waste may require special handling; such wastes are sometimes called "special waste."
- B. Hazardous and non-hazardous solid waste may be generated by the actions of the Contractor including, but not limited to, the direct purchase of hazardous materials, demolition, site preparation, grading, excavation, construction, or maintenance of equipment. If questionable material is encountered during construction activities, the Contractor must immediately notify the DIA Communications Center at (303) 342-4200 and the DIA Project Manager. If the Contractor will utilize any chemicals that will result in the generation of a potentially hazardous waste, the Contractor must prepare and submit a Waste Management Plan (Section 3.05.I)
- C. Remove scrap and waste material and dispose of it in accordance with laws, codes, regulations, ordinances, and permits.
- D. The Contractor is responsible for the safe management and disposal of all hazardous and non-hazardous solid waste and shall dispose of such waste in accordance with all environmental requirements. Waste disposal options include reuse on the project (with DIA approval only), sale, use for fuel, donation to other public or private projects, or through disposal in approved public or private disposal sites, either free of charge or for a fee. The method of disposal is restricted according to the classification of the waste. Hazardous and non-hazardous solid waste shall not be abandoned, dumped, buried or in any other way

disposed on DIA property.

- E. City and County of Denver Executive Order No. 115 requires all non-hazardous solid waste generated at DIA to be directed to the Denver Arapahoe Disposal Site (DADS) landfill. This includes all non-hazardous solid waste collected or transported in Denver vehicles, Contractor vehicles, or subcontractor vehicles. Through the DIA Project Manager, the Contractor shall establish accounts in advance for the disposal of non-hazardous solid waste generated on the project. Therefore, this bid shall include costs for transportation to the DADS landfill only and the City is responsible for disposal fees and any applicable State surcharges. The Contractor is responsible for any special handling charge imposed by the transporter or the DADS landfill operator.

NOTE: To establish contractor accounts, the DIA Project Manager shall follow procedures outlined in ES-308-06.03: *Municipal and Special Solid Waste Administrative Management Work Instruction*.

1. In the interest of public relations and to maximize the long-term use of the Site, haul routes adjacent to DADS shall be limited to State Highways 30 or 470 unless these routes are impassable (refer to Exhibit A for preferred haul route). Specifically, Gun Club Road between Interstate Highway 70 ("I-70") and Mississippi Avenue shall be avoided.
- F. Some of the naturally occurring material found by the Contractor, especially tar or oil-impregnated soil, may not be obviously hazardous. Physical and chemical analyses and tests may be required to determine if the material meets the criteria set forth in State of Colorado, CDPHE, Hazardous Materials and Waste Management Division (HMWMD) regulations. The Contractor shall pay for such chemical analyses and will coordinate with local authorities to determine the quantity and origin of samples analyzed for any questionable material. The Contractor will provide the classification of the material to the City.
- G. The routes to be followed when transporting solid or hazardous wastes may be subject to the approval of the local agency having jurisdiction.
- H. The Contractor shall not wash down equipment in such a manner as to flush grease and oils into the project site or onto airport property unless the waste is properly contained, treated, and disposed.
- I. Unless waived, the Contractor shall submit a Waste Management Plan that meets these minimum requirements:
1. Contractor's name and contract number;
  2. A list of all materials, products, and wastes for the project; acknowledgment whether any of those materials and products require special handling or storage for environmental, safety, or fire code reasons; and acknowledgment whether any of the wastes will become regulated wastes upon disposal. The list of materials, products, and wastes shall include, at a minimum, trash and unclassified construction debris, asphalt spoils, concrete spoils, pavement sweepings, soils contaminated by chemicals or petroleum products during the project, lime and cement trimmings, scrap metal, and every chemical product used on the project. Reuse of a product on site for its original intended purpose (e.g., cement trimmings from one part of the project used elsewhere on the airport) does not constitute generation of a waste for disposal.
  3. For each material and product listed, the Contractor shall identify the storage method, and identify measures to store hazardous waste separately from non-hazardous waste.

4. For each waste listed, the Contractor shall identify the handling/transportation method, the disposal method, and the disposal facility utilized.
  5. If the Contractor anticipates generation of hazardous waste, the Contractor shall provide its USEPA (generator) identification number.
  6. Recycling measures.
  7. Waste minimization measures.
  8. Pollution prevention measures.
  9. Training measures for management of hazardous materials and hazardous wastes on site.
- J. The Contractor shall maintain copies of MSDSs for any and all materials used at the airport project, at its on-site project office or other designated location. DIA Environmental Services may, at any time, request copies of MSDSs and/or waste manifests for any waste shipments from the project site. Any such request must be fulfilled within 1 business day.
- K. The Contractor shall require all shipments to the worksite to contain documentation that shows whether the material is hazardous or requires special handling, storage, or disposal; what type of material it is; what hazard(s) it poses; how to treat exposure(s); and the quantity of hazardous material in the shipment. This information must be provided to the DIA PM prior to any hazardous material being allowed on site.
- L. Before leaving the site with any hazardous waste or material requiring special handling, disposal, or storage, the Contractor must provide the DIA PM with a detailed description of the material, its source, quantity, who is hauling it off site, and where it is being taken, along with verification that the destination site can legally receive it.
- M. The Contractor shall recycle all construction materials to the extent practicable.

### 3.06 CONSTRUCTION DEBRIS RECYCLING

- A. The City and County of Denver encourages recycling applicable materials. Scrap metal, wood, and other construction materials may be eligible for recycling. The Contractor is responsible for coordinating all aspects with regard to recycling. The Contractor can contact DIA Purchasing or DIA Environmental Services for information regarding recycling policies and practices.
- B. Dry concrete and asphalt materials are considered solid waste, but may be eligible for recycling. DIA maintains two dry concrete and asphalt recycling yards used for the accumulation and crushing of these materials. The only allowable materials at the recycle yards are dry concrete and asphalt materials derived from construction activities occurring on DIA property. The South Yard is located on 71<sup>st</sup> Ave just east of Jackson Gap Street. The North Yard is located on the south side of 110<sup>th</sup>, west of Queensburg Street. The use of these yards must be approved by the DIA Project Manager.
1. Concrete washout activities are prohibited anywhere on DIA property unless a) the activity is specifically authorized under a CDPS permit and included in the SWMP or b) the washwater is collected and hauled offsite for disposal at an appropriately permitted facility. Concrete washout activities authorized by permit are only allowed at a designated concrete washout area as indicated in the approved CASMP and include the washing of the chute and tools ONLY. Concrete washout spoils are eligible for recycling once the washout has been segregated and allowed to dry and harden in accordance with permitted methods.



2. Rejected loads and/or other wet concrete or asphalt materials are prohibited to be placed ANY WHERE on DIA property unless the Contractor holds a permit that authorizes the placement of such material on the site. Unless specifically authorized in a CDPS permit issued to the Contractor, these materials must be returned to the facility of origination or other permitted facility for proper disposal.
3. The Contractor shall not place any concrete containing welded wire fabric or deformed steel reinforcing bars installed in a crisscross fashion in either of the airport's two construction spoils recycling yards. The Contractor shall remove reinforced concrete from the project site and haul such waste to the DADS landfill.
4. A Recycle Materials Manifest is required to be filled out by the Contractor for each load of concrete or asphalt placed in these areas and given to the responsible Project Manager. It will be the responsibility of the Project Manager to ensure the accuracy and completeness of the manifests. The Project Manger will also be responsible for instituting controls to ensure that only the manifested materials are placed in the approved site. If two or more Project Managers have material going into a site at the same time, they will need to coordinate their efforts to ensure that only approved and manifested materials are allowed on the site.
5. A copy of all manifests must be turned in on a weekly basis to the Assistant Deputy Manager of the Construction Management Section (Michael Steffens). A copy of the Recycled Materials Manifest form is available from the DIA Project Manager.

**NOTE:** Concrete and asphalt waste materials are considered a potential pollutant source and must be addressed in the CASMP and/or SWMP.

### 3.07 STORAGE OF OIL, FUELS, OR HAZARDOUS SUBSTANCES

- A. The Contractor shall prevent oil or other hazardous substances (as defined in federal and state regulations) from entering the ground, drainage or local bodies of water, and shall provide containment, diversionary structures, or equipment to prevent discharged oil from reaching a watercourse and take immediate action to contain and clean up any spill of oily substances, petroleum products, or hazardous substances. The Contractor shall provide one or more of the following preventive systems at each petroleum storage site:
  1. Dikes, berms, or retaining walls capable of containing at least 100% of the volume of the largest single tank and equipped with sufficient freeboard to contain precipitation events. The secondary containment must be "sufficiently impermeable" to prevent a release to the environment.
  2. Culverting, curbing, guttering or other similar structures capable of containing at least 100% of the volume of the largest single tank.
- B. The provision of such preventive systems shall be subject to acceptance by the DIA PM prior to tank installation and shall follow the SPCC regulations (40 CFR Part 112).
- C. Prior to bringing any containers of 55-gallon or above capacity onto DIA property for storage of oil, fuel, or other petroleum substances, the Contractor may be required to prepare an SPCC Plan that conforms to 40 CFR Part 112. The plan must include either a certification from a Professional Engineer or self-certification (if applicable), as well as management approval from the legally responsible Contractor representative.

### 3.08 SPILL RESPONSE AND NOTIFICATION

- A. The Contractor is responsible for all spills that may result from its activities. For ANY suspected or confirmed release or spill of oil, fuel, solid waste, hazardous waste, unknown

materials, lavatory waste, or miscellaneous chemicals, etc. that occurs as the result of the Contractor's activities on DIA property, the Contractor is required to take immediate action to mitigate the release or spill and report it to the DIA Project Manager and to the DIA Communications Center at (303) 342-4200.

- B. The Contractor is responsible for notifying the appropriate regulatory agency(ies) in the event suspected and/or confirmed releases are identified, in accordance with regulatory requirements.

### 3.09 SITE REMEDIATION AND RESTORATION

- A. The Contractor shall be required to perform any necessary site assessment and remediation activities required by applicable regulatory agency(ies).
- B. During routine construction activities, the Contractor is required to manage soils using typical construction techniques. The Contractor must differentiate between soils and wastes (including contaminated soils versus clean soils) and determine those materials that can remain on DIA property and those that must be transported offsite for disposal.
- C. During all construction activities that require the management of soils, the Contractor must notify the Project Manager and DIA Environmental Services (ES) that soils being managed may be impacted by industrial activities conducted at the airport. "Process knowledge" pertaining to previous use and/or impact for the location(s) under construction can be used to determine whether impacted soils are probable. Also, common indices such as soil staining and odor can be used as a determination for the probable condition. If probable contamination conditions are suspected, the Contractor will notify the Project Manager and DIA ES immediately. At that time (which may be before the work is initiated where indicative conditions exist), all work will cease until a sampling and analysis approach is determined and implemented by the proper responder.
- D. If the site conditions warrant based on evidence of spillage or contamination, process knowledge, and/or visual or olfactory observations, the Contractor may be required to conduct sampling and analysis to confirm that no remedial action is required. Prior to conducting any removal activities, the Contractor must provide a Scope of Work to the DIA PM describing the proposed site assessment activities.
- E. The impacted project will modify its operation to include a segregation area where probable impacted soils can be placed, stored, and sampled for characterization. Should the soil materials be determined to exceed the applicable standards, the Project Manager in conjunction with DIA ES, will be responsible for the proper disposal of these materials. Materials that are determined to contain contamination levels below the applicable standards can be considered clean soils and placed back into the excavation or reused elsewhere on DIA property. In accordance with Section 3.06, materials removed that are suitable for recycling will be placed within areas designated on DIA to store these materials.
- F. The Contractor shall restore any area on the Airport which becomes contaminated as a result of its operations. Restoration shall be either to applicable standards under federal and state law or to such other levels as may be required by the Manager of Aviation, at the Manager's sole discretion. Such restoration shall be completed at the earliest possible time, and the Contractor's restoration shall be subject to inspection and approval by the Manager of Aviation or her duly authorized representative (see DIA Rules & Regulations – Part 180).

## PART 4 - MEASUREMENT

**4.01 METHOD OF MEASUREMENT**

- A. Refer to Appendix A for Method of Measurement.

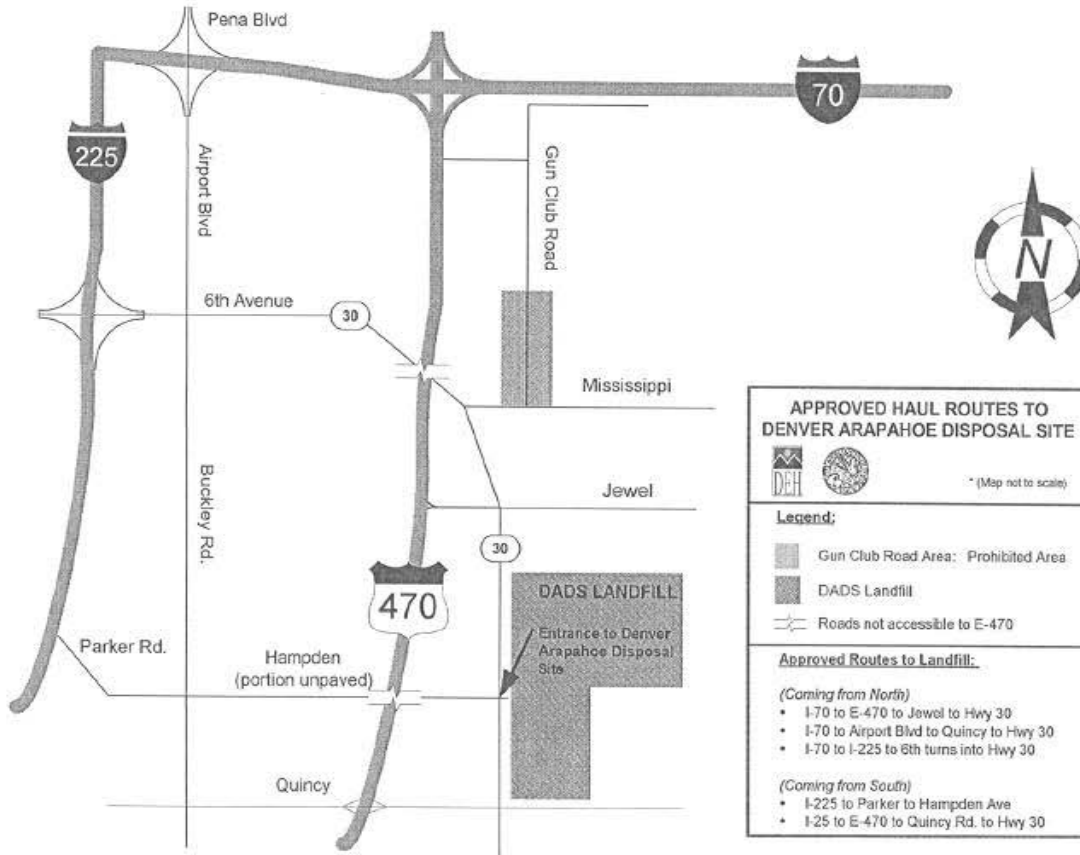
**PART 5 - PAYMENT**

**5.01 METHOD OF PAYMENT**

- A. Refer to Appendix A for Basis of Payment.

EXHIBIT A

MAP OF ROUTE TO DADS LANDFILL



END OF SECTION 01566

## SECTION 01575

### ELECTRICAL PHASING

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

The Work specified in this Section consists of furnishing, installing, operating, maintaining and removing temporary series circuit cable, secondary isolation transformer shorting plugs, tie backs, sign panel covers, and elevated light covers at locations and in accordance with the design and details shown on the plans and this specification or as directed by the DIA Project Manager. It shall include furnishing all equipment, materials, labor, services, and incidentals necessary to establish the temporary electrical phasing and to establish existing conditions prior to construction.

##### 1.02 QUALITY CONTROL

- A. Provide products for, and the execution of, the Work of this Section that will satisfy the requirements of the NEC, OSHA and local codes. Provide products that satisfy requirements of NEMA and are UL listed.

#### PART 2 - PRODUCTS

##### 2.01 LIGHTING EQUIPMENT

- A. Provide temporary power and lighting equipment consisting of plugs, conduits and wiring sized and capable of continuous service and having adequate capacity to ensure a complete temporary operating system. Comply with NEMA. The airfield equipment shall meet the following FAA criteria.

| <u>Cited FAA Specification</u> | <u>Equipment Name</u>                                                        |
|--------------------------------|------------------------------------------------------------------------------|
| AC 150/5345-26C                | Specification for L-823 Plug and Receptacle, Cable Connectors                |
| AC 150/5345-7E                 | Specification for L-824, Underground Electrical Cables for Lighting Circuits |

- B. Rubber and vinyl electrical tapes shall be Scotch Electrical Numbers 130C and Super 88, respectively, or approved equal.
- C. Shorting plugs shall be Style 1, Class A, Type II with a #12 AWG XHHW-2 cable soldered across the conductors on the cable side. Wrap the soldered interface with vinyl electrical tape making sure to half lap until there is 0.25" build up around the solder interface.
- D. Conduit shall be HDPE SDR 11 orange or PVC, schedule 40 impregnated with orange color or marked with orange tape. The conduit shall be in accordance with NEMA TC-2 and/or UL651B.

#### PART 3 - EXECUTION

##### 3.01 ELECTRICAL PHASING

- A. Prior to start of installing jumper cables, the Contractor shall test the insulation resistance, of the circuits being temporarily disconnected, from the airfield lighting vault with the DIA Project Manager as a witness to record the results. The insulation test shall be performed using a

“Megger” with an output of at least 1,000V dc.

**Caution:** The series lighting circuit must always be complete. Normal circuit voltage is less than 5,000 volts; open circuit voltage can be more than 10,000 volts. All personnel shall be instructed to protect the integrity of the lighting circuit. Turn off the regulator at the vault before opening the circuit.

B. The Contractor shall bypass semi-flush centerline lights that are located on a closed taxiway. The Contractor shall do one of the following two things as shown on the Plans.

1. Remove and disconnect the semi-flush fixture from the secondary of the isolation transformer. Install a shorting plug on the secondary of the isolation transformer and reinstall the fixture. The connection shall be waterproofed by taping the connectors 1-1/2 inches on both sides of the joint with rubber tape and a layer of vinyl tape. The fixture plug shall be wrapped with vinyl tape to protect it from moisture.
2. The Contractor shall remove heat shrink tubing by lightly scoring the surface with a sharp knife and then heating with a torch equipped with a flame spreader. If the Contractor causes any damage to the connector, cable, or transformer, all damaged material shall be replaced at no additional cost to DIA.

Install a #8, 5,000V, L-824 jumper cable above grade routed through orange HDPE or PVC conduit that is either impregnated with orange or using orange tape to complete the temporary circuit. The jumper cable can be existing cable removed from an area that is part of demolition. If the existing cable is damaged or of inadequate length, the Contractor shall supply additional cable as part of this item.

Continuity of the circuit shall be checked before the regulator is reconnected and energized. Temporary cable used for bypassing of circuits will not be allowed to be installed as part of the permanent construction.

C. Elevated taxiway edge lights that remain connected to an energized circuit shall be covered using corrugated PVC full length as shown in the Plans. The globe will be covered thus blocking any light that may be visible to a pilot.

D. Taxiway exit signs will be modified to correspond to the construction limits as shown on the Plans. Black geotextile fabric shall cover the faces so that the numerals are not recognizable during daylight or nighttime operations for those signs that require covering. Once construction is complete, the fabric shall be removed and the signs restored for normal operations. Fastening of the fabric to the signs shall be secure so that it does not become dislodged by the wind. Nothing will be allowed to be fastened directly to the sign (ie duct tape) frame itself.

E. When construction is complete, the Contractor shall turn the regulator off at the airfield lighting vault. The temporary cable and/or the shorting plugs shall be removed and all lights reconnected. The connectors shall be waterproofed per Specification L-108. The circuit shall be tested for continuity and the insulation resistance shall be tested and compared to the original value. If the insulation resistance has decreased, the Contractor shall be responsible for correcting the problem. When all work is complete, check continuity, reenergize the regulator and check for proper operation.

## PART 4 - MEASUREMENT

### 4.01 METHOD OF MEASUREMENT

A. Refer to Appendix A for Method of Measurement.

**PART 5 - PAYMENT**

**5.01 METHOD OF PAYMENT**

- A. Refer to Appendix A for Basis of Payment.

**END OF SECTION 01575**

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## SECTION 01576

### TRAFFIC CONTROL

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Work specified in this Section consists of furnishing plans and designs for traffic control and haul routes, implementing these plans with all necessary personnel and equipment. Installation may require but not be limited to signage, cones, flaggers, signal lights, lighting and temporary roads. All work must be in conformance with the Manual of Uniform Traffic Control Devices (MUTCD), Colorado Department of Highway Standards and SSPWC Specifications. The Contractor must coordinate his proposed traffic control needs with the needs of other contractors on the airport construction site in writing through the Project Manager.
- B. Reference Contract General Condition, GC 805.

##### 1.02 QUALITY CONTROL

- A. Temporary signal work shall conform to "Standard Specifications for Public Works Construction".
- B. Designate a qualified person to inspect and test traffic control devices daily and to ascertain that those devices are continuously operating, serviceable, in place and clean.
- C. Provide trained personnel who will be responsible for design, implementation and inspection of traffic control needs.

##### 1.03 SUBMITTALS

- A. Refer to Technical Specifications Sections 01300 and 01340 for submittal procedures.
- B. Submit a Traffic Control Plan (TCP) that includes, at a minimum, the following list of items for approval before starting work. Submit an updated TCP when necessary to modify traffic operation or undertake a construction activity that creates a different traffic pattern.
  - 1. Traffic blockade and reductions anticipated to be caused by construction operations.
  - 2. Temporary detours.
  - 3. Show and describe proposed location, dates, hours and duration of detours, vehicular traffic routing and management, traffic control devices for implementing detours and details of barricades.
- C. Submit Haul Route Plan for both on- and off-site hauls. The Haul Route Plan shall be submitted 30 days prior to hauling any permanent material. The plan shall be updated as the contractor's plans change.
- D. Specific Traffic Considerations: The Project Manager may require the Contractor to revise the Traffic Control Plan to address traffic considerations not included in the Contractor's plan.

#### PART 2 - PRODUCTS

## **2.01 TRAFFIC CONTROL DEVICES**

- A. Such devices which include signs, delineators, striping, barriers, barricades and high level warning devices shall conform to the latest revision of the "Manual on Uniform Traffic Control Devices" and the latest revision of the CDOT Supplement thereto.

## **PART 3 - EXECUTION**

### **3.01 TEMPORARY TRAFFIC CONTROL DEVICES**

- A. Place temporary control devices in those locations that will enable traffic to traverse the area without hazard or abrupt changes in direction. Place traffic cones or delineators on not more than 35 foot centers. Operate warning lights between sunset and sunrise; place control devices so that approaching traffic is alerted to hazards and variances to normal traffic patterns. Place high rise warning flag units where motorist's visibility of warning devices, traffic signals, and pedestrian crosswalks will be either limited or obscured. Place barricades, cones and similar protective devices where personnel and equipment will be working within five feet of the edge of a lane bearing traffic. Clean and repair damaged devices or replace them with new devices as required.

### **3.02 TEMPORARY TRAFFIC STRIPING AND PAVEMENT MARKINGS**

- A. Stripe and mark bituminous and Portland cement pavement before diverting traffic. Maintain stripes and marks until permanent traffic marking and striping has been provided, or the temporary condition is no longer required. Remove temporary striping and marks when no longer required.

### **3.03 FLAGGERS**

- A. Furnish flaggers where construction equipment may intermittently encroach on traffic lanes, already existing haul routes, and where construction operations would affect public or construction safety and convenience and also where active haul roads cross existing access roads.

### **3.04 CONSTRUCTION VEHICULAR TRAFFIC**

- A. Restrict construction vehicles to approved haul routes.

### **3.05 CONTROLLING VEHICULAR AND PEDESTRIAN FLOW ADJACENT TO WORKSITE**

- A. Ensure that construction operations will not impede normal traffic. Where work is in the area of pedestrian or occupant activity, the Contractor shall erect barriers to prevent pedestrian intrusion into the worksite. The barriers will be a minimum of 42 inches in height and shall not be penetrable from floor or grade to the top of the barrier. Barriers erected in areas where there is a change in grade of over six inches shall meet barrier requirements as defined in the UBC and the DBC.

### **3.06 SIGNS**

- A. Coordinate and pay any expense associated with the furnishing and installation of all parking regulatory signs, such as "No Stopping Any Time," etc. at the worksite. The Contractor must contact the Project Manager a minimum of five working days in advance of construction for installation, relocation or removal of regulatory parking signs.

- B. Furnish and install any necessary advance detour or guidance signing.
- C. Authorize, modify and install regulatory parking controls and vehicle turn restrictions.
- D. Implement those traffic control modifications outside of the traffic control zone which are necessary to manage diverted traffic.

**PART 4 - MEASUREMENT**

**4.01 METHOD OF MEASUREMENT**

- A. Refer to Appendix A for Method of Measurement.

**PART 5 - PAYMENT**

**5.01 METHOD OF PAYMENT**

- A. Refer to Appendix A for Basis of Payment.

**END OF SECTION 01576**

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## SECTION 01580

### TEMPORARY SIGNS

#### PART 1 - GENERAL

##### 1.01 CONSTRUCTION SIGNAGE VISIBLE TO THE PUBLIC.

##### 1.02 TEMPORARY DIRECTIONAL, INFORMATIONAL OR REGULATORY SIGNAGE.

##### 1.03 QUALITY CONTROL

- A. Construction and other temporary signage visible to the public must be commercial grade quality, professionally fabricated and installed for the location of the sign. The contractor is responsible to maintain this signage until it is no longer needed.

#### PART 2 - PRODUCTS

##### 2.01 GENERAL

- A. Interior signs that are visible and not physically accessible to the public may be made of rigid board, such as "Gator Board" with vinyl messages. All edges must be finished and conceal all attachments.
- B. Interior signs that are visible and physically accessible by the public must be vandal-proof. Acceptable examples of vandal-proof signs are messages applied second surface with concealed tamperproof fasteners.
- C. Exterior signs must be vandal-proof and fabricated of weatherproof materials.

#### PART 3 - EXECUTION

##### 3.01 HARDWARE

- A. Interior Signs: Attach with suitable adhesive and/or tape which may be removed with out damage to finishes.
- B. Exterior Signs: Must be secured to withstand site conditions and varying weather conditions.

##### 3.02 SIGN FINISHES, MATERIALS AND PAINT

- A. Provide temporary signage to reflect permanent sign design and/or as directed by the Signage Design Project Manager. Submit temporary sign finishes, materials and paint, etc., for review and approval prior to any fabrication.

##### 3.03 MAINTENANCE

- A. The Contractor is responsible to maintain temporary signage until it is no longer needed.

##### 3.04 REMOVAL

- A. The contractor is responsible to remove all temporary signs, clean and refurbish affected

areas to their original (or intended) condition.

**PART 4 - MEASUREMENT**

**4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

**PART 5 - PAYMENT**

**5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01580**

## SECTION 01620

### STORAGE AND PROTECTION

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Work specified in this Section consists of providing storage and protection of the materials, products and supplies which are to be incorporated into the construction and indicating such storage areas on the working drawings with the location and dates when such areas will be available for each purpose.

##### 1.02 SUBMITTALS

- A. Refer to Technical Specifications Sections 01300 and 01340 for submittal procedures. Submit concurrently with submittals required in Section 01050.
- B. Submit working drawings showing locations of storage areas not indicated on the Contract Drawings.
- C. Submit descriptions of proposed methods and locations for storing and protecting products.

#### PART 2 - PRODUCTS

##### 2.01 MATERIALS

- A. Materials required for the storage and protection of the items specified shall be durable, weatherproof and either factory finished or painted to present an appearance acceptable to the City. Storage facilities shall be uniform in appearance with similar materials used to the maximum extent possible.

#### PART 3 - EXECUTION

##### 3.01 GENERAL REQUIREMENTS OF EXECUTION

- A. Palletize materials, products and supplies which are to be incorporated into the construction and stored off the ground. Material and equipment shall be stored only in those areas that are indicated as storage areas on the contract drawings and on the reviewed and accepted working drawings. Store these items in a manner which will prevent damage and which will facilitate inspection. Leave seals, tags and labels intact and legible. Maintain access to products to allow inspection. Protect products that would be affected by adverse environmental conditions.
- B. Periodically inspect stored products to ensure that products are being stored as stipulated and that they are free from damage and deterioration.
- C. Do not remove items from storage until they are to be incorporated into the Work.
- D. The Contractor shall ensure that all protective wrappings and coverings are secure and ballasted to prevent any items from deterioration and/or subsequent dislodgment. All items on the worksite that are subject to becoming windborne shall be ballasted or anchored.

### 3.02 HANDLING AND TRANSPORTATION

- A. Handling
  - 1. Avoid bending, scraping or overstressing products. Protect projecting parts by blocking with wood, by providing bracing or by other approved methods.
  - 2. Protect products from soiling and moisture by wrapping or by other approved means.
  - 3. Package small parts in containers such as boxes, crates or barrels to avoid dispersal and loss. Firmly secure an itemized list and description of contents to each container
- B. Transportation
  - 1. Conduct the loading, transporting, unloading and storage of products so that they are kept clean and free from damage.

### 3.03 STORAGE

- A. Store items in a manner that shall prevent damage to the owner's property. Do not store hydraulic fluids, gasoline, liquid petroleum, gases, explosives, diesel fuel and other flammables in excavations, except one day's supply of diesel fuel may be stored in open excavations.
- B. Provide sheltered weather-tight or heated weather-tight storage as required for products subject to weather damage.
- C. Provide blocking, platforms or skids for products subject to damage by contact with the ground.
- D. All material shall be stored according to the manufacturer's recommendations. Any material that has to be stored within specified temperature or humidity ranges shall have a 24-hour continuously written recording made of the applicable condition. Should the recording show that the material was not stored within the recommended ranges the material shall be considered defective and in nonconformance. If a certification from the manufacturer's engineering design representative is provided stating that the actual variations are acceptable and will in no way harm the material or affect warranties, then the deficiency will be considered corrected.
- E. Store hazardous material separately, with all material marked with a label showing the hazard and how to treat exposure to the material.

### 3.04 LABELS

- A. Storage cabinets and sheds that will contain flammable substances and explosive substances shall be labeled FLAMMABLE--KEEP FIRE AWAY and NO SMOKING with conspicuous lettering and conforming to OSHA requirements.

## PART 4 - MEASUREMENT

### 4.01 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

## PART 5 - PAYMENT



**5.01 METHOD OF PAYMENT**

- A. The cost of the Work described in this Section shall be included in the applicable unit price item, work order, or lump sum bid item. See Technical Specifications Section 01370 for additional requirements for the possible payment of stored material.

**END OF SECTION 01620**

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## SECTION 01630

### SUBSTITUTIONS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Work specified in this Section consists of submitting for the approval of a different material, equipment or process then is described in the Contract Documents. The Contractor is to use the Request for "Or Equal" Approval form found in the Instructions to Bidders before submitting his bid. The Request for Substitution form, found in Section 01999, is used after the Contractor receives his Notice to Proceed.
- B. If the substitution changes the scope of work, contract cost or contract time, a change order is required. As-built drawings and specifications must include all substitutions even if a change order is not issued.

##### 1.02 QUALITY CONTROL

- A. The substitution must provide the same quality as what it is replacing. The level of quality is defined by:
  - 1. Maintenance and operating cost
  - 2. Reliability
  - 3. Durability
  - 4. Life expectancy
  - 5. Ease of cleaning
  - 6. Ability to be upgraded as needed
  - 7. Ease of interacting with other systems or components
  - 8. Ability to be repaired
  - 9. Availability of replacement parts
  - 10. Established history of use in similar environments
  - 11. Performance equal or superior to that which it is replacing.

##### 1.03 SUBMITTAL

- A. Refer to Technical Specifications Sections 01300 and 01340 for submittal procedures.
- B. A complete Request for Substitution using the form in Section 01999 must be made at least 60 days prior to when an order needs to be placed or a method needs to be changed.
- C. The submittal shall contain, as appropriate, detailed product data sheets for the specified items and the substitution. Samples and shop drawings shall also be submitted of the substitution as applicable. The submittal shall contain all the data required to be submitted for acceptance of the originally specified item or process.
- D. The submittal shall contain all the applicable information required in Technical Specifications

Section 01630, paragraph 2.01 below.

- E. A signed statement as outlined in Technical Specifications Section 01630, paragraph 2.03.B below must accompany the Request for Substitution.

## **PART 2 - EXECUTION**

### **2.01 INFORMATION**

- A. Provide the following information as applicable with the Request for Substitution on the item or process that is being requested to be substituted:
1. A complete description of the item or process
  2. Utility connections including electrical, plumbing, HVAC, fire protection and controls
  3. The physical dimensions and clearances
  4. A parts list with prices
  5. Samples of color and texture
  6. Detailed cost comparisons of the substitution and the contract specified item or process
  7. Manufacturer warranties
  8. Energy consumption over a one-year period
  9. What local organization is certified to maintain the item
  10. Performance characteristics and production rates
  11. A list of any license fees or royalties that must be paid
  12. A list of all variations for the item or method specified
  13. A list of at least three other projects of similar nature to this contract where the products or methods have been in use for at least one year including telephone number and name of the person to contact at these other projects
  14. An analysis of the effect of the substitution on the schedule and contract cost and on the overall project as it relates to adjoining work.

### **2.02 SUBSTITUTION REQUEST**

- A. The formal Request for Substitution will be evaluated by the Project Manager and the Designer of Record based on the following criteria:
1. Compatibility with the rest of the project
  2. Reliability, ease of use and maintenance
  3. Both initial and long term cost
  4. Schedule impact
  5. The willingness of the Contractor to share equally in any cost savings
  6. The ability of the item or process to meet all applicable governing regulations, rules and laws along with funding agency requirements
  7. The cost of evaluating the substitution.
- B. Based upon the above evaluation the Deputy Manager of Aviation will make a final

determination of what is in the best interest of the City and either approve, disapprove or approve as noted the requested substitution.

## **2.03 CONDITIONS**

- A. As a condition for submitting a Request for Substitution the Contractor waives all rights to claim for extra cost or change in contract time other than those outlined in the request and approved by the Deputy Manager of Aviation. The Contractor, by submitting a Request for Substitution, also accepts all liability for cost and scheduling impact on other contractors or the City due to the substitution.
- B. Included with the Request for Substitution shall be the following statement:
  - 1. "The substitution being submitted is equal to or superior in all respects to the contract-required item or process. All differences between the substitution and the contract-required item or process are described in this request along with all cost and scheduling data."
- C. The statement shall be signed and dated by the Contractor's Superintendent.

## **PART 3 - EXECUTION (NOT USED)**

## **PART 4 - MEASUREMENT**

### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

## **PART 5 - PAYMENT**

### **5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or the lump bid item.

**END OF SECTION 01630**

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## SECTION 01650

### SYSTEM STARTUP, TESTING AND TRAINING

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION OF WORK

- A. Provide complete startup, testing and operator training services to ensure operability of all electrical and electronic equipment supplied.

##### 1.02 SUBMITTAL

- A. Refer to Technical Specifications Sections 01300 and 01340 for submittal procedures.
  - 1. Test procedures
  - 2. Test report
  - 3. Training outline.

##### 1.03 FIELD TESTS AND ADJUSTMENTS

- A. All electrical and mechanical equipment including the interfaces with control systems and the communication system, and all alarm and operating modes for each piece of equipment shall be tested by the Contractor to the satisfaction of the Project Manager before any facility is put into operation. Tests shall be as specified herein and shall be made to determine whether the equipment has been properly assembled, aligned and connected. Any changes, adjustments or replacements required to make the equipment operate as specified shall be carried out by the Contractor as part of the work.
  - 1. At least 30 days before the time allowed in the construction schedule for commencing startup and testing procedures, the Contractor shall submit to the Project Manager six copies of the detailed procedures he proposes for testing and startup of all electrical and mechanical equipment. These procedures are submitted for review and acceptance.
  - 2. The Contractor's startup and testing procedures shall include detailed descriptions of all pre-operational hardware, electrical, mechanical and instrumentation used for testing work. Each control device, item of electrical, mechanical and instrumentation equipment, and all control circuits shall be considered in the testing procedures which shall be designed in a logical sequence to ensure that all equipment has been properly serviced, aligned, connected, wired, calibrated and adjusted prior to operation. Motors shall be tested in accordance with ANSI/IEEE Publication 112. The Contractor is advised that failure to observe these precautions may place the acceptability of the subject equipment in question, and he may either be required to demonstrate that the equipment has not been damaged, or replace it as determined by the Project Manager.
  - 3. Testing procedures shall be designed to duplicate as nearly as possible all conditions of operations and shall be carefully selected to ensure that the equipment is not damaged. All filters shall be in place during startup and testing. Once the Project Manager has accepted the testing procedures, the Contractor shall provide checkout, alignment, adjustment and calibration signoff forms for each item of equipment and each system that will be used. The Contractor and the Project Manager shall use the

signoff forms in the field jointly to ensure that each item of electrical, mechanical and instrumentation equipment and each system has been properly installed and tested. The Contractor shall cooperate with project wide systems contractors where startup and testing is to be conducted concurrently.

4. Any special equipment needed to test equipment shall be provided to the City at no cost for a period of 30 days during startup.
- B. Before starting up the equipment, the Contractor shall properly service it and other items, which normally require service in accordance with the maintenance instructions. The Contractor shall be responsible for lubrication and maintenance of equipment and filters throughout the entire equipment “break-in” period described by the manufacturer.
1. The Contractor shall be responsible for the startup, adjustment, preliminary maintenance and checkout of all equipment and instrumentation. All systems shall be carefully checked for conformance with the design criteria.
  2. If any equipment or system does not operate as specified in the contract, the Contractor shall immediately replace or repair components until it operates properly.
  3. The Contractor shall submit a test report to the Project Manager within 30 days after completion of the system startup period.

#### **1.04 SYSTEMS STARTUP AND TESTING**

- A. The Contractor shall be responsible for a 30-day startup period during which time all hardware, electrical and mechanical equipment, communications, alarm systems and associated devices shall be energized and operated under local and automatic controls. The Contractor shall be present during the startup period with adequate labor and support personnel to adjust equipment and troubleshoot system failures that might arise.
- B. When a piece of electrical or mechanical equipment is found to be in conflict with specific criteria, an experienced representative of the manufacturer shall make an adjustment to the item.
- C. If adjustments fail to correct the operation of a piece of equipment or fixture, the Contractor shall remove the equipment or fixture from the project site and replace it with a workable replacement that meets the specification requirements.
- D. The 30-day startup period shall commence 30 days prior to the contract completion date and shall be completed prior to final payment. If, during the startup, any system fails to operate in accordance with contract requirements, the failure shall be corrected and the startup period shall begin again. At the end of the startup period, all filters shall be replaced with new ones. The City may, at its option, provide a Commissioning Representative to observe or participate in the startup and testing of any system. The Contractor shall coordinate with the Commissioning Representative relating to scheduling, reporting, forms, methods and procedures of the startup and testing.

#### **1.05 FINAL INSTRUCTIONS AND OPERATION TRAINING**

- A. After startup and testing is completed, the Contractor shall demonstrate to the City's personnel the proper manner of operating the equipment, programming messages, making adjustments, responding to alarms and emergency signals, and maintaining the system.
- B. The Contractor shall provide on-the-job training by a suitably qualified instructor to



designated personnel and shall instruct them in the operation and maintenance of the systems. In the event qualified instructors on the Contractor's staff are not available, the Contractor shall arrange with the equipment manufacturer for such instruction at no additional cost to the City.

- C. The Contractor shall provide a minimum of 16 hours of maintenance training to the Airport. Classes shall accommodate up to five people at a time.
- D. The Contractor shall provide a minimum of 8 hours of operator training to the Airport. Classes shall accommodate up to five people at a time with up to two separate courses (one for each shift).
- E. The Contractor shall provide a syllabus to the Project Manager at least seven calendar days prior to the start of each course that outlines topics to be covered, the proposed time allotted to each topic, and the target audience of the training session (technical, casual operator, overview, etc.). The Contractor shall not commence any training courses until the syllabus has been reviewed and approved by the Project Manager.
- F. The Contractor shall videotape all training sessions and provide labeled digital video disks (DVD) to the Project Manager. The Contractor shall provide three copies of the DVD to the Project Manager in DVD+R format. All disks shall be labeled using the LightScribe technology.
- G. The Contractor shall provide an annotated syllabus to the Project Manager that indicates topics contained on each tape.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**PART 4 - MEASUREMENT**

**4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

**PART 5 - PAYMENT**

**5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or the lump bid item. No contractual item requiring startup or testing will be paid until the conditions of this Section are completely satisfied.

**END OF SECTION 01650**

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## SECTION 01700

### CONTRACT CLOSEOUT

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Work specified in this Section includes procedures required prior to Final Acceptance of the Work in addition to those specified in General Conditions Title 20 and Technical Specifications Section 01720.

##### 1.02 PREPARATION FOR FINAL INSPECTION

- A. Before requesting inspection for Final Acceptance of the Work by the City, inspect, clean and repair the Work as required.

##### 1.03 FINAL INSPECTION

- A. When the Contractor considers that the Work is complete, he shall submit written certification that:
  - 1. Work has been inspected by the Contractor for compliance with contract documents.
  - 2. Work has been completed in accordance with contract documents.
  - 3. Work is ready for final inspection by the City.
  - 4. All as-built required documents have been submitted and accepted.
  - 5. All damaged or destroyed real, personal, public or private property has been repaired or replaced.
  - 6. All operation and maintenance manuals have been submitted and accepted and all training has been completed.
  - 7. All personnel badges and vehicle permits have been returned to DIA Airport Security.
- B. The Project Manager will inspect to verify the status of completion with reasonable promptness after receipt of such certifications. The inspection of the work will be done in accordance with the General Conditions.
- C. If the Project Manager finds incomplete or defective work:
  - 1. The Project Manager may, at the Project Manager's sole discretion, either terminate the inspection or prepare a punch list and notify the Contractor in writing, listing incomplete or defective work.
  - 2. The Contractor shall take immediate steps to remedy stated deficiencies and send a second written certification to the Project Manager that Work is complete.
  - 3. The Project Manager will then reinspect the Work.

##### 1.04 REINSPECTION FEES

- A. Should the Project Manager perform reinspection due to failure of the Work to comply with the claims of status of completion made by the Contractor:

1. The Contractor shall compensate the City for such additional services at the rate of \$100.00 per man-hour.
2. The City shall deduct the amount of such compensation from the final payment to the Contractor.

#### **1.05 FINAL ADJUSTMENT OF ACCOUNTS**

- A. Submit a Final Statement of Accounting to the Project Manager.
- B. The Final Statement of Accounting shall reflect all adjustments to the contract amount and shall include the following:
  1. The original contract amount.
  2. Additions and deductions resulting from:
    - a. Previous change orders.
    - b. Allowances.
    - c. Final quantities for unit price items. Along with this statement shall be detailed backup for the quantities.
    - d. Deductions or corrected work.
    - e. Penalties.
    - f. Deductions for liquidated damages.
    - g. Deductions for re-inspection payments.
    - h. City resurveys required due to the Contractor.
    - i. Other adjustments.
  3. Total contract amount, as adjusted.
  4. Previous payments.
  5. Sum remaining due.
- C. If required, the Project Manager will prepare a final change order, reflecting approved adjustments to the Contract sum which were not previously made by change orders.

#### **1.06 FINAL APPLICATION FOR PAYMENT**

- A. The Contractor shall submit the final application for payment in accordance with the procedures and requirements stated in the General Conditions Title 20.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 - EXECUTION (NOT USED)**

#### **PART 4 - MEASUREMENT**

##### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

#### **PART 5 - PAYMENT**

##### **5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work

described in this Section shall be included in the applicable unit price item, work order, or lump sum bid item.

**END OF SECTION 01700**

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## SECTION 01710

### CLEANING

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Work specified in this section consists of maintaining a clean, orderly, hazard free worksite during construction, and final cleaning for the City's Final Acceptance. Failure to maintain the worksite will be grounds for withholding monthly payments until corrected to the satisfaction of the Project Manager.

##### 1.02 JOB CONDITIONS

- A. Safety Requirements
1. Maintain the worksite in a neat, orderly and hazard-free manner in conformance with all federal, state and local rules, codes, regulations and orders, including all OSHA requirements, until Final Acceptance of the Work. Keep catwalks, underground structures, worksite walks, sidewalks, roadways and streets, along with public and private walkways adjacent to the worksite, free from hazards caused by construction activities. Inspect those facilities regularly for hazardous conditions caused by construction activities.
- B. Hazards Control
1. Store volatile wastes in covered metal containers and remove those wastes from worksite daily.
  2. Do not accumulate wastes which create hazardous conditions.
  3. If volatile and noxious substances are being used in spaces that are not naturally ventilated, provide artificial ventilation.
  4. Hazard controls shall conform to the applicable federal, state and local rules and regulations.
  5. Provide appropriate waste receptacles in all areas in which employees are working. Waste receptacles shall be kept covered at all times. All materials on site shall be anchored and covered to prevent any objects from becoming wind-borne.
- C. Access
1. Maintain the worksite to permit access by other City contractors as required and to allow access by emergency personnel.

##### 1.03 SUBMITTALS

- A. Washing Plan. The Contractor shall prepare a plan describing the specific procedures and materials to be utilized for any equipment, vehicle, etc. washing activities. The plan must be submitted to the PM and also approved by the PM and Environmental Services. Outdoor washing at DIA is not allowed unless the materials will be collected or managed in a manner to ensure that they will not enter the municipally-owned separate storm sewer system (MS4). The materials can only be disposed at a location pre-approved by DIA Environmental Services (refer to DIA SWMP). Failure to comply with this requirement would result in the

discharge of non-stormwater. Indoor washing must be conducted in accordance with the Best Management Practices (BMPs) detailed in the DIA SWMP. Refer to Technical Specification 01566. In addition, all indoor washing must be conducted in a manner that ensures that there are no prohibited discharges to the sanitary sewer system.

## **PART 2 - PRODUCTS**

### **2.01 CLEANING MATERIALS**

- A. Utilize the type of cleaning materials recommended by the manufacturer for the surfaces to be cleaned.
- B. Maintain current Material Safety Data Sheets (MSDS) on site for all chemicals. DIA Environmental Services must approve the chemicals used prior to discharge to the sanitary sewer system.
- C. Ensure proper disposal of all wastes generated from the use of these materials. Must ensure compliance with all environmental regulations. No wastes can be disposed on DIA property.

## **PART 3 - EXECUTION**

### **3.01 INTERIM CLEANING**

- A. Clean the worksite every shift/workday for the duration of the construction contract. Maintain structures, grounds, storage areas and other areas of worksite, including public and private properties immediately adjacent to worksite, free from accumulations of waste materials caused by construction operations. Place waste materials in covered metal containers. All hard concrete, steel, wood and finished walking surfaces shall be swept clean daily.
- B. Remove or secure loose material on open decks and on other exposed surfaces at the end of each workday or more often in a manner that will maintain the worksite hazard free. Secure material in a manner that will prevent dislodgment by wind and other forces.
- C. Sprinkle waste materials with water or acceptable chemical palliative to prevent blowing of dust.
- D. Promptly empty waste containers when they become full and legally dispose of the contents at dumping areas off the City's property.
- E. Control the handling of waste materials. Do not permit materials to be dropped or thrown from structures.
- F. Immediately remove spillage of construction related materials from haul routes, work site, private property, public rights of way, or on the Denver International Airport site.
- G. Clean only when dust and other contaminants will not precipitate upon newly painted surfaces.
- H. Cleaning shall be done in accordance with manufacturer's recommendation.
- I. Cleaning shall be done in a manner and using such materials as to not damage the Work.
- J. Clean areas prior to painting or applying adhesive.



- K. Clean all heating and cooling systems prior to operations. If the contractor is allowed to use the heating and cooling system it shall be cleaned prior to testing.
- L. Clean all areas that will be concealed prior to concealment.
- M. Dispose of all fluids according to the approved Washing Plan.
- N. The use of steel bits on loaders, graders, etc, is not allowed for cleaning pavement. Any damage to joints, grooving, light cans, etc., shall be repaired by the contractor at no cost to the City prior to opening surfaces to aircraft. The method of repair shall be approved by the Project Manager and may require removal and replacement of panels.

### **3.02 FINAL CLEANING**

- A. Inspect interior and exterior surfaces, including concealed spaces, in preparation for completion and acceptance.
- B. Remove dirt, dust, litter, corrosion, solvents, discursive paint, stains and extraneous markings.
- C. Remove surplus materials, except those materials intended for maintenance.
- D. Remove all tools, appliances, equipment and temporary facilities used in the construction.
- E. Remove detachable labels and tags. File them with the manufacturer's specifications for that specific material for the City's records.
- F. Repair damaged materials to the specified finish or remove and replace.
- G. After all trades have completed their work and just before Final Acceptance, all catch basins, manholes, drains, strainers and filters shall be cleaned; roadway, driveways, floors, steps and walks shall be swept. Interior building areas shall be vacuum cleaned and mopped.
- H. Final cleanup applies to all areas, whether previously occupied and operational or not.
- I. Dispose of all fluids according to the approved Washing Plan.

## **PART 4 - MEASUREMENT**

### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

## **PART 5 - PAYMENT**

### **5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01710**

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## SECTION 01720

### CONTRACT RECORD DOCUMENTS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Work specified in this Section consists of maintaining, marking, recording and submitting contract record documents which include shop drawings, warranties, contract documents and contractor records.

##### 1.02 SUBMITTALS

- A. Each submittal of record documents shall contain the following information:
1. Date
  2. Project title and numbers
  3. Contractor's name and address
  4. Title and number of each record document
  5. Certification that each document as submitted is complete and accurate
  6. Signature of the Contractor or his authorized representative.
- B. At the completion of this contract, deliver all record documents including the following:
1. As-built shop drawings, diagrams, illustrations, schedules, charts, brochures and other similar data
  2. Warranties, guarantees and bonds
  3. Contract documents
  4. Contractor records.
- C. As-built contract drawings shall be submitted with each monthly progress payment application, and a complete set shall be submitted prior to final payment.
1. The Contractor shall provide a single electronic copy of each contract drawing sheet which has been used to produce work during the payment period or work that payment is being requested on, which records the current as-built conditions of work, including the posting of any change orders or change directives not shown on the contract documents at the time of contract signing.
    - a. The Contractor must show as-built work completed through the payment application date including but not limited to utilities, empty conduit, conduit for actual electrical lines, plumbing, HVAC, location of anchor bolts and support points for use by others.
    - b. The Contractor shall be liable for any costs incurred by the City or a third party due to errors or lack of information provided on the as-built drawings.
    - c. All markings on drawings shall be legible to identify the portion of work completed.

### 1.03 QUALITY CONTROL

- A. Record documents shall be prepared to a high standard of quality, such as that set forth in MIL STD 100, ANSI Standard Drafting Manual Y14 or other relevant lower tier specification defining equal drafting quality for microfilming, except for daily reports.

### PART 2 - PRODUCTS (NOT USED)

### PART 3 - EXECUTION

#### 3.01 MAINTENANCE OF DOCUMENTS

- A. The Contractor shall maintain at the worksite on a current basis one record copy of all drawings, specifications, addenda, change orders, approved shop drawings, working drawings, product data and samples in good order and marked currently to record all changes made during construction.
- B. Maintain at the field office one copy of the following record documents:
  - 1. Contract Documents
    - a. Contract drawings with all clarifications, requests for information, directives, changes and as-built conditions clearly posted.
    - b. Contract specifications with all clarifications, requests for information, changes, directives and record of manufacturer actually used along with product trade name.
    - c. Reference Standards in accordance with Technical Specifications Section 01091.
    - d. Affirmative Action Plan and documents.
    - e. One set of drawings to record the following:
      - 1) Horizontal and vertical location of underground utilities affected by the Work.
      - 2) Location of internal utilities; include valves, controls, conduit, duct work, switches, pressure reducers, size reducers, transitions, crosses, tees, filters, motors, heaters, dampers, regulators, safety devices, sensors, access doors and appurtenances that are concealed in the construction shall be shown with dimensions given from a visible and recognizable reference to the item being located in all three dimensions. The drawing shall also reference the applicable submittal for the item being located.
      - 3) Field changes of dimensions and details including as-built elevations and location (station and offset).
      - 4) Details not on original contract drawings but obtained through requests for information or by other communications with the City.
  - 2. Contractor Records
    - a. Daily QC Reports
    - b. Certificates of compliance for materials used in construction
    - c. Nonconformance Reports (NCRs)
    - d. Remedial Action Requests (RARs)
    - e. Completed inspection list
    - f. Inspection and test reports
    - g. Test procedures
    - h. Qualification of personnel
    - i. Approved submittals
    - j. Material and equipment storage records

- k. Safety Plan
- l. Erosion, sediment, hazardous and quality plans
- m. Hazardous material records
- n. First report of injuries..

### **3.02 RECORDING**

- A. Label each document page or article "PROJECT RECORD" in two inch high letters.
- B. Keep record documents current daily.
- C. Legibly mark copies of the contract drawings to record actual construction.
- D. Legibly mark up each Section of the technical specifications and contract drawings to record:
  - 1. Manufacturer, trade name, catalog number and supplier of each product and item actually installed
  - 2. Changes made by change orders, requests for information, substitutions and variations approved by submittals.

### **3.03 DOCUMENT MAINTENANCE**

- A. Provide files and racks for storage of documents to maintain in clean, dry and legible condition, which shall be turned over to the City prior to final acceptance.
- B. Do not use record documents for construction purposes.
- C. Make documents available for inspection by the Project Manager and any others having jurisdiction.

### **3.04 MONTHLY REVIEW**

- A. Prior to any application for payment, the Project Manager or his designated representative will inspect the record documents to ensure that they are being maintained and contain the most current correct data with particular attention to as-built drawings.
- B. If, during the inspection, the Project Manager determines that the documents are not being maintained and kept current as to as-built conditions, an amount may be withheld from the payment request and deducted from the contract value to cover the City's cost of collecting and recording the as-built contract data. This cost will be determined on the basis of \$75.00 per man-hour of effort.

## **PART 4 - MEASUREMENT**

### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

## **PART 5 - PAYMENT**

### **5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work

described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01720**

## SECTION 01730

### OPERATION AND MAINTENANCE DATA

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Work specified in this Section consists of preparing and submitting operation and maintenance data for mechanical, electrical and other specified equipment.

##### 1.02 SUBMITTALS

- A. Refer to Technical Specifications Section 01300 and 01340 for submittal procedures.
- B. Submit one (1) electronic copy and one (1) bound hard copy of the proposed Operation and Maintenance Data Manual format including a table of contents not less than 90 days prior to acceptance tests and final inspection.
- C. Submit one (1) electronic copy and one (1) bound hard copy of the complete Operation and Maintenance Data Manuals in final form 30 days prior to system startup.
- D. Submit one (1) electronic copy and one (1) bound hard copy of Operation and Maintenance Data Manual within ten days after system startup is complete. These copies shall incorporate any comments made on the previous submittals, along with final readings on all settings and gauges taken while the system is in fully satisfactory operation.

##### 1.03 CONTINUOUS UPDATING PROGRAM

- A. Furnish one electronic copy of the Contractor's letter indicating that suppliers have been notified to provide updated operation and maintenance data, service bulletins and other information pertinent to the equipment, as it becomes available.

#### PART 2 - PRODUCTS

- A. The following products are the requirements of hard copies:
- B. PAPER SIZE 8-½ inches x 11 inches.
- C. PAPER White bond, at least 20 pound weight.
- D. TEXT typewritten.
- E. PRINTED DATA Manufacturer's catalog cuts, brochures, operation and maintenance data. Clear reproductions thereof will be acceptable. If this data is in color, all final manuals must contain color data.
- F. DRAWINGS 8-½ inches x 11 inches, bound with the text. Larger drawings are acceptable provided they are folded to fit into a pocket inside the rear cover of the manual. Reinforce edges of large drawings.
- G. PRINTS OF DRAWINGS black ink on white paper, sharp in detail and suitable for making reproductions.

- H. FLYSHEETS Separate each portion of the manual with colored, neatly prepared flysheets briefly describing the contents of the ensuing portion.
- I. COVERS Provide 40 to 50 mil, clear plastic, front and plain back covers for each manual. The front covers shall contain the information required in paragraph 3.02 below.
- J. BINDINGS Conceal the binding mechanism inside the manual; lockable 3 ring binders shall be provided.

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. Assemble each operation and maintenance manual using the manufacturer's latest standard commercial data.

#### **3.02 COVER**

- A. Include the following information on the front cover and on the inside cover sheet:
  - 1. OPERATION AND MAINTENANCE INSTRUCTIONS
  - 2. (TITLE OF STRUCTURE OR FACILITY)
  - 3. (TITLE AND NUMBER OF CONTRACT)
  - 4. (CONTRACTOR'S NAME AND ADDRESS)
  - 5. (GENERAL SUBJECT OF THE MANUAL)
  - 6. (Leave spaces for signatures of the City representatives and acceptance date)

#### **3.03 CONTENTS OF THE MANUAL**

- A. An index of all volumes in each volume of multiple volume systems.
- B. An index in front of each volume. List and combine the literature for each system in the sequence of operation.
- C. Name, address and telephone numbers of Contractor, suppliers and installers along with the manufacturer's order number and description of the order.
- D. Name, address and telephone numbers of manufacturer's nearest service representatives.
- E. Name, address and telephone number of nearest parts vendor and service agency.
- F. Copy of guaranties and warranties issued to, and executed in the name of, the City.
- G. Anticipated date City assumes responsibility for maintenance.
- H. Description of system and component parts including theory of operation.
- I. Pre operation check or inspection list.
- J. Procedures for starting, operating and stopping equipment.



- K. Post operation check or shutdown list.
- L. Inspection and adjustment procedures.
- M. Troubleshooting and fault isolation procedures for on-site level of repair.
- N. Emergency operating instructions.
- O. Accepted test data.
- P. Maintenance schedules and procedures.
- Q. Test procedures to verify the adequacy of repairs.
- R. One copy of each wiring diagram.
- S. One copy of each piping diagram.
- T. Location where all measurements are to be made.
- U. One copy of each duct diagram.
- V. One copy of control diagram.
- W. One copy of each accepted shop drawing.
- X. One copy of software programs imputable or changeable on site.
- Y. Manufacturer's parts list with catalog names, numbers and illustrations.
- Z. A list of components which are replaceable by the City.
- AA. An exploded view of each piece of the equipment with part designations.
- BB. List of manufacturer's recommended spare parts, current prices and recommended quantities for two years of operation.
- CC. List of special tools and test equipment required for the operation, maintenance, adjustment, testing and repair of the equipment, instruments and components.
- DD. Scale and corrosion control procedures.
- EE. Disassembly and re-assembly instructions.
- FF. Troubleshooting and repair instructions.
- GG. Calibration procedures.
- HH. Ordering information.
- II. Training course material used to train City staff, including slides and other presentation material.

**PART 4 - MEASUREMENT**

**4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

**PART 5 - PAYMENT**

**5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order, or lump sum bid item.

**END OF SECTION 01730**

## SECTION 01740

### WARRANTIES AND BONDS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Work specified in this Section consists of preparing and submitting warranties and bonds required by these specifications.

##### 1.02 SUBMITTALS

- A. Refer to Technical Specifications Section 01300 for submittal procedures.
- B. Submit executed warranties and bonds.

#### PART 2 - PRODUCTS (NOT USED)

#### PART 3 - EXECUTION

##### 3.01 WARRANTIES AND BONDS

- A. Execute the warranties and bonds required by the Contract Documents. Prepare and submit a list of all warranties and bonds on the form provided by the City. Reference Technical Specifications Section 01999.
- B. Provide warranties or bonds for the materials, labor and time period set forth in the sections of these specifications requiring such documents. All warranties shall be for a minimum period of one year unless the technical specifications for a specific item require a greater period of time.
- C. Provide all warranties and bonds that the manufacturer or supplier furnishes at no additional cost in regular commercial trade. All warranties shall be for a minimum period of one year unless the technical specifications for a specific item require a greater period of time.

#### PART 4 - MEASUREMENT

##### 4.01 METHOD OF MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

#### PART 5 - PAYMENT

##### 5.01 METHOD OF PAYMENT

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01740**

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**SECTION 01999**  
**STANDARD FORMS**

**PART 1 - GENERAL**

**1.01 FORMS**

- A. The forms listed below will be used for performance of the Work as indicated. This is not a complete listing of all required forms. The Contractor shall properly complete all forms required by the contract or the Project Manager. The Project Manager shall review and approve all submitted forms. If submitted forms are not acceptable the Contractor shall resubmit forms in an acceptable format. The Project Manager will provide all forms upon Contract Execution for utilization on the project.

**1.02 APPENDICES**

- A. The Project Manager will provide the following forms:
1. Daily Quality Control Report (Form CM-13) (1 Page)
  2. Request for Information (Form CM-17) (1 Page)
  3. Submittal Transmittal Form (Form CM-30) (Page 1 of 2)
  4. Submittal Transmittal Form (Form CM-30) (Page 2 of 2)
  5. Contractor Warranty (Form CM-10) (4 Pages)
  6. Contractor/Subcontractor Warranty (Form CM-11) (4 Pages)
  7. Contractors Certification of Payment (Form CM-19) (this form shall be completed and submitted with each pay application) (1 Page)
  8. Pay Application Form (CM-18) (1 Page)
  9. Certificate of Current Cost or Pricing Data (Form CM-69) (1 Page)
  10. Subcontractor Partial Lien Release Form (Form CM-26) (1 Page)
  11. Subcontractor Final Lien Release Form (Form CM-70) (1 Page)
  12. Request for Substitution (Form CM-09) (5 pages)
  13. System Shutdown Request Forms:
    - a. AGTS and Baggage Systems
    - b. Airfield Systems
    - c. CCTV Security Systems
    - d. Electrical Power and Lighting
    - e. Elevator, Escalator and Autowalk
    - f. Fire Protection Plumbing
    - g. HVAC Systems
    - h. Temperature Control Systems
    - i. Life Safety/ Fire Alarm Systems
    - j. Plumbing
    - k. Roadways

- l. Security
- m. Sterile Public Areas
- n. X-Ray

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.01 COMPLETING FORMS**

- A. All documents are to be filled digitally by the Contractor using the format provided by the Project Manager or using Adobe Acrobat 6 or newer. It is at the discretion of the Project Manager if other forms or formats will be accepted.

### **3.02 SIGNING FORMS**

- A. Original hand written signatures are acceptable for all documents. The Contractor is to fill out the document as indicated above prior to signing the hard copy. If the form is to be submitted digitally to the Project Manager the document shall be scanned and saved as an Adobe Acrobat 6 or newer file.
- B. Digital signatures are acceptable for all documents. The Contractor is to fill out the document digitally in the format provided by the Project Manager or Adobe Acrobat 6 or newer. The file must be signed using Adobe Acrobat 6 or newer and submitted digitally to the Project Manager.
  - 1. Add digital signatures must contain the name of signer in plain text and the time and date the signature is executed.

## **PART 4 - MEASUREMENT**

### **4.01 METHOD OF MEASUREMENT**

- A. No separate measurement shall be made for work under this Section.

## **PART 5 - PAYMENT**

### **5.01 METHOD OF PAYMENT**

- A. No separate payment will be made for work under this Section. The cost of the work described in this Section shall be included in the applicable unit price item, work order or lump sum bid item.

**END OF SECTION 01999**

**DIVISION 2**  
**TECHNICAL SPECIFICATIONS**  
**AIRFIELD**





1  
2  
3                                           **SECTION GP-110**  
4                                           **METHOD OF ESTIMATING PERCENTAGE OF MATERIAL WITHIN SPECIFICATION**  
5                                           **LIMITS (PWL)**

6                   **PART 1 GENERAL**

7  
8 1.01 When the specifications provide for acceptance of material based on the method of estimating  
9 percentage of material within specification limits (PWL), the PWL will be determined in accordance  
10 with this section. All test results for a lot will be analyzed statistically to determine the total  
11 estimated percent of the lot that is within specification limits. The PWL is computed using the  
12 sample average (X) and sample standard deviation (S<sub>n</sub>) of the specified number (n) of sublots for  
13 the lot and the specification tolerance limits, L for lower and U for upper, for the particular  
14 acceptance parameter. From these values, the respective Quality index(s), Q<sub>L</sub> for Lower Quality  
15 Index and/or Q<sub>U</sub> for Upper Quality Index, is computed and the PWL for the lot for the specified n is  
16 determined from Table 1.

17  
18 There is some degree of uncertainty (risk) in the measurement for acceptance because only a  
19 small fraction of production material (the population) is sampled and tested. This uncertainty exists  
20 because all portions of the production material have the same probability to be randomly sampled.  
21 The Contractor's risk is the probability that material produced at the acceptable quality level is  
22 rejected or subjected to a pay adjustment. The Owner's risk is the probability that material  
23 produced at the rejectable quality level is accepted.  
24

25 IT IS THE INTENT OF THIS SECTION TO INFORM THE CONTRACTOR THAT, IN ORDER TO  
26 CONSISTENTLY OFFSET THE CONTRACTOR'S RISK FOR MATERIAL EVALUATED,  
27 PRODUCTION QUALITY (USING POPULATION AVERAGE AND POPULATION STANDARD  
28 DEVIATION) MUST BE MAINTAINED AT THE ACCEPTABLE QUALITY SPECIFIED OR  
29 HIGHER. IN ALL CASES, IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PRODUCE  
30 AT QUALITY LEVELS THAT WILL MEET THE SPECIFIED ACCEPTANCE CRITERIA WHEN  
31 SAMPLED AND TESTED AT THE FREQUENCIES SPECIFIED.  
32  
33

34                   **PART 2 METHOD FOR COMPUTING PWL**

35  
36 2.01 The computational sequence for computing PWL is as follows:

- 37  
38 a. Divide the lot into n sublots in accordance with the acceptance requirements of the  
39 specification.  
40 b. Locate the random sampling position within the subplot in accordance with the requirements of  
41 the specification.  
42 c. Make a measurement at each location, or take a test portion and make the measurement on  
43 the test portion in accordance with the testing requirements of the specification.  
44 d. Find the sample average (X) for all subplot values within the lot by using the following formula:

45  
46                   
$$X = (x_1 + x_2 + x_3 + \dots + x_n) / n$$

47  
48                   Where: X           = Sample average of all subplot values within a lot  
49                                    x<sub>1</sub>, x<sub>2</sub>   = Individual subplot values  
50                                    n         = Number of sublots

- 51  
52 e. Find the sample standard deviation (S<sub>n</sub>) by use of the following formula:

53  
54                   
$$S_n = [(d_1^2 + d_2^2 + d_3^2 + \dots + d_n^2)/(n-1)]^{1/2}$$

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Where:  $S_n$  = Sample standard deviation of the number of subplot values in the set

$d_1, d_2, \dots$  = Deviations of the individual subplot values  $x_1, x_2, \dots$  from the average value  $X$

that is:  $d_1 = (x_1 - X), d_2 = (x_2 - X) \dots d_n = (x_n - X)$

$n$  = Number of sublots

- f. For single sided specification limits (i.e., L only), compute the Lower Quality Index  $Q_L$  by use of the following formula:

$$Q_L = (X - L) / S_n$$

Where: L = specification lower tolerance limit

Estimate the percentage of material within limits (PWL) by entering Table 1 with  $Q_L$ , using the column appropriate to the total number (n) of measurements. If the value of  $Q_L$  falls between values shown on the table, use the next higher value of PWL.

- g. For double sided specification limits (i.e. L and U), compute the Quality Indexes  $Q_L$  and  $Q_U$  by use of the following formulas:

$$Q_L = (X - L) / S_n \text{ and } Q_U = (U - X) / S_n$$

Where:

L and U = specification lower and upper tolerance limits

Estimate the percentage of material between the lower (L) and upper (U) tolerance limits (PWL) by entering Table 1 separately with  $Q_L$  and  $Q_U$ , using the column appropriate to the total number (n) of measurements, and determining the percent of material above  $P_L$  and percent of material below  $P_U$  for each tolerance limit. If the values of  $Q_L$  fall between values shown on the table, use the next higher value of  $P_L$  or  $P_U$ . Determine the PWL by use of the following formula:

$$PWL = (P_U + P_L) - 100$$

Where:

$P_L$  = percent within lower specification limit

$P_U$  = percent within upper specification limit

## 2.02 EXAMPLE OF PWL CALCULATION

Project: Example Project  
Test Item: Item P-401, Lot A.

### A. PWL Determination for Mat Density

1. Density of four random cores taken from Lot A.

A-1 96.60

A-2 97.55

109 A-3 99.30  
110 A-4 98.35  
111 n = 4  
112

113  
114 2. Calculate average density for the lot.

115  
116 
$$X = (x_1 + x_2 + x_3 + \dots + x_n) / n$$
  
117 
$$X = (96.60 + 97.55 + 99.30 + 98.35) / 4$$
  
118 
$$X = 97.95 \text{ percent density}$$

119  
120 3. Calculate the standard deviation for the lot.

121  
122 
$$S_n = \left[ \frac{((96.60 - 97.95)^2 + (97.55 - 97.95)^2 + (99.30 - 97.95)^2 + (98.35 - 97.95)^2)}{(4 - 1)} \right]^{1/2}$$
  
123  
124 
$$S_n = [(1.82 + 0.16 + 1.82 + 0.16) / 3]^{1/2}$$
  
125 
$$S_n = 1.15$$

126  
127 4. Calculate the Lower Quality Index  $Q_L$  for the lot. ( $L=96.3$ )

128  
129 
$$Q_L = (X - L) / S_n$$
  
130 
$$Q_L = (97.95 - 96.30) / 1.15$$
  
131 
$$Q_L = 1.4348$$

132  
133 5. Determine PWL by entering Table 1 with  $Q_L = 1.44$  and  $n = 4$ .

134  
135 
$$PWL = 98$$

136  
137 B. PWL Determination for Air Voids

138  
139 1. Air Voids of four random samples taken from Lot A.

140  
141

|     |      |
|-----|------|
| A-1 | 5.00 |
| A-2 | 3.74 |
| A-3 | 2.30 |
| A-4 | 3.25 |

144  
145

146 2. Calculate the average air voids for the lot.

147  
148 
$$X = (x_1 + x_2 + x_3 + \dots + x_n) / n$$
  
149  
150 
$$X = (5.00 + 3.74 + 2.30 + 3.25) / 4$$
  
151  
152 
$$X = 3.57 \text{ percent}$$

153  
154 3. Calculate the standard deviation  $S_n$  for the lot.

155  
156 
$$S_n = \left[ \frac{((3.57 - 5.00)^2 + (3.57 - 3.74)^2 + (3.57 - 2.30)^2 + (3.57 - 3.25)^2)}{(4 - 1)} \right]^{1/2}$$
  
157  
158  
159 
$$S_n = [(2.04 + 0.03 + 1.62 + 0.10) / 3]^{1/2}$$
  
160  
161 
$$S_n = 1.12$$

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4. Calculate the Lower Quality Index  $Q_L$  for the lot. ( $L= 2.0$ )

$$Q_L = (X - L) / S_n$$

$$Q_L = (3.57 - 2.00) / 1.12$$

$$Q_L = 1.3992$$

5. Determine  $P_L$  by entering Table 1 with  $Q_L = 1.40$  and  $n = 4$ .

$$P_L = 97$$

6. Calculate the Upper Quality Index  $Q_U$  for the lot. ( $U= 5.0$ )

$$Q_U = (U - X) / S_n$$

$$Q_U = (5.00 - 3.57) / 1.12$$

$$Q_U = 1.2702$$

7. Determine  $P_U$  by entering Table 1 with  $Q_U = 1.27$  and  $n = 4$ .

$$P_U = 93$$

8. Calculate Air Voids PWL

$$PWL = (P_L + P_U) - 100$$

$$PWL = (97 + 93) - 100 = 90$$

### 2.03 EXAMPLE OF OUTLIER CALCULATION (Reference ASTM E 178)

Project: Example Project  
Test Item: Item P-401, Lot A.

#### A. Outlier Determination for Mat Density.

1. Density of four random cores taken from Lot A. arranged in descending order.

A-3 99.30

A-4 98.35

A-2 97.55

A-1 96.60

2. Use  $n=4$  and upper 5 percent significance level to find the critical value for test criterion = 1.463”.

3. Use average density, standard deviation, and test criterion value to evaluate density measurements.

a. For measurements greater than the average:

If:  $(\text{measurement} - \text{average}) / (\text{standard deviation})$  is less

215 than test criterion,  
 216 Then: the measurement is not considered an outlier  
 217 for A-3 Check if  $(99.30 - 97.95) / 1.15$  greater than  
 218 1.463  
 219 1.174 is less than 1.463, the value is not an outlier

220  
 221 b. For measurements less than the average:  
 222 If  $(\text{average} - \text{measurement}) / (\text{standard deviation})$  is less than test  
 223 criterion, the measurement is not considered an outlier

224  
 225 for A-1 Check if  $(97.95 - 96.60) / 1.15$  greater than 1.463  
 226 1.0 is less than 1.463, the value is not an outlier

227  
 228 NOTE: In this example, a measurement would be considered an outlier if the  
 229 density was:  
 230 greater than  $(97.95 + 1.463 \times 1.15) = 99.63$  percent or,  
 231 less than  $(97.95 - 1.463 \times 1.15) = 96.27$  percent

232  
 233  
 234 TABLE 1. TABLE FOR ESTIMATING PERCENT OF LOT WITHIN LIMITS (PWL)  
 235

| TABLE 1. TABLE FOR ESTIMATING PERCENT OF LOT WITHIN LIMITS (PWL) |                                          |        |        |        |        |        |        |        |
|------------------------------------------------------------------|------------------------------------------|--------|--------|--------|--------|--------|--------|--------|
| Percent Within Limits<br>( $P_L$ and $P_U$ )                     | Positive Values of Q ( $Q_L$ and $Q_U$ ) |        |        |        |        |        |        |        |
|                                                                  | n=3                                      | n=4    | n=5    | n=6    | n=7    | n=8    | n=9    | n=10   |
| 99                                                               | 1.1541                                   | 1.4700 | 1.6714 | 1.8008 | 1.8888 | 1.9520 | 1.9994 | 2.0362 |
| 98                                                               | 1.1524                                   | 1.4400 | 1.6016 | 1.6982 | 1.7612 | 1.8053 | 1.8379 | 1.8630 |
| 97                                                               | 1.1496                                   | 1.4100 | 1.5427 | 1.6181 | 1.6661 | 1.6993 | 1.7235 | 1.7420 |
| 96                                                               | 1.1456                                   | 1.3800 | 1.4897 | 1.5497 | 1.5871 | 1.6127 | 1.6313 | 1.6454 |
| 95                                                               | 1.1405                                   | 1.3500 | 1.4407 | 1.4887 | 1.5181 | 1.5381 | 1.5525 | 1.5635 |
| 94                                                               | 1.1342                                   | 1.3200 | 1.3946 | 1.4329 | 1.4561 | 1.4717 | 1.4829 | 1.4914 |
| 93                                                               | 1.1269                                   | 1.2900 | 1.3508 | 1.3810 | 1.3991 | 1.4112 | 1.4199 | 1.4265 |
| 92                                                               | 1.1184                                   | 1.2600 | 1.3088 | 1.3323 | 1.3461 | 1.3554 | 1.3620 | 1.3670 |
| 91                                                               | 1.1089                                   | 1.2300 | 1.2683 | 1.2860 | 1.2964 | 1.3032 | 1.3081 | 1.3118 |
| 90                                                               | 1.0982                                   | 1.2000 | 1.2290 | 1.2419 | 1.2492 | 1.2541 | 1.2576 | 1.2602 |
| 89                                                               | 1.0864                                   | 1.1700 | 1.1909 | 1.1995 | 1.2043 | 1.2075 | 1.2098 | 1.2115 |
| 88                                                               | 1.0736                                   | 1.1400 | 1.1537 | 1.1587 | 1.1613 | 1.1630 | 1.1643 | 1.1653 |
| 87                                                               | 1.0597                                   | 1.1100 | 1.1173 | 1.1192 | 1.1199 | 1.1204 | 1.1208 | 1.1212 |
| 86                                                               | 1.0448                                   | 1.0800 | 1.0817 | 1.0808 | 1.0800 | 1.0794 | 1.0791 | 1.0789 |
| 85                                                               | 1.0288                                   | 1.0500 | 1.0467 | 1.0435 | 1.0413 | 1.0399 | 1.0389 | 1.0382 |
| 84                                                               | 1.0119                                   | 1.0200 | 1.0124 | 1.0071 | 1.0037 | 1.0015 | 1.0000 | 0.9990 |
| 83                                                               | 0.9939                                   | 0.9900 | 0.9785 | 0.9715 | 0.9671 | 0.9643 | 0.9624 | 0.9610 |
| 82                                                               | 0.9749                                   | 0.9600 | 0.9452 | 0.9367 | 0.9315 | 0.9281 | 0.9258 | 0.9241 |
| 81                                                               | 0.9550                                   | 0.9300 | 0.9123 | 0.9025 | 0.8966 | 0.8928 | 0.8901 | 0.8882 |
| 80                                                               | 0.9342                                   | 0.9000 | 0.8799 | 0.8690 | 0.8625 | 0.8583 | 0.8554 | 0.8533 |
| 79                                                               | 0.9124                                   | 0.8700 | 0.8478 | 0.8360 | 0.8291 | 0.8245 | 0.8214 | 0.8192 |
| 78                                                               | 0.8897                                   | 0.8400 | 0.8160 | 0.8036 | 0.7962 | 0.7915 | 0.7882 | 0.7858 |
| 77                                                               | 0.8662                                   | 0.8100 | 0.7846 | 0.7716 | 0.7640 | 0.7590 | 0.7556 | 0.7531 |
| 76                                                               | 0.8417                                   | 0.7800 | 0.7535 | 0.7401 | 0.7322 | 0.7271 | 0.7236 | 0.7211 |
| 75                                                               | 0.8165                                   | 0.7500 | 0.7226 | 0.7089 | 0.7009 | 0.6958 | 0.6922 | 0.6896 |
| 74                                                               | 0.7904                                   | 0.7200 | 0.6921 | 0.6781 | 0.6701 | 0.6649 | 0.6613 | 0.6587 |
| 73                                                               | 0.7636                                   | 0.6900 | 0.6617 | 0.6477 | 0.6396 | 0.6344 | 0.6308 | 0.6282 |
| 72                                                               | 0.7360                                   | 0.6600 | 0.6316 | 0.6176 | 0.6095 | 0.6044 | 0.6008 | 0.5982 |
| 71                                                               | 0.7077                                   | 0.6300 | 0.6016 | 0.5878 | 0.5798 | 0.5747 | 0.5712 | 0.5686 |
| 70                                                               | 0.6787                                   | 0.6000 | 0.5719 | 0.5582 | 0.5504 | 0.5454 | 0.5419 | 0.5394 |

TABLE 1. TABLE FOR ESTIMATING PERCENT OF LOT WITHIN LIMITS (PWL)

| Percent Within Limits<br>( $P_L$ and $P_U$ ) | Positive Values of Q ( $Q_L$ and $Q_U$ ) |         |         |         |         |         |         |         |
|----------------------------------------------|------------------------------------------|---------|---------|---------|---------|---------|---------|---------|
|                                              | n=3                                      | n=4     | n=5     | n=6     | n=7     | n=8     | n=9     | n=10    |
| 69                                           | 0.6490                                   | 0.5700  | 0.5423  | 0.5290  | 0.5213  | 0.5164  | 0.5130  | 0.5105  |
| 68                                           | 0.6187                                   | 0.5400  | 0.5129  | 0.4999  | 0.4924  | 0.4877  | 0.4844  | 0.4820  |
| 67                                           | 0.5878                                   | 0.5100  | 0.4836  | 0.4710  | 0.4638  | 0.4592  | 0.4560  | 0.4537  |
| 66                                           | 0.5563                                   | 0.4800  | 0.4545  | 0.4424  | 0.4355  | 0.4310  | 0.4280  | 0.4257  |
| 65                                           | 0.5242                                   | 0.4500  | 0.4255  | 0.4139  | 0.4073  | 0.4030  | 0.4001  | 0.3980  |
| 64                                           | 0.4916                                   | 0.4200  | 0.3967  | 0.3856  | 0.3793  | 0.3753  | 0.3725  | 0.3705  |
| 63                                           | 0.4586                                   | 0.3900  | 0.3679  | 0.3575  | 0.3515  | 0.3477  | 0.3451  | 0.3432  |
| 62                                           | 0.4251                                   | 0.3600  | 0.3392  | 0.3295  | 0.3239  | 0.3203  | 0.3179  | 0.3161  |
| 61                                           | 0.3911                                   | 0.3300  | 0.3107  | 0.3016  | 0.2964  | 0.2931  | 0.2908  | 0.2892  |
| 60                                           | 0.3568                                   | 0.3000  | 0.2822  | 0.2738  | 0.2691  | 0.2660  | 0.2639  | 0.2624  |
| 59                                           | 0.3222                                   | 0.2700  | 0.2537  | 0.2461  | 0.2418  | 0.2391  | 0.2372  | 0.2358  |
| 58                                           | 0.2872                                   | 0.2400  | 0.2254  | 0.2186  | 0.2147  | 0.2122  | 0.2105  | 0.2093  |
| 57                                           | 0.2519                                   | 0.2100  | 0.1971  | 0.1911  | 0.1877  | 0.1855  | 0.1840  | 0.1829  |
| 56                                           | 0.2164                                   | 0.1800  | 0.1688  | 0.1636  | 0.1607  | 0.1588  | 0.1575  | 0.1566  |
| 55                                           | 0.1806                                   | 0.1500  | 0.1406  | 0.1363  | 0.1338  | 0.1322  | 0.1312  | 0.1304  |
| 54                                           | 0.1447                                   | 0.1200  | 0.1125  | 0.1090  | 0.1070  | 0.1057  | 0.1049  | 0.1042  |
| 53                                           | 0.1087                                   | 0.0900  | 0.0843  | 0.0817  | 0.0802  | 0.0793  | 0.0786  | 0.0781  |
| 52                                           | 0.0725                                   | 0.0600  | 0.0562  | 0.0544  | 0.0534  | 0.0528  | 0.0524  | 0.0521  |
| 51                                           | 0.0363                                   | 0.0300  | 0.0281  | 0.0272  | 0.0267  | 0.0264  | 0.0262  | 0.0260  |
| 50                                           | 0.0000                                   | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  | 0.0000  |
| 49                                           | -0.0363                                  | -0.0300 | -0.0281 | -0.0272 | -0.0267 | -0.0264 | -0.0262 | -0.0260 |
| 48                                           | -0.0725                                  | -0.0600 | -0.0562 | -0.0544 | -0.0534 | -0.0528 | -0.0524 | -0.0521 |
| 47                                           | -0.1087                                  | -0.0900 | -0.0843 | -0.0817 | -0.0802 | -0.0793 | -0.0786 | -0.0781 |
| 46                                           | -0.1447                                  | -0.1200 | -0.1125 | -0.1090 | -0.1070 | -0.1057 | -0.1049 | -0.1042 |
| 45                                           | -0.1806                                  | -0.1500 | -0.1406 | -0.1363 | -0.1338 | -0.1322 | -0.1312 | -0.1304 |
| 44                                           | -0.2164                                  | -0.1800 | -0.1688 | -0.1636 | -0.1607 | -0.1588 | -0.1575 | -0.1566 |
| 43                                           | -0.2519                                  | -0.2100 | -0.1971 | -0.1911 | -0.1877 | -0.1855 | -0.1840 | -0.1829 |
| 42                                           | -0.2872                                  | -0.2400 | -0.2254 | -0.2186 | -0.2147 | -0.2122 | -0.2105 | -0.2093 |
| 41                                           | -0.3222                                  | -0.2700 | -0.2537 | -0.2461 | -0.2418 | -0.2391 | -0.2372 | -0.2358 |
| 40                                           | -0.3568                                  | -0.3000 | -0.2822 | -0.2738 | -0.2691 | -0.2660 | -0.2639 | -0.2624 |
| 39                                           | -0.3911                                  | -0.3300 | -0.3107 | -0.3016 | -0.2964 | -0.2931 | -0.2908 | -0.2892 |
| 38                                           | -0.4251                                  | -0.3600 | -0.3392 | -0.3295 | -0.3239 | -0.3203 | -0.3179 | -0.3161 |
| 37                                           | -0.4586                                  | -0.3900 | -0.3679 | -0.3575 | -0.3515 | -0.3477 | -0.3451 | -0.3432 |
| 36                                           | -0.4916                                  | -0.4200 | -0.3967 | -0.3856 | -0.3793 | -0.3753 | -0.3725 | -0.3705 |
| 35                                           | -0.5242                                  | -0.4500 | -0.4255 | -0.4139 | -0.4073 | -0.4030 | -0.4001 | -0.3980 |
| 34                                           | -0.5563                                  | -0.4800 | -0.4545 | -0.4424 | -0.4355 | -0.4310 | -0.4280 | -0.4257 |
| 33                                           | -0.5878                                  | -0.5100 | -0.4836 | -0.4710 | -0.4638 | -0.4592 | -0.4560 | -0.4537 |
| 32                                           | -0.6187                                  | -0.5400 | -0.5129 | -0.4999 | -0.4924 | -0.4877 | -0.4844 | -0.4820 |
| 31                                           | -0.6490                                  | -0.5700 | -0.5423 | -0.5290 | -0.5213 | -0.5164 | -0.5130 | -0.5105 |
| 30                                           | -0.6787                                  | -0.6000 | -0.5719 | -0.5582 | -0.5504 | -0.5454 | -0.5419 | -0.5394 |
| 29                                           | -0.7077                                  | -0.6300 | -0.6016 | -0.5878 | -0.5798 | -0.5747 | -0.5712 | -0.5686 |
| 28                                           | -0.7360                                  | -0.6600 | -0.6316 | -0.6176 | -0.6095 | -0.6044 | -0.6008 | -0.5982 |
| 27                                           | -0.7636                                  | -0.6900 | -0.6617 | -0.6477 | -0.6396 | -0.6344 | -0.6308 | -0.6282 |
| 26                                           | -0.7904                                  | -0.7200 | -0.6921 | -0.6781 | -0.6701 | -0.6649 | -0.6613 | -0.6587 |
| 25                                           | -0.8165                                  | -0.7500 | -0.7226 | -0.7089 | -0.7009 | -0.6958 | -0.6922 | -0.6896 |
| 24                                           | -0.8417                                  | -0.7800 | -0.7535 | -0.7401 | -0.7322 | -0.7271 | -0.7236 | -0.7211 |
| 23                                           | -0.8662                                  | -0.8100 | -0.7846 | -0.7716 | -0.7640 | -0.7590 | -0.7556 | -0.7531 |
| 22                                           | -0.8897                                  | -0.8400 | -0.8160 | -0.8036 | -0.7962 | -0.7915 | -0.7882 | -0.7858 |
| 21                                           | -0.9124                                  | -0.8700 | -0.8478 | -0.8360 | -0.8291 | -0.8245 | -0.8214 | -0.8192 |
| 20                                           | -0.9342                                  | -0.9000 | -0.8799 | -0.8690 | -0.8625 | -0.8583 | -0.8554 | -0.8533 |

**TABLE 1. TABLE FOR ESTIMATING PERCENT OF LOT WITHIN LIMITS (PWL)**

| Percent Within Limits<br>( $P_L$ and $P_U$ ) | Positive Values of Q ( $Q_L$ and $Q_U$ ) |         |         |         |         |         |         |         |
|----------------------------------------------|------------------------------------------|---------|---------|---------|---------|---------|---------|---------|
|                                              | n=3                                      | n=4     | n=5     | n=6     | n=7     | n=8     | n=9     | n=10    |
| 19                                           | -0.9550                                  | -0.9300 | -0.9123 | -0.9025 | -0.8966 | -0.8928 | -0.8901 | -0.8882 |
| 18                                           | -0.9749                                  | -0.9600 | -0.9452 | -0.9367 | -0.9315 | -0.9281 | -0.9258 | -0.9241 |
| 17                                           | -0.9939                                  | -0.9900 | -0.9785 | -0.9715 | -0.9671 | -0.9643 | -0.9624 | -0.9610 |
| 16                                           | -1.0119                                  | -1.0200 | -1.0124 | -1.0071 | -1.0037 | -1.0015 | -1.0000 | -0.9990 |
| 15                                           | -1.0288                                  | -1.0500 | -1.0467 | -1.0435 | -1.0413 | -1.0399 | -1.0389 | -1.0382 |
| 14                                           | -1.0448                                  | -1.0800 | -1.0817 | -1.0808 | -1.0800 | -1.0794 | -1.0791 | -1.0789 |
| 13                                           | -1.0597                                  | -1.1100 | -1.1173 | -1.1192 | -1.1199 | -1.1204 | -1.1208 | -1.1212 |
| 12                                           | -1.0736                                  | -1.1400 | -1.1537 | -1.1587 | -1.1613 | -1.1630 | -1.1643 | -1.1653 |
| 11                                           | -1.0864                                  | -1.1700 | -1.1909 | -1.1995 | -1.2043 | -1.2075 | -1.2098 | -1.2115 |
| 10                                           | -1.0982                                  | -1.2000 | -1.2290 | -1.2419 | -1.2492 | -1.2541 | -1.2576 | -1.2602 |
| 9                                            | -1.1089                                  | -1.2300 | -1.2683 | -1.2860 | -1.2964 | -1.3032 | -1.3081 | -1.3118 |
| 8                                            | -1.1184                                  | -1.2600 | -1.3088 | -1.3323 | -1.3461 | -1.3554 | -1.3620 | -1.3670 |
| 7                                            | -1.1269                                  | -1.2900 | -1.3508 | -1.3810 | -1.3991 | -1.4112 | -1.4199 | -1.4265 |
| 6                                            | -1.1342                                  | -1.3200 | -1.3946 | -1.4329 | -1.4561 | -1.4717 | -1.4829 | -1.4914 |
| 5                                            | -1.1405                                  | -1.3500 | -1.4407 | -1.4887 | -1.5181 | -1.5381 | -1.5525 | -1.5635 |
| 4                                            | -1.1456                                  | -1.3800 | -1.4897 | -1.5497 | -1.5871 | -1.6127 | -1.6313 | -1.6454 |
| 3                                            | -1.1496                                  | -1.4100 | -1.5427 | -1.6181 | -1.6661 | -1.6993 | -1.7235 | -1.7420 |
| 2                                            | -1.1524                                  | -1.4400 | -1.6016 | -1.6982 | -1.7612 | -1.8053 | -1.8379 | -1.8630 |
| 1                                            | -1.1541                                  | -1.4700 | -1.6714 | -1.8008 | -1.8888 | -1.9520 | -1.9994 | -2.0362 |

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**END OF SECTION GP-110**

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**SECTION GP-120**  
**NUCLEAR GAUGES**

**PART 1 GENERAL**

1.02 TESTING When the specifications provide for nuclear gauge testing of material, the testing shall be performed in accordance with this test section. At each test location, the in-place density and moisture content shall be determined in accordance with ASTM D 6938 using Procedure A, the Direct Transmission Method. The depth of the probe shall represent the full thickness of the layer (lift) requiring testing. The operator of the nuclear gauge must show evidence of safety training and experience in the use of the instrument. The test report shall include as a minimum the information required in ASTM D 6938, paragraph 12.

The nuclear gauge shall be calibrated in accordance with Annex A1 and Annex A2. The gauge shall also be standardized daily in accordance with ASTM D 6938, paragraph 9.

**END OF SECTION GP-120**

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1  
2 **ITEM P-150**

3  
4 **DEMOLITION**

5  
6 **PART 1 GENERAL**

7  
8 1.01 DESCRIPTION. This item shall consist of removal of existing concrete slabs on grade,  
9 foundations, sheds and building foundations, fences, water wells, asphalt pavement,  
10 concrete pavement, corrugated metal and reinforced concrete pipe, existing headwalls and  
11 wingwalls, guardrail, drainage items, pavement markings, electrical items, and any non-  
12 newly constructed above ground features remaining within the Project Limits. The Contractor  
13 shall dispose of the material at a licensed disposal site or as directed by the Engineer.  
14 Material salvaged shall become the property of the Contractor.

15  
16 The Contractor shall notify oil and gas facility owners and the Engineer in writing 30 days in  
17 advance of requiring work areas currently occupied by oil and gas wells and buried pipelines.

18  
19 1.02 BURIED PIPELINES. Contractor is responsible to contact the owner as to the status of the  
20 pipeline. If pipelines have been abandoned in-place by the pipeline owners. The pipelines  
21 may not have been purged or cleaned and may contain petroleum products. The contractor  
22 shall exercise extreme care in removing these facilities and is responsible for removing the  
23 pipe including any remaining contents, irrespective of the current pipe conditions. The  
24 Contractor should also expect to find other pipelines, etc. which have been abandoned by  
25 unknown owners during the 15 to 20 year life of the oil and gas fields. Contract documents  
26 indicate the general location of known pipelines and developed utilities. All pipelines shown  
27 on the drawings shall be located by Contractor by potholing to verify location, depth, and  
28 usage. The Contractor shall remove all utility pipes and lines included in the earthwork  
29 contract area in accordance with these specifications. All buried pipelines, utilities, buried  
30 tanks, and any other structures within the construction area of all runways, taxiways and  
31 aprons extending to 10 feet outside the limits of construction and not less than 15 feet below  
32 the finished grade level shall be removed.

33  
34 Piping a minimum of 15' below finished grade elevations or plan excavation may be left in  
35 place or removed and salvaged at the discretion of the Contractor. The ends of any  
36 pipelines left in place shall have the ends capped prior to burial, according to applicable  
37 Federal Department of Transportation Regulations. Any piping which is left in place, shall be  
38 surveyed and the coordinates of the ends of the abandoned pipe (or other items left in place)  
39 shall be provided to the Resident Engineer and included on the "as-built" drawings.

40  
41 1.03 ELECTRICAL. The Contractor shall remove all abandoned cable, cable identified to be  
42 removed, ductwork, and remove base cans including concrete encasement and all light  
43 fixtures, signs and duct markers within the construction limits of taxiway and runway  
44 pavements to be removed, widened or constructed, or as shown on the Drawings. Protect  
45 airfield lighting fixtures and base plates from damage and deliver them to the Airport for  
46 storage as directed by the Engineer. Discard all base cans, conduit, Transformers and  
47 cable off-site. The Electrical Contractor shall provide written documentation that electrical  
48 cable has been removed prior to slab sawcutting and demolition.

- 51 1.04 FOUNDATIONS AND SLABS ON GRADE. All structures at or above grade and to a depth  
52 of not less than 15 feet below the final finished grade line and within 10 feet horizontally of  
53 the construction limits shall be removed.  
54
- 55 1.05 WATER WELLS. There is a possibility that water wells are located in work areas. The wells  
56 are permitted by the State of Colorado and shall be abandoned in accordance with current  
57 Revised and Amended Rules and Regulations of the Board of Examiners of Water Well  
58 Construction and Pump Installation Contractors.  
59
- 60 1.06 REMOVAL OF PAVEMENT MARKINGS OR CURING COMPOUND. All paint or  
61 concrete curing compound to be removed, as shown on the Plans shall be removed from the  
62 surface of the existing pavement. Equipment, tools and machines used in the  
63 performance of the removal operation shall be safe and in satisfactory working condition  
64 at all times. The Contractor shall provide satisfactory evidence that the Contractor's  
65 equipment has been used in the performance of similar work. On asphalt pavements,  
66 Water blasting will be allowed only if it can be demonstrated that no damage to the  
67 asphalt pavement occurs, otherwise, grinding will be required. On concrete pavements,  
68 water blasting shall be used for all removals.  
69
- 70 The water blasting equipment shall be truck mounted and shall be capable of water  
71 pressures of 2,000 to 40,000 psi. The equipment shall be capable of adjusting the  
72 pressure to accomplish paint or cure removal without damaging the paving surface. The  
73 equipment shall be capable of following a straight line and be maneuverable to  
74 accommodate various pavement markings. The spray width needs to be able to  
75 accommodate lines 6" and wider. If water blasting is used to remove lines on active  
76 airfield pavements, a vacuum system will be provided to allow for timely repainting and  
77 the prevention of any debris being ingested into propellers or turbine engines once the  
78 water blasting equipment has exited the active pavements.  
79
- 80 If required on asphalt pavement, the grinding equipment shall be capable of adjusting the  
81 height to accomplish paint removal with only lightly scaring, but not damaging the paving  
82 surface. The equipment shall be capable of following a straight line and be  
83 maneuverable to accommodate various pavement markings. A vacuum truck shall be  
84 used to immediately clean up all debris created by the removal process.  
85
- 86 1.07 EXISTING ROADWAYS. Roadway demolition shall consist of all portions of asphalt and  
87 concrete roadway within the project limits, including all existing haul roads and any alternate  
88 access road.  
89
- 90 1.08 REMOVAL OF GUARDRAIL. Guardrail removal shall consist of the removal and disposal of  
91 the existing guardrail, cable road guard and guardrail posts.  
92
- 93 1.09 REMOVAL OF ASPHALT PAVEMENT. The sawing and removal of asphalt pavement shall  
94 meet the requirements of Colorado Department of Transportation "Standard Specification for  
95 Road and Bridge Construction" and all application sections found elsewhere in the plans and  
96 technical specifications.  
97
- 98 1.10 EXISTING CONCRETE PAVEMENT REMOVAL AND REPAIR  
99
- 100 All operations shall be carefully controlled to prevent damage to the concrete pavement

101 and to the underlying material to remain in place. All saw cuts shall be made  
102 perpendicular to the slab surface.

103

104 A. Removal of Existing Pavement Slab. When it is necessary to remove existing  
105 concrete pavement and leave adjacent concrete in place the joint between the  
106 removal area and adjoining pavement to stay in place shall first be cut full depth  
107 with a standard diamond-type concrete saw. Next, a full depth saw cut shall be  
108 made parallel to the joint at least 24 inches from the joint and at least 12 inches  
109 from the end of any dowels. All pavement between this last saw cut and the joint  
110 line shall be carefully broken up and removed using hand-held jackhammers, 30  
111 lb. (14 kg) or less, or the approved light-duty equipment which will not cause  
112 stress to propagate across the joint saw cut and cause distress in the pavement  
113 which is to remain in place. The joint face shall be sawed or otherwise trimmed  
114 so that there is no abrupt offset in any direction greater than 1/2-inch and no  
115 gradual offset greater than 1 inch when tested in a horizontal direction with a 12  
116 ft. straightedge. Sawcutting depth may vary nominally and no extra payment will  
117 be allotted for varying depths.

118 The Contractor shall remove the remaining portion of concrete pavement slab by  
119 lifting and placing directly into haul trucks. The Contractor will not be allowed to  
120 use hydraulic rams on excavators that may damage the cement treated base  
121 below the pavement to be removed.

122

123 An alternative removal method may be accepted by the Project Manager if the  
124 Contractor can demonstrate to the Project Manager successful removal without  
125 damage to adjacent concrete or base material below. If during subsequent  
126 removals it is found the method is causing damage to the adjacent panels or  
127 base material below, the Contractor's method shall be rejected by the Project  
128 Manager and the Project Manager shall direct the Contractor to begin using  
129 Method A above.

130

131 B. Edge Repair. The edge of existing concrete pavement against which new  
132 pavement abuts shall be protected from damage at all times. Areas which are  
133 damaged during construction shall be repaired at not cost to the Owner; repair of  
134 previously existing damage areas will be paid for as listed in the bid schedule.

135

136 (1) Spall Repair. Spalls shall be repaired where indicated and where  
137 directed. Repair materials and procedures shall be as required in  
138 specification P-501.

139

140 (2) Underbreak Repair. Any under breaking of slabs that are to remain in-  
141 place shall result in the entire slab removal and replacement at the  
142 Contractor's expense to the next joint.

143

144 (3) Underlying Material. The underlying material adjacent to the edge of an  
145 under the existing pavement which is to remain in place shall be  
146 protected from damage or disturbance during removal operations and  
147 until placement of new concrete, and shall be shaped as shown on the  
148 drawings or as directed. Sufficient material shall be kept in place outside  
149 the joint line to prevent disturbance (or sloughing) of material under the

150 pavement which is to remain in place. Any material under the portion of  
151 the concrete pavement to remain in place which is disturbed or loses its  
152 compaction shall be carefully removed and replaced with concrete as  
153 specified in paragraph "Underbreak Repair." The underlying material  
154 outside the joint line shall be thoroughly compacted and moist when new  
155 concrete is placed.

156  
157 1.11 EXISTING ASPHALT CONCRETE PAVEMENT REMOVAL AND REPAIR BY  
158 ROTOMILL.

159  
160 This item shall consist of milling existing bituminous concrete pavement to provide for  
161 placement of sufficient thickness of bituminous concrete for pavement repairs or  
162 construction on the runway or taxiway shoulder.

163  
164 The vertical edges of the rotomilled surface shall be sawcut to expose a clean true  
165 vertical edge to pave against.

166  
167 All operations shall be carefully controlled to prevent damage to the asphalt pavement  
168 and to the underlying material to remain in place.

169  
170 Stairstep milling is required for the runway shoulder widening interface. This item shall  
171 consist of multiple passes as required to establish the "stairstep" as illustrated on the  
172 plans.

173  
174 1.12 EXISTING FULL DEPTH ASPHALT CONCRETE PAVEMENT REMOVAL.

175  
176 This item shall consist of sawcutting and removal of existing bituminous concrete  
177 pavement (including ATPB) to allow for replacement of  
178 P-501 slabs along the edges adjacent to asphalt shoulders. A standard diamond-type  
179 concrete saw shall be used to make the sawcut the full depth of the asphalt pavement  
180 (Including the Asphalt Treated Permeable Base Course (ATBP)).

181  
182 The edge of existing bituminous concrete pavement against which new pavement abuts  
183 shall be protected from damage at all times. Areas which are damaged during  
184 construction shall be repaired at no cost to the Owner.

185  
186 All operations shall be carefully controlled to prevent damage to the asphalt pavement  
187 and to the underlying material to remain in place.

188  
189 1.13 REMOVAL OF SIGNS & DELINEATORS. Sign demolition shall consist of the removal and  
190 disposal of the all existing signs and delineators, including their foundations, within the  
191 project limits along all existing haul roads and any alternate access road.

192  
193  
194 **PART 2 MATERIALS**

195  
196 2.01 BURIED PIPELINE. Materials used to cap off pipelines remaining in the ground shall be of  
197 the size and type normally used for this operation. Materials used for backfilling trenches  
198 shall conform to the same specifications as described in Item P-152, Excavation and  
199 Embankment.

- 200  
201 2.02 EQUIPMENT. Excavation and Hauling Equipment: Provide equipment as necessary to  
202 remove underground pipelines and other demolished items.  
203  
204 Backfilling and Compaction Equipment: Provide equipment as necessary to restore trenches  
205 and other areas back to final grade and to compact backfill as specified.  
206  
207 2.03 BACKFILL MATERIALS. Materials used for backfilling the first 12 inches of the trench shall  
208 consist of naturally occurring material that can be rendered by normal construction activity to  
209 contain no individual particles greater than one (1) inch in maximum diameter. The material  
210 shall also meet all criteria for select material in Section P-152.  
211

212

### 213 PART 3 CONSTRUCTION METHODS

214

- 215 3.01 General. Blasting will not be allowed on this project.  
216  
217 3.02 SLABS AND FOUNDATIONS. All existing foundation structures encountered within the  
218 established grading sections shall be removed. Structures consist of concrete slabs on  
219 grade, farmhouse and outbuilding foundations, and other foundations for existing or  
220 abandoned structures.  
221  
222 3.03 BURIED PIPELINE AND STORM SEWERS.  
223  
224 A. Trenching. The removal of cover on top of and surrounding the abandoned  
225 pipelines shall be performed without damaging the pipeline. All trench sidewalls  
226 shall be properly sloped or benched and/or braced, shored or sheeted to afford safe  
227 working conditions, to protect adjacent pipelines, and to prevent caving.  
228  
229 B. Testing. The Contractor shall test the exposed trench excavation and the pipeline  
230 for dangerous or explosive gases and to positively determine that the line has been  
231 emptied, cleaned and/or purged prior to performing any further operations.  
232  
233 C. Cutting of Pipeline and Storm Sewers. Extreme care shall be exercised whenever  
234 the pipeline or storm sewer to be removed is cut into, especially the first cut on the  
235 abandoned pipeline. The Contractor shall use a method to cut the pipeline into  
236 sections for removal which provides safety for workers and equipment. The initial cut  
237 shall not be made with an cutting torch.  
238  
239 D. 1. BACKFILLING  
240  
241 a. If required, select embankment (1" maximum size), per Technical  
242 Specification P-152 Excavation and Embankment, or P-162 Controlled Low-  
243 Strength Material, to 12 inches over the top of the pipe shall be completed  
244 before backfilling operations are started.  
245  
246 b. The Contractor shall take all necessary precautions to protect the pipe from  
247 any damage, movement or shifting. In general, backfilling shall be  
248 performed by pushing the material from the end of the trench into, along  
249 and directly over the pipe so that the material will be applied in the form of a

- 250 rolling slope rather than by side filling which may damage the pipe.  
251 Backfilling from the sides of the trench will be permitted after sufficient  
252 material has first been carefully placed over the pipe to such a depth as to  
253 protect the pipe.  
254  
255 c. Compaction equipment used above the pipe zone shall be of a type that  
256 does not damage the pipe.  
257  
258 d. Provide for the proper maintenance of traffic flow and accessibility as may  
259 be necessary.  
260  
261 e. Make adequate provisions for the safety of property and persons.  
262  
263 f. Temporary cribbing, sheeting, or other timbering shall be removed unless  
264 specifically authorized in writing.  
265  
266 g. Dewatering shall be continued until the trench is completely backfilled.  
267  
268 h. Brush, stumps, logs, planking, disconnected drains, boulders, etc., shall be  
269 removed from the material to be used for backfilling the trench.  
270  
271 2. GENERAL COMPACTION REQUIREMENTS  
272  
273 a. Requirements of this section shall apply unless more stringent requirements  
274 are established by the local agency involved.  
275  
276 b. When working in an existing traveled roadway, restoration and compaction  
277 must be achieved as the trench is backfilled so as to maintain traffic.  
278  
279 c. Trench backfill shall be mechanically compacted to not less than 95.0% of  
280 the maximum dry density as determined by ASTM D 698.  
281  
282  
283 3. MECHANICAL COMPACTION  
284  
285 a. Method of compaction shall be at Contractor's option.  
286  
287 b. The Contractor shall be responsible to provide the proper size and type of  
288 compaction equipment and select the proper method of utilizing said  
289 equipment to attain the required compaction density.  
290  
291 c. In place compaction tests shall be made. Contractor shall remove and  
292 recompact material that does not meet specified requirements.  
293  
294 E. Removal of Water and Residual Petroleum Products from Pipelines. Any pipeline  
295 containing water or residual petroleum products after abandonment by the pipeline  
296 owner, shall have the water or the residual products removed from the pipeline, by  
297 the Contractor, using a nitrogen purge, steam, or other approved means. The  
298 material removed from the pipeline shall be hauled away and disposed of properly.  
299 The Contractor shall assume that all pipelines to be removed contain significant



- 300 amounts of residual products that must be disposed of offsite.  
301  
302 3.04 BURIED UTILITY LINES. The Contractor shall remove all abandoned electrical and  
303 telephone lines whether shown on the contract drawings or not. All known lines are shown,  
304 but there may be other unknown abandoned lines in the area. It shall be the Contractor's  
305 responsibility to check the status of all abandoned lines. Care shall be taken to assure that  
306 all abandoned electric lines are not live and can not be activated accidentally.  
307  
308 3.05 Section Deleted.  
309  
310 3.06 GROUND SURFACE REPAIR. The Contractor shall rough grade and compact areas  
311 affected by demolition to maintain site grades and contours. All holes remaining after  
312 demolition operations shall have sides broken down to flatten out the slopes, and shall be  
313 filled with acceptable material, moistened and properly compacted in layers to the density  
314 required in Item P-152, Excavation and Embankment. The ground surface area repaired  
315 shall properly drain and that water will not pond.  
316  
317 3.07 WATER WELLS. The Contractor shall employ a licensed water well contractor to demolish  
318 and abandon existing water wells and provide necessary documentation to the State of  
319 Colorado Agencies and Boards as required.  
320  
321 3.08 WASTE DISPOSAL. Refer to Division 1 Technical Specification Section 01566 -  
322 Environmental Controls.  
323  
324 3.09 INSPECTION POINTS. Upon completion of demolition work and prior to backfilling  
325 operations, the Project Manager shall inspect the Contractor's work. After backfilling and  
326 grading operations, the Contractor's Quality Control Inspector shall perform inspection and  
327 final acceptance, per Division 1 Technical Specification Section 01403 – Contractor Quality  
328 Control Program.  
329  
330 3.10 ROTOMILLING. The construction operation shall be scheduled and proceed in a manner  
331 that produces a uniformly finished milled surface with a neat uniform right angle cut at  
332 the end of the milled section. The depth of the Asphalt Pavement Removal shall be as  
333 called for on the plans and/or full depth of the joining lift. The entire area designated on  
334 the plans shall be milled until the pavement surfaces result in pavement that conforms to  
335 the typical section and cross section requirements specified. The milling process shall  
336 produce a pavement surface that is true to grade with a uniform texture. The transverse  
337 slope of the pavement shall be uniform to a degree that no depressions or misalignment  
338 of slope greater than 1/2-inch in 16 feet are present when tested with a straightedge.  
339  
340 The Contractor shall establish positive means for removal of milled residue. Solid  
341 residue shall be removed from pavement surfaces before it is blown by traffic action or  
342 wind. Residue shall not be permitted to flow into drainage facilities. The milled residue  
343 shall be disposed of legally off airport property. The millings generated shall be disposed  
344 of off-site.  
345

#### 346 PART 4 METHOD OF MEASUREMENT

- 347  
348 4.01 Refer to Appendix A for Method of Measurement.  
349

350 **PART 5 BASIS OF PAYMENT**

351

352 5.01 Refer to Appendix A for Basis of Payment.

353

354

355

356

357

.....  
**END OF ITEM P-150**

ITEM P-152

EXCAVATION AND EMBANKMENT

PART 1 GENERAL

1.01 DESCRIPTION This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required to grade the runway safety areas, runways, taxiways, aprons, drainage channels, detention ponds, as well as other areas for other purposes in accordance with these specifications and in conformity to the dimensions and typical sections shown on the Contract Drawings.

PART 2 MATERIALS

2.01 GENERAL Materials encountered on the project shall be identified by the Unified Classification System per ASTM D 2487.

- A. Rock - A sound and solid mass, layer, or ledge of mineral matter in place and of such hardness and texture that it cannot be effectively loosened or broken down by ripping in a single pass with a late model tractor-mounted hydraulic ripper equipped with a single shank of standard manufacturer's design adequately sized for use with and propelled by a track mounted dozer with a minimum rated 500 net flywheel horsepower, operating in low gear. Ripping is still more art than science and much will depend on the skill and experience of the tractor operator. Therefore, the Project Manager can direct cross-ripping, the number and type of shanks, tooth angle, direction and throttle position, as well as, determine operator's qualifications to help determine if a material is unrippable.
- B. Common Material - All earth materials which are not classifiable as topsoil, rock embankment material, select embankment material or unsuitable material.
- C. Formation - Any sedimentary, igneous, or metamorphic material represented as a unit in geology, generally called rock but not necessarily meeting the classification requirements for rock in (A) above.
- D. Cobbles - Rounded pieces of rock which are not greater than 12 inches, but are larger than 3 inches in maximum dimension.
- E. Boulders - Detached pieces of rock, generally rounded but may be subrounded to angular, which are larger than 12 inches in maximum dimension.
- F. Rock Fragments - Pieces of rock which generally are not rounded.
- G. Select Material - Clays and/or sands, meeting the requirements of Article 2.03.
- H. Soil Components - Soils in nature usually consist of a number of soil components. They are identified by the predominance of one of the components and other criteria given in the Unified Soil Classification System.

(1) Clay - Plastic soil which passes a United States Standard No. 200 sieve.

(2) Silt - Non-plastic soil which passes a United States Standard No. 200 sieve.

54  
55 (3) Sand - Mineral grains which pass a United States Standard No. 4 sieve and are  
56 retained on a United States Standard No. 200 sieve.

57  
58 (4) Gravel - Pieces of rock which are not greater than 3 inches in maximum  
59 dimension, and are retained on a United States Standard No. 4 sieve.

60  
61 I. Sedimentary Bedrock Materials: Sedimentary bedrock materials may be composed of  
62 sand, silt or clay and occur in definable formations or geologic units. The sedimentary  
63 bedrock materials are lithified into formations by overburden pressure and cementing by  
64 various types and in different degrees. Common sedimentary bedrock types in the  
65 project area include sandstone, siltstone and claystone. These types of sedimentary  
66 bedrock may also be interbedded.

67  
68 J. Deleterious Materials: Deleterious materials are defined as materials which are subject  
69 to chemical decomposition in the soil mass. If placed in fill material, deleterious  
70 substances may decompose, leaving a void which could result in settlement. Materials  
71 such as wood, plant matter, or other organic materials are considered deleterious.

72  
73 K. Topsoil - Refer to Section T-905, 2.01 of these Technical Specifications.

74  
75 2.02 ROCK EMBANKMENT MATERIAL: Shall be comprised of rock fragments which do not break  
76 down under normal construction activity to less than 5 (five) inches in size. Normal construction  
77 activity includes ripping, excavation, hauling, processing and placement in 8 (eight) inch thick  
78 loose lifts, moisture conditioning in the borrow area and on the fill.

79  
80 2.03 SELECT EMBANKMENT MATERIAL: Select Embankment Material shall be placed as described  
81 below or as indicated in the drawing set.

82  
83 There are 2 zones of Select Embankment Material: the lower 4.5 feet, and the upper 1.5 feet.  
84 The upper 8-inches to 1-foot will be cement treated.

85  
86 The lower 4.5 feet of Select Embankment Material shall be free of unsuitable materials, including  
87 claystone, contain 100% passing the 3-inch sieve, less than 90% passing the No. 200 sieve,  
88 have a maximum Liquid Limit of 40, a maximum Plasticity Index of 30, and less than 3% swell  
89 potential. The swell sample shall be remolded to 95% of the maximum dry density at optimum  
90 moisture as determined by ASTM D 698 for initial acceptance of the proposed Select  
91 Embankment Material. During placement of the Select Embankment Material, the swell sample  
92 shall be obtained from the compacted in-place Select Embankment Material. The sample shall  
93 be tested for swell-consolidation in accordance with Section 6.03.

94  
95 A. Lime Treated Select Embankment: Not Applicable

96  
97 B. Cement Treated Select Embankment: The upper 1.5 feet of Select Embankment Material, of  
98 which the upper 8-inches to 1-foot will be cement-treated shall be free of unsuitable  
99 materials, contain 100% passing the 1-inch sieve, no more than 45% retained on a No. 4  
100 sieve, less than 50% passing the No. 200 sieve, have a maximum Plasticity Index of 15, a  
101 maximum water soluble sulfates content of 0.5% and less than 3% swell potential. The swell  
102 sample shall be remolded to 95% of the maximum dry density at optimum moisture as  
103 determined by ASTM D 698 for initial acceptance of the proposed Select Embankment  
104 Material. During placement of the Select Embankment Material, the swell sample shall be  
105 obtained from the compacted in-place Select Embankment Material. The sample shall be  
106 tested for swell-consolidation in accordance with Section 6.03.

107  
108 The select embankment should be properly moisture conditioned and compacted in accordance with  
109 section 3.09.  
110

111 Select embankment used in the upper 1.5 feet for cement treatment shall be obtained from the  
112 borrow area indicated in the plans and shall meet the requirements of 2.03 B.  
113

114 2.04 COMMON EMBANKMENT MATERIAL: Shall be comprised of common material which meets  
115 the requirements of Section 2.01B except as allowed in Sections 3.06 and 3.07  
116

117 2.05 WATER. Construction water shall be obtained from the City in accordance with Section P-153  
118 Watering.  
119

120 2.06 UNSUITABLE MATERIAL. Material which is not classified as topsoil, rock work, common  
121 embankment, select embankment or containing vegetable material, construction debris or  
122 deleterious material.  
123

124 2.07 VEGETABLE MATERIAL. The removed vegetable material accumulated as a part of the clearing  
125 and grubbing operation shall be hauled to a stockpile area designated by the Project Manager.  
126  
127

### 128 PART 3 CONSTRUCTION METHOD

129  
130 3.01 GENERAL. Before beginning excavation, grading, and embankment operations in any area, the area  
131 shall be completely cleared and grubbed in accordance with Section P-151, Clearing and Grubbing,  
132 and demolition shall be completed in accordance with Section P-150, Demolition. Areas shall be  
133 cleared and grubbed of 6 inches of topsoil and vegetation prior to beginning any excavation or  
134 embankment operations.  
135

136 Any existing turf areas which become disturbed due to construction activities, outside the contract  
137 limits shall be reclaimed at no additional cost to the City.  
138

139 Several utilities cross the construction area as shown (from best information available) on the  
140 Contract Drawings. The Contractor shall schedule and conduct its work to protect all utilities until  
141 they are removed by the Contractor, utility owner or others. Demolition of utilities by the  
142 Contractor is covered in Section P-150, Demolition. The Contractor's proposed method(s) to  
143 protect and locate the utilities shall be submitted to the Project Manager, in writing, for approval a  
144 minimum of 14 days in advance of the work. The Contractor shall be responsible for protecting  
145 all utilities within the project limits whether shown on the Contract Drawings or not.  
146

147 If and when the Contractor's excavating operations encounter artifacts of archeological  
148 significance, including but not limited to discovery of skeletal remains and associated burial  
149 artifacts, the Contractor shall immediately cease work in that area and notify the Project  
150 Manager. At the direction of the Project Manager, the Contractor shall arrange for the excavation  
151 of the site in such a manner as to preserve the artifacts encountered and allow for their removal  
152 and proper disposal, in accordance with the General Conditions.  
153

154 If it becomes necessary to temporarily interrupt existing surface drainage, sewers or under-  
155 drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible  
156 for and shall take all necessary precautions to preserve them or provide temporary services.  
157 When such facilities are encountered, the Contractor shall notify the Project Manager, in writing.  
158 The Contractor shall, at its own expense, satisfactorily repair or pay the cost of all damage to  
159 such facilities or structures which may result from any of the Contractor's operations during the

160 period of the Contract.

161  
162  
163 3.02 EXCAVATION. No excavation shall be started in any area until the work has been staked out by  
164 the Contractor, cross-sections of existing ground taken and plotted, and all surveying and cross-  
165 sections approved in writing by the Project Manager. Excavation shall be made to the lines and  
166 grades shown on the Contract Drawings. All suitable excavated materials shall be used in the  
167 formation of embankment, subgrade, or for other purposes shown on the Contract Drawings. All  
168 unsuitable material shall be disposed of as described herein.

169  
170 Rock excavated in the borrow areas, if encountered, can be buried in locations designated by the  
171 Project Manager.

172  
173 The criteria for burial of rock in these borrow areas shall be as follows:

- 174  
175 1) There is no size limitation of buried rock in these areas.  
176  
177 2) A minimum of two feet of common embankment shall be placed over the top of the  
178 buried rock.  
179  
180 3) All areas shall be graded to drain upon completion of the rock fill.  
181  
182 4) Rock obtained from the prism fill areas may be placed in the borrow rock fill areas at  
183 the option of the Contractor.  
184  
185 5) All aspects of the rock disposal area shall be included in the written Common  
186 Excavation Plan.

187  
188 "XYZ" coordinates of the rock disposal area in common borrow areas shall be carefully measured  
189 and shown on the as-built plans.

190  
191 Grades shall be maintained so that all surfaces are well drained at all times. When necessary,  
192 temporary drains and drainage ditches shall be installed to intercept or divert surface water which  
193 may affect the work. The cost of placing rock in the borrow area is incidental to the cost of the  
194 common embankment.

195  
196 A. Unsuitable Material - If the Contractor encounters at the bottom of the excavation: muck,  
197 peat, matted roots, or other material unsatisfactory for embankment construction he shall  
198 notify the Project Manager in accordance with the General Condition Article 12 and  
199 request whether the material is to be removed. If removal is required the Contractor shall  
200 submit to the Project Manager written recommendations outlining the proposed handling,  
201 placement or removal of the material. The Contractor shall not begin excavation of the  
202 material until written approval is obtained from the Project Manager. When material is  
203 encountered that is classified as unsuitable, it shall be disposed of at Denver Arapahoe  
204 Disposal Site (DADS).

205  
206 B. CARBONACEOUS MATERIALS. Carbonaceous materials encountered during  
207 excavation operations shall be placed as common embankment as noted hereafter.  
208 Excavated carbonaceous materials shall be thoroughly mixed with other common  
209 embankment materials in the ratio of 5 parts of common materials (minimum) to 1 part of  
210 carbonaceous material in the embankment. The carbonaceous materials shall be  
211 thoroughly mixed with the common material in order to fully meet all of the requirements  
212 for common embankment.



266 4. Estimate of select material available in each area.  
267

268 3.04 DRAINAGE EXCAVATION. Drainage excavation shall consist of excavating for intercepting, inlet  
269 or outlet ditches and channels, detention ponds, or for any other type as designed or as shown  
270 on the Contract Drawings. The work shall be performed in the proper sequence with the other  
271 construction. All material meeting the criteria in Section 2.04 shall be placed in embankments;  
272 intercepting ditches shall be constructed prior to starting adjacent excavation and embankment  
273 operations. All necessary work shall be performed to secure a finish true of line, elevation, and  
274 cross section.

275  
276 The Contractor shall maintain ditches constructed on the project to the required cross section and  
277 shall keep them free of debris or obstructions until the project is accepted. There will be no pay  
278 item for maintaining drainage channels and ditches and shall be considered incidental.  
279

280 3.05 PREPARATION OF EMBANKMENT AREA. All testing shall be done by a laboratory hired by the  
281 Contractor. The results shall be provided to the Project Manager in accordance with 6.02  
282 paragraph 2.  
283

284 Where an embankment is to be constructed, all sod, vegetable matter, debris, organic, or other  
285 undesirable material and topsoil shall be removed from the surface upon which the embankment  
286 is to be placed, and the cleared surface shall be completely broken up by plowing or scarifying to  
287 a minimum depth of 8 inches. No debris, organic, or other unsuitable material shall be allowed  
288 in the embankment.  
289

290 This area shall then be recompacted to a minimum of 95.0% of the maximum dry density at -2%  
291 of optimum moisture content or above as determined by ASTM D 698.  
292

293 The top 8" of all existing surfaces shall also be scarified, moisture conditioned, recompacted, and  
294 retested, prior to any additional fill or material placement. All work required in the top 8" of  
295 existing material shall be included in the price of common embankment or applicable material  
296 placement and shall be considered incidental to that work. No separate payment shall be made.  
297

298 Where embankments are to be placed on slopes steeper than 4 (horizontal) to 1  
299 (vertical), benches shall be excavated into the slope. These slopes include natural and previously  
300 constructed embankments. The benches shall be cut a minimum of ten (10) feet horizontally into  
301 the existing slope and shall be of sufficient width to accommodate the approved construction  
302 equipment, to create a stepped bench condition the full length of the section. The vertical step  
303 shall not exceed two (2) feet in the bench. All surfaces to receive embankment material shall be  
304 inspected and approved by the Project Manager immediately prior to embankment placement.  
305

306 3.06 FORMATION OF COMMON EMBANKMENTS No embankment fill shall be placed until the work  
307 has been staked out, and cross-sections obtained by the Contractor, and approved in writing by  
308 the Project Manager. The first embankment placed shall be a test fill. Embankments shall be  
309 formed in successive horizontal layers of not more than 8 inches in loose depth for the full width  
310 of the cross section. No cobble shall exceed five (5) inches in top 10 feet of common  
311 embankment or as defined in Article 3.07. Each layer shall be disked to break up lumps and  
312 clods of soil, claystone, sandstone, and claystone-sandstone mixes before compaction of the  
313 layer. Claystone and sandstone fragments in the layer shall be broken down to three (3) inch  
314 maximum pieces before compaction of the layer. Disking shall be performed with a heavy disk  
315 plow to full depth of the compacted layer.  
316

317 The grading operations shall be conducted, and the various soil strata shall be placed, to produce  
318 a soil structure as shown on the typical cross section in the Contract Drawings or as directed by



319 the Project Manager. Materials such as brush, hedge, roots, and stumps shall not be  
320 incorporated or buried in the embankment.

321  
322 Some carbonaceous claystone and lignite lenses may be found in the excavated materials.  
323 These materials can be incorporated into the common embankments provided they are well  
324 mixed with other common embankment material in a ratio of 5 parts of common (minimum) to 1  
325 part carbonaceous claystone or lignite material to meet all the requirements of common  
326 embankment.

327  
328 Operations on earthwork shall be suspended at any time when satisfactory results cannot be  
329 obtained because of rain, snow, sleet, freezing, or other unsatisfactory conditions of the field.  
330 The Contractor shall drag, blade, seal, or slope the embankment to provide proper surface  
331 drainage. In no case shall frozen soils, snow or ice be allowed in any embankment materials, nor  
332 shall any material be placed over frozen native or embankment materials, snow or ice.

333  
334 The material in the layer shall be at least minus two (-2) of optimum moisture content or above as  
335 determined by ASTM D 698 after rolling and after compaction. In order to achieve a uniform  
336 moisture content throughout the layer, wetting or drying of the material and manipulation shall be  
337 required when necessary. Should the material be too wet, all work on all of the affected portions  
338 of the embankment shall be delayed until the material has dried to the required moisture content.  
339 Wetting of dry material to obtain the proper moisture content shall be done with approved  
340 equipment that will sufficiently distribute the water. Sufficient equipment to furnish the required  
341 water shall be available at all times. Moisture conditioning shall be done in both the excavation  
342 and embankment areas, as required. Each layer of embankment shall be conditioned by disking  
343 or other approved methods so that the water is distributed uniformly throughout the layer prior to  
344 compaction. If wet or dry areas are observed, these areas shall be remediated so that the water  
345 is distributed uniformly throughout the area prior to compaction.

346  
347 For claystone fill where the in situ moisture content is more than 3% below optimum moisture,  
348 pre-wetting of the borrow area or hydration of the placed fill may be required to achieve a uniform  
349 moisture prior to placement of subsequent lifts.

350  
351 Compaction operations shall be continued until each layer of embankment material is compacted  
352 to not less than 95.0% of maximum dry density as determined by ASTM D 698. Additional fill  
353 shall not be placed upon any 8 inch thick loose lift until it is tested and meets compaction and  
354 moisture requirements.

355  
356 For embankments higher than 10 feet directly beneath the paved portions of the runways and  
357 taxiways, fill shall be compacted to a minimum 98.0% of the maximum dry density with moisture  
358 contents at or above the optimum moisture content as determined by ASTM D 698.

359  
360 The Contractor shall provide access to the Project Manager, testing and inspection personnel for  
361 all lifts of material for testing purposes. The Contractor shall plan his work so as to allow  
362 sufficient time for the testing to be completed in all cases.

363  
364 In the construction of embankments, layer placement shall begin in the deepest portion of the fill;  
365 as placement progresses, layers shall be constructed approximately parallel to the finished rough  
366 grade line. Temporary gaps through the embankment shall be allowed with the Project  
367 Manager's approval. All temporary slopes between the previously completed portions of the  
368 embankment and the embankment to be placed shall not be steeper than 4H:1V. Prior to  
369 construction of embankment in temporary openings, all loose, disturbed, dry or frost damaged  
370 embankment shall be removed from the bonding surface.

371

372 The surfaces of previously placed embankment and foundation areas that have not had fill placed  
373 on them for a period of time sufficient to allow those surfaces to become dry, less than minus two  
374 (-2) percent of the optimum moisture content shall be reconditioned and brought to specified  
375 tolerances.

376  
377 All areas will require proof rolling with pneumatic tired equipment with a minimum axel load of 18  
378 kips/18,000 lbs per axle. Tire pressure shall be inflated to 90 psi. Proof rolling shall be performed  
379 in a systematic manner ensuring documentation of the location and the results. Areas that are  
380 observed to have soft spots, where deflection is not uniform, or where deflection is excessive as  
381 determined by the Project Manager's Inspector, shall be ripped, scarified, moisture conditioned  
382 as needed, and then recompacted to the requirements for density and moisture at the  
383 Contractor's expense. After recompaction, these areas shall be proof rolled again and all failures  
384 corrected at the Contractor's expense. Any areas containing free standing water on the surface  
385 shall be removed to stable material, tested, then proof rolled as required above.

386  
387 Earthmoving equipment, watering equipment and compaction equipment are the responsibility of  
388 the Contractor. Such equipment shall be of suitable type and capacity to perform the excavation  
389 and embankment work in accordance with these specifications and to meet the contract  
390 schedule. The equipment shall be operated in accordance with manufacturer's  
391 recommendations and instructions and maintained such that it will deliver the manufacturer's  
392 rated energies and compactive efforts. If equipment at the site proves inadequate to maintain  
393 Contract schedules or results in work not meeting specification requirements, additional, larger  
394 and/or different types of equipment shall be obtained and used.

395  
396 Any existing bituminous roadway surfaces shall be scarified and broken into pieces suitable for  
397 embankments prior to placing embankment over the existing surface.

398  
399 3.07 ROCK MATERIAL IN COMMON EMBANKMENT

400  
401 Excavated material containing solid rock consisting of cobbles, boulders or rock fragments (rock  
402 material) less than - one- third cubic yard in volume; a maximum thickness of one (1) foot; and a  
403 maximum dimension of three (3) feet that can be placed in layers without additional crushing,  
404 breaking or pulverizing, may be placed in embankments below ten feet from the rough subgrade  
405 elevation in embankments as shown on the Contract Drawings or directed by the Project Manager.  
406 The rock material shall be incorporated in layers (or lifts) no larger than the thickness of the largest  
407 pieces. The rock material shall be carefully dispersed throughout the layers and throughout the  
408 embankment to avoid nesting. Rocks shall be spaced far enough apart to allow the Contractor's  
409 equipment to operate between the rock. Contractor shall demonstrate his ability to achieve filling in of  
410 all voids with fines and obtaining the required uniform density around the rock fragments. Voids shall  
411 be filled with finer material to form a dense and thoroughly compacted mass. The embankment  
412 areas containing such rock material shall be compacted with adequate equipment and sufficient  
413 passes to ensure that the embankments meet all specified moisture and density requirements for  
414 common embankment before the next lift is placed. The Contractor shall perform a test fill in  
415 accordance with the requirements of Section P-152-3.10 to demonstrate satisfactory compliance with  
416 these specifications prior to placing rock material. No additional payment will be made to the  
417 Contractor for incorporation of rock material into common embankment. All costs will be included in  
418 the unit price payment for Section P-152-5.01, Common Embankment in Place.

419  
420 3.08 ROCK EMBANKMENT ZONE

421  
422 Rock material of one-third cubic yard or greater in volume which occurs in sound and solid  
423 masses, layers or ledges of mineral matter of such hardness and texture that it cannot be broken  
424 down with rippers, scrapers, etc., may be placed in designated Rock Embankment areas.

425  
426 The Contractor shall notify the Project Manager upon encountering rock material which cannot be  
427 broken down with rippers, scraper, etc., as noted in Section P-152-2.01. The Contractor shall  
428 uncover the rock material so that its volume can be estimated and shall demonstrate by ripping,  
429 that the material should be classified as material suitable for rock embankment. A written  
430 agreement shall be executed by the Contractor and Project Manager acknowledging that the rock  
431 is unrippable, is classified as rock material for the rock embankment and an agreed upon  
432 estimate of material based upon physical measurements by the Contractor of the uncovered  
433 rock.

434  
435 Rock material for Rock Embankment Zones, should be well-graded in size to a maximum of one  
436 cubic yard. The Contractor shall provide suitable equipment to process the rock material to  
437 generally meet maximum size requirement, and to load, haul, intermix common material as  
438 necessary to fill voids, spread in 8" loose lifts and compact the rock material. All Rock  
439 Embankments shall be constructed in areas designated on the plans. The rock material shall be  
440 placed in layers (maximum lift thickness three (3) feet) with the voids filled with finer materials  
441 and compacted to form a stable mass.

442  
443 The rock embankment shall be constructed by (6) passes of a vibrating smooth wheel, steel drum  
444 compactor, operating at a frequency between 1100 and 1500 vibration per minute (vpm). The  
445 compactor shall be equipped with cleaning devices to maintain a clean drum surface. The  
446 vibratory compactor may be either towed or self-propelled and shall have an unsprung drum  
447 weight that is a minimum of sixty (60) percent of the compactor's static weight. Towed  
448 compactors shall have at least ninety (90) percent of their weight transmitted to the ground  
449 through the compaction drum when the compactor is standing in a level position hitched to the  
450 towed vehicle. The compactor shall have a minimum static weight of twenty thousand (20,000)  
451 pounds, a minimum dynamic force of forty thousand (40,000) pounds when operation at 1400  
452 vpm, and an applied force not less than nine thousand (9,000) pounds per foot or compaction,  
453 drum length. A compactor pass shall be one passage of the roller drum over the entire surface of  
454 the layer. A minimum overlap of six (6) inches shall be maintained for adjacent coverage of fill  
455 compaction. The compactor shall operate within the specified frequency range of 1100-1500  
456 vpm and at a maximum travel rock fill.

457  
458 Rock embankment zones shall be constructed so that there are no interferences with drainage,  
459 utilities, blanket drains, or other construction features. The Contractor shall perform a test fill in  
460 accordance with the requirements of Section P-152-3.10 to demonstrate satisfactory compliance  
461 with these specifications.

462  
463 Any rock material removed before the physical inspection by the Project Manager and written  
464 agreement execution shall be paid for as common embankment.

465  
466 The rock embankment zone for this contract shall be as noted on the Contract Drawings. This  
467 area shall be reserved for rock embankment only until the Contractor is notified in writing that  
468 other materials may be placed in this area.

469  
470 3.09 SELECT EMBANKMENT

471  
472 Prior to placement of Lower Select Embankment, Upper Select Embankment, and Lime or  
473 Cement stabilized subgrade, the existing surfaces shall be proof rolled using pneumatic tired  
474 equipment with a minimum axle load of 18 kips/18,000 lbs per axle and tires inflated to 90psi.  
475 Proof rolling shall be performed in a systematic manner ensuring documentation of the location  
476 and the results. Areas that are observed to have soft spots, where deflection is not uniform, or  
477 where deflection is excessive as determined by the Project Manager's Inspector, shall be ripped,

478 scarified, moisture conditioned as needed, and then recompact to the requirements for density  
479 and moisture at the Contractor's expense. After recompaction, these areas shall be proof rolled  
480 again and all failures corrected at the Contractor's expense.

481  
482 The Select Embankment material shall be placed in loose lifts no greater than eight (8) inches.  
483 Water shall be added to the soil and/or the soil should be dried, to obtain moisture content at a  
484 minimum of minus one (-1) percentage points of the optimum moisture content or above. For  
485 sandier select embankment that has a maximum 20% fines, the moisture content shall be a  
486 minimum of minus three (-3) percentage points of the optimum moisture content or above. No  
487 individual particle size greater than five (5) inches in maximum diameter shall be allowed in the  
488 select embankment.

489  
490 Approved Select Embankment materials shall be compacted to at least 95.0% of the maximum  
491 dry density as determined by ASTM D698.

492  
493 The Contractor's Independent Testing laboratory shall conduct Swell-Consolidation Tests as  
494 specified in 6.01, Test Schedule. If the Plasticity Index of the material is less than 10 when  
495 tested in accordance with ASTM D 4318, Swell-Consolidation testing may be waived by the  
496 Project Manager (with concurrence of the DOR) upon written request by the Contractor.

497

### 498 3.10 TEST FILLS

499  
500 Test fills will be performed for Common Embankment, Select Embankment, Rock Embankment,  
501 Common Embankment containing Carbonaceous Materials, and for other conditions which vary  
502 from the conditions tested in the initial test fills.

503  
504 The Contractor shall incorporate test fills in its work to establish and demonstrate methods and  
505 procedures to moisten and compact fill materials to specified conditions. The test fills shall  
506 consist of a minimum of 2 lifts. The tests fills shall be conducted at the beginning of each type of  
507 fill placement and when materials used for fills change sufficiently that previously established  
508 moistening and compaction procedures do not consistently produce fills meeting specification  
509 requirements. Data concerning spreading, diskings, additional moistening, type and numbers of  
510 compaction equipment, and number of compactor coverages per fill layer to obtain minimum  
511 specified compaction shall be developed and demonstrated from the test fills. The test fills shall  
512 be conducted within project fill areas. The Contractor shall submit a proposed construction and  
513 testing plan for each test fill for approval by the Project Manager prior to starting work. Based on  
514 the test fills, the minimum number of coverages of each type of compactor shall be chosen which  
515 consistently produces the minimum specified relative compaction. Each subsequent layer of fill  
516 shall be compacted with the minimum number of coverages developed above. Additional  
517 compactor coverages shall be made as needed to obtain the minimum specified relative  
518 compaction. The contractor shall maintain the fill at all times so that water will not pond.

519  
520 Upon completion of each test fill, the Contractor shall submit a letter to the Project Manager  
521 documenting the results of the test fill including type of material, equipment type used, number of  
522 passes for all equipment including water wagons, compactors, and disks per lift, and all other  
523 pertinent facts about the test fill operation. This letter shall be submitted within five (5) days of  
524 the completion of the test fill for the Project Manager's written approval.

525  
526 3.11 FINISHING AND PROTECTION OF COMPLETED WORK. Excavations, embankment and  
527 stockpiles shall be graded to the lines and grades shown on the Contract Drawings. In common,  
528 select, and topsoil borrow areas the site shall be graded uniformly with no slopes exceeding  
529 neither 4:1 nor flatter than 1% prior to topsoiling. The surfaces of completed excavations and  
530 embankment shall be rolled with wheeled equipment to help seal them and to reduce subsequent

- 531 erosion.
- 532
- 533 Grading of the embankment and excavated surfaces including common, select, and topsoil
- 534 borrow areas shall be performed so that it will drain readily. The Contractor shall take all
- 535 precautions necessary to protect the surface from damage. Hauling over the finished surface
- 536 shall be limited to that which is essential for construction purposes. All ruts or rough places that
- 537 develop in a completed surface shall be smoothed and recompacted.
- 538
- 539 3.12 ALTERNATIVE ACCESS ROADS. The construction of alternative access roads including
- 540 embankments, gravel, associated drainage, structures, and all other work associated with the
- 541 alternative access roads shall be considered incidental to the excavation and embankment items
- 542 of work and shall be removed upon completion of the work.
- 543
- 544 3.13 HAUL. All hauling shall be considered a necessary and incidental part of the work. Its cost shall
- 545 be considered by the Contractor and included in the contract unit price for the pay of items of
- 546 work involved. No payment shall be made separately or directly for hauling on any part of the
- 547 work.
- 548
- 549 3.14 TOLERANCES. The surface of excavations, common embankments, select embankments, and
- 550 drainage channels shall be of such smoothness that it will not vary more than plus 0 to minus ½
- 551 inch from true grade as shown on the Contract Drawings. Any deviation in excess of this amount
- 552 shall be corrected by loosening, adding and removing materials, and reshaping.
- 553
- 554 The top of common embankments shall be surveyed and approved in writing by the Project
- 555 Manager prior to placement of any select or topsoil material. The top of common embankment,
- 556 under the select shall not vary more than 0 to minus ½ inch from the true grade as shown on the
- 557 Contract Drawings.
- 558
- 559 3.15 TOPSOIL. When topsoil is specified or required as shown on the Contract Drawings, it shall be
- 560 salvaged from stripping or other grading operations. If, at the time of excavation or stripping, the
- 561 topsoil cannot be placed in its proper and final section of finished construction, the material shall
- 562 be stockpiled at approved locations. If, in the judgment of the Project Manager, it is practical to
- 563 place the salvaged topsoil at the time of excavation or stripping, the material shall be placed in its
- 564 final position without stockpiling or further rehandling.
- 565
- 566 Upon completion of grading operations, stockpiled topsoil shall be handled and placed as
- 567 directed or as required in Section T-905.
- 568
- 569 No direct payment shall be made for topsoil as such under Section P-152. Topsoil shall be paid
- 570 for at the contract unit prices as provided in Section T-905.
- 571
- 572 3.16 QUALITY CONTROL. The Contractor's Independent Testing Laboratory shall provide all testing .
- 573 The Independent Testing Agency shall meet the requirements of Section 01401 and have been
- 574 approved through the submittal process prior to performing testing.
- 575
- 576 The Contractor shall provide X, Y, and Z coordinates for the locations of all tests and inspections.
- 577 These coordinates shall be accurately established by using GPS methods with an accuracy of
- 578 +/- one (1) foot horizontally and +/- one-half (1/2) foot vertically; use of slope stake references
- 579 shall not be acceptable. The proposed control system and method to determine these
- 580 coordinates shall be submitted by the Contractor and approved in writing by the Project Manager
- 581 prior to any test fill, excavation, or embankment operations.
- 582
- 583 The test types, minimum frequency of tests and test standards are shown in P-152-6.01 - Test

584 Schedule. If variable earth materials and/or test results indicate that materials do not meet  
585 specification requirements, more frequent tests shall be taken.  
586

587 Any earthwork construction which does not meet specification requirements shall be reworked, at  
588 the Contractor's expense, to bring that work within specification requirements. Remediated areas  
589 will be retested as if the area were a new embankment. New test pits shall be dug to the  
590 midpoint of the lift in question for visual inspection of moisture uniformity. Density tests shall be  
591 taken from the top of the lift in question. The remediated areas, shall equate to the volume of  
592 material represented by the failing test.  
593

594 The Project Manager's Quality Assurance Lab will perform intermittent testing This testing may  
595 be in conjunction or independent of the Contractor's Independent Testing Laboratory and shall be  
596 used as a guide in evaluating whether project earthwork meets specification requirements. If the  
597 test results of the Project Manager's Quality Assurance Laboratory indicates the material does  
598 not meet either moisture or compaction requirements, the test fails and a passing retest by the  
599 QA Lab will be required.  
600

601 The contractor's Independent Testing Laboratory's test results shall be provided to the Project  
602 Manager in accordance with 6.02 paragraph 2. Upon completion of embankment testing, the  
603 Independent Testing Agency shall provide documentation stating the material used, moisture  
604 content, compaction, and test frequencies meet project specifications. This documentation shall  
605 be signed and stamped by an Engineer employed by the Independent Testing Agency registered  
606 in the State of Colorado At the end of the project, provide a spread sheet with all tests and data  
607 performed throughout the project.  
608

609 3.17 COMPACTION CONTROL TESTS. This section shall govern the determination of the maximum  
610 density, field density, and percent compaction of those materials for which a minimum percent  
611 compaction is specified. It covers the basic procedures to be followed in performing the test for  
612 maximum density, field density, and percent compaction. In all cases density shall be stated as  
613 the dry weight in pounds per cubic foot.  
614

615 A. Maximum Density. Maximum density is defined as the maximum dry weight in pounds  
616 per cubic foot obtained when a material is mixed with different percentages of water and  
617 compacted in a standard manner. The percentage of water at which maximum density is  
618 obtained is termed the optimum moisture content.  
619

620 B. Laboratory Compaction Tests. The maximum dry density shall be determined by using  
621 the moist method in accordance with ASTM D 698. For soils that are expected to contain  
622 more than 30% retained on the 3/4-inch sieve, use AASHTO T 99.  
623

624 C. Field Density. Field density refers to the dry density expressed in pounds per cubic foot  
625 of compacted material in place at the site as determined by a sample representative of  
626 the compacted layer. The field density shall be determined in accordance with ASTM D  
627 1556 or ASTM D 6938.  
628

629 If nuclear density gages are to be used for density determination, the gages shall be  
630 used and calibrated in accordance with Section GP-120.  
631

632 D. Percent Compaction. The percent compaction is defined as the density of the  
633 compacted layer expressed as a percentage of the maximum density of the material  
634 when tested in accordance with these specifications. The percentage of compaction is  
635 computed by the formula:  
636

637 Percent compaction = (Field dry density X 100) / Maximum dry density

638  
639 The percent compaction shall be reported to the nearest 0.1 (tenth). The areas  
640 represented by tests falling below the minimum specified compaction will be corrected  
641 and retested.

642  
643 3.18 Borrow Areas

644 The Contractor shall, upon completion of his borrow excavation activities, prepare the borrow  
645 sites for planting by performing the following work:

- 646  
647  
648 1) Remove and bury all rock over 6" in dimension in accordance with rock disposal  
649 methods as noted under Section 3.02 Excavation P-152.  
650  
651 2) Grade all sites to drain as indicated in these specifications and drawings.  
652  
653 3) Remove all trash and other foreign objects so that the areas can be reused for  
654 farming purposes.  
655  
656 4) Rip the borrow area site in a manner noted under Section 302.B T-907 Tilling for  
657 Erosion Control, and as approved by the Project Manager. After the area is  
658 ripped to the 18 inch depth, the area ripped shall be treated on the surface to  
659 reduce excessive surface roughness or cloddiness and produce an area suitable  
660 for future seeding. Treatment may include discing, harrowing, cultipacking or  
661 other means as approved by the Project Manager. In areas where rock is the  
662 predominant surface remaining, the Contractor may spread 18 inches of  
663 acceptable material over the rock areas as approved by the Project Manager at  
664 no additional cost to the City.  
665

666 All work required to prepare the borrow area for planting as designated under this section shall  
667 be considered as incidental work.  
668

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670 **PART 4 METHOD OF MEASUREMENT**

671  
672 4.01 Refer to Appendix A for Method of Measurement.  
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674  
675 **PART 5 BASIS OF PAYMENT**

676  
677 5.01 Refer to Appendix A for Basis of Payment.  
678

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680 **PART 6 TESTING REQUIREMENTS**

681  
682 6.01 TEST SCHEDULE

683 (Use of most current version of ASTM Standard is required)  
684  
685

| <u>Test Type</u>                                       | <u>Test Standard</u>              | <u>Minimum Frequency of Tests</u>                                                                                 |
|--------------------------------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------|
| 1. Standard Compaction<br>(Moisture Density Relations) | ASTM D 698<br>(moist preparation) | Ten tests at the beginning of fill<br>placement to provide information on<br>moisture density. Characteristics of |

| <u>Test Type</u>                              | <u>Test Standard</u>                         | <u>Minimum Frequency of Tests</u><br>soils to be used as fills.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2. In-Place Soil Density and Moisture Content | ASTM D 1556<br>ASTM D 6938                   | a) One test per each 10,000 square feet of embankment preparation and existing surface preparation.<br>b) One test for each 1000 cubic yards and portion placed per lift of common and select embankment placed. Every lift is to be representatively tested regardless of quantity placed.<br>c) One test for each 200 linear feet or fraction thereof per 8" lift for Backfill, Storm Sewer trenches, and inlet/outlet structures.<br>d) One test on pipe bedding for each 200 feet of pipe place.<br>e) Correlation tests as outlined below. |
| 3. Correlation Test Procedures                | ASTM D 1556<br>ASTM D 698                    | One sand cone test (D 1556) and one one point Proctor test (D 698) should be performed for every tenth nuclear density test. The results of these tests should be used to correlate the field nuclear density test results and the Proctor curve selection.                                                                                                                                                                                                                                                                                     |
| 4. Soluble Sulfate                            | ASTM D 516<br>10 to 1 ratio<br>dilution rate | One test for every 1000 square yards of the top 20" of select embankment placed under the runway and taxiways. If the P-301 Soil-Cement Base Course is produced at a Pug Mill or similar method, perform one test for every 15,000 cubic yards of select fill excavated and/or stockpiled.                                                                                                                                                                                                                                                      |
| 5. Gradation                                  | ASTM D 422<br>or<br>ASTM D 6913              | a) One test for each 20,000 cubic yards of common embankment placed. This test shall be run in conjunction with Item 3.<br>b) One Test for each 2,500 cubic yards of select embankment and initial backfill. This test shall be taken in conjunction with Item 3.<br>c) If procedure D 422 is used, the hydrometer method in determining the particle size of the material passing the No. 200 sieve is not required. Report results for 6 inch, 3 inch, 1-1/2 inch, 3/4 inch, 3/8 inch, No. 4, No. 8, No. 16,                                  |



| <u>Test Type</u>                        | <u>Test Standard</u>                                                                                           | <u>Minimum Frequency of Tests</u>                                                                                                                                                                                                 |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6. Atterberg                            | ASTM D 4318<br>(Dry Method for preparing the test specimen and Method B for performing the Liquid Limit test). | No. 30, No. 50, No. 100 and No. 200 sieve sizes, for Common Embankment and Select Embankment materials, and on the specified sieve sizes for drainage soils and utility backfill.<br><br>One test on every gradation test sample. |
| 7. Classification                       | ASTM D 2487<br>ASTM D 2488                                                                                     | Classify each sample of the above tests (Items 1 through 5) using data from those tests and visual methods.                                                                                                                       |
| 8. Swell-Consolidation Test (Sec. 6.03) |                                                                                                                | One test for every 10,000 yards of Select Embankment material.                                                                                                                                                                    |

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6.02 TEST RESULTS

1. Tests for reworked areas shall be the quantity represented by the original test.
2. Test results for in-place nuclear soil densities and moisture content shall be given to the inspector in rough draft form immediately upon completion of the day's testing if the inspector is present. If the inspector is unavailable, the rough draft shall be electronically delivered to the Project Manager's office and the QA Lab Manager before commencement of additional fill placement. The final original typed test results shall be provided in the weekly summary reports in accordance with Section 01401, 1.06.

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6.03 DENVER SWELL TEST (SWELL-CONSOLIDATION TEST)

- A. Test Objectives: To determine the magnitude of swell/ consolidation of soil sample under a given surcharge load with 1-dimensional consolidometer (DENVER MACHINE),
- B. References: ASTM D 2435-80, Part 1  
F.H. Chen, Foundation on Expansive Soils, 1988
- C. Equipment:
1. Trimming equipment
  2. Calipers, sensitive to 0.001 inch
  3. Balance, sensitive to 0.1 grams
  4. Oven, set at 110 ±5 degree C
  5. Moisture dishes
  6. Consolidometer ring 1.94 inch diameter by 1.00 inch diameter by 1.00 inch depth
  7. Porous stones
  8. Loading device

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- 717 9. Dial Indicator, sensitive to 0.001 inch  
718 10. Weights  
719  
720 D. Procedures: 1. Sample Preparation  
721  
722 a. For qualification of a borrow area, samples shall be remolded to  
723 a minimum 95% of the maximum dry density with a moisture  
724 content near optimum moisture as determined by ASTM D 698  
725  
726 b. For qualification of in-place fill, samples shall be undisturbed  
727 samples from California tube, or approved hand drive thin-wall  
728 sampler.  
729  
730 c. Determine and record the sample weight, height, and diameter.  
731  
732 d. Obtain trimmings of sample for moisture content evaluation.  
733  
734  
735  
736 2. Testing  
737  
738 a. Assemble by placing the ring sample with top and bottom porous  
739 stones in the consolidometer dish. Place the top loading cap on  
740 top of the porous stone, and place the consolidometer dish into  
741 the loading device.  
742  
743 b. Once the sample is placed in the consolidometer, adjust the dial  
744 to read 0 (zero) or a round number (i.e. 200). Record this dial  
745 reading.  
746  
747 c. Apply the specified surcharge load. If no surcharge load is  
748 specified, use 200 psf.  
749  
750 d. Record dial readings hourly until the readings remain constant,  
751 or a minimum of 4 hours.  
752  
753 e. Add water to the consolidometer.  
754  
755 f. Record dial readings periodically until sample movement  
756 stabilizes, and a minimum of 24 hours.  
757  
758 g. Add additional loads to bring the sample to its original height.  
759 The following load increments are suggested 500, 1000, 3000,  
760 6000, 10,000, 15,000 and 20,000 psf. As a minimum load the  
761 sample to 6000 psf. Record dial readings for each increment  
762 until the readings remain constant, or a minimum of 2 to 4 hours,  
763 before additional load increment application.  
764  
765 h. At completion of all load increments, dismantle the  
766 consolidometer and obtain final sample moisture content.  
767  
768 E. Calculations: 1. Obtain final dial reading for each load increment (correct for machine  
769 deflection by adding deflection when sample swells, and subtracting

- 770 when sample consolidates).
- 771
- 772 2. Calculate percent swell (+) or consolidation (-) as follows:
- 773
- 774 Percent Swell =Corrected final
- 775 dial reading X
- 776 100 Initial Sample
- 777 Height
- 778
- 779 3. Prepare plot of swell % - Consolidation % versus log of pressure
- 780 curve; include sample number, location, natural dry density, natural
- 781 moisture, soil description.
- 782

783 **END OF ITEM P-152**

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**ITEM P-153**

**WATERING**

**PART 1 GENERAL**

1.01 DESCRIPTION This work shall consist of obtaining, conveying, and applying water for compaction of embankments and subgrades; for concrete; haul road; for dust control; and for any other purposes in accordance with the requirements of the Contract Documents or as designated by the DIA Project Manager.

**PART 2 EQUIPMENT AND MATERIALS**

2.01 WATER QUALITY Water required for construction use shall be clean and free from sewage, oil, acid, strong alkalis, organic material, and other substances injurious to the finished product. Water obtained from the City supplied source is acceptable for use as construction water. If the Contractor provides an alternative source for water supply, water of questionable quality shall be tested in accordance with AASHTO T 26. All alternative supply sources shall be subject to approval by the DIA Project Manager.

2.02 CITY SUPPLIED WATER SOURCE. The City shall make available a source of construction water from the water line close to the existing Contractor Staging Area location shown on the Drawings. There is not an unlimited supply of water available and the Contractor will be held responsible for misuse of water. The tap size shall be limited to 1-1/2 inch.

It shall be the Contractor's responsibility to contact the DWD and the DIA Project Manager and arrange for connection to the above referenced waterline, to include installation of meter. The Contractor is advised to initiate such contact with the DWD prior to Bid, Attention: Mr. Tom Malmberg, 628-6112. The Contractor's connection plan, its distribution system, and its filling operations must be coordinated with, submitted to, and approved by the DWD prior to installation. All costs associated with waterline connections and distribution shall be included in the unit prices bid for the applicable items of construction.

2.03 POTABLE WATER Potable water may be hauled in and stored by the Contractor.

**PART 3 CONSTRUCTION METHODS**

3.01 TRANSPORT OF WATER The Contractor may transport water overland to an approved temporary storage facility, or construct temporary supply piping to his primary use point. The approximate location and alignment of the Contractor's temporary supply/distribution system must be approved by the DIA Project Manager in writing prior to its installation and must be removed by the Contractor upon completion of work. Potential contamination of existing domestic water system shall be held as the responsibility of the contractor.

3.02 EQUIPMENT The water equipment shall be of capacity and designed to assure uniform application of water in the amounts required.

3.03 PERMITS The Contractor shall obtain the required DWD permit(s) relative to tapping the water line and/or the use of said water.

**PART 4 METHOD OF MEASUREMENT**

57  
58 4.01 Refer to Appendix A for Method of Measurement.  
59

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61 **PART 5 BASIS OF PAYMENT**

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63 5.01 Refer to Appendix A for Basis of Payment.  
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66

66 **PART 6 TESTING REQUIREMENTS**

67

68 AASHTO T 26 Water

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**END OF ITEM P-153**

ITEM P-161

GEOTEXTILE

PART 1 DESCRIPTION

1.01 WORK INCLUDED This section covers the work necessary to furnish and install the geotextile fabrics, complete.

1.02 QUALITY ASSURANCE QUALIFICATION Contractors shall furnish geotextile fabric materials and shall submit to the DIA Project Manager, six (6) copies, a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the fabric. The mill certificate or affidavit shall attest that the fabric meets chemical, physical, and manufacturing requirements stated in this Specification. Contractors shall also submit to the DIA Project Manager, not later than 45 days prior to commencing work in this section, documented evidence of proven technical competence, past record of satisfactory performance on similar projects, and sufficient capacity to do the volume of work specified herein. Materials shall be the end products of one manufacturer in order to achieve standardization for appearance, maintenance, and replacement.

1.03 SUBMITTALS

A. All contractors shall furnish to the DIA Project Manager, no later than 45 days prior to delivery of materials to the project, the following data:

(1) Complete material specifications, descriptive drawings, and literature.

(2) Listing of all exceptions to the requirements specified herein.

(3) Factory test results of materials certified by fabric manufacturer being similar shall be submitted showing conformance with the requirements of these Specifications and which by actual usage has been demonstrated to be satisfactory for the intended application.

B. Before commencing the work specified under this section, the Contractor shall submit to the DIA Project Manager for approval all installation drawings, procedures, and a schedule for carrying out the work.

C. Contractors shall submit certification from to manufacturer that the product delivered to the project site will have property values equal to or greater than those specified. Certified property values shall be equal to the average value less 2 standard deviations.

D. A sample of 1 square foot of the geotextile fabric shall be furnished to the DIA Project Manager from each shipment for verification and testing. The lot number of the roll and the location of the sample obtained must be documented.

E. Samples of fabric sewn seams and/or securing pins shall also be furnished if required on the project.

1.04 MANUFACTURER'S SERVICES

A. A fabric manufacturer's representative shall inspect the site for acceptability and provide technical supervision and assistance at all times during installation of the

fabric, and as may be required by the DIA Project Manager.

**PART 2 EQUIPMENT AND MATERIALS**

**2.01 NONWOVEN GEOTEXTILE FABRIC**

- A. The non-woven geotextile fabric shall be used for geotextile lining of the underdrain trench, placed beneath the shoulder section P-403 Asphalt Treated Permeable Base and placed over the stabilized base course P-304 Cement Treated Base Course or P-306 Econocrete Subbase Course. All non-woven geotextile filter fabric installed as a component part of the underdrain system shall be considered incidental to the installation of the underdrain system and not measured or paid for individually. Fabric material as manufactured by Carthage Mills, Cincinnati, OH; Foss Manufacturing Company, Haverhill, MA; Hoechst Celanese Corp. Spartanburg, SC; Propex Fabrics ; or equal, shall be a pervious sheet of polyester, polypropylene, polyethylene, or polyamide fibers oriented into a stable network so that the fibers retain their relative position with respect to each other. The fabric shall be composed of continuous or discontinuous (staple) fibers held together through spun-bonding, melt-bonding, resin-bonding, or needle-punching. The edges of the fabric shall be salvaged or otherwise finished to prevent the other material from pulling away from the fabric. The fabric shall be woven into a width greater than 6 feet. The fabric shall conform to the physical requirements in Table No. 1.

| Table 1<br>PHYSICAL REQUIREMENTS<br>(for Nonwoven Fabric)                 |                       |                            |
|---------------------------------------------------------------------------|-----------------------|----------------------------|
| Physical                                                                  | Physical Requirements | Test Method                |
| Thickness, MU., min                                                       | 70                    | ASTM D 5199                |
| Mass (Weight), oz./sq.yd., min.                                           | 6.0                   | ASTM D 5261                |
| Water Permittivity sec, min.                                              | 1.5                   | ASTM D 4491 (Falling Head) |
| Apparent Opening Six (AOS), U.S. Standard Sieve Size                      | 50                    | ASTM D 4751                |
| Grab Tensile Strength, lbs., min.                                         | 180                   | ASTM D 4632                |
| Grab Elongation, % min.                                                   | 50                    | ASTM D 4632                |
| Mullen Burst Strength, psi, min.                                          | 290                   | ASTM D 3786                |
| Puncture Strength, lbs., min.                                             | 80                    | ASTM D 4833                |
| Trapezoid Tear Strength, lbs., min.                                       | 75                    | ASTM D 4533                |
| Seam Efficiency, %                                                        | 70-90                 | ASTM D 4632                |
| Hydrocarbon Resistance, % Change                                          | <20                   | USEPA 9090 (Modified)      |
| Ultraviolet Radiation Resistance, % Strength Retention, min. at 150 hours | 70                    | ASTM D 4355                |

- 2.02 SECURING PINS Securing pins for geotextile filter fabric shall be secured with 9 inch steel staples having a 3/16 inch dia with pointed ends. Geotextile fabric over CTB shall be secured with concrete nails with 1.5 inch dia washers long enough to hold the fabric in place



86 while the next pavement section is placed.

87

88 2.03 SEAMS

89

90 A. Seaming may be applied to both woven and nonwoven geotextile fabrics. Seams  
91 shall be required in applications where stress transfer from one geotextile to another  
92 is necessary. Seaming may replace overlapping at the Contractor's option.

93

94 B. Seam types shall be either a flat or player seam, a "J" type seam, or a butterfly scam.  
95 A "J" type seam is preferred. Stitch counts (stitches per inch) shall range from 3 to 7.  
96 The standard stitch hype shall be a chainstitch.

97

98 C. Sewing machinery shall make a double thread chainstitch, Type 401, and be capable  
99 of penetrating four layers of the geotextile. Machines may be hand-held or  
100 table/equipment-mounted, depending on fabric specified.

101

102 D. Sewing thread shall consist of nylon, polypropylene, polyester, or Kevlar thread.

103

104 E. A minimum 2 inches of fabric shall extend beyond the seam threads or a length  
105 sufficient to develop the required seam strength.

106

107 F. Seam strength shall be measured using grab-tensile procedures (ASTM D 4632).  
108 Scam efficiency is defined as the ratio of tensile strength across the seam to the  
109 strength of the intact fabric.

110

111 G. Factory sewing shall be utilized wherever possible to eliminate or reduce field seams.

112

113

114 2.04 DELIVERY, STORAGE, AND HANDLING OF MATERIALS

115

116 A. Geotextile materials delivered to site shall be inspected for damage, unloaded, and  
117 stored with the minimum of handling. Materials shall not be stored directly on the  
118 ground. During shipment and storage, filter cloth shall be furnished with a suitable  
119 wrapping for protection against moisture and extended ultraviolet exposure prior to  
120 placement. Rolls shall be stored in a manner which protects them from the elements.  
121 If stored outdoors, they shall be elevated and protected with a waterproof cover.  
122 Materials shall be handled in such a manner as to ensure delivery to the site in  
123 sound, undamaged condition.

124

125 B. Contractor shall furnish certified test reports with each shipment of material attesting  
126 that the fabric meets tile requirements of this Specification. Each roll shall be labeled  
127 or tagged to provide product identification sufficient for inventory and quality control  
128 purposes.

129

130

131 **PART 3 CONSTRUCTION METHODS**

132

133 3.01 GENERAL

134

135 A. The geotextile fabric shall be placed in the manner and at the locations shown in the  
136 Drawings or as directed by the DIA Project Manager.

137

138 B. At the time of installation, fabric shall be rejected if it has defects, ribs, holes, flaws,  
139 deterioration, or damage incurred during manufacture, transportation, storage, or  
140 placement. Visual review of the fabric shall be performed once the fabric has been  
141 placed and prior to placement of any overlying materials.

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- C. The fabric shall be placed with the machine direction (long dimension) down slope or normal to the natural slope, unless otherwise directed by the DIA Project Manager, and shall be laid smooth and free of tension, stress, folds, wrinkles, or creases. The strips shall be laid smooth to provide a minimum width of 12 inches, or greater if specified, of overlap for each joint. Overlap Joints and seams shall be measured as a single layer of cloth.
- D. Securing pins with washers shall be inserted through both strips of overlapped cloth at not greater than the following intervals along a line through the midpoint of the overlap:

| Pin Spacing | Slope            |
|-------------|------------------|
| 2 feet      | Steeper than 3:1 |
| 3 feet      | 3:1 to 4:1       |
| 5 feet      | Flatter than 4:1 |

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- (1) Additional pins regardless of location shall be installed as necessary to prevent any slippage of the filter fabric. Each securing pin shall be pushed through the fabric until the washer bears against the fabric and secures it firmly to the foundation.
- (2) Bags of soil or other methods approved by the DIA Project Manager shall be used to secure the geotextile during installation.

- E. The fabric shall be protected at all times during construction from contamination by surface runoff and any fabric so contaminated shall be removed and replaced with uncontaminated fabric.
- F. Should the fabric be damaged during any of the installation, the torn or punctured section shall be repaired by placing a piece of fabric which extends at least 18 inches in all directions beyond the damaged area. The fabric shall be sewn, secured with pins and washers as described above, or other methods as approved by the DIA Project Manager.

3.02 UNDERDRAIN/PAVEMENT APPLICATIONS

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- A. The filter geotextile shall be placed in the excavated trench prior to placement of underdrain gravel. Fabric shall surround all aggregate and pipe placed as the drainage media. Fabric shall be in direct contact with the adjacent soil.
- B. Geotextiles shall be overlapped a minimum of 12 inches in the direction of flow.
- C. Care shall be taken during aggregate filter placement operation and pipe installation to prevent damage to the fabric.
- D. Subbase shall be cleared of all sharp objects.
- E. Unroll geotextile fabric on prepared subbase. Provide minimum 18-inch overlap of material. Provide minimum 12-inch overlap of material with geotextile lining of underdrain trench.
- F. Place overlying drainable asphalt treated permeable base material in same direction as the geotextile overlap to avoid separation. Construction equipment other than hauling and paving equipment necessary for placement of the drainable base shall

193 not be allowed on the geotextile. Operate hauling and paving equipment in a manner  
194 to prevent damage or displacement of the geotextile. Equipment shall avoid sudden  
195 acceleration, hard braking, and sharp turns while on the geotextile, and the paver  
196 shall not turn while on the geotextile. Large fabric wrinkles which may develop  
197 during the spreading operations shall be folded and flattened in the direction of the  
198 spreading. Special care shall be given to maintaining proper overlap and fabric  
199 continuity.

200  
201 G. After placement of the drainable base, wrap geotextile around edge of drainable base  
202 to completely surround exposed drainable base. The exposed fabric shall then be  
203 covered with the subsequent course.

204  
205 H. Any damage to the fabric, such as tears, puncture, or excessive displacement, shall  
206 be repaired. The drainable base shall be cleared from the fabric and the damaged  
207 area repaired as previously described Section 3.1-f.

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209

#### 210 PART 4 METHOD OF MEASUREMENT

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212 4.01 Refer to Appendix A for Method of Measurement.

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214

#### 215 PART 5 BASIS OF PAYMENT

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217 5.01 Refer to Appendix A for Basis of Payment.

218

219

#### 220 PART 6 MATERIAL REQUIREMENTS

221

222 American Society for Testing and Materials (ASTM)

223

224 ASTM D 5199 Method for Measuring Thickness of Textile Materials

225

226 ASTM D 5261 Test Method for Mass per Unit Area (Weight) of Woven Fabric

227

228 ASTM D 3786 Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven  
229 Fabrics: Diaphragm Bursting Strength Tester Method.

230

231 ASTM D 4355 Test Method for Deterioration of Geotextiles from Exposure to ultraviolet  
232 Light and Water (Xenon-Arc Type Apparatus)

233

234 ASTM D 4491 Test Methods for Water Permeability of Geotextiles by Permittivity

235

236 ASTM D 4533 Test Method for Trapezoid-Tearing Strength of Geotextiles

237

238 ASTM D 4632 Test Method for Breaking Load and Elongation of Geotextiles (Grab Method)

239

240 ASTM D 4751 Test Method for Determining the Apparent Opening Size of a Geotextile

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242 ASTM D 4833 Index Puncture Resistance of Geotextiles, Geomembranes, and Related  
243 Products.

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**END OF ITEM P-161**

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**ITEM P-162**

**CONTROLLED LOW-STRENGTH MATERIAL (CLSM)**

**PART 1 DESCRIPTION**

1.01 This item shall consist of furnishing, transporting, and placing a controlled low-strength material (CLSM) as flowable backfill in trenches or at other locations shown on the plans or as directed by the Engineer.

**PART 2 MATERIALS**

2.01

A. Portland Cement: Portland cement shall conform to the requirements of ASTM C 150 Type V or an equivalent Type I/II cement meeting the requirements of Item P-501, 2.02. If for any reason, cement becomes partially set or contains lumps of caked cement, it shall be rejected. Cement salvaged from discarded or used bags shall not be used.

B. Fly Ash: Fly Ash shall conform to ASTM C 618, Class F.

C. Fine Aggregate (Sand): Fine aggregate shall conform to the requirements of ASTM C 33 except for aggregate gradation. Any aggregate gradation which produces performance characteristics of the CLSM specified herein will be accepted, except as follows.

| <u>Sieve Size</u>  | <u>Percent Passing by Weight</u> |
|--------------------|----------------------------------|
| 3/4 inch (19.0 mm) | 100                              |
| No. 200 (0.075 mm) | 0 - 12                           |

D. Water: Water used in mixing shall be free of oil, salt, acid, alkali, sugar, vegetable matter, or other substances injurious to the finished product.

E. The flowable backfill used in the construction of the L-110, Duct Bank, shall have Red Color added.

**PART 3 CONSTRUCTION METHODS**

3.01 MIX DESIGN

A. Compressive Strength: CLSM shall be designed to achieve a 28-day compressive strength of 50 to 300 psi (345 to 2,070 kPa) when tested in accordance with ASTM C 39. There should be no significant strength gain after 28 days. Test specimens shall be made in accordance with ASTM D 4832.

B. Consistency: Consistency of the fresh mixture shall such that the mixture may be placed without segregation. A desired consistency may be approximated by filling an open-ended three inch (75 mm) diameter cylinder, six inches (150 mm) high to the top, with the mixture and the cylinder immediately pulled straight up. The correct consistency of the mixture will produce an approximate eight inch (205 mm) diameter circular-type spread without segregation. Adjustments of the proportions of materials should be made to achieve proper solid suspension and flowable characteristics, however the theoretical

yield shall be maintained at one cubic yard (cubic meter) for the given batch weights.

3.02 TESTING LABORATORY The laboratory used to develop the mix design shall meet the requirements of ASTM C 1077 including accreditation. Accreditation shall include all test procedures required to develop the mix design. A certification signed by the manager of the laboratory stating it meets these requirements shall be submitted to the Project Manager. The certification shall contain as a minimum:

- A. Qualifications of personnel: including the laboratory manager, supervision technician and testing technicians.
- B. Evidence of current accreditation by a nationally recognized laboratory accreditation organization for all the test methods used in developing the mix design.

3.03 MIX DESIGN SUBMITTAL The Contractor shall submit a mix design to the Project Manager for the CLSM at least 30 days prior to use. The mix design **will not** be approved when the laboratory trial mix data and materials Certificates of Compliance are the results from tests performed more than one (1) year in the past. The laboratory trial mix submittal package shall include the following:

- A. The weights and sources of all ingredients including cement, fly ash, aggregates, water and the water/cement ratio (w/c).
- B. Certified Certificates of Compliance showing the cement, fly ash, aggregates and additives meet the specification requirements and supporting this statement with actual test results.
- C. The laboratory trial mix data, consisting of:
  - Mix identification number
  - Date mix was developed
  - Developer of mix
  - Consistency
  - Weight per cubic foot
  - Yield
  - Air content
  - Compressive strength (at least two specimens at seven days and three specimens at twenty-eight days)
- D. Testing laboratory qualifications required in Item P-162, Part 3, 3.02.

3.04 PLACEMENT

- A. PLACEMENT. CLSM may be placed by any reasonable means from a mixing unit into the space to be filled. Agitation is required during transportation and waiting time. Placement shall be performed in such a manner that structures or pipes are not displaced from their desired final position and intrusion of CLSM into undesirable areas is avoided. The material shall be brought up uniformly to the fill line shown on the plans or as directed to the Project Manager. Each placement of CLSM shall be as continuous an operation as possible. If CLSM is placed in more than one layer, the base layer shall be free of surface water and loose or foreign material prior to placement of the next layer.
- B. LIMITATIONS OF PLACEMENT. CLSM shall not be placed on frozen ground. Mixing and placing may begin when the air or ground temperature is at least 35 degrees F (2 degrees C) and rising. At the time of placement, CLSM shall have a temperature of at

111 least 40 degrees F (4 degrees C). Mixing and placement shall stop when the air  
112 temperature is 40 degrees F (4 degrees C) and falling or when the anticipated air or  
113 ground temperature will be 35 degrees F (2 degrees C) or less in the 24 hour period  
114 following proposed placement.  
115  
116

117 **3.05 CURING AND PROTECTION**  
118

119 A. CURING. The air in contact with the CLSM should be maintained at temperatures above  
120 freezing for a minimum of 72 hours. If the CLSM is subjected to temperatures below 32  
121 degrees F (0 degrees C), the material may be rejected by the Engineer if damage to the  
122 material is observed.  
123

124 B. PROTECTION. The CLSM shall not be subject to loads and shall remain undisturbed by  
125 construction activities for a period of 48 hours or until a compressive strength of 15 psi  
126 (105 kPa) is obtained. The Contractor shall be responsible for providing evidence to the  
127 Engineer that the material has reached the desired strength. Acceptable evidence shall  
128 be based upon compressive tests made in accordance with paragraph 153-3.01.A.  
129

130 **3.06 ACCEPTANCE:** Acceptance of CLSM delivered and placed as shown on the plans or as  
131 directed by the Project Manager shall be based upon mix design approval and batch tickets  
132 provided by the Contractor to confirm that the delivered material conforms to the mix design. The  
133 Contractor shall verify by additional testing, each 5,000 cubic yards (3,825 cubic meters) of  
134 material used. Verification shall include confirmation of material proportions and tests of  
135 compressive strength to confirm that the material meets the original mix design and the  
136 requirements of CLSM as defined in this specification. Adjustments shall be made as necessary  
137 to the proportions and materials prior to further production.  
138  
139

140 **PART 4 METHOD OF MEASUREMENT**  
141

142 **4.01** Refer to Appendix A for Method of Measurement.  
143  
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145 **PART 5 BASIS OF PAYMENT**  
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147 **5.01** Refer to Appendix A for Basis of Payment.  
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**PART 6 MATERIAL REQUIREMENTS**

- ASTM C 33 Concrete Aggregates
- ASTM C 94 Ready-Mixed Concrete
- ASTM C 150 Portland Cement
- ASTM C 260 Air Entraining Admixtures for Concrete
- ASTM C 618 Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement concrete
- ASTM C 685 Concrete Made by Volumetric Batching and Continuous Mixing

**PART 7 TESTING REQUIREMENTS**

- ASTM C 117 Materials Finer than 75  $\mu$ m (No. 200) Sieve in Mineral Aggregates by Washing
- ASTM C 136 Sieve Analysis of Fine and Coarse Aggregates
- ASTM C 143 Slump of Hydraulic Cement Concrete
- ASTM D 75 Sampling Aggregates
- ASTM D 558 Moisture-Density Relations of Soil-Cement Mixtures
- ASTM D 4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D 4832 Preparation and Testing of Soil-Cement Slurry Test Cylinders

**END OF ITEM P-162**



ITEM P-301

SOIL-CEMENT BASE COURSE

PART 1 GENERAL

1.01 DESCRIPTION This item shall consist of constructing a base course by uniformly mixing together soil, Portland cement, and water. The mixed material shall be spread, shaped, and compacted in accordance with these specifications and in conformity to the dimensions and typical cross section shown on the plans.

Runway, taxiway, or apron pavements shall be built in a series of parallel lanes using a plan of processing that reduces longitudinal and transverse joints to a minimum.

PART 2 MATERIALS

2.01 PORTLAND CEMENT. Portland cement shall conform to the requirements of ASTM C 150, Type V, or an equivalent Type I/II cement meeting the requirements of Item P-501, 2.02..

2.02 WATER. Water shall be clean and free from sewage, oil, acid, strong alkalis, or vegetable matter. Water of questionable quality shall be tested in accordance with the requirements of AASHTO T 26.

2.03 SOIL. The soil shall consist of the upper most 18 inches of select embankment as placed and paid for by Specifications Item P-152, Upper Select Embankment. The soil shall meet the requirements of P-152, 2.03 B.

2.04 BITUMINOUS MATERIAL The types, grades, controlling specifications, and application temperatures for the bituminous materials used for curing the soil-cement are listed in Table 1. The Designer of Record shall approve the specific material used.

TABLE 1. BITUMINOUS MATERIALS

| Type and Grade     | Specification | Application<br>Deg. F | Temperature<br>Deg. C |
|--------------------|---------------|-----------------------|-----------------------|
| Cutback Asphalt    |               |                       |                       |
| RC-70              | ASTM D 2028   | 120-160               | 50-70                 |
| RC-250             | ASTM D 2028   | 160-200               | 70-95                 |
| Emulsified Asphalt |               |                       |                       |
| RS-1, SS-1         | ASTM D 977    | 75-130                | 25-55                 |
| CRS-1              | ASTM D 2397   | 75-130                | 25-55                 |
| CSS-1h             | ASTM D 2397   | 75-160                | 20-70                 |

PART 3 CEMENT QUANTITY

3.01 LABORATORY SOIL TESTS. Prior to soil-cement base course construction, laboratory tests of soils shall be made to determine the quantity of cement required in the mix to provide a minimum 200 psi unconfined compressive strength. Mix designs shall be required for each soil type or combination of soils. The test specimens shall be fabricated in accordance with ASTM D 558, cured at 100 degrees F for 5 days, and tested for compressive strength in accordance with ASTM D 1633.

- 58 3.02 TESTING LABORATORY. The Contractor shall employ a testing laboratory to design the soil-  
59 cement base course mixture. The laboratory shall meet the requirements of ASTM D 3740  
60 including accreditation. Accreditation shall include all test procedures required to develop the mix  
61 design. A certification signed by the manager of the laboratory stating it meets these  
62 requirements shall be submitted to the Project Manager. The certification shall contain as a  
63 minimum:  
64
- 65 A. Qualifications of personnel; including the laboratory manager, supervising technician,  
66 and testing technicians involved in developing the soil-cement base course mixture.
  - 67
  - 68 B. Evidence of current accreditation by a nationally recognized laboratory accreditation  
69 organization for all test methods used in developing the soil-cement base course mixture.  
70
- 71 3.03 MIX DESIGN SUBMITTAL The contractor shall submit the laboratory soil-cement base course  
72 mix design to the Project manager at least thirty (30) days prior to use. The submittal shall  
73 include the following:  
74
- 75 A. Source of soil
  - 76 B. Gradation of soil
  - 77 C. Atterberg limits of soil
  - 78 D. Water soluble sulfate content of soil
  - 79 E. Swell potential of soil
  - 80 F. Certificate of Compliance current within one (1) year verifying that the cement meets the  
81 specification requirements and support of this statement with test results
  - 82 G. Moisture-density relationships for each cement content
  - 83 H. Compressive strength results for each cement content
  - 84 I. Recommended cement content
  - 85 J. Testing laboratory qualifications required in 3.02
- 86  
87

#### 88 PART 4 CONSTRUCTION METHODS

- 89
- 90 4.01 WEATHER LIMITATIONS. The soil-cement base shall not be mixed or placed while the  
91 atmospheric temperature is below 35°F or when conditions indicate that the temperature may fall  
92 below 35°F within 24 hours, or when the weather is foggy or rainy, or when the soil or subgrade is  
93 frozen.  
94
- 95 4.02 EQUIPMENT. The soil-cement base course may be constructed with any equipment that will  
96 meet the requirements for soil pulverization, cement application, mixing, water application,  
97 incorporation of materials, compaction, finishing, and curing specified herein.  
98
- 99 4.03 PREPARATION. The area to be paved shall be graded and shaped to conform to the grades and  
100 typical cross section shown on the plans. Any soft or yielding areas in the subgrade shall be  
101 removed and replaced with acceptable soil and compacted as specified.  
102
- 103 4.04 PULVERIZATION. The soil for the soil-cement base course shall be so pulverized that at the  
104 completion of moist-mixing, 100% by dry weight passes a 1-inch (25 mm) sieve and a minimum  
105 of 80% passes a No. 4 sieve, exclusive of gravel or stone retained on the No. 4 sieve.  
106
- 107 4.05 CEMENT APPLICATION, MIXING, AND SPREADING. Mixing of the soil, cement, and water  
108 shall be accomplished either by the mixed-in-place or the central-plant-mixed method.  
109
- 110 The percentage of moisture in the soil, at the time of cement application, shall not exceed the  
111 quantity that will permit a uniform and intimate mixture of soil and cement during mixing  
112 operations, and it shall not exceed the specified optimum moisture content for the soil-cement  
113 mixture.  
114

115 (1) Method A - Mixed-in-place: The specified quantity of cement shall be spread uniformly on  
116 the soil.

117  
118 Cement that has been displaced shall be replaced before mixing is started. After the cement  
119 has been applied, it shall be mixed with the soil. Mixing shall continue until the cement has  
120 been sufficiently blended with the soil to prevent the formation of cement balls when water is  
121 applied.

122  
123 Immediately after the soil and cement have been mixed, water shall be incorporated into the  
124 mixture. Excessive concentrations of water on or near the surface shall be avoided. A water  
125 supply and pressure distributing equipment shall be provided that will assure the application  
126 within 3 hours of all mixing water on the section being processed. After all mixing water has  
127 been applied, mixing shall continue until a uniform and intimate mixture of soil, cement, and  
128 water has been obtained.

129  
130 The Project Manager may stop the dry mixing application if blowing of cement dust becomes  
131 a hindrance to airfield operations. The Contractor shall not spread more dry cement than  
132 what his forces can mix within a one-hour time frame. This quantity may be reduced by the  
133 Project Manager if, in his/her opinion the blowing cement dust is a hazard to airfield  
134 operations.

135  
136 (2) Method B - Central plant mixed: The soil, cement, and water shall be mixed in a pugmill,  
137 either of the batch or continuous-flow type. The plant shall be equipped with feeding and  
138 metering devices, which will add the soil, cement, and water into the mixer in the specified  
139 quantities. Soil and cement shall be mixed sufficiently to prevent cement balls from forming  
140 when water is added. Mixing shall continue until a uniform and intimate mixture of soil,  
141 cement, and water is obtained.

142  
143 The mixture shall be hauled to the project in trucks equipped with protective covers. The  
144 mixture shall be placed on the moistened subgrade in a uniform layer by an approved  
145 spreader(s).

146  
147 If the design thickness of the soil-cement exceeds 8 inches it shall be placed in equal lifts not  
148 less than 4 inches compacted and not greater than 8 inches compacted, uniform in surface  
149 contour.

150  
151 Not more than 60 minutes shall elapse between the start of moist mixing and the start of  
152 compaction of the soil-cement base course.

153  
154 4.06 COMPACTION. Immediately upon completion of the spreading operations, the mixture shall be  
155 thoroughly compacted. The number, type, and weight of rollers shall be sufficient to compact the  
156 mixture to the required density.

157  
158 The field density of the compacted mixture shall be at least 98.0 percent of the maximum density  
159 of laboratory specimens prepared from samples of the soil-cement base course taken from the  
160 material in place. The specimens shall be compacted and tested in accordance with ASTM D  
161 558. The in-place field density shall be determined in accordance with ASTM D 1556 or ASTM D  
162 6938. If ASTM D 6938 is used, reference GP-120 Nuclear Gauges. Any mixture that has not  
163 been compacted shall not be left undisturbed for more than 30 minutes. The moisture content of  
164 the mixture at the start of compaction shall not be below the optimum moisture content as  
165 determined by ASTM D 558.

166  
167 4.07 FINISHING. Finishing operations shall be completed during daylight hours, and the completed  
168 soil-cement base course shall conform to the required lines, grades, and cross section. Finishing  
169 shall be done in such a manner as to produce a dense surface free of compaction planes, cracks,  
170 ridges, or loose materials and will conform to the required grade and cross section. If necessary,  
171 the surface shall be lightly scarified to eliminate any imprints made by the compacting or shaping

172 equipment. The surface shall be kept damp during the finishing operations then - re-compacted  
173 to the required density using steel-wheel and pneumatic-tire rollers.

174  
175 4.08 CONSTRUCTION JOINTS. At the end of each day's run, a transverse construction joint shall be  
176 formed by a header or by cutting back into the compacted material to form a true vertical face  
177 free of loose material.

178  
179 The protection provided for construction joints shall permit the placing, spreading, and  
180 compacting of base material without injury to the work previously laid. Where it is necessary to  
181 operate or turn any equipment on the completed base course, sufficient protection and cover  
182 shall be provided to prevent damage to the finished surface. A supply of mats or wooden planks  
183 shall be maintained and used as approved and directed by the Project Manager.

184  
185 Care shall be exercised to ensure thorough compaction of the soil-cement base course  
186 immediately adjacent to all construction joints. When spreading or compacting soil-cement base  
187 course adjacent to a previously constructed lane, care shall be taken to prevent injury to the work  
188 already constructed.

189  
190 4.09 PROTECTION AND CURING. After the soil-cement base course has been finished as specified  
191 herein, it shall be protected against drying for a period of 7 days by the application of bituminous  
192 material or other acceptable methods. The curing method shall begin as soon as possible, but  
193 no later than 24 hours after the completion of finishing operations. The finished soil-cement base  
194 course shall be kept moist continuously until the curing material is placed.

195  
196 The bituminous material specified shall be uniformly applied to the surface of the completed soil-  
197 cement base course at the rate of approximately 0.2 gallon per square yard (0.92 liter/square  
198 meter) with approved heating and distributing equipment. The exact rate, and temperature of  
199 application to give complete coverage without excessive runoff shall be as specified.

200  
201 At the time the bituminous material is applied, the surface shall be dense, free of all loose and  
202 extraneous material, and shall contain sufficient moisture to prevent penetration of the bituminous  
203 material. Water shall be applied in sufficient quantity to fill the surface voids immediately before  
204 the bituminous curing material is applied.

205  
206 The curing material shall be maintained and applied as needed by the Contractor during the  
207 7-day protection period so that all of the soil-cement base course will be covered effectively  
208 during this period.

209  
210 Finished portions of soil-cement base course that are used by equipment in constructing an  
211 adjoining section shall be protected to prevent equipment from marring or damaging the  
212 completed work.

213  
214 When the air temperature may be expected to reach the freezing point, sufficient protection from  
215 freezing shall be given the soil-cement base course for 7 days after its construction and until it  
216 has hardened.

217  
218 Other curing materials such as moist straw or hay may be used if approved.

219  
220 4.10 CONSTRUCTION LIMITATIONS. When any of the operations after the application of cement are  
221 interrupted for more than 30 minutes or when the un-compacted soil-cement base course mixture  
222 exceeds the upper limit of the moisture content tolerance the portion affected shall be removed at  
223 the Contractor's expense. In the event the uncompacted, rain-wetted mixture exceeds the  
224 specified moisture content tolerance, the Contractor shall reconstruct at his/her expense the  
225 portion affected. All material along the longitudinal or transverse construction joints not properly  
226 compacted shall be removed and replaced, at the Contractor's expense, with properly moistened  
227 and mixed soil-cement base course compacted to specified density.

228

229 4.11 SURFACE TESTS. The finished surface shall not vary more than 3/8 inch (9 mm) when tested  
230 with a 16-foot (4.8 m) straightedge applied parallel with, or at right angles to, the longitudinal axis  
231 of the pavement. Any variations in excess of this tolerance shall be corrected by the Contractor,  
232 at his/her own expense, and in a manner satisfactory to the Project Manager.

233  
234 A. Grade tolerance; True grade will not vary more than plus zero to minus 1/2 inch from  
235 design grade.

236  
237 4.12 THICKNESS. The thickness of the soil-cement base course shall be determined from  
238 measurements of cores drilled from the finished base or from thickness measurements at holes  
239 drilled in the base at intervals so that each test shall represent no more than 300 square yards  
240 (250 square meters). The average thickness of the base constructed during one day shall be  
241 within 1/2 inch (12 mm) of the thickness shown on the plans, except that the thickness of any one  
242 point may be within 3/4 inch (13 mm) of that shown on the plans. Where the average thickness  
243 shown by the measurements made in one day's construction is not within the tolerance given, the  
244 Project Manager shall evaluate the area and determine if, in his/her opinion, it shall be  
245 reconstructed at the Contractor's expense or the deficiency deducted from the total material in  
246 place.

247  
248 4.13.1 MAINTENANCE. The Contractor shall be required to maintain, at his/her own expense, the  
249 entire soil-cement base course within the limits of his/her contract in a condition satisfactory to  
250 the Engineer from the time he starts work until all the work has been completed. Maintenance  
251 shall include immediate repairs of any defects that may occur either before or after the cement is  
252 applied. The work shall be done by the Contractor at his/her own expense and repeated as often  
253 as necessary to keep the area intact at all times. Repairs shall be made in a manner that will  
254 insure restoration of a uniform surface and the durability of the part repaired. Faulty work must  
255 be replaced for the full depth of treatment. Any low areas shall be remedied by replacing the  
256 material for the full depth of treatment rather than by adding a thin layer of soil-cement base  
257 course to the completed work.

258  
259

## 260 PART 5 QUALITY ASSURANCE TESTING

261  
262 5.01 CONTRACTOR'S INDEPENDENT TESTING AGENCY. The Contractor's Independent Testing  
263 Agency shall provide all testing. The Independent Testing Agency shall meet the requirements of  
264 Section 01401 and have been approved through the submittal process prior to performing testing.

265  
266 The testing shall be performed in accordance with the requirements of 4.06 and the Test  
267 Schedule. Test results for in-place density and moisture content shall be given to the DIA  
268 Inspector in rough draft form upon completion of the day's testing. Electronic copies of the in-  
269 place density and moisture content tests and ASTM D 558 tests shall be provided to the Project  
270 Manager and the QA Lab Manager the following morning. All test results shall be typed and  
271 included in the weekly summary reports in accordance with Section 01401, 1.06. In addition, all  
272 test results shall be typed and included in the weekly summary reports in accordance with  
273 Section 01401, 1.06.

274  
275 The Project Manager's Quality Assurance Lab may perform intermittent testing. This testing may  
276 be in conjunction or independent of the testing performed by the Contractor's Independent  
277 Testing Agency.

278  
279 Any soil-cement base course construction that does not meet specification requirements as  
280 indicated by testing performed by the Contractor's Independent Testing Agency shall be re-  
281 worked, at the Contractor's expense, to bring that work within specification requirements.

282  
283 Upon completion of the testing, the Independent Testing Agency shall provide documentation  
284 stating the moisture content, compaction, compression strength, and test frequencies meet

285 project specifications. This documentation shall be signed and stamped by an Engineer  
286 employed by the Independent Testing Agency in the State of Colorado.  
287

288 5.02 TEST SCHEDULE

289  
290 Use of most current version of ASTM Standard is required.  
291

| 292 <u>Test Type</u>                  | 293 <u>Test Standard</u> | 294 <u>Minimum Frequency of Tests</u>                                                                                                                                                                                                                                                                                  |
|---------------------------------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 295 Moisture-Density<br>296 Relations | 297 ASTM D 558           | 298 Two each for the first 2 days of<br>299 placement, then 1 test each day there<br>300 after. Additional ASTM D 558 tests shall be<br>301 performed as variations in the soil-cement base<br>302 course occur and when in-place density tests<br>303 do not correlate with previous ASTM D 558 tests<br>304 results. |

|                                                  |                                    |                                                                                                                                             |
|--------------------------------------------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 305 In-Place Density and<br>306 Moisture Content | 307 ASTM D 1556<br>308 ASTM D 6938 | 309 One test each for each 300 square<br>310 yards of soil-cement base course material<br>311 placed per lift, per day or fraction thereof. |
|--------------------------------------------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|

|                                 |                                   |                                                                                                                                                                                                                                                                                                             |
|---------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 312 Compressive<br>313 Strength | 314 ASTM D 558<br>315 ASTM D 1633 | 316 a. One set of four cylinders per 6,000<br>317 square yards or a minimum 2 sets<br>318 per day.<br>319<br>320 Two sealed and cured for five days<br>321 accelerated.<br>322<br>323 Two sealed and cured for 28 days at<br>324 ambient temperature.<br>325<br>326 b. Strength not corrected for diameter. |
|---------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

327  
328 **PART 6 METHOD OF MEASUREMENT**

329 6.01 Refer to Appendix A for Basis of Measurement.  
330

331  
332 **PART 7 BASIS OF PAYMENT**

333 7.01 Refer to Appendix A for Basis of Payment.  
334

335  
336 **PART 8 TESTING REQUIREMENTS**

|                 |                                                               |
|-----------------|---------------------------------------------------------------|
| 337 ASTM C 136  | 338 Sieve or Screen Analysis of Fine and Coarse Aggregate     |
| 339 ASTM D 558  | 340 Moisture-Density Relations of Soil-Cement Mixtures        |
| 341 ASTM D 1556 | 342 Test for Density of Soil In-Place by the Sand Cone Method |
| ASTM D 1663     | Compressive Strength of Molded Soil-Cement Cylinders          |

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ASTM D 6938      In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

**PART 9 MATERIAL REQUIREMENTS**

ASTM C 150      Portland Cement  
ASTM D 977      Emulsified Asphalt  
ASTM D 202      Liquid Asphalt (Rapid Curing Type)  
ASTM D 239      Cationic Emulsified Asphalt  
AASHTO T 26      Quality of Water to be used in Concrete

**END OF ITEM P-301**

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**ITEM P-304C**

**CDOT AGGREGATE BASE COURSE  
(For Access Roads only)**

**PART 1 GENERAL**

1.01 DESCRIPTION This work consists of furnishing and placing one or more courses of aggregate on a prepared base course.

**PART 2 MATERIALS**

2.01 AGGREGATE Aggregates for bases shall be crushed stone, crushed slag, crushed gravel, natural gravel, or crushed reclaimed concrete or asphalt material which conforms to the quality requirements of AASHTO M 147 except that the requirements for the ratio of minus No. 200 sieve fraction to the minus No. 40 sieve fraction, stated in 2.2.2 of AASHTO M 147, shall not apply. Aggregates for bases shall meet the grading requirements of Table 1. The liquid limit shall not be greater than 30 and the plasticity index shall not exceed 6 when the aggregate is tested in accordance with AASHTO T 89 and T 90 respectively.

| <b>Sieve Size</b> | <b>Design Range<br/>Percentage by Weight</b> |
|-------------------|----------------------------------------------|
| 3/4 in            | 100                                          |
| No. 4             | 30-65                                        |
| No. 8             | 25-55                                        |
| No. 200           | 3-12                                         |

Acceptance will be based on random samples taken from each lift.

**PART 3 CONSTRUCTION METHODS**

3.01 PLACING If the required compaction depth of the aggregate base course exceeds 6 inches, it shall be constructed in two or more layers of approximately equal thickness. The maximum compacted thickness of any one layer shall not exceed 6 inches.

3.02 MIXING The Contractor shall mix the aggregate by methods that insure a thorough and homogeneous mixture.

3.03 SHAPING AND COMPACTION Compaction of each layer shall continue until a density of not less than 95 percent of maximum density determined in accordance with AASHTO T 180 has been achieved. The surface of each layer shall be maintained during the compaction operations so that a uniform texture is produced and the aggregates are firmly keyed. Water shall be uniformly applied during compaction in the quantity necessary for proper consolidation.

44           Compaction of each reclaimed asphalt pavement aggregate layer shall continue until a wet  
45           density of not less than 95 percent of the maximum wet density when determined in accordance  
46           with a one point AASHTO T 180, Method D test has been achieved.  
47

48           The surface of the base course will be tested with a 16-foot straightedge. The surface shall be  
49           tested prior to placement of the pavement. The variation of the surface from the testing edge of  
50           the straightedge between any two contacts with the surface shall not exceed 3/8-inch. All  
51           irregularities exceeding the specified tolerance shall be corrected to the satisfaction of the DIA  
52           Project Manager at no additional cost to the Owner.  
53

54

55   **PART 4 METHOD OF MEASUREMENT**

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57   4.01   Refer to Appendix A for Method of Measurement.  
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61   **PART 5 BASIS OF PAYMENT**

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63   5.01   Refer to Appendix A for Basis of Payment.  
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68   **PART 6 TESTING REQUIREMENTS**

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70           AASHTO T 89       Standard Method Test for Determining the Liquid Limit of Soils

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72           AASHTO T 90       Standard Method of Test for Determining the Plastic Limit and Plasticity  
73           Index of Soils

74

75           AASHTO T 180      Standard Method of Test for Moisture-Density Relations of Soils  
76

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79   **PART 9 MATERIAL REQUIREMENTS**

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81           AASHTO M 147      Standard Specification for Materials for Aggregate and Soil-Aggregate  
82           Subbase, Base and Surface Courses  
83

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**END OF ITEM P-304C**

ITEM P-401C

CDOT PLANT MIX PAVEMENTS  
(For Access Roads Only)

PART 1 GENERAL

1.01 DESCRIPTION This item consists of constructing hot mix asphalt (HMA) pavement on a prepared base in accordance with these Specifications, and in conformity with the lines, grades, thicknesses, and typical cross sections show on the Plans.

PART 2 MATERIALS

2.01 COMPOSITION OF MIXTURE The bituminous plant mix shall be composed of a mixture of aggregate, filler or additives if required and approved, asphalt cement, and reclaimed material if permitted and used.

A. Mix Design. The Contractor shall submit the following to the Engineer:

- 1) A proposed hot mix asphalt design prepared in accordance with Colorado Procedure 52 which shall be wholly within the Master Range Table of Table 2 before the tolerances shown in Table 1 are applied. The weight of lime shall be included in the total weight of the material passing the No. 200 sieve.
- 2) The name of the refinery supplying the asphalt cement and the source of the anti-stripping additive.
- 3) The job mix formula shall establish a single percentage of aggregate passing each required sieve size, a single percentage of asphalt cement to be added to the aggregate, and a single temperature for the mixture at the discharge point of the plant.

B. Mixtures Furnished to the Project. After the job mix formula is established, all mixtures furnished for the project shall conform thereto within the ranges of tolerances listed in Table 1.

|                                                                                                                                                                      |        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Asphalt Content                                                                                                                                                      | ±0.3%  |
| Asphalt Recycling Agent                                                                                                                                              | ±0.2%  |
| Temperature of Mixture When Discharged from Mixer                                                                                                                    | ±20 °F |
| Hot Mix Asphalt                                                                                                                                                      |        |
| Passing the 3/8-inch and larger sieves                                                                                                                               | ±6%    |
| Passing the No. 4 and No. 8 sieves                                                                                                                                   | ±5%    |
| Passing the No. 30 sieve                                                                                                                                             | ±4%    |
| Passing the No. 200 sieve                                                                                                                                            | ±2%    |
| <sup>1</sup> When 100% passing is designated, there shall be no tolerance. When 90—100% passing is designated, 90% shall be the minimum; no tolerance shall be used. |        |
| <sup>2</sup> These tolerances apply to the Contractor's Quality Control Testing.                                                                                     |        |

C. Should a change in sources of materials be made, a new job mix formula shall be established before the new material is used. This new job mix formula shall be in effect

42 until modified by the Engineer. Requests made in writing by the Contractor for changes  
 43 in the job mix formula will be considered. The job mix formula may be changed by the  
 44 Engineer if the change will produce a mixture of equal or better quality and will:

- 45  
 46 1) Permit better utilization of available material, or  
 47  
 48 2) Result in a saving in cost to the Sponsor through an adjustment in unit price.

49  
 50 D. Tests for cleanliness, abrasion loss, and percent of fractured faces will be made on  
 51 representative samples of aggregate taken during production or from the stockpiles.  
 52

53 2.02 AGGREGATES All sieve sizes and designations described in this section refer to laboratory  
 54 sieves having square openings and conforming to ASTM E 11.

55  
 56 A. Aggregates for hot plant mix bituminous pavement (HMA) shall be of uniform quality,  
 57 composed of clean, hard, durable particles of crushed stone, crushed gravel, natural  
 58 gravel, or crushed slag. Excess of fine material shall be wasted before crushing. A  
 59 percentage of the aggregate retained on the No. 4 sieve shall have at least two  
 60 mechanically induced fractured faces when tested in accordance with Colorado  
 61 Procedure 45. The angularity of the fine aggregate shall be a minimum of 45.0% when  
 62 determined according to AASHTO T 304. Aggregate samples representing each  
 63 aggregate stockpile shall be non-plastic if the percent of aggregate passing the No. 8  
 64 sieve is greater than, or equal to, 10% by weight of the individual aggregate sample.  
 65 Plasticity will be determined in accordance with AASHTO T 90. The material shall not  
 66 contain clay balls, vegetable matter, or other deleterious substances.  
 67

68 B. The aggregates shall have a percentage of wear of 45 or less when tested in accordance  
 69 with AASHTO T 96.  
 70

| Table 2<br>MASTER RANGE TABLE FOR HOT MIX ASPHALT |                                                              |
|---------------------------------------------------|--------------------------------------------------------------|
| Sieve Size                                        | Percent by Weight Passing<br>Square Mesh Sieves<br>(Grade S) |
| 1-1/2"                                            |                                                              |
| 1"                                                | 100                                                          |
| 3/4"                                              | 100                                                          |
| 1/2"                                              | *                                                            |
| 3/8"                                              | *                                                            |
| #4                                                | *                                                            |
| #8                                                | 23—49                                                        |
| #16                                               |                                                              |
| #30                                               | *                                                            |
| #50                                               |                                                              |
| #100                                              |                                                              |
| #200                                              | 2—8                                                          |

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 72 2.03 FILTER MATERIAL Filter material shall consist of free draining sand, gravel, slag, or crushed  
 73 stone. The grading requirements are set forth in Table 3.  
 74

| Table 3<br>GRADATION SPECIFICATIONS FOR FILTER MATERIAL |                                                    |
|---------------------------------------------------------|----------------------------------------------------|
| Sieve Size                                              | Mass Percent Passing Square Mesh Sieves<br>Class B |
| 3"                                                      |                                                    |

| Sieve Size | Mass Percent Passing Square Mesh Sieves |
|------------|-----------------------------------------|
|            | Class B                                 |
| 1-1/2"     | 100                                     |
| 3/4"       |                                         |
| No. 4      | 20—60                                   |
| No. 16     | 10—30                                   |
| No. 50     | 0—10                                    |
| No. 100    |                                         |
| No. 200    | 0—3                                     |

75  
 76 2.04 MINERAL FILLER Mineral filler shall conform to the requirements of AASHTO M 17 and shall  
 77 consist of rock, dust, slag dust, hydrated lime, hydraulic cement, fly ash, or other suitable mineral  
 78 matter. It shall be free of organic impurities and agglomerations. When used, it shall be dry  
 79 enough to flow freely. Mineral filler shall have a plasticity index of not greater than four excluding  
 80 hydrated lime and hydraulic cement. Mineral filler shall be graded within the following limits:  
 81

| Sieve Size | Mass percent passing |
|------------|----------------------|
| No. 30     | 100                  |
| No. 50     | 95-100               |
| No. 200    | 70-100               |

82  
 83 2.05 HYDRATED LIME Hydrated lime for aggregate pretreatment shall conform to the requirements  
 84 of ASTM C 207, Type N. In addition, the residue retained on a No. 200 sieve shall not exceed  
 85 10% when determined in accordance with ASTM C 110. (Drying of the residue in an atmosphere  
 86 free from carbon dioxide will not be required.)  
 87

88 2.06 ASPHALT CEMENT Superpave Performance Graded Binders shall conform to the requirements  
 89 listed in Table 4. (Taken from the AASHTO Provisional Standard MP1)  
 90  
 91 A. Asphalt cement shall not be acid modified or alkaline modified.  
 92  
 93 B. Asphalt cement shall not contain any used oils that have not been rerefined. Modifiers  
 94 that do not comply with environmental rules and regulations including 40 CFR Part  
 95 261.6(a)(3)(IV), and part 266/Subpart C shall not be added. Modifiers shall not be  
 96 carcinogenic.  
 97  
 98 C. The supplier of PG binder shall be certified in accordance with CP 11.  
 99

| ORIGINAL BINDER PROPERTIES                                                                | PG BINDER | AASHTO Test No. |
|-------------------------------------------------------------------------------------------|-----------|-----------------|
|                                                                                           | 64-22     |                 |
| Flash Point Temp., °C, minimum                                                            | 230       | T 48            |
| Viscosity at 135 °C, Pa•s, maximum                                                        | 3         | TP 48           |
| Dynamic Shear, Temp. °C, where $G^*/\sin \delta @ 10 \text{ rad/s} \geq 1.00 \text{ kPa}$ | 64        | TP 5            |
| Ductility, 4 °C (5 cm/min.), cm minimum                                                   | -         | T 51            |
| Toughness, joules (inch-lbs)                                                              | -         | CP L-2210       |
| Tenacity, joules (inch-lbs)                                                               | -         | CP L-2210       |
| Acid or Alkali Modification (pass-fail)                                                   |           | CP L-2214       |

**Table 4  
 SUPERPAVE PERFORMANCE GRADED BINDERS**

| ORIGINAL BINDER PROPERTIES                                                                        | PG BINDER | AASHTO                |
|---------------------------------------------------------------------------------------------------|-----------|-----------------------|
|                                                                                                   | 64-22     | Test No.              |
| <b>RTFO Residue Properties</b>                                                                    |           | CP L 2215             |
| Mass Loss, percent maximum                                                                        | 1.00      | CP L 2215             |
| Dynamic Shear, Temp. °C, where $G^*/\sin \delta @ 10 \text{ rad/s} \geq 2.20 \text{ kPa}$         | 64        | TP 5                  |
| Elastic Recovery, 25 °C, percent min.                                                             | -         | CP L-2211<br>Method A |
| Ductility, 4 °C (5 cm/min.), cm minimum                                                           | -         | T 51                  |
| <b>PAV Residue Properties, Aging Temperature 100 °C</b>                                           |           | PP 1                  |
| Dynamic Shear, Temp. °C, where $G^* \bullet \sin \delta @ 10 \text{ rad/s} \leq 5000 \text{ kPa}$ | 25        | TP 5                  |
| Creep Stiffness, @ 60 s, Test Temperature in °C                                                   | -12       |                       |
| S, maximum, Mpa                                                                                   | 300       | TP 1                  |
| m-value, minimum                                                                                  | 0.300     | TP 1                  |
| **Direct Tension, Temperature in °C, @ 1 mm/min., where failure strain $\geq 1.0 \%$              | -12       | TP 3                  |
| **Direct tension measurements are required when needed to show conformance to AASHTO MP 1.        |           |                       |

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2.07 RECYCLING AGENTS Asphalt recycling agents shall conform to the physical and chemical requirements of Table 5.

**Table 5  
 ASPHALT RECYCLING AGENT**

| Property                                                                                                                                     | Test Method | Requirement       |
|----------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------|
| Viscosity @ 60 °C (140 °F), mm <sup>2</sup> /s (cSt)                                                                                         | ASTM D2170  | 200-800 (200-800) |
| Specific Gravity                                                                                                                             | ASTM D 70   | Report            |
| Flash Point C.O.C., °C (°F) min.                                                                                                             | ASTM D 92   | 204 (400)         |
| Oven Weight Change, 5 hrs. @ 163 °C (325 °F), % max.                                                                                         | ASTM D1754  | 4                 |
| *Viscosity Ratio, % max.                                                                                                                     | ASTM D2170  | 3                 |
| Saturates, % max.                                                                                                                            | ASTM D4124  | 30                |
| *Viscosity Ratio = $\frac{\text{Viscosity after oven wt. change test, measured @ 60 °C (77 °F)}}{\text{Original Viscosity @ 60 °C (77 °F)}}$ |             |                   |

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**PART 3 CONSTRUCTION REQUIREMENTS**

3.01 WEATHER LIMITATIONS AND PLACEMENT TEMPERATURES Hot mix asphalt shall be placed only on properly prepared, unfrozen surfaces which are free of water, snow, and ice. The hot mix asphalt shall be placed only when both the air and surface temperatures equal or exceed the temperatures specified in Table 6 and the Engineer determines that the weather conditions permit the pavement to be properly placed and compacted. If the temperature falls below the minimum air or surface temperatures, paving shall stop.

**Table 6  
 PLACEMENT TEMPERATURE LIMITATIONS IN °F**

| Compacted Layer Thickness in Inches | Minimum Surface and Air Temperature °F |                        |
|-------------------------------------|----------------------------------------|------------------------|
|                                     | Top Layer                              | Layers Below Top Layer |
| <1-1/2                              | 60                                     | 50                     |
| 1-1/2 - <3                          | 50                                     | 40                     |
| 3 or more                           | 45                                     | 35                     |

Note: Air temperature is taken in the shade. Surface is defined as the existing base on which the new pavement is to be placed.

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- 3.02 BITUMINOUS MIXING PLANT The bituminous mixing plant shall be capable of producing a uniform material, have adequate capacity, and be maintained in good mechanical condition. Defective parts shall be replaced or repaired immediately if they adversely affect the proper functioning of the plant or plant units, or adversely affect the quality of the hot bituminous plant mix.
- A. Acceptable safety equipment shall be provided by the Contractor to accommodate sampling and testing.
  - B. Hot bituminous plant mix shall not be stored longer than nine hours, unless additional protective measures are used and approved.
  - C. When hot bituminous plant mix is obtained from a commercial plant, the Contractor shall make arrangements for approved laboratory facilities at the plant site for testing hot bituminous paving mixtures.
- 3.03 HAULING EQUIPMENT Trucks used for hauling bituminous mixtures shall have tight, clean, smooth metal beds thinly coated with a minimum amount of paraffin oil, lime solution, or other approved release agent. Petroleum distillates such as kerosene or fuel oil will not be permitted. Each truck shall have a cover of canvas or other suitable material to protect the mixture from the weather.
- 3.04 BITUMINOUS PAVERS Self-propelled bituminous pavers shall be provided and equipped with an activated screed assembly, heated if necessary, capable of spreading and finishing the bituminous plant mix material in lane widths applicable to the typical section and thickness shown in the Plans.
- A. The paver's receiving hopper shall have sufficient capacity for a uniform spreading operation and shall have an automatic distribution system that will place the mixture uniformly in front of the screed.
  - B. The screed or strike-off assembly shall produce the specified finished surface without tearing, shoving, or gouging the mixture.
  - C. The paver shall be capable of operating at forward speeds consistent with uniform and continuous laying of the mixture. Stop and go operations of the paver shall be avoided.
  - D. The bituminous paver shall be equipped with a means of preventing the segregation of the coarse aggregate particles from the remainder of the bituminous plant mix when that mix is carried from the paver hopper back to the paver augers. The means and methods used shall be approved by the paver manufacturer and may consist of chain curtains, deflector plates, or other such devices and any combination of these.
  - E. The Contractor shall supply a Certificate of Compliance that verifies that the approved means and methods used to prevent bituminous paver segregation have been implemented on all pavers used on the project.
  - F. The controls shall be capable of maintaining the screed at the specified transverse slope within plus or minus 0.1%. Manual operation will be permitted.
  - G. If the automatic controls fail or malfunction the equipment may be operated manually for the remainder of the normal working day, provided specified results are obtained.

169 H. If the Contractor fails to obtain and maintain the specified surface tolerances, the paving  
170 operations shall be suspended until satisfactory corrections, repairs, or equipment  
171 replacements are made.  
172

173 3.05 SURFACE CONDITIONING Irregularities in the existing pavement or base shall be brought to  
174 uniform grade and cross section.  
175

176 3.06 PREPARATION OF ASPHALT CEMENT The asphalt cement shall be heated to the specified  
177 temperature without local overheating and shall be continuously supplied to the mixer at a  
178 uniform temperature within the specified range.  
179

180 3.07 PREPARATION OF AGGREGATES Heating and drying of the aggregates shall be  
181 accomplished without damaging the aggregate  
182

183 A. When hydrated lime is used, it shall be added to the aggregate in accordance with one of  
184 the following methods:  
185

186 1) **Lime Slurry Added to Aggregate.** The hydrated lime shall be added to the  
187 aggregate in the form of a slurry and then thoroughly mixed in an approved  
188 pugmill. The slurry shall contain a minimum of 70% water by weight.  
189

190 2) **Dry Lime Added to Wet Aggregate.** The dry hydrated lime shall be added to  
191 aggregate wetted with a minimum 2% above the surface saturated dry condition  
192 (SSD) of the blended aggregate as shown on CDOT Form 43, and then  
193 thoroughly mixed in an approved pugmill. The Engineer will not require the  
194 Contractor to go above 5% total moisture, although the Contractor may elect to  
195 do so if the added water is necessary to meet the minimum Lottman  
196 specification.  
197

198 The lime-aggregate mixture may be fed directly into the hot plant after mixing or it  
199 may be stockpiled for not more than 90 days before introduction into the plant for  
200 mixing with the asphalt cement. The hydrated lime may be added to different  
201 sized aggregates and stockpiled, by adding 75% of the lime to the aggregate  
202 passing the No. 4 sieve and 25% to the aggregate retained on the No. 4 sieve.  
203

204 In order to ensure the required lime and water quantities are introduced, lime and  
205 water feed for lime operation shall have control systems that change introduction  
206 rates in conjunction with changes in plant mix production. The control systems  
207 shall be documented in the Contractor's Quality Control Plan.  
208

209 When a test for aggregate percent moisture falls below the required minimum,  
210 the Contractor will receive a warning. When two consecutive tests for aggregate  
211 percent moisture fall below the required minimum, a follow up test will  
212 immediately be performed. A failure on the follow up test will result in suspension  
213 of work. Production will remain suspended until the source of the problem is  
214 identified and corrected. Each time production is suspended corrective actions  
215 shall be proposed in writing by the Contractor and approved in writing by the  
216 Engineer before production may resume.  
217

218 3.08 MIXING The dried aggregates and asphalt shall be combined in the mixer in the quantities  
219 required to meet the job mix formula.  
220

221 A. The materials shall be mixed until the aggregate is completely and uniformly coated, and  
222 the asphalt is uniformly distributed throughout the aggregate.  
223



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- B. The minimum temperature of the mixture when discharged from the mixer and when delivered for use shall be as shown in Table 7:

| <b>Asphalt Grade</b>                                                                                                                                                                    | <b>Minimum Mix Discharge Temperature, °F*</b> | <b>Minimum Delivered Mix Temperature, °F**</b> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|------------------------------------------------|
| PG 64-22                                                                                                                                                                                | 290                                           | 235                                            |
| *The maximum mix discharge temperature shall not exceed the minimum discharge temperature by more than 30 °F.<br>**Delivered mix temperature shall be measured behind the paver screed. |                                               |                                                |

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- C. Hot-mix asphalt mixture shall be produced at the lowest temperature within the specified temperature range that produces a workable mix and provides for uniform coating of aggregates (95% minimum in accordance with AASHTO T 195), and that allows the required compaction to be achieved.
- D. Storing or holding of asphalt mixture will be permitted provided the characteristics of the mixture are not altered. If storing or holding of the mixture causes segregation, excessive heat loss, or adversely affects the quality of the finished product, corrective action shall be taken. Unsuitable mixtures shall be disposed of at the Contractor's expense.

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SPREADING AND FINISHING Bituminous pavers shall be used to distribute the mixture to the established grade and required thickness over the entire width or partial width as practicable.

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- A. The longitudinal joint in both a new pavement and an overlay pavement layer shall offset the joint in the layer immediately below by 6 inches. In every pavement layer, the joints shall not be constructed in the wheel paths. The Contractor shall use a continuous string line to delineate every longitudinal joint during paving operations. All exposed string line shall be picked up and disposed of at the end of each day's paving.
- B. On areas where the use of mechanical spreading and finishing equipment is impracticable, the mixture shall be dumped, spread, raked, screeded, and luted by hand tools to the required compacted thickness and grades.
- C. The bituminous mixture shall be transported and placed without segregation. All segregated areas behind the paver shall be removed immediately upon discovery. The segregated material shall be replaced with specification material before the initial rolling has taken place.
- D. If at any time, the Engineer observes segregated areas of pavement, they will notify the Contractor immediately.
- E. After rolling, segregated areas will be delineated by the Engineer and evaluated as follows:

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- 1) The Engineer will delineate the segregated areas to be evaluated and inform the Contractor of the location and extent of these areas within 2 calendar days, excluding weekends and holidays, of placement.
- 2) In each segregated area or group of areas to be evaluated, the Contractor shall take five 10-inch cores at random locations designated by the Engineer. In accordance with CP 75, the Contractor shall also take five 10-inch cores at random locations designated by the Engineer in non-segregated pavement adjacent to the segregated area. These cores shall be within the boundary of the segregated area and in the newly placed pavement. The coring shall be in the

- 272 presence of the Engineer and the Engineer will take immediate possession of the  
273 cores. The Contractor may take additional cores at the Contractor's expense.  
274  
275 3) Gradation of the aggregate of the cores will be determined by the Sponsor in  
276 accordance with CP 46.  
277  
278 4) The core aggregate gradations from the segregated area will be compared to the  
279 core aggregate gradations of the corresponding non-segregated area.  
280  
281 5) Two key sieves of the core gradations from the segregated area will be  
282 compared to the core gradations from the corresponding non-segregated area to  
283 determine the difference. If differences for both key sieves exceed the allowable  
284 difference specified in the table below, the area is segregated.  
285

| Table for Segregation Determination |            |                         |
|-------------------------------------|------------|-------------------------|
| Mix Grading                         | Key Sieves | Allowable Difference, % |
| S                                   | #8, #4     | 9                       |

- 286  
287 6) Segregated areas in the top lift shall be removed and replaced, full lane width, at  
288 the Contractor's expense. The Engineer may approve a method equivalent to  
289 remove and replace that results in a non-segregated top lift.  
290

291 3.10 COMPACTION The hot mix asphalt shall be compacted by rolling. Both steel wheel and  
292 pneumatic tire rollers will be required. The number, weight and type of rollers furnished shall be  
293 sufficient to obtain the required density while the mixture is in a workable condition. Compaction  
294 shall begin immediately after the mixture is placed and be continuous until the required density is  
295 obtained. When the mixture contains unmodified asphalt cement (PG 64-22) and the surface  
296 temperature falls below 185 degrees F, further compaction effort shall not be applied unless  
297 approved.

- 298  
299 A. All roller marks shall be removed with the finish rolling. Use of vibratory rollers with the  
300 vibrator on will not be permitted during surface course final.  
301  
302 B. Pavement shall be compacted to a density of 92 to 96% of the maximum theoretical  
303 density, determined according to CP 51. If more than one theoretical maximum specific  
304 gravity is taken in a day, the average of the theoretical maximum specific gravity results  
305 will be used to determine the percent compaction. Field density determinations will be  
306 made in accordance with CP 44 or 81.  
307  
308 C. The longitudinal joints shall be compacted to a target density of 92% of the theoretical  
309 maximum specific gravity. The tolerance shall be  $\pm 4\%$ . The theoretical maximum  
310 specific gravity used to determine the joint density will be the average of the daily  
311 theoretical maximum specific gravities for the material that was placed on either side of  
312 the joint. Density (percent relative compaction) will be determined in accordance with CP  
313 44.  
314  
315 D. The Contractor shall obtain one 6-inch diameter core at a random location within each  
316 longitudinal joint sampling section for determination of the joint density. The Contractor  
317 shall mark and drill the cores at the location directed by the Engineer and in the presence  
318 of the Engineer. The Engineer will take possession of the cores for testing. The  
319 Contractor may take additional cores at his own expense. . Coring locations shall be  
320 centered on the visible line where the joint between the two adjacent lifts abut the  
321 surface. The center of all joint cores shall be within 1 inch of this visible joint line. Core  
322 holes shall be repaired by the Contractor using materials and methods approved by the

323 Engineer. QC and QA joint coring shall be completed within five calendar days of joint  
324 construction.

325  
326 E. Longitudinal joint coring applies to all pavement lifts. When constructing joints in an  
327 echelon paving process, the joints shall be clearly marked to ensure consistent coring  
328 location. In small areas, such as intersections, where the Engineer prescribes paving and  
329 phasing methods, the Engineer may temporarily waive the requirement for joint density  
330 testing.

331  
332 F. The Contractor may take additional cores at the expense of the Contractor. Coring  
333 locations shall be centered on the line where the joint between the two adjacent lifts abut  
334 at the surface. Core holes shall be repaired by the Contractor using materials and  
335 methods approved by the Engineer.

336  
337 G. Along any places not accessible to the rollers, the mixture shall be thoroughly compacted  
338 with mechanical tampers.

339  
340 H. Any mixture that becomes loose and broken, mixed with dirt, or is in any way defective,  
341 shall be immediately removed and replaced with fresh hot mixture, and compacted to  
342 conform to the surrounding area.

343  
344 3.11 JOINTS Placing of the HMA shall be continuous, and rollers shall not pass over the unprotected  
345 end of a freshly laid mixture. Transverse joints shall be formed by cutting back on the previous  
346 run to expose the full depth of the course. A coat of asphalt cement shall be applied to contact  
347 surfaces of all joints just before additional mixture is placed against the previously compacted  
348 material.

349  
350 3.12 PAVEMENT SAMPLES The Engineer may take samples of the compacted pavement at random  
351 locations on the project for testing. Where samples have been taken, new material shall be  
352 placed and compacted by the contractor to conform with the surrounding area.

353  
354

355 **PART 4 METHOD OF MEASUREMENT**

356  
357 4.01 Refer to Appendix A for Method of Measurement.

358  
359

360 **PART 5 BASIS OF PAYMENT**

361  
362 5.01 Refer to Appendix A for Basis of Payment.

363  
364

365 **PART 6 TESTING REQUIREMENTS**

366  
367 CDOT Procedure 45 Standard Test Method for Determining Percent of Particles with Two or  
368 More Fractured Faces

369  
370 AASHTO T 48 Standard Test Method for Flash and Fire Points by Cleveland Open Cup

371  
372 AASHTO T 90 Standard Test Method for Determining the Plastic Limit and Plasticity  
373 Index of Soils

374  
375 AASHTO T 96 Standard Test Method for Resistance to Degradation of Small-Size  
376 Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

377

|     |              |                                                                                                     |
|-----|--------------|-----------------------------------------------------------------------------------------------------|
| 378 | AASHTO T 195 | Standard Method of Test for Determining Degree of Particle Coating of Bituminous-Aggregate Mixtures |
| 379 |              |                                                                                                     |
| 380 |              |                                                                                                     |
| 381 | AASHTO T 304 | Standard Method of Test for Uncompacted Void Content of Fine Aggregate                              |
| 382 |              |                                                                                                     |
| 383 |              |                                                                                                     |
| 384 | ASTM C 110   | Standard Test Methods for Physical Testing of Quicklime, Hydrated Lime, and Limestone               |
| 385 |              |                                                                                                     |
| 386 |              |                                                                                                     |
| 387 | ASTM D 1754  | Standard Test Method for Effect of Heat and Air on Asphaltic Materials                              |
| 388 |              |                                                                                                     |
| 389 | ASTM D 2170  | Standard Test Method for Kinematic Viscosity of Asphalts                                            |
| 390 |              |                                                                                                     |
| 391 | ASTM D 4124  | Standard Test Method for Separation of Asphalt into Four Fractions                                  |
| 392 |              |                                                                                                     |
| 393 | ASTM D 70    | Standard Test Method for Density of Semi-Solid Bituminous Materials                                 |
| 394 |              |                                                                                                     |
| 395 | ASTM D 92    | Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester                         |
| 396 |              |                                                                                                     |
| 397 |              |                                                                                                     |
| 398 |              |                                                                                                     |

**PART 7 MATERIAL REQUIREMENTS**

|     |             |                                                                          |
|-----|-------------|--------------------------------------------------------------------------|
| 399 |             |                                                                          |
| 400 |             |                                                                          |
| 401 | ASTM E 11   | Test Sieves                                                              |
| 402 |             |                                                                          |
| 403 | AASHTO M 17 | Standard Specification for Mineral Filler for Bituminous Paving Mixtures |
| 404 |             |                                                                          |
| 405 | ASTM C 207  | Standard Specification for Hydrated Lime for Masonry Purposes            |
| 406 |             |                                                                          |
| 407 |             |                                                                          |
| 408 |             |                                                                          |

**END OF ITEM P-401C**

1 **ITEM P-403**

2 **ASPHALT-TREATED PERMEABLE BASE**

3  
4 **PART 1 GENERAL**

5  
6 1.01 DESCRIPTION. This work shall consist of the construction of an asphalt-treated permeable base  
7 (ATPB) course, composed of mineral aggregate and bituminous material mixed in a central mixing  
8 plant and placed on a prepared course in accordance with these specifications and shall conform to  
9 the lines, grades, thicknesses, and typical cross sections shown on the plans. Each course shall be  
10 constructed to the depth, typical section, and elevation required by the plans and shall be rolled,  
11 finished, and approved before the placement of the next course.  
12

13  
14 **PART 2 MATERIALS**

15  
16 2.01 AGGREGATE. Aggregates shall consist of crushed stone or crushed gravel with or without sand  
17 or other inert finely divided mineral aggregate. The portion of materials retained on the No. 4  
18 sieve shall be known as the coarse aggregate. The portion passing the No. 4 sieve and retained  
19 on the No. 200 sieve shall be known as the fine aggregate, and the portion passing the No. 200  
20 sieve as mineral filler.

21  
22 A. Coarse Aggregate. Coarse aggregate shall consist of sound, tough, durable particles,  
23 free from coatings of clay, organic matter and other deleterious substances that would  
24 prevent thorough coating with the bituminous material. The percentage of wear shall not  
25 be greater than 40 percent when tested in accordance with ASTM C 131 (aggregates  
26 below 1-1/2 inches). The sodium sulfate soundness loss shall not exceed 20 percent, or  
27 the magnesium sulfate soundness loss shall not exceed 13 percent, after five cycles,  
28 when tested in accordance with ASTM C 88.

29  
30 The source of coarse aggregate shall be from quarried rock or river gravel. No slag shall  
31 be permitted. All aggregates shall have demonstrated a satisfactory service record of at  
32 least 10 years duration under similar conditions of service and exposure.  
33

34 Aggregate shall contain at least 90 percent by weight of crushed pieces having two or  
35 more fractured faces and shall contain at least 75 percent by weight of crushed pieces  
36 having two or more fractured faces with the area of each face being equal to at least  
37 75 percent of the smallest mid-sectional area of the piece. When two fractured faces are  
38 contiguous, the angle between the planes of fractures shall be at least 30 degrees to  
39 count as two fractured faces. Fractured faces shall be obtained by artificial crushing.  
40

41 The aggregate shall not contain more than 8 percent, by weight, of flat or elongated  
42 pieces, a flat particle is one having a ratio of width to thickness greater than five; an  
43 elongated particle is one having a ratio of length to width greater than five.  
44

45 B. Fine Aggregate. Fine aggregate shall consist of clean, sound, durable, angular particles  
46 produced by crushing stone or gravel that meets the requirements for wear and  
47 soundness specified for coarse aggregate. The aggregate particles shall be free from  
48 coatings of clay, silt, or other objectionable matter and shall contain no clay balls. The  
49 fine aggregate, including any blended filler, shall have a plasticity index of not more than  
50 six and a liquid limit of not more than 25 when tested in accordance with ASTM D 4318.  
51

52 Natural (non-manufactured) sand may be used to obtain the gradation of the aggregate  
53 blend or to improve the workability of the mix. The amount of sand to be added will be  
54 adjusted to produce mixtures conforming to requirements of this specification.  
55

56 The percentage of natural sand (not manufactured by crushing) shall be kept below 15  
57 percent to obtain optimum pavement properties as the addition of natural sand tends to  
58 decrease stability of pavement. If used, the natural sand shall meet the requirements of  
59 ASTM D 1073 and shall have a plasticity index of not more than 6 and a liquid limit of not  
60 more than 25 when tested in accordance with ASMT D 4318.

61  
62 The aggregate shall have sand equivalent values of 30 or greater when tested in  
63 accordance with ASTM D 2419.

64  
65 C. Sampling and Testing. ASTM D 75 shall be used in sampling coarse aggregate and  
66 ASTM C 183 shall be used in sampling mineral filler. All aggregate samples required for  
67 testing shall be furnished by the Contractor and tested by an independent certified  
68 laboratory chosen by the Contractor and approved by the Project Manager. No  
69 aggregate shall be used in the production of mixtures without prior approval.

70  
71 2.02 BITUMINOUS MATERIAL. Bituminous material shall conform to the following requirements:

72  
73 Type and Grade Asphalt Cement: PG 64-22 (AC-20)

74  
75 Specification: ASTM D 3381, Table 2

76  
77 A mixing temperature for the bituminous material shall be established where the viscosity is  
78 between 150 and 300 centistokes. A tolerance of plus or minus 15 degrees F will be permitted if  
79 the application of these tolerances to the mixing temperature maintains the viscosity between 150  
80 and 300 centistokes. In no case will mixing be permitted at a temperature of less than  
81 275 degrees or greater than 325 degrees F.

82  
83 The Contractor shall furnish vendor's certified test reports for each tankload of bitumen shipped  
84 to the project. The report shall be delivered to the Project Manager before permission is granted  
85 for use of the material. The furnishing of the vendor's certified test report for the bituminous  
86 material shall be the basis for final acceptance.

87  
88 A. Bituminous Material Certification. The Bidder shall submit a "Bituminous Material  
89 Certification" form in accordance with the Part I, Project Requirements, Bid Forms, Bid Data  
90 Forms, of these contract documents. To bid this Project, the Bidder shall certify that the  
91 asphalt cement specified in this section is available at bid time and that the Bidder will obtain  
92 100 percent of the product when the Notice to Proceed is issued for the contract.

93  
94  
95 **PART 3 COMPOSITION**

96  
97 3.01 COMPOSITION OF MIXTURE. The bituminous plant mix shall be composed of a mixture of  
98 aggregate and bituminous material. The several aggregate fractions shall be sized, uniformly  
99 graded, and combined in such proportions that the resulting mixture meets the grading  
100 requirements of the job mix formula.

101  
102 3.02 JOB MIX FORMULA. No bituminous mixture for payment shall be produced until a job mix  
103 formula has been approved by the Project Manager. The formula shall be submitted in writing by  
104 the Contractor to the Project Manager at least 10 days prior to the start of paving operations and  
105 shall indicate the definite percentage of each sieve fraction of aggregate, the percentage of  
106 bitumen, and the temperature of the completed mixture when discharged from the mixer. All test  
107 data used to develop the job mix formula shall also be submitted. The job mix formula for each  
108 mixture shall be in effect until modified in writing by the Project Manager. Should a change in  
109 sources of materials be made, a new job mix formula must be established before the new  
110 material is used.

112 For the ATPB, the bituminous mixture shall be a combination of aggregate and bituminous  
 113 material conforming to the gradation and bitumen content limits specified in Table 1.  
 114

TABLE 1. AGGREGATE GRADATION AND  
 BITUMEN FOR ATPB

| Sieve Size      | Percentage by Weight<br>Passing Sieves |
|-----------------|----------------------------------------|
| 1-1/2 inch      | 100                                    |
| 1 inch          | 95-100                                 |
| 1/2-inch        | 25-60                                  |
| No. 4           | 0-10                                   |
| No. 8           | 0-5                                    |
| No. 200         | 0-2                                    |
| Bitumen Content | 2.0 - 3.5 percent                      |

115 The Contractor shall establish the percent of bitumen to be used in the ATPB based on the  
 116 results of his tests of aggregate and based on the observed performance and plant and field tests  
 117 on the ATPB during the test section specified hereinafter. Further, the Project Manager reserves  
 118 the right to vary the percent of bitumen of all bituminous mixtures during production as necessary  
 119 to provide for full coating of all aggregate particles yet provide minimum drain down of bitumen.  
 120 The bitumen content may be adjusted within the limits of Table 1 without adjustments in the  
 121 Contract unit price.  
 122  
 123

124 The Contractor shall use an approved heat-stable anti-stripping additive. The anti-stripping  
 125 additive shall meet the approval of the Project Manager based on the results of laboratory tests.  
 126 The additive shall be added to the asphalt tank at the recommended dosage (0.5 to 1.0 percent  
 127 by weight of asphalt cement) and shall be thoroughly mixed by circulation of the asphalt for at  
 128 least 4 hours prior to being incorporated into the mix. The exact amount of additive to be used  
 129 shall be determined based on laboratory tests and submitted with the mix design.  
 130

131 The job mix tolerances shown in Table 2 shall be applied to the job mix formula to establish a job  
 132 control grading band. The full tolerances still will apply if application of the job mix tolerances  
 133 results in a job control grading band outside the master grading band based on Table 1, except  
 134 the upper three sieve sizes in each column shall be within the master band.  
 135

TABLE 2. JOB MIX FORMULA TOLERANCES  
 (Based on a Single Test)

| Material                                   | Tolerance- plus or minus |
|--------------------------------------------|--------------------------|
| Aggregate passing No. 4 sieve or larger    | 7 percent                |
| Aggregate passing No. 8 and 16 sieves      | 6 percent                |
| Aggregate passing No. 30 and 50 sieves     | 5 percent                |
| Aggregate Passing No. 100 and 200 sieves   | 3 percent                |
| Bitumen Content (Individual Tests)         | 0.45 percent             |
| Bitumen Content (Moving average of last 5) | 0.25 percent variation   |
| Temperature of mix                         | 20 degrees F             |

136 The aggregate gradation may be adjusted within the limits of Table 2 as directed, without  
 137 adjustments in the contract unit prices.  
 138  
 139

140 Deviation from the final approved design for bitumen content and gradation of aggregates shall  
 141 not be greater than the tolerances permitted and shall be based on daily plant extraction.

142 Should a change in sources of materials be made, a new job mix formula shall be established  
143 before the new material is used and a new test section shall be required.  
144

145 3.03 JOB MIX FORMULA (JMF) LABORATORY. The laboratory used to develop the job mix formula  
146 shall meet the requirements of ASTM D 3666 including accreditation. Accreditation shall include  
147 all test procedures required to develop the mix design. A certification signed by the manager of  
148 the laboratory stating it meets these requirements shall be submitted to the Project Manager.  
149 The certification shall contain as a minimum:

151 A. Qualifications of personnel; including the laboratory manager, supervising technician,  
152 and testing technicians.  
153

154 B. Evidence of accreditation by a nationally recognized laboratory accreditation organization  
155 for all test methods used in developing the asphalt-treated permeable base  
156 job mix formula.  
157

158 3.04 TEST SECTION. Prior to full production, the Contractor shall prepare a quantity of bituminous  
159 mixture according to the job mix formula. The amount of mixture should be sufficient to construct  
160 a test section 100 feet long by 10 feet wide and shall be of the same depth specified for the  
161 construction of the course which it represents. The underlying grade or pavement structure upon  
162 which the test section is to be constructed shall be the same as the remainder of the course  
163 represented by the test section. The equipment used in construction of the test section shall be  
164 the same type and weight to be used on the remainder of the course represented by the test  
165 section.  
166

167 For the ATPB, plant material and field cores will be taken to perform aggregate gradation,  
168 bitumen content, permeability, and temperature. Density and Marshall Stability Tests need not be  
169 performed. In no case will the plant-produced mix be considered acceptable if the mix properties  
170 of the test section do not meet the requirements of the mix design criteria.  
171

172 If the test section should prove to be unsatisfactory, the necessary adjustments to the mix design,  
173 plant operation, and/or rolling procedures shall be made. Additional test sections, as required,  
174 shall be constructed and evaluated for conformance to the specifications. When test sections do  
175 not conform to specification requirements, the pavement shall be removed and replaced at the  
176 Contractor's expense. A marginal quality test section that has been placed in an area of little or  
177 no traffic may be left in place. If a second test section also does not meet specification  
178 requirements, both sections shall be removed at the Contractor's expense. Full production shall  
179 not begin without the Project Manager's approval. Test sections will be paid for in accordance  
180 with Section 7.01.  
181

#### 182 **PART 4 QUALITY CONTROL**

185 4.01 GENERAL. The Contractor will provide and maintain a quality control system that will require the  
186 Contractor to provide reasonable assurance that all materials and completed construction  
187 submitted for acceptance conform to the Contract requirements whether manufactured or  
188 processed by the Contractor, or procured from subcontractors or vendors.  
189

190 A job mix shall be required by Section 3.2 of this specification prior to start of production, and  
191 whenever a change in materials warrants retesting.  
192

193 4.02 QUALITY CONTROL DEFICIENCIES. The Contractor shall take prompt action to correct any  
194 errors, equipment malfunction, process changes, or other assignable causes which have resulted  
195 or could result in submission of materials and completed construction which do not conform to  
196 the requirements of the specifications.  
197



- 198 4.03 TOLERANCES. After the job mix formula is approved, the Contractor shall control the aggregate  
199 gradations, the percent bitumen, and the mix temperature within the tolerances specified herein.  
200 Failure to meet the control tolerances will be cause to suspend production until the Contractor  
201 has identified and corrected the operation to within the job mix tolerances. Continued production  
202 without correction may result in rejection and removal of the material.  
203
- 204 4.04 TESTING LABORATORY. The Contractor or Producer shall provide a testing laboratory to  
205 perform all quality control tests necessary to control the production and construction processes  
206 applicable to these specifications and as set forth in the Quality Control program. The laboratory  
207 performing the testing shall meet the requirements of Section 01401 including ASTM D 3666  
208 accreditation and have been approved through the submittal process prior to performing testing.  
209
- 210 4.05 QUALITY CONTROL TESTING. Extraction tests for bitumen content and aggregate gradation  
211 will be made at least twice daily. Sample aggregate for gradation in accordance with ASTM D  
212 979 or D 75, as applicable. The mixture will be tested for bitumen content in strict conformance  
213 with ASTM D 2172, D 4125, or D 6307. If methods D 2172 or D 6307 are used, test aggregate for  
214 gradation in accordance with ASTM D 5444. If method D 4125 is used, test aggregate for  
215 gradation in accordance with ASTM C 136 and C 117.  
216  
217

218 **PART 5 CONSTRUCTION METHODS**  
219

- 220 5.01 WEATHER LIMITATIONS. The bituminous mixture shall not be placed upon a wet surface or  
221 when the surface temperature of the underlying course is less than specified in Table 3. The  
222 temperature requirements may be waived, but only at the discretion of the Project Manager.  
223

TABLE 3. BASE TEMPERATURE LIMITATIONS

| Mat Thickness                              | Base Temperature<br>(Minimum) degrees<br>F |
|--------------------------------------------|--------------------------------------------|
| 3 inches or greater                        | 40                                         |
| Greater than 1 inch but less than 3 inches | 45                                         |
| 1 inch or less                             | 50                                         |

- 224
- 225 A. Other limitations The excavation of this material is temperature and light sensitive. Due to  
226 this, methods of trenching and placing conduit shall be developed.  
227
- 228 5.02 BITUMINOUS MIXING PLANT. Plants used for the preparation of bituminous mixtures shall  
229 conform to the requirements of ASTM D 995 with the following changes:  
230
- 231 A. Requirements for All Plants.  
232
- 233 (1) Truck Scales. The bituminous mixture shall be weighed on approved scales  
234 furnished by the Contractor, or on public scales at the Contractor's expense.  
235 Such scales shall be inspected and sealed as often as the Project Manager  
236 deems necessary to assure their accuracy. Scales shall conform to the  
237 requirements of Section 90.  
238
- 239 (2) Inspection of Plant. The Project Manager, or his/her authorized representative,  
240 shall have access, at all times, to all parts of the plant for checking adequacy of  
241 equipment; inspecting operation of the plant; verifying weights, proportions, and  
242 character of materials; and checking the temperatures maintained in the  
243 preparation of the mixtures.  
244
- 245 (3) Storage Bins and Surge Bins. Paragraph 3.9 of ASTM D 995 is deleted.

246 Instead, the following applies. Use of surge bins or storage bins for temporary  
247 storage of hot bituminous mixtures will be permitted as follows:

248  
249 (a) The bituminous mixture may be stored in surge bins as directed by the  
250 Project Manager for period of time not to exceed 3 hours,

251  
252 (b) The bituminous mixture may NOT be stored in insulated storage bins.  
253

254 5.03 TRUCKS. Trucks used for hauling bituminous mixtures shall have tight, clean, and smooth  
255 metal beds. To prevent the mixture from adhering to them, the truck beds shall be lightly coated  
256 with a minimum amount of paraffin oil, lime solution, or other approved material. Each truck shall  
257 have a suitable cover to protect the mixture from adverse weather. When necessary, to ensure  
258 that the mixture will be delivered to the site at the specified temperature, truck beds shall be  
259 insulated and covers shall be securely fastened.  
260

261 5.04 BITUMINOUS PAVERS. Bituminous pavers shall be self-contained, power-propelled units with  
262 an activated screed or strike-off assembly, heated if necessary, and shall be capable spreading  
263 and finishing courses of bituminous plant mix material which will meet the specified thickness,  
264 smoothness, and grade. Pavers used for shoulders and similar construction shall be capable of  
265 spreading and finishing courses of bituminous plant mix material in widths shown on the Plans.  
266

267 The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading  
268 operation. The hopper shall be equipped with a distribution system to place the mixture uniformly  
269 in front of the screed. The screed or strike-off assembly shall effectively produce a finished  
270 surface of the required evenness and texture without tearing, shoving, or gouging the mixture.  
271

272 The paver shall be capable of operating at forward speeds consistent with satisfactory laying of  
273 the mixture.  
274

275 The paver shall be equipped with a control system capable of automatically maintaining the  
276 specified screed elevation. The control system shall be automatically actuated from either a  
277 reference line or surface through a system of mechanical sensors or sensor-directed  
278 mechanisms or devices which will maintain the paver screed at a predetermined transverse slope  
279 and at the proper elevation to obtain the required surface. The transverse slope controller shall  
280 be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent.  
281

282 The controls shall be capable of working in conjunction with any of the following attachments:  
283

284 A. Ski-type device of not less than 30 feet (9.14 m) in length or as directed by the Project  
285 Manager  
286

287 B. Taut stringline (wire) set to grade  
288

289 C. Short ski or shoe  
290

291 5.05 ROLLERS. An approved steel wheel roller, weighing not less than 8 tons nor more than 12 tons  
292 and having a unit compression on the drive wheels of not less than 250 nor more than  
293 400 pounds per inch of roller width, shall be used to compact the mix. Vibratory rollers meeting  
294 the above requirements may be used to compact the ATPB provided the vibratory unit is turned  
295 off. Rollers shall be in good condition, capable of operating at slow speeds to avoid displacement  
296 of the bituminous mixture. The number, type, and weight of rollers shall be sufficient to compact  
297 the mixture to the required density while it is still in a workable condition.  
298

299 The use of equipment which causes excessive crushing of the aggregate will not be permitted.  
300

301 5.06 PREPARATION OF BITUMINOUS MATERIAL. The bituminous material shall be heated in a

302 manner that will avoid local overheating and provide a continuous supply of the bituminous  
303 material to the mixer at a uniform temperature. The temperature of the bituminous material  
304 delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the  
305 aggregate particles but shall not exceed 325 degrees F (160 degrees C).

306  
307 5.07 PREPARATION OF MINERAL AGGREGATE. The aggregate for the mixture shall be dried and  
308 heated to the temperature designated by the job formula within the job tolerance specified. The  
309 maximum temperature and rate of heating shall be such that no permanent damage occurs to the  
310 aggregates. Particular care shall be taken that aggregates high in calcium or magnesium content  
311 are not damaged by overheating. The temperature shall not be lower than is required to obtain  
312 complete coating and uniform distribution on the aggregate particles and to provide a mixture of  
313 satisfactory workability.

314  
315 5.08 PREPARATION OF BITUMINOUS MIXTURE. The aggregates and the bituminous material  
316 shall be weighed or metered and introduced into the mixer in the amount specified by the job mix  
317 formula.

318  
319 The combined materials shall be mixed until the aggregate obtains a uniform coating of bitumen  
320 and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time  
321 that will produce a satisfactory mixture. It shall be established by the Contractor, based on the  
322 procedure for determining the percentage of coated particles described in ASTM D 2489, and  
323 approved by the Project Manager for each individual plant and for each type of aggregate used.  
324 The minimum mixing time shall be 25 seconds. The mixing time will be set to achieve 95 percent  
325 of coated particles. For continuous mix plants, the minimum mixing time shall be determined by  
326 dividing the weight of its contents at operating level by the weight of the mixture delivered per  
327 second by the mixer. The moisture content of the mix shall not exceed 1.0 percent.

328  
329 5.09 TRANSPORTING, SPREADING, AND FINISHING. The mixture shall be transported from the  
330 mixing plant to the point of use in vehicles conforming to the requirements of Section 5.03.  
331 Deliveries shall be scheduled so that spreading and rolling of all mixture prepared for 1 day's run  
332 can be completed during daylight, unless adequate artificial lighting is provided. Hauling over  
333 freshly placed material shall not be permitted until the material has been compacted, as  
334 specified, and allowed to cool to atmospheric temperature.

335  
336 Immediately before placing the bituminous mixture, the underlying course shall be cleared of all  
337 debris with power blowers, power brooms, or hand brooms as directed.

338  
339 The mix shall be placed at a temperature of not less than 250 degrees F (107 degrees C). In  
340 addition, the ATPB shall be spread only when the atmospheric temperature is above  
341 40 degrees F.

342  
343 Upon arrival, the ATPB shall be spread to the full width by an approved bituminous paver. The  
344 ATPB shall be placed and compacted in a single layer thickness of 6 inches and will conform to  
345 the grade and contour indicated on the Plans. Automatic grade control shall be used for  
346 placement of the permeable base. Grade control shall be wire or string reference lines for  
347 elevation and alignment. When string lines are required, they shall consist of piano wire or other  
348 approved material. The string lines shall be supported at a minimum of 25 foot centers. Additional  
349 supports shall be installed to prevent sag, if required. The horizontal alignment of the string lines  
350 shall be within plus or minus 1/4-inch per 10 feet. The Contractor shall provide a satisfactory  
351 method of securing the string line where vertical curves are constructed to maintain the proper  
352 grade.

353  
354 After the first lane is constructed, the joint matcher (short ski) shall be used on the previously laid  
355 lane. The free edge shall be controlled as specified herein before. The automatic transverse  
356 grade control device shall be used only when one paving lane of each side of the high point of  
357 the pavement is to be constructed. Example: One lane pavement or two lane crowned

358 pavement.

359  
360 The control system shall be automatically actuated from the reference line through a system of  
361 mechanical sensors or sensor-directed mechanisms or devices which will maintain the paver  
362 screed at a predetermined transverse slope and at the proper elevation to obtain the required  
363 surface. The speed of the paver shall be regulated to eliminate pulling and tearing of the  
364 bituminous mat. Unless otherwise directed, placement of the mixture shall begin along the  
365 centerline of a crowned section or on the high side of areas with a one-way slope. The mixture  
366 shall be placed in consecutive adjacent strips having a minimum width of 12 feet except where  
367 edge lanes require less width to complete the area. Transverse joints in adjacent lanes shall be  
368 offset a minimum of 10 feet (3 m).

369  
370 On areas where irregularities or unavoidable obstacles make the use of mechanical spreading  
371 and finishing equipment impractical, the mixture may be spread, raked, and luted by hand tools.

372  
373 5.10 COMPACTION OF MIXTURE. After spreading, the mixture shall be thoroughly and uniformly  
374 compacted by rolling. The surface shall be rolled when the mixture has attained sufficient stability  
375 so that the rolling does not cause undue displacement, cracking or shoving. Rolling of the ATPB  
376 shall begin when the temperature of the mixture is less than 150 degrees F and shall be  
377 completed before the mixture is less than 100 degrees F. The sequence of rolling operations and  
378 the type of rollers used shall be at the discretion of the Contractor.

379  
380 The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot  
381 mixture. Any displacement occurring as a result of reversing the direction of the roller, or from  
382 any other cause, shall be corrected at once. To prevent adhesion of the mixture to the roller, the  
383 wheels shall be kept properly moistened, but excessive water will not be permitted. Water shall  
384 not be used to cool the mixture.

385  
386 Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until all  
387 roller marks are eliminated, the surface is of uniform texture and true to grade and cross section,  
388 and the required field density obtained by the test section evaluation is obtained. In areas not  
389 accessible to the roller, the mixture shall be thoroughly compacted with hot hand tampers.

390  
391 Rolling shall be by three complete coverages of the specified static roller. The Project Manager  
392 reserves the right to increase or decrease the specified number of roller coverages and the  
393 specified temperature limits for rolling during construction based on test data and observed  
394 performance from the test section or production placement of the ATPB.

395  
396 Any mixture that becomes loose and broken, mixed with dirt, or in any way defective shall be  
397 removed and replaced with fresh hot mixture and immediately compacted to conform to the  
398 surrounding area. This work shall be done at the Contractor's expense. Skin patching shall not be  
399 allowed.

400  
401 5.11 JOINTS. The formation of all joints shall be made in such a manner as to ensure a continuous  
402 bond between old and new sections of the course. All joints shall have the same texture, density,  
403 and smoothness as other sections of the course.

404  
405 The roller shall not pass over the unprotected end of the freshly laid mixture except when  
406 necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made  
407 by means of placing a bulkhead or by tapering the course, in which case the edge shall be cut  
408 back to its full depth and width on a straight line to expose a vertical face. In both methods, all  
409 contact surfaces shall be given a tack coat of bituminous material before placing any fresh  
410 mixture against the joint.

411  
412 Longitudinal joints which are irregular, damaged, or otherwise defective shall be cut back to  
413 expose a clean, sound surface for the full depth of the course. All contact surfaces shall be given

414 a tack coat of bituminous material prior to placing any fresh mixture against the joint.  
415  
416

- 417 5.12 SURFACE TESTS. Tests for conformity with the specified crown and grade shall be made by  
418 the Contractor immediately after initial compaction. Any variation shall be corrected by the  
419 removal or addition of materials and by continuous rolling as described in this section. Tabular  
420 summary of straight edge records and location will be given to the Project Manager.  
421

422 After the ATPB has been compacted, the surface shall be tested by the Contractor and furnished  
423 to the Project Manager for smoothness and conformance to the elevations shown on the Plans.  
424 The finished surface shall not vary more than 3/8-inch from the surface course when tested with  
425 a 16-foot (4.8 m) straightedge applied parallel with and at right angles to the centerline, nor more  
426 than plus zero to minus 1/2 inch from the elevations shown on the Plans. This tolerance shall be  
427 maintained prior to the installation of the edge light cans.  
428

429 ATPB with a surface higher than design elevation or with a surface variation exceeding the  
430 specified tolerances shall be removed and replaced with ATPB which complies with these  
431 specifications. If approved by the Project Manager, the high spots may be removed to within  
432 specified tolerance by any method that does not produce contaminating fines nor damage the  
433 ATPB to remain in place. Grinding shall not be permitted.  
434

435 Hardened ATPB with a surface lower than 1/2 inch below elevations shown shall be removed and  
436 replaced with ATPB which complies with these specifications. If approved by the Project  
437 Manager, the low areas may be filled with bituminous course conforming to the requirements for  
438 the overlaying course. This shall be done as a separate operation prior to placement of the  
439 overlying course. No additional compensation will be allowed for additional bituminous course  
440 depth resulting from ATPB elevations being too low.  
441

- 442 5.13 PROTECTION OF ATPB. Care shall be exercised to prevent contamination or damage to  
443 previously completed ATPB. The Contractor will only place an amount of ATPB that can be  
444 covered by the overlying course in a reasonable amount of time.  
445

446 Construction equipment other than hauling and paving equipment necessary for placement of the  
447 overlying course and electrical installation shall not operate on the finished ATPB. Route and  
448 operate material hauling trucks and other equipment in a manner to minimize the amount of mud  
449 and dirt carried onto the ATPB. If necessary, clean equipment of mud and dirt prior to operation  
450 on the ATPB. Contractor has the option to construct the electrical directly on the ATPB or after  
451 the placement of the first lift of P-401 asphalt base course.  
452

453 Operate equipment in a manner to prevent damage to the completed ATPB. Equipment shall  
454 avoid rapid acceleration, hard braking, or sharp turning.  
455

456 Any ATPB which, in the opinion of the Project Manager, has become contaminated or damaged  
457 shall be removed and replaced by the Contractor with ATPB which conforms to these  
458 specification requirements, at the Contractor's sole expense.  
459  
460

## 461 PART 6 METHOD OF MEASUREMENT

462

- 463 6.01 Refer to Appendix A for Method of Measurement.  
464  
465

## 466 PART 7 BASIS OF PAYMENT

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- 468 7.01 Refer to Appendix A for Basis of Payment.  
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**PART 8 TESTING REQUIREMENTS**

|                                             |                                                                                              |
|---------------------------------------------|----------------------------------------------------------------------------------------------|
| ASTM C 29                                   | Unit Weight of Aggregate                                                                     |
| ASTM C 88                                   | Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate                        |
| ASTM C 131                                  | Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine      |
| ASTM C 136                                  | Sieve or Screen Analysis of Fine and Coarse Aggregates                                       |
| ASTM C 183                                  | Sampling Hydraulic Cement                                                                    |
| ASTM D 75                                   | Sampling Aggregates                                                                          |
| ASTM D 995                                  | Requirements for Mixing Plants for Hot-Mixed Hot-Laid Bituminous Paving Mixtures             |
| ASTM D 1075                                 | Effect of Water on Cohesion of Compacted Bituminous Mixtures                                 |
| ASTM D 1188                                 | Bulk Specific Gravity of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens       |
| ASTM D 1559                                 | Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus                   |
| ASTM D 2172                                 | Quantitative Extraction of Bitumen from Bituminous Paving Mixtures                           |
| ASTM D 2489                                 | Degree of Particle Coating of Bituminous-Aggregate Mixtures                                  |
| ASTM D 2726                                 | Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens |
| ASTM D 3665                                 | Random Sampling of Paving Materials                                                          |
| ASTM D 3666                                 | Inspection and Testing Agencies for Bituminous Paving Materials                              |
| ASTM D 4125                                 | Asphalt Content of Bituminous Mixtures by the Nuclear Method                                 |
| ASTM D 4318                                 | Liquid Limit, Plastic Limit, and Plasticity Index of Soils                                   |
| ASTM D 6307                                 | Asphalt Content of Hot-Mix Asphalt by the Ignition Method                                    |
| AASHTO T 30                                 | Mechanical Analysis of Extracted Aggregate                                                   |
| The Asphalt Institute's Manual No. 2 (MS-2) | Mix Design Methods for Asphalt Concrete                                                      |

**PART 9 MATERIAL REQUIREMENTS**

|            |                                                 |
|------------|-------------------------------------------------|
| ASTM D 242 | Mineral Filler for Bituminous Paving Mixtures   |
| ASTM D 946 | Asphalt Cement for Use in Pavement Construction |

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ASTM D 3381      Viscosity-Graded Asphalt Cement for Use in Pavement Construction

**END OF ITEM P-403**

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ITEM P-501

PORTLAND CEMENT CONCRETE PAVEMENT

PART 1 GENERAL

1.01 DESCRIPTION The work set forth in this section consists of the Contractor's preparation and submittal of an appropriate concrete mix design, including the Contractor's options with respect thereto, discussion of appropriate equipment for use by the Contractor and the placement of pavement composed of Portland cement concrete, with reinforcement and without reinforcement constructed on a prepared underlying surface in accordance with these specifications and shall conform to the lines, grades, thickness, and typical cross sections shown on the plans.

It is the intention of this Section P-501 that all concrete placed shall be in accordance with good construction practices and meet or exceed all standards for quality and durability of airfield pavements of the highest quality.

Section headings used in this Section P-501 or any other part of this contract are for convenience only and shall not be used in the interpretation of this Section P-501 or any other section or subsection of this contract so as to indicate that phrases or clauses describing standards, tests, equipment, workmanship, material descriptions, characteristics or results to be achieved are confined to the Section heading under which they appear. Any requirement appearing in one location shall be as binding as if appearing in all. It is the intention of this contract that the work will result in an end concrete product which is dense, homogeneous, without segregation, and which is of the highest quality to meet or exceed all standards of quality in the industry and of the government, with a durability of at least 20 years.

The paving contractor shall be required to have the electrical contractor confirm in writing if no electrical work is present in the associated concrete panel replacement.

PART 2 MATERIALS

2.01 AGGREGATES

A. Reactivity - Fine and course aggregates to be used in all concrete shall be evaluated and tested by the contractor for alkali-aggregate reactivity in accordance with ASTM C 1260 Potential Alkali Reactivity of Aggregates (Mortar-Bar Method). The laboratory conducting the tests shall be accredited under ASTM C 1077. Fine and coarse aggregates shall be evaluated separately in accordance with ASTM C 1260. In addition each aggregate source shall be evaluated separately and if the aggregate source changes, aggregates from the new source require testing. Test results that have a measured expansion of 0.10 percent or less at 28 days meet the requirements of these specifications. Should any of the test data indicate an expansion of greater than 0.10 percent, the aggregates shall be rejected or additional testing, by the Contractor utilizing ASTM C 1567 shall be performed.

The aggregates shall also be tested for deleterious reactivity with alkalis in the proposed concrete mix using a sodium hydroxide soak solution and a potassium acetate soak solution in accordance with modified ASTM C 1567, Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method). Acceptance of the aggregates shall be based upon satisfactory evidence furnished by the concrete supplier that the aggregates, combined with the proposed low alkali Portland cement and class F fly ash do not produce

57 expansion in excess of 0.10% at 28 days with the sodium hydroxide soak solution and  
58 expansion in excess of 0.08% with the potassium acetate soak solution. This evidence  
59 shall include certified records of tests by a testing laboratory accredited under ASTM C  
60 1077. Should any of the test data indicate an expansion of greater than that specified, the  
61 aggregates shall be rejected. A new source for the aggregates shall be found and the  
62 new mix retested with the modified ASTM C 1567. This shall be repeated until  
63 satisfactory test results are achieved. If any changes of any kind are made to the  
64 approved mix design, either to aggregate sources, Portland cement or fly ash, then the  
65 new mix shall be tested in accordance with modified ASTM C 1567 and submitted for  
66 approval prior to use. All testing is to be performed by the contractor at the Contractor's  
67 expense.

68  
69 ASTM C 1567 shall be modified as follows: The modified test requires at least one  
70 comparator reading every 3 or 4 days and a comparator reading at 28 days after the zero  
71 reading. The report shall include a graph of percent length change data at each reading  
72 from the time of the zero reading to the end of the 28-day period.

73  
74 Utilize the Contractor's proposed Portland cement with class F fly ash for the test  
75 proportioning. The laboratory shall use the Contractor's proposed percentage of  
76 Portland cement and class F fly ash. The quantity shall be determined that will meet all  
77 the requirements of these specifications and that which will lower the expansion to 0.10  
78 percent or less at 28 days with the sodium hydroxide soak solution and 0.08% or less  
79 with the potassium acetate soak solution . Class F fly ash shall be used at a rate of 20  
80 percent to 30 percent of the total cementitious mass.

81  
82 Proportioning of Mortar - Utilize the Contractor's proposed Portland cement and class F  
83 fly ash in combination for the test proportioning. The laboratory shall use 1 part of  
84 cementitious materials (Contractor's proposed percentage of Portland cement plus fly  
85 ash) to 2.25 parts of graded aggregate (Contractor's proposed combination percentage  
86 of coarse and fine aggregate by mass). Use a water-cementitious materials ratio equal  
87 to 0.47 by mass. The cementitious material combination shall be determined that will  
88 meet all the requirements of these specifications and that which will lower the expansion  
89 to less 0.10 percent at 28 days. Class F fly ash shall be used at a minimum rate of 20  
90 percent of the total cementitious material by mass.

91  
92 The Contractor's QC shall employ a professional Geologist with five years of documented  
93 petrographic experience. Prior to production the Geologist, accompanied by the Project  
94 Manager, shall inspect and qualify that the material at the gravel pit is the material used  
95 for the ASTM C 1567 tests. The Geologist shall submit a report to the Project Manager  
96 that meets the requirements of ASTM C 295, paragraph 16 and includes a map indicating  
97 the location of the pit, the area of the pit where the inspected materials are located, and  
98 types of aggregates encountered.

99  
100 The Contractor's QC shall sample the aggregates stockpiled at the batch plant every  
101 week during hauling. The samples shall be submitted to the Geologist for inspection.  
102 The Geologist shall submit the results of the inspections to the Project Manager. If at any  
103 time during visual inspection of the samples, the material changes and is no longer  
104 represented by the original modified ASTM C 1567 test a new modified ASTM C 1567  
105 test shall be required.

- 106  
107 B. Fine Aggregate - Fine aggregate shall conform to the requirements of ASTM C 33.  
108 Gradation shall meet the requirements of Table 1 when tested in accordance with ASTM  
109 C 136, except as may otherwise be qualified under Section 6 of ASTM C 33. The  
110 amount of deleterious material in the fine aggregate shall not exceed the following limits  
111 by mass:

Material Percentage by Mass

|                                                                                                        |     |
|--------------------------------------------------------------------------------------------------------|-----|
| Clay lumps and friable particles ASTM C 142                                                            | 1.0 |
| Material finer than 0.075 mm (No. 200 sieve) ASTM C 117                                                | 3.0 |
| Lightweight particles ASTM C 123 using a medium with a density of 2.0 Mg/cubic meter (Sp. Gr. of 2.0)) | 0.5 |
| Total of all above                                                                                     | 3.0 |

**TABLE 1. GRADATION FOR FINE AGGREGATE**

| Sieve Designation<br>(square openings) | Percentage by Weight<br>Passing Sieves |
|----------------------------------------|----------------------------------------|
| 3/8 in. (9.5 mm)                       | 100                                    |
| No. 4 (4.75 mm)                        | 95-100                                 |
| No. 8 (2.36 mm)                        | 80-100                                 |
| No. 16 (1.18 mm)                       | 50-85                                  |
| No. 30 (600 micro-m)                   | 25-60                                  |
| No. 50 (300 micro-m)                   | 10-30                                  |
| No. 100 (150 micro-m)                  | 2-10                                   |

- C. Coarse Aggregate - Coarse aggregate shall conform to the requirements of ASTM C 33. Gradation, within the separated size groups, shall meet the requirements of Table 2 when tested in accordance with ASTM C 136. When the nominal maximum size of the aggregate is greater than 1 inch, the aggregates shall be furnished in two size groups.

Aggregates delivered to the mixer shall consist of crushed stone, crushed or uncrushed gravel, air-cooled blast furnace slag, or a combination thereof. The aggregate shall be composed of clean, hard, uncoated particles and shall meet the requirements for deleterious substances contained in ASTM C 33, Class 5S with the exceptions of 40 percent for abrasion and 12 percent for magnesium sulfate soundness. Dust, particles produced during crushing and mining, and other coatings shall be thoroughly removed from the aggregates by washing. Aggregate that visually contains dust, particles produced during crushing and mining, or other coatings shall not be used in the mix. If used, the material shall not be paid for by the City. The aggregate in any size group shall not contain more than 8 percent by weight of flat or elongated pieces when tested in accordance with ASTM D 4791. A flat or elongated particle is one having a ratio between the maximum and the minimum dimensions of a circumscribing rectangular prism exceeding 5 to 1.

The percentage of wear shall be no more than 40 percent when tested in accordance with ASTM C 131 or ASTM C 535.

**LIMITS OF DELETERIOUS MATERIALS IN COARSE AGGREGATE  
 FOR AIRFIELD PAVEMENTS**

|                                                                                                                           | Maximum<br>Percentage by Mass |
|---------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| Clay lumps and friable particles (ASTM C 142)                                                                             | 0.2                           |
| Shale (a) (ASTM C 295)                                                                                                    | 0.1                           |
| Material finer than 0.075 mm (No. 200 sieve) (b) (ASTM C 117)                                                             | 0.5                           |
| Lightweight particles (c) (ASTM C 123)                                                                                    | 0.2                           |
| Clay ironstone (d) (ASTM C 295)                                                                                           | 0.1                           |
| Chert and cherty stone (less than 2.40 Mg/cubic meter density SSD (2.40 Sp. Gr.)) (e) (ASTM C 123 followed by ASTM C 295) | 0.1                           |

|                                                                                               |     |
|-----------------------------------------------------------------------------------------------|-----|
| Claystone, mudstone, and siltstone (f) (ASTM C 295)                                           | 0.1 |
| Shaly and argillaceous limestone (g) (ASTM C 295)                                             | 0.2 |
| Other soft particles COE CRD-C 130                                                            | 1.0 |
| Total of all deleterious substances exclusive of material finer than 0.075 mm (No. 200 sieve) | 1.0 |

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- 1) Shale is defined as a fine-grained, thinly laminated or fissile sedimentary rock. It is commonly composed of clay or silt or both. It has been indurated by compaction or by cementation, but not so much as to have become slate.
- 2) Limit for material finer than 0.075 mm (No. 200 sieve) will be increased to 1.5 percent for crushed aggregates if the fine material consists of crusher dust that is essentially free from clay or shale.
- 3) The separation medium shall have a density of 2.0 Mg/cubic meter (Sp. Gr. of 2.0). This limit does not apply to coarse aggregate manufactured from blast-furnace slag unless contamination is evident.
- 4) Clay ironstone is defined as an impure variety of iron carbonate, iron oxide, hydrous iron oxide, or combinations thereof, commonly mixed with clay, silt, or sand. It commonly occurs as dull, earthy particles, homogeneous concretionary masses, or hard-shell particles with soft interiors. Other names commonly used for clay ironstone are "chocolate bars" and limonite concretions.
- 5). Chert is defined as a rock composed of quartz, chalcedony or opal, or any mixture of these forms of silica. It is variable in color. The texture is so fine that the individual mineral grains are too small to be distinguished by the unaided eye. Its hardness is such that it scratches glass but is not scratched by a knife blade. It may contain impurities such as clay, carbonates, iron oxides, and other minerals. Cherty stone is defined as any type of rock (generally limestone) that contains chert as lenses and nodules, or irregular masses partially or completely replacing the original stone.
- 6). Claystone, mudstone, or siltstone, is defined as a massive fine-grained sedimentary rock that consists predominantly of indurated clay or silt without laminations or fissility. It may be indurated either by compaction or by cementation.
- 7). Shaly limestone is defined as limestone in which shale occurs as one or more thin beds or laminae. These laminae may be regular or very irregular and may be spaced from a few inches down to minute fractions of an inch. Argillaceous limestone is defined as a limestone in which clay minerals occur disseminated in the stone in the amount of 10 to 50 percent by weight of the rock; when these make up from 50 to 90 percent, the rock is known as calcareous (or dolomitic) shale (or claystone, mudstone, or siltstone).

**TABLE 2. GRADATION FOR COARSE AGGREGATE**  
 ASTM C 33

| Sieve Designations<br>(square openings) |      | Percentage by Weight Passing Sieves<br>From 1-1/2" to No.4 (38.1mm-4.75mm) |                  |
|-----------------------------------------|------|----------------------------------------------------------------------------|------------------|
|                                         |      | #4<br>1-1/2"-3/4"                                                          | #67<br>3/4"-No.4 |
| in.                                     | mm   |                                                                            |                  |
| 2                                       | 50.8 | 100                                                                        | ---              |
| 1-1/2                                   | 38.1 | 90-100                                                                     | ---              |

|       |      |       |        |
|-------|------|-------|--------|
| 1     | 25.0 | 20-55 | 100    |
| 3/4   | 19.0 | 0-15  | 90-100 |
| 1/2   | 12.5 | ---   | ---    |
| 3/8   | 9.5  | 0-5   | 20-55  |
| No. 4 | 4.75 | ---   | 0-10   |
| No. 8 | 2.36 | ---   | 0-5    |

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D. Aggregate susceptibility to Disintegration (D) Cracking. Aggregates that have a history of D-cracking shall not be used. Prior to approval of the aggregate, the Contractor shall submit written certification that the aggregate does not have a history of D-cracking. If the aggregates have previously been used at DIA, provide the project name, project number, mix design number, and current condition of the concrete.

2.02 CEMENT: Cement shall conform to the requirements of ASTM C 150, Type V, or equivalent. If for any reason, cement becomes partially set or contains lumps of caked cement, it shall be rejected. Cement salvaged from discarded or used bags shall not be used.

A Type I/II cement may be substituted for Type V providing it meets the following requirements:

- Magnesium Oxide (MgO), max, % 6.0 ASTM C 114
- Sulfur trioxide (SO<sub>3</sub>),<sup>A</sup> max, % 2.3 ASTM C 114
- Loss on Ignition, max, % 3.0 ASTM C 114
- Insoluble residue, max, % 0.75 ASTM C 114
- Equivalent alkalis (Na<sub>2</sub>O + 0.658K<sub>2</sub>O), max, % 0.60 ASTM C 114
- Air content of mortar, max volume, % 12 ASTM C 185
- Fineness<sup>B</sup>, specific surface, m<sup>2</sup>/kg  
 (alternative methods):
  - Turbidimeter test:
    - average value, min 160 ASTM C 115
    - any one sample, min 150 ASTM C 115
  - or
  - Air permeability test (Blain)
    - average value, min 280 ASTM C 204
    - any one sample, min 260 ASTM C 204
- Autoclave expansion, max, % 0.80 ASTM C 151
- Strength, not less than the values shown  
 for the ages indicated as follows:
  - Compressive strength, MPa (psi) @ 3 days 10.0 (1450) ASTM C 109/  
C 109M
  - Compressive strength, MPa (psi) @ 7 days 17.0 (2470) ASTM C 109/  
C 109M
  - Compressive strength, MPa (psi) @ 28 days 21.0 (3050) ASTM C 109/  
C 109M
- Time of setting; Vicat test:<sup>C</sup>
  - Time of setting, min, not less than 45 ASTM C 191
  - Time of setting, min, not more than 375 ASTM C 191
- Sulfate Resistance<sup>D</sup>, 14 days, max, %  
 expansion 0.040 ASTM C 452

<sup>A</sup> If the (SO<sub>3</sub>) requirement can not be met, exceeding values will be acceptable provided it has been demonstrated by Test Method C 1038 that the cement with the increased SO<sub>3</sub> will not develop expansion in water exceeding 0.020% at 14 days. Supporting test data must be provided.

- 235 <sup>B</sup> The testing laboratory shall select the fineness method to be used. However, when the  
236 sample fails to meet the requirements of the air-permeability test, the Turbidimeter test  
237 shall be used, and the requirements for the turbidimetric method shall govern.  
238
- 239 <sup>C</sup> The time of setting is that described as initial setting time in Test Method C 191.  
240
- 241 <sup>D</sup> ASTM C 1012 "Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate  
242 Solution" test may be substituted for ASTM C 452 "Potential Expansion of Portland  
243 Cement Mortars Exposed to Sulfate" test. For acceptance of the C 1012 results  
244 expansion shall be less than 0.05% at 6 months or less than 0.1% at 1 year.  
245
- 246 Total Alkalis ( $\text{Na}_2\text{O} + 0.658 \text{K}_2\text{O}$ ) shall be independently verified in accordance with ASTM C114.  
247 Total equivalent alkalis shall be less than 0.6%.  
248
- 249 The Contractor shall furnish vendors' certified test reports for each carload, or equivalent, of  
250 cement shipped to the project. The report shall be delivered to the Engineer before permission to  
251 use the cement is granted. All such test reports shall be subject to verification by testing sample  
252 materials received for use on the project.  
253
- 254 2.03 CEMENTITIOUS MATERIALS. Fly ash shall meet the requirements of ASTM C 618, class F  
255 with the exception of loss on ignition, where the maximum shall be less than 6 percent for class  
256 F. The supplementary optional chemical and physical properties for Increase of Drying  
257 Shrinkage in Mortar Bars, Effectiveness in Controlling Alkali-Silica Reaction, and Effectiveness in  
258 Controlling Sulfate Resistance of Table 3 contained in ASTM C618 shall apply. The available  
259 alkalis, as equivalent, as  $\text{Na}_2\text{O}$  shall be a maximum of 1.5%. The limit of CaO content shall be  
260 13.0% or less. Fly ash such as is produced in furnace operations utilizing liming materials or  
261 soda ash (sodium carbonate) as an additive shall not be acceptable. A certificate of compliance  
262 shall be submitted for each source of Fly Ash. ASTM C 618 Tables 1 and 2 test results shall not  
263 be greater than 60 days old and the Increase of Drying Shrinkage in Mortar Bars, Effectiveness in  
264 Controlling Alkali-Silica Reaction, and Effectiveness in Controlling Sulfate Resistance test results  
265 of Table 3 shall not be greater than 18 months old.  
266
- 267 2.04 PREMOLDED JOINT FILLER. Premolded joint filler for expansion joints shall conform to the  
268 requirements of ASTM D 1752, Type I and shall be punched to admit the dowels where called for  
269 on the plans. The filler for each joint shall be furnished in a single piece for the full depth and  
270 width required for the joint, unless otherwise specified by the Project Manager. When the use of  
271 more than one piece is required for a joint, the abutting ends shall be fastened securely and held  
272 accurately to shape by stapling or other positive fastening means satisfactory to the Project  
273 Manager. This pre-molded joint filler must be removed full depth of joint prior to sealing the joint.  
274
- 275 2.05 JOINT SEALER. The joint sealer for the joints in the concrete pavement shall meet the  
276 requirements of Item P-604A, P-604B, and P-605 and shall be of the type(s) specified in the  
277 plans.  
278
- 279 2.06 STEEL REINFORCEMENT. Reinforcing shall consist of welded deformed steel fabric  
280 conforming to the requirements of ASTM A 497 or deformed Reinforcing steel as shown in the  
281 Contract Drawings. Support devices shall be constructed such that they do not transfer oxidation  
282 or corrosion to the reinforcement. The portion of the support device that comes in contact with  
283 the subgrade surface must be epoxy or plastic coated. Support devices shall be of the correct  
284 height and width to support the reinforcement as indicated on the contract documents without  
285 modification.  
286
- 287 2.07 DOWEL AND TIE BARS Tie bars shall be deformed steel bars and conform to the requirements  
288 of ASTM A 615, ASTM A 616, or ASTM A 617, except that rail steel bars, Grade 50 or 60, shall  
289 not be used for tie bars that are to be bent or re-straightened during construction. Tie bars  
290 designated as Grade 40 in ASTM A 615 can be used for construction requiring bent bars.  
291

292 Dowel bars shall be plain steel bars conforming to ASTM A 615, ASTM A 616 or ASTM A 617  
293 and shall be free from burring or other deformation restricting slippage in the concrete. High  
294 strength dowel bars shall conform to ASTM A 714, Class 2, Type S, Grade I, II or III, Bare Finish.  
295 Before delivery to the construction site each dowel bar shall be epoxy coated in conformance  
296 with ASTM A 775/A 775M. Metal or plastic collars shall be full circular device supporting the  
297 dowel until the epoxy hardens.

298  
299 The sleeves for dowel bars used in expansion joints shall be metal or other type of an approved  
300 design to cover 2 to 3 inches (50 mm to 75 mm) of the dowel, with a closed end and with a  
301 suitable stop to hold the end of the bar at least 1 inch (25 mm) from the closed end of the sleeve.  
302 Sleeves shall be of such design that they will not collapse during construction.

303  
304 Support devices shall be constructed such that they do not transfer oxidation or corrosion to the  
305 dowel and tie bars. The portion of the support device that comes in contact with the subgrade  
306 surface must be epoxy or plastic coated.

307  
308 2.08 WATER. Water used in mixing or curing shall be clean and free of oil, salt, acid, alkali, sugar,  
309 vegetable, or other substances injurious to the finished product. Water will be tested in  
310 accordance with the requirements of AASHTO T 26. Water known to be of potable quality may  
311 be used without testing.

312  
313 2.09 COVER MATERIAL FOR CURING. Curing materials shall conform to one of the following  
314 specifications:

315  
316 A. Liquid membrane-forming compounds for curing concrete shall conform to the  
317 requirements of ASTM C 309, Type 2, Class B.

318  
319 B. White polyethylene film for curing concrete shall conform to the requirements of ASTM C  
320 171.

321  
322 C. White burlap-polyethylene sheeting for curing concrete shall conform to the requirements  
323 of ASTM C 171.

324  
325 D. Waterproof paper for curing concrete shall conform to the requirements of ASTM C 171.

326  
327 E. Product must be stored as per Manufacturer's guidelines.

328  
329 2.10 ADMIXTURES. The use of any material added to the concrete mix shall be approved by the  
330 Project Manager. The Contractor shall submit certificates indicating that the material to be  
331 furnished meets all of the requirements indicated below. In addition, the Contractor will submit  
332 complete test data from an approved laboratory showing that the material to be furnished meets  
333 all of the requirements of the cited specifications. Subsequent tests may be made of samples  
334 taken by the Project Manager from the supply of material being furnished or proposed for use on  
335 the work to determine whether the admixture is uniform in quality with that approved.

336  
337 A. Air-Entraining Admixtures. Air-entraining admixtures shall meet the requirements of  
338 ASTM C 260 and shall consistently entrain the air content in the specified ranges under  
339 field conditions. The air-entrainment agent and any chemical admixtures shall be  
340 compatible.

341  
342 B. Chemical Admixtures. Water-reducing, set retarding, and set-accelerating admixtures  
343 shall meet the requirements of ASTM C 494, including the flexural strength test.

344  
345 2.11 EPOXY-RESIN. Epoxy-resin used to anchor dowels and tie bars in pavements shall conform to  
346 the requirements of ASTM C 881, Type I, Grade 3, Class C. Class A or B shall be used when the  
347 surface temperature of the hardened concrete is below 60 degrees F (16 degrees C). Epoxy

348 samples shall be taken by the Contractor twice daily, or as requested by the Project Manager or  
349 his representative, during placement to confirm the material sets properly.  
350

351 2.12 MATERIAL ACCEPTANCE. Prior to use of materials, the Contractor shall submit certified test  
352 reports to the Project Manager for those materials proposed for use during construction. The  
353 certification shall show the appropriate ASTM test(s) for each material, the test results, and a  
354 statement that the material passed or failed.  
355

356 The Project Manager may request samples for testing, prior to and during production, to verify  
357 the quality of the materials and to ensure conformance with the applicable specifications.  
358  
359

### 360 PART 3 MIX DESIGN

361  
362 3.00 MIX DESIGN. The mix design for all Portland Cement Concrete to be placed under this Section  
363 P-501 shall be prepared and tested by a qualified laboratory and shall be certified by the stamp  
364 or seal of the responsible professional retained by the Contractor who is in charge of and  
365 responsible for the mix design. Certification shall constitute a warranty that the materials selected  
366 and the proportions proposed by the Contractor are in full compliance with this Section P-501 and  
367 when properly placed with good workmanship and appropriate construction means, methods and  
368 techniques as specifically contemplated by the Contractor under this contract will result in a  
369 concrete meeting or exceeding the requirement of the specifications and of the finished product  
370 after taking into account all of the conditions associated with such compliance.  
371

372 The inclusion of specific aggregates, cement, additive or other allowed materials within this  
373 section shall not require the use of any specific material. The selection of materials and  
374 proportions is for the Contractor and its certifying professional to determine in order to achieve  
375 the requirements set forth herein, including but not limited to the requirements of Paragraph 5.02,  
376 ACCEPTANCE CRITERIA.  
377

378 No work shall be placed until the mix design has been submitted to the Project Manager for  
379 review and the Project Manager has reviewed and taken appropriate action with respect thereto.  
380 The Project Manager's review shall be for the limited purpose of checking whether the materials  
381 selected by the Contractor and certifying professional are permitted or allowed in this section and  
382 shall not relieve the Contractor and certifying professional of the responsibility to select and  
383 proportion the materials chosen so as to achieve the intent of this Section P-501, which is to  
384 require the placement of a completed pavement that in all respects meets the highest standards  
385 and requirements for rigid concrete pavements of the highest quality. The Project Manager's  
386 review shall not indicate acceptance or approval of the material proportions or of the specific  
387 interactions of such materials as proportioned or of the Contractor's selected means, methods,  
388 techniques, sequences or procedures, all of which remain the responsibility of the Contractor.  
389 Approval by the Project Manager of specific materials as complying with this Section shall not  
390 indicate a representation that the materials and proportions selected will result in an acceptable  
391 completed pavement. The responsibility for such assurance remains that of the Contractor and its  
392 certifying professional.  
393

394 Certification by the Contractor's mix design professional shall be a specific warranty that such  
395 professional in determining the materials and proportions has considered the appropriateness  
396 thereof for use with the specific equipment and means and methods intended for use by the  
397 Contractor.  
398

### 399 3.01 PROPORTIONS

400  
401 A. Concrete shall be designed to achieve a 28-day flexural strength that meets or exceeds the  
402 acceptance criteria contained in paragraph 501-5.02 E(1) for a flexural strength of 700 psi.  
403 The mix shall be designed using the procedures contained in Chapter 9 of the Portland  
404 Cement Association's manual, "Design and Control of Concrete Mixtures."



405  
406 B. Concrete shall be designed to achieve a 72 hour flexural strength that meets or exceeds the  
407 acceptance criteria contained in paragraph 501-5.02 E (1) for a flexural strength of 550 psi.  
408 The mix shall be designed using the procedures contained in Chapter 9 of the Portland  
409 Cement Association's manual, "Design and Control of Concrete Mixtures". The PWL  
410 calculation in Appendix A, P-501, Part 8 Basis of Pavement shall use the 28 day strength for  
411 the evaluation.  
412

413 The Contractor shall note that to ensure that the concrete actually produced will meet or exceed  
414 the acceptance criteria for the specified strength; the mix design average strength must be higher  
415 than the specified strength. The amount of over-design necessary to meet specification  
416 requirements depends on the producer's standard deviation of flexural test results and the  
417 accuracy which that value can be estimated from historic data for the same or similar materials.  
418

419 The minimum cementitious material (cement plus fly ash) shall be 564 pounds per cubic yard  
420 (227 kg per cubic meter). Class "F" fly ash shall make up 20 to 30 percent of the total weight.  
421 The ratio of water to cementitious material, including free surface moisture on the aggregates but  
422 not including moisture absorbed by the aggregates shall not be more than 0.45 by weight.  
423

424 Prior to the start of paving operations and after approval of all material to be used in the concrete,  
425 the Contractor shall submit a mix design showing the proportions and flexural strength obtained  
426 from the concrete at 7 and 28 days. The mix design shall include copies of test reports, including  
427 test dates, and a complete list of materials including type, brand, source, and amount of; cement,  
428 fly ash, ground slag, coarse aggregate, fine aggregate, water, and admixtures. The fineness  
429 modulus of the fine aggregate and the air content shall also be shown. The mix design shall be  
430 submitted to the Project Manager at least 10 days prior to the start of operations. The submitted  
431 mix design shall not be more than 90 days old. Production shall not begin until the mix design is  
432 approved in writing by the Project Manager.  
433

434 Should a change in sources be made, changes in the amounts of cementitious material,  
435 admixtures added or deleted from the mix, or any other changes made in the approved mix, a  
436 new mix design shall be submitted to the Project Manager for approval. Any material placed  
437 without an approved mix shall be removed at the contractor's expense.  
438

439 Flexural strength test specimens shall be prepared in accordance with ASTM C 192 and tested in  
440 accordance with ASTM C 78. The mix determined shall be workable concrete having a target  
441 slump for side-form concrete of 1½ inches, (38 mm) as determined by ASTM C 143. For vibrated  
442 slip-form concrete, the target slump shall be 1½ inches (38 mm). For the action and Suspension  
443 limits see paragraph 6.03, Control Charts.  
444

445 3.02 CEMENTITIOUS MATERIALS  
446

447 A. Fly Ash. Fly ash shall be used in the mix design. The minimum cement content shall be  
448 met by considering Portland cement plus fly ash as the total cementitious material. The  
449 rate shall be 20 to 30 percent by weight of the total cementitious material.  
450

451 3.03 ADMIXTURES  
452

453 A. Air-Entraining. Air-entraining admixture shall be added in such a manner that will insure  
454 uniform distribution of the agent throughout the batch. The air content of freshly mix  
455 air-entrained concrete shall be based upon trial mixes with the materials to be used in the  
456 work adjusted to produce concrete of the required plasticity and workability. The  
457 percentage of air in the mix shall be 5.5 percent. Air content shall be determined by  
458 testing in accordance with ASTM C 231 for gravel and stone coarse aggregate and  
459 ASTM C 173 for slag and other highly porous coarse aggregate.  
460

- 461 B. Chemical Water-reducing, set-controlling, and other approved admixtures shall be added  
462 to the mix in the manner recommended by the manufacturer and in the amount  
463 necessary to comply with the specification requirements. Tests shall be conducted on  
464 trial mixes, with the materials to be used in the work, in accordance with ASTM C 494.  
465
- 466 3.04 TESTING LABORATORY. The laboratory used to develop the mix design shall meet the  
467 requirements of ASTM C 1077 including accreditation. Accreditation shall include all test  
468 procedures required to develop the mix design. A certification signed by the manager of the  
469 laboratory stating it meets these requirements shall be submitted to the Project Manager prior to  
470 the start of mix design and shall contain as a minimum:  
471
- 472 A. Qualifications of personnel; including the laboratory manager, supervising technician,  
473 and testing technicians involved in developing the mix design.  
474
- 475 B. Evidence of current accreditation by a nationally recognized laboratory accreditation  
476 program for all test methods used in developing the mix design. The evidence shall  
477 include the results of the last inspection including responses to deficiencies.  
478
- 479 3.05 TOTAL ALKALI. The total alkali in the mix shall be in accordance with ASTM C 114, total alkalis  
480 ( $\text{Na}_2\text{O} + 0.658 \text{K}_2\text{O}$ ) shall not exceed 5 pounds per cubic yard with all components. The amount  
481 of total alkali shall be documented in all mix design submittals.  
482
- 483 3.06 MIX MATERIALS AND MIX DESIGN SUBMITTALS. The Contractor shall submit mix materials  
484 and a mix design submittal to the Project Manager for the PCCP at least 30 days prior to use.  
485 The Mix Design will not be approved when the laboratory trial mix is greater than 90 days old and  
486 the aggregate, cement and fly ash data are the results from tests performed more than one year  
487 in the past.  
488
- 489 A. Fine Aggregate – Individual submittals shall be provided for each source of fine aggregate.  
490 The submittal packages shall include the source of the fine aggregate and Certified  
491 Certificates of Compliance including actual test results showing that the fine aggregate meets  
492 the requirements of paragraph 2.01 B. ASTM C 1260 test results and proof of accreditation  
493 under ASTM C 1077 of the laboratory performing the ASTM C 1260 tests shall also be  
494 included in the submittal.  
495
- 496 B. Coarse Aggregate – Individual submittals shall be provided for each source of coarse  
497 aggregate. The submittal packages shall include the source of the coarse aggregate and  
498 Certified Certificates of Compliance including actual test results showing that the coarse  
499 aggregate meets the requirements of paragraph 2.01 B. ASTM C 1260 test results and proof  
500 of accreditation under ASTM C 1077 of the laboratory performing the ASTM C 1260 tests  
501 shall also be included in the submittal.  
502
- 503 C. Cement – Individual submittals shall be provided for each source and each Type of cement.  
504 The submittal packages shall include the source, type and Certified Certificates of  
505 Compliance including actual test results showing that the cement meets the requirements of  
506 paragraph 2.02.  
507
- 508 D. Fly Ash - Individual submittals shall be provided for each source of fly ash. The submittal  
509 packages shall include the source, class and Certified Certificates of Compliance including  
510 actual test results showing that the fly ash meets the requirements of paragraph 2.03.  
511
- 512 E. Admixtures - Individual submittals shall be provided for each admixture including brand  
513 and/or manufacturer, Certified Certificates of Compliance, the manufacture's recommended  
514 procedures for use and storage showing and that the admixtures meet the requirements of  
515 paragraph 2.10.  
516
- 517 F. Mix Design – Individual submittals shall be provided for each mix design and shall include:

- 518  
519 a. The weights and sources of all ingredients including cement, fly ash, aggregates,  
520 water, and admixtures.  
521 b. The laboratory trial mix data:  
522 • mix identification number  
523 • date mix was developed  
524 • developer of the mix  
525 • water/cement ratio (w/c); include the theoretical and trial batch water/cement  
526 ratios. Note: the trial batch water/cement ratio shall not be exceeded during  
527 production.  
528 • yield  
529 • coarse aggregate gradation  
530 • fine aggregate gradation  
531 • fineness modulus of the fine aggregate  
532 • consistency  
533 • air content  
534 • flexural strength; at least 2 specimens at 7 days and three specimens at 28 days  
535 • ASTM C 1567 test results  
536  
537 G. Testing Laboratory Qualifications – Individual submittals shall be provided for each laboratory  
538 designing PCCP mixtures. All information required in 3.04 shall be provided.  
539  
540

#### 541 PART 4 CONSTRUCTION METHODS

- 542  
543 4.01 EQUIPMENT: Equipment necessary for handling materials and performing all parts of the work,  
544 shall be approved by the Project Manager or their designated representative as to design,  
545 capacity, mechanical conditions and cleanliness. The equipment shall be at the jobsite sufficiently  
546 ahead of the start of paving operations to be examined thoroughly and approved.  
547  
548 A. Batch Plant and Equipment. The batch plant and equipment shall conform to the  
549 requirements of ASTM C 94. In addition, dry-batch batching plants will not be allowed  
550 and central-mixed concrete will be the required method of producing concrete.  
551  
552 B. Mixers and Transportation Equipment.  
553  
554 (1) General - Concrete shall be mixed at a central plant. Each mixer shall have  
555 attached in a prominent place a manufacturer's nameplate showing the capacity  
556 of the drum in terms of volume of mixed concrete and the speed of rotation of the  
557 mixing drum or blades.  
558  
559 (2) Central Plant Mixer - Central plant mixers shall conform to the requirements of  
560 ASTM C 94.  
561  
562 The mixer shall be examined daily by the Project Manager or assigned  
563 representative for changes in condition due to accumulation of hard concrete or  
564 mortar or wear of blades. The pickup and throwover blades shall be replaced  
565 when they have worn down 3/4 inch (19 mm) or more. The Contractor shall have  
566 a copy of the manufacturer's design on hand showing dimensions and  
567 arrangement of blades in reference to original height and depth.  
568  
569 (3) Truck Agitators. Truck agitators used for hauling central-mixed concrete shall  
570 conform to the requirements of ASTM C 94.  
571  
572 (4) Nonagitator Trucks. Nonagitating hauling equipment shall conform to the  
573 requirements of ASTM C 94.

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- C. Finishing Equipment. The standard method of constructing concrete pavements on FAA projects shall be with an approved slip-form paving equipment designed to spread, consolidate, screed, and float-finish the freshly placed concrete in one complete pass of the machine so a dense and homogeneous pavement is achieved with a minimum of hand finishing. The paver-finisher shall be a heavy duty, self propelled machine designed specifically for paving and finishing high quality concrete pavements. It shall weigh at least 2,200 pounds per foot of paving lane width and be powered by an engine having at least 6.0 horsepower per foot of lane width. On projects requiring less than 500 square yards of cement concrete pavement or requiring individual placement areas of less than 500 square yards, or irregular areas at locations inaccessible to slip-form paving equipment, cement concrete pavement may be placed with approved placement and finishing equipment utilizing stationary side forms. Hand screeding and float finishing may only be utilized on small irregular areas as allowed by the DIA Project Manager. The use of roller screeds will not be allowed.
- D. Vibrators. Vibrators shall be the internal type. Operating frequency for internal vibrators shall be between 8,000 and 12,000 vibrations per minute. Average amplitude for internal vibrators shall be 0.025-0.05 inches (0.06-0.13 cm). The number, spacing, and frequency shall be as necessary to provide a dense and homogeneous pavement. Adequate power to operate all vibrators shall be available on the paver. The vibrators shall be automatically controlled so that they shall be stopped as forward motion ceases.
- Hand held vibrators shall be used in irregular areas and as directed by the Project Manager.
- Verification of operational frequencies of all vibrators shall be documented by Quality Control personnel at the beginning of each paving shift.
- E. Concrete Saws. The Contractor shall provide sawing equipment adequate in number of units and power to complete the sawing to the required dimensions. The Contractor shall provide at least one standby saw in good working order and a supply of saw blades at the site of the work at all times during sawing operations.
- F. Side Forms. Straight side forms shall be made of steel and shall be furnished in sections not less than 10 feet (3 m) in length. Forms shall have a depth equal to the pavement thickness at the edge. Flexible or curved forms of proper radius shall be used for curves of 100-foot (31 m) radius or less. Forms shall be provided with adequate devices for secure settings so that when in place they will withstand, without visible spring or settlement, the impact and vibration of the consolidating and finishing equipment. Forms with battered top surfaces and bent, twisted or broken forms shall not be used. Built-up forms shall not be used. The top face of the form shall not vary from a true plane more than 1/8 inch (3 mm) in 10 feet (3 m), and the upstanding leg shall not vary more than 1/4 inch (6 mm). The forms shall contain provisions for locking the ends of abutting sections together tightly for secure setting. Wood forms may be used under special conditions, when approved by the Project Manager. Forms shall have a depth equal to the pavement thickness at the edge, and a base width equal to or greater than the depth. Forms shall be continuous from the base material to the finished surface of the pavement with no voids.
- G. Pavers. The paver shall be fully energized, self-propelled, and designed for the specific purpose of placing, consolidating, and finishing the concrete pavement, true to grade, tolerances, and cross section. It shall be of sufficient weight and power to construct the maximum specified concrete paving lane width as shown in the plans, at adequate forward speed, without transverse, longitudinal or vertical instability or without displacement. The paver shall be equipped with electronic or hydraulic horizontal and vertical control devices.

- 631  
632 4.02 FORM SETTING. Forms shall be set sufficiently in advance of the concrete placement to insure  
633 continuous paving operation. After the forms have been set to correct grade, the underlying  
634 surface shall be thoroughly tamped, either mechanically or by hand, at both the inside and  
635 outside edges of the base of the forms. Forms shall be staked into place sufficiently to maintain  
636 the form in position for the method of placement.  
637  
638 Form sections shall be tightly locked and shall be free from play or movement in any direction.  
639 The forms shall not deviate from true line by more than 1/8 inch (3 mm) at any joint. Forms shall  
640 be so set that they will withstand, without visible spring or settlement, the impact and vibration of  
641 the consolidating and finishing equipment. Forms shall be cleaned and oiled prior to the placing  
642 of concrete.  
643  
644 The alignment and grade elevations of the forms shall be checked and corrections made by the  
645 Contractor before concrete placement has begun.  
646  
647 4.03 CONDITIONING OF UNDERLYING SURFACE. The compacted underlying surface on which the  
648 pavement will be placed shall be widened approximately 3 feet (1 m) to extend beyond the paving  
649 machine track to support the paver without any noticeable displacement. After the underlying  
650 surface has been placed and compacted to the required density, the areas which will support the  
651 paving machine and the area to be paved shall be trimmed or graded to the plan grade elevation  
652 and profile by means of a properly designed machine. The grade of the underlying surface shall  
653 be controlled by a positive grade control system using lasers, stringlines, or guide wires. If the  
654 density of the underlying surface is disturbed by the trimming operations, it shall be corrected by  
655 additional compaction and retested at the option of the Project Manager before the concrete is  
656 placed except when stabilized subbases are being constructed. If damage occurs on a stabilized  
657 subbase, it shall be corrected full depth by the Contractor. If traffic is allowed to use the prepared  
658 grade, the grade shall be checked and corrected immediately before the placement of concrete.  
659 The prepared grade shall be moistened with water, without saturating, immediately ahead of  
660 concrete placement to prevent rapid loss of moisture from concrete. The underlying surface shall  
661 be protected so that it will be entirely free of frost when concrete is placed.  
662  
663 The Contractor shall obtain written verification from the Electrical Contractor that all new or  
664 existing ducts beneath concrete pavement to be placed have been mandreled.  
665  
666 4.04 CONDITIONING OF UNDERLYING SURFACE, SIDE-FORM AND FILL-IN LANE  
667 CONSTRUCTION. The prepared underlying surface shall be moistened with water, without  
668 saturating, immediately ahead of concrete placement to prevent rapid loss of moisture from the  
669 concrete. Damage caused by hauling or usage of other equipment shall be corrected and  
670 retested at the option of the Project Manager. If damage occurs to a stabilized subbase, it shall  
671 be corrected full depth by the Contractor. A template shall be provided and operated on the  
672 forms immediately in advance of the placing of all concrete. The template shall be propelled only  
673 by hand and not attached to a tractor or other power unit. Templates shall be adjustable so that  
674 they may be set and maintained at the correct contour of the underlying surface. The adjustment  
675 and operation of the templates shall be such as will provide an accurate retest of the grade  
676 before placing the concrete thereon. All excess material shall be removed and wasted. Low areas  
677 shall be filled and compacted to a condition similar to that of the surrounding grade. Any standing  
678 water shall be completely removed from the underlying surface prior to the installation of  
679 concrete. Displacement of excess water is not permitted during the installation of concrete. The  
680 underlying surface shall be protected so that it will be entirely free from frost when the concrete is  
681 placed. The use of chemicals to eliminate frost in the underlying surface shall not be permitted.  
682  
683 The template shall be maintained in accurate adjustment, at all times by the Contractor, and shall  
684 be checked daily.  
685  
686 4.05 HANDLING, MEASURING, AND BATCHING MATERIAL. The batch plant site, layout,  
687 equipment, and provisions for transporting material shall assure a continuous supply of material

688 to the work. Stockpiles shall be constructed in such a manner that prevents segregation and  
689 intermixing of deleterious materials. Aggregates from different sources shall be stockpiled,  
690 weighed and batched separately at the concrete batch plant.

691  
692 Aggregates that have become segregated or mixed with earth or foreign material shall not be  
693 used. All aggregates produced or handled by hydraulic methods, and washed aggregates, shall  
694 be stockpiled or binned for draining at least 12 hours before being batched. Rail shipments  
695 requiring more than 12 hours will be accepted as adequate binning only if the car bodies permit  
696 free drainage.

697  
698 Batching plants shall be equipped to proportion aggregates and bulk cement, by weight,  
699 automatically using interlocked proportioning devices of an approved type. When bulk cement is  
700 used, the Contractor shall use a suitable method of handling the cement from weighing hopper to  
701 transporting container or into the batch itself for transportation to the mixer, such as a chute,  
702 boot, or other approved device, to prevent loss of cement. The device shall be arranged to  
703 provide positive assurance that the cement content specified is present in each batch.

704  
705 A copy of the proposed batch ticket shall be submitted to the Project Manager for approval.  
706 Batch tickets shall include as a minimum the information required in ASTM C 94. Two copies of  
707 the batch tickets shall also be provided to the Project Manager or his representative for each  
708 batch of concrete prior to unloading at the site.

709  
710 4.06 MIXING CONCRETE. The concrete will be mixed at the central mix plant. The mixer shall be of  
711 an approved type and capacity. Mixing time shall be measured from the time all materials,  
712 except water, are emptied into the drum. All concrete shall be mixed and delivered to the site in  
713 accordance with the requirements of ASTM C 94. Mixed concrete from the central mixing plant  
714 shall be transported in truck mixers, truck agitators, or nonagitating trucks. The elapsed time from  
715 the addition of cementitious material to the mix until the concrete is deposited in place at the work  
716 site shall not exceed 30 minutes when the concrete is hauled in nonagitating trucks, nor 90  
717 minutes when the concrete is hauled in truck mixers or truck agitators. Retempering concrete by  
718 adding water or by other means will not be permitted. With transit mixers additional water may be  
719 added to the batch materials and additional mixing performed to increase the slump to meet the  
720 specified requirements provided the addition of water is performed prior to placement and within  
721 45 minutes after the initial mixing operations and the water/cementitious ratio specified in the mix  
722 design is not exceeded, and approved by the Project Manager.

723  
724 4.07 LIMITATIONS ON MIXING AND PLACING. No concrete shall be mixed, placed, or finished  
725 when the natural light is insufficient, unless an adequate and approved artificial lighting system is  
726 operated.

727  
728 A. Cold Weather. Unless authorized in writing by the Project Manager, mixing and  
729 concreting operations shall be discontinued when a descending air temperature in the  
730 shade and away from artificial heat reaches 40 degrees F (4 degrees C) and shall not be  
731 resumed until an ascending air temperature in the shade and away from artificial heat  
732 reaches 40degrees F (4 degrees C).

733  
734 The aggregate shall be free of ice, snow, and frozen lumps before entering the mixer.  
735 The temperature of the mixed concrete shall not be less than 50 degrees F (10 degrees  
736 C) at the time of placement. Concrete shall not be placed on frozen material nor shall  
737 frozen aggregates be used in the concrete.

738  
739 When concreting is authorized during cold weather, water and/or the aggregates may be  
740 heated to not more than 150 degrees F (66 degrees C). The apparatus used shall heat  
741 the mass uniformly and shall be arranged to preclude the possible occurrence of  
742 overheated areas which might be detrimental to the materials.

743

744 B. Hot Weather. During periods of hot weather when the maximum daily air temperature  
745 exceeds 85 degrees F (30 degrees C), the following precautions shall be taken.  
746

747 The forms and/or the underlying surface shall be sprinkled with water immediately before  
748 placing the concrete. The concrete shall be placed at the coolest temperature  
749 practicable, and in no case shall the temperature of the concrete when placed exceed 90  
750 degrees F (35 degrees C). The aggregates and/or mixing water shall be cooled as  
751 necessary to maintain the concrete temperature at or not more than the specified  
752 maximum.  
753

754 The finished surfaces of the newly laid pavement shall be kept damp by applying a  
755 water-fog or mist with approved spraying equipment until the pavement is covered by the  
756 curing medium. If necessary, wind screens shall be provided to protect the concrete  
757 from an evaporation rate in excess of 0.2 psf per hour as determined in accordance with  
758 Figure 2.1.5 in ACI 305R, Hot Weather Concreting, which takes into consideration  
759 relative humidity, wind velocity, and air temperature.  
760

761 When conditions are such that problems with plastic cracking can be expected, and  
762 particularly if any plastic cracking begins to occur, the Contractor shall immediately take  
763 such additional measures as necessary to protect the concrete surface. Such measures  
764 shall consist of wind screens, more effective fog sprays, and similar measures  
765 commencing immediately behind the paver. If these measures are not effective in  
766 preventing plastic cracking, paving operations shall be immediately stopped.  
767

768 C. Prior to the start of paving operation for each day of paving, the Contractor shall provide  
769 the Project Manager with a Temperature Management Program for the concrete to be  
770 placed to assure that uncontrolled cracking is avoided. As a minimum the program shall  
771 address the following items:  
772

773 (1) Anticipated tensile strains in the fresh concrete as related to heating and cooling  
774 of the concrete material.  
775

776 (2) Anticipated weather conditions such as ambient temperatures, wind velocity, and  
777 relative humidity.  
778

779 (3) Anticipated timing of initial sawing of joint.  
780

781 4.08 PLACING CONCRETE. The Contractor has the option of side (fixed) form or slip-form paving. At  
782 any point in concrete conveyance, the free vertical drop of the concrete from one point to another  
783 or to the underlying surface shall not exceed 3 feet (1 m) or as approved by the Project Manager  
784 or their representative provided the aggregate and mortar are not separated during placement.  
785 Concrete may be dumped on grade from the hauling equipment provided that the dumping does  
786 not increase the segregation of the material. Backhoes and Grading equipment shall not be used  
787 to distribute the concrete in front of the paver. Front-end loaders will not be used unless the  
788 contractor demonstrates that they can be used without contaminating the concrete and base  
789 course and it is approved by the DIA Project Manager.  
790

791 Hauling equipment or other mechanical equipment can be permitted on adjoining previously  
792 constructed pavement when the concrete strength reaches a flexural strength of 550 psi, based  
793 on the average of four field cured specimens per 2,000 cubic yards of concrete placed.  
794 Subgrade and subbase planers, concrete pavers, and concrete finishing equipment may be  
795 permitted to ride upon the edges of previously constructed pavement when the concrete has  
796 attained a minimum flexural strength of 400 psi. Results of the field cured specimens shall be  
797 provided to the Project Manager prior to the pavement receiving any traffic.  
798

799 A. Slip-Form Construction. The concrete shall be distributed uniformly into final position by  
800 a self propelled slip-form paver without delay. The alignment and elevation of the paver

801 shall be regulated from outside reference lines established for this purpose. The paver  
802 shall vibrate the concrete for the full width and depth of the strip of pavement being  
803 placed and the vibration shall be adequate to provide a consistency of concrete that will  
804 stand normal to the surface with sharp well defined edges. The sliding forms shall be  
805 rigidly held together laterally to prevent spreading of the forms.  
806

807 The plastic concrete shall be effectively consolidated by internal vibration with transverse  
808 vibrating units for the full width of the pavement and/or a series of equally placed  
809 longitudinal vibrating units. The space from the outer edge of the pavement to  
810 longitudinal unit shall not exceed 9 inches for slip-form and at the end of the dowels for  
811 the fill-in lanes. The spacing of internal units shall be uniform and shall not exceed 18  
812 inches.  
813

814 The Area around light cans, block outs, ect shall be consolidated with hand vibrators to  
815 assure proper consolidation.  
816

817 The term internal vibration means vibrating units located within the specified thickness of  
818 pavement section.  
819

820 The rate of vibration of each vibrating unit shall be within 8,000 to 12,000 cycles per  
821 minute and the amplitude of vibration shall be sufficient to be perceptible on the surface  
822 of the concrete along the entire length of the vibrating unit and for a distance of at least  
823 one foot. The frequency of vibration or amplitude shall vary proportionately with the rate  
824 of travel to result in a uniform density and air content. The paving machine shall be  
825 equipped with a tachometer or other suitable device for measuring and indicating the  
826 actual frequency of vibrations. If at any point pavement consolidation becomes  
827 questionable, operations shall be halted, and all vibrators verified for frequency.  
828

829 The concrete shall be held at a uniform consistency. The slip-form paver shall be  
830 operated with as nearly a continuous forward movement as possible. And all operations  
831 of mixing, delivering, and spreading concrete shall be coordinated to provide uniform  
832 progress with stopping and starting of the paver held to a minimum. If for any reason, it is  
833 necessary to stop the forward movement of the paver, the vibratory and tamping  
834 elements shall also be stopped immediately. No tractive force shall be applied to the  
835 machine, except that which is controlled from the machine.  
836

837 When concrete is being placed adjacent to an existing pavement, that part of the  
838 equipment which is supported on the existing pavement shall be equipped with protective  
839 pads on crawler tracks or rubber-tired wheels on which the bearing surface is offset to  
840 run a sufficient distance from the edge of the pavement to avoid breaking the pavement  
841 edge.  
842

- 843 B. Side-Form Construction. Side form sections shall be straight, free from warps, bends,  
844 indentations, or other defects. Defective forms shall be removed from the work. Metal  
845 side forms shall be used except at end closures and transverse construction joints where  
846 straight forms of other suitable material may be used.  
847

848 Side forms may be built up by rigidly attaching a section to either top or bottom of forms.  
849 If such build-up is attached to the top of metal forms, the build-up shall also be metal.  
850

851 Side forms shall be of sufficient rigidity, both in the form and in the interlocking  
852 connection with adjoining forms, that springing will not occur under the weight of  
853 subgrading and paving equipment or from the pressure of the concrete. The Contractor  
854 shall provide sufficient forms so that there will be no delay in placing concrete due to lack  
855 of forms. The use of false form work for the purpose of load barring for paving equipment  
856 will not be allowed.  
857



858 Before placing side forms, the underlying material shall be at the proper grade. Side  
859 forms shall have full bearing upon the foundation throughout their length and width of  
860 base and shall be placed to the required grade and alignment of the finished pavement.  
861 They shall be firmly supported during the entire operation of placing, compacting, and  
862 finishing the pavement.

863  
864 Forms shall be drilled in advance of being placed to line and grade to accommodate tie  
865 bars where these are specified.

866  
867 Immediately in advance of placing concrete and after all subbase operations are  
868 completed, side forms shall be trued and maintained to the required line and grade for a  
869 distance sufficient to prevent delay in placing.

870  
871 Side forms shall remain in place at least 12 hours after the concrete has been placed,  
872 and in all cases until the edge of pavement no longer requires the protection of the forms.  
873 Curing compound shall be applied to the concrete immediately after the forms have  
874 been removed.

875  
876 Side forms shall be thoroughly cleaned and oiled each time they are used and before  
877 concrete is placed against them.

878  
879 Concrete shall be spread, screeded, shaped and consolidated by one or more self-  
880 propelled machines. These machines shall uniformly distribute and consolidate concrete  
881 without segregation so that the completed pavement will conform to the required cross  
882 section with a minimum of handwork.

883  
884 The number and capacity of machines furnished shall be adequate to perform the work  
885 required at a rate equal to that concrete delivery.

886  
887 Concrete for the full paving width shall be effectively consolidated by internal vibrators  
888 without causing segregation. Internal type vibrator's rate of vibration shall be not less  
889 than 8,000 cycles per minute. Amplitude of vibration shall be sufficient to be perceptible  
890 on the surface of concrete more than one foot from the vibrating element. The Contractor  
891 shall furnish a tachometer or other suitable device for measuring and indicating  
892 frequency of vibration.

893  
894 Power to vibrators shall be connected so that vibration ceases when forward or backward  
895 motion of the machine is stopped.

896  
897 The Contractor shall be responsible for providing sufficient frequency and amplitude  
898 above the minimum specified to ensure adequate density in the hardened concrete.

899  
900 C. Consolidation Testing. The provisions relating to the frequency and amplitude of internal  
901 vibration shall be considered the minimum requirements and are intended to ensure  
902 adequate density in the hardened concrete. If a lack of consolidation of the concrete is  
903 suspected by the Project Manager, additional referee testing may be required. Referee  
904 testing of hardened concrete will be performed by cutting cores from the finished  
905 pavement after a minimum of 24 hours curing. Density determinations will be made  
906 based on the water content of the core as taken. ASTM C 642 shall be used for the  
907 determination of core density in the saturated-surface dry condition. Referee cores will be  
908 taken at the minimum rate of one for each 500 cubic yards of pavement, or fraction there  
909 of.

910  
911 The average density of the cores shall be at least 97 percent of the original mix design  
912 density, with no cores having a density of less than 96 percent of the original mix design  
913 density.

914

915 Failure to meet the above requirements will be considered as evidence that the minimum  
916 requirements for vibration are inadequate for the job conditions, and additional vibrating  
917 units or other means of increasing the effect of vibration shall be employed so that the  
918 density of the hardened concrete as indicated by further referee testing shall conform to  
919 the above listed requirements. All failing concrete shall be removed and replaced.  
920

921 4.09 STRIKE-OFF OF CONCRETE AND PLACEMENT OF REINFORCEMENT. Following the placing  
922 of the concrete, it shall be struck off to conform to the cross section shown on the plans and to an  
923 elevation such that when the concrete is properly consolidated and finished, the surface of the  
924 pavement shall be at the elevation shown on the plans. When reinforced concrete pavement is  
925 placed in two layers, the bottom layer shall be struck off to such length and depth that the sheet  
926 of reinforcing steel fabric or bar mat may be laid full length on the concrete in its final position  
927 without further manipulation. The reinforcement shall then be placed directly upon the concrete,  
928 after which the top layer of the concrete shall be placed, struck off, and screeded. If any portion  
929 of the bottom layer of concrete has been placed more than 30 minutes without being covered  
930 with the top layer or if initial set has taken place, it shall be removed and replaced with freshly  
931 mixed concrete at the Contractor's expense. When reinforced concrete is placed in one layer, the  
932 reinforcement shall be positioned in advance of concrete placement and placed on chairs or  
933 stands that are epoxy coated on the bottom to prevent corrosion.  
934

935 Reinforcing steel, at the time concrete is placed, shall be free of mud, oil, or other organic matter  
936 that may adversely affect or reduce bond. Reinforcing steel with rust, mill scale or a combination  
937 of both will be considered satisfactory, provided the minimum dimensions, weight, and tensile  
938 properties of a hand wire-brushed test specimen are not less than the applicable ASTM  
939 specification requirements.  
940

941 4.10 JOINTS. Joints shall be constructed as shown on the plans and in accordance with these  
942 requirements. All joints shall be constructed with their faces perpendicular to the surface of the  
943 pavement and finished or edged as shown on the plans. Joints shall not vary more than 1/2 inch  
944 (13 mm) from their designated position and shall be true to line with not more than 1/4-inch (6  
945 mm) variation in 10 feet (3 m). Any effected portion of pavement in which the installed joint varies  
946 by more than 1/2 inch (13 mm) from the designated location or a 1/4 inch (6 mm) in 10 feet (3 m)  
947 shall be immediately removed and replaced as described herein at the sole expense of the  
948 Contractor. The surface across the joints shall be tested with a Contractor furnished 10-foot (3 m)  
949 straightedge as the joints are finished and any irregularities in excess of 1/4 inch (6 mm) shall be  
950 corrected before the concrete has hardened. All joints shall be so prepared, finished, or cut to  
951 provide a groove of uniform width and depth as shown on the plans.  
952

953 A. Construction. Longitudinal construction joints shall be slip-formed or formed against side  
954 forms without keyways, as shown in the plans.  
955

956 Transverse construction joints shall be installed at the end of each day's placing  
957 operations and at any other points within a paving lane when concrete placement is  
958 interrupted for more than 30 minutes or it appears that the concrete will obtain its initial  
959 set before fresh concrete arrives. The installation of the joint shall be located at a planned  
960 contraction or expansion joint. If placing of the concrete is stopped, the Contractor shall  
961 remove the excess concrete back to the previous planned joint.  
962

963 B. Contraction. Contraction joints shall be installed at the locations and spacing as shown  
964 on the plans. Contraction joints shall be installed to the dimensions required by forming a  
965 groove or cleft in the top of the slab while the concrete is still plastic or by sawing a  
966 groove into the concrete surface after the concrete has hardened. When the groove is  
967 formed in plastic concrete the sides of the grooves shall be finished even and smooth  
968 with an edging tool. If an insert material is used, the installation and edge finish shall be  
969 according to the manufacturer's instructions. The groove shall be finished or cut clean so  
970 that spalling will be avoided at intersections with other joints. Grooving or sawing shall  
971 produce a slot at least 1/8 inch (3 mm) wide and to the depth shown on the plans.

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C. Expansion. Expansion joints shall be installed as shown on the plans. The premolded filler of the thickness as shown on the plans, shall extend for the full depth and width of the slab at the joint, except for space for sealant at the top of the slab. The filler shall be securely staked or fastened into position perpendicular to the proposed finished surface. A cap shall be provided to protect the top edge of the filler and to permit the concrete to be placed and finished. After the concrete has been placed and struck off, the cap shall be carefully withdrawn leaving the space over the premolded filler. The edges of the joint shall be finished and tooled while the concrete is still plastic. Any concrete bridging the joint space shall be removed for the full width and depth of the joint. Premolded filler shall be removed full depth of joint before sealant is placed.

D. Keyways. Keyways are not permitted.

E. Tie Bars. Tie bars shall consist of deformed bars installed in joints as shown on the plans. Tie bars shall be placed at right angles to the centerline of the concrete slab and shall be spaced at intervals shown on the plans. They shall be held in position parallel to the pavement surface and in the middle of the slab depth. When tie bars extend into an unpaved lane, they may be bent against the form at longitudinal construction joints, unless threaded bolt or other assembled tie bars are specified. These bars shall not be painted, greased, or enclosed in sleeves.

F. Dowel Bars. Dowel bars or other load-transfer units of an approved type shall be placed across joints in the manner as shown on the plans. They shall be of the dimensions and spacings as shown and held rigidly in the middle of the slab depth in the proper horizontal and vertical alignment by an approved assembly device to be left permanently in place. The dowel or load-transfer and joint devices shall be rigid enough to permit complete assembly as a unit ready to be lifted and placed into position. A metal, or other type, dowel expansion cap or sleeve shall be furnished for each dowel bar used with expansion joints. These caps shall be substantial enough to prevent collapse and shall be placed on the ends of the dowels as shown on the plans. The caps or sleeves shall fit the dowel bar tightly and the closed end shall be watertight. The portion of each dowel epoxy coated, as required under paragraph 2.07, and as shown on the plans to receive a debonding lubricant, shall be thoroughly coated with asphalt MC-70, or an approved lubricant, to prevent the concrete from bonding to that portion of the dowel. Where butt-type joints with dowels are designated, the exposed end of the dowel shall be oiled.

G. Installation of Joint Devices. All joint devices shall be approved by the Project Manager. The top of an assembled joint device shall be set at the proper distance below the pavement surface and the elevation shall be checked. Such devices shall be set to the required position and line and shall be securely held in place by stakes or other means to the maximum permissible tolerances during the placing and finishing of the concrete. Where premolded joint material is used, it shall be placed and held in a vertical position; if constructed in sections, there shall be no offsets between adjacent units.

Dowel bars and assemblies shall be checked for position and alignment. The maximum permissible tolerances on dowel bar alignment shall be in accordance with paragraph 5.02E(8). During the concrete placement operation, it is advisable to place plastic concrete directly on dowel assemblies immediately prior to passage of the paver to help maintain dowel position and alignment within maximum permissible tolerances. Grout disks may be necessary to retain the epoxy in the hole until it hardens.

When concrete is placed using slip-form pavers, dowels and tie bars shall be placed in longitudinal construction joints by bonding the dowels or tie bars into holes drilled into the hardened concrete. Holes approximately 1/8-inch to 1/4-inch (3 to 6 mm) greater in diameter than the dowel or tie bar shall be drilled with rotary-type core drills that must be held securely in place to drill perpendicularly into the vertical face of the pavement slab.

1029 Rotary-type percussion drills may be used provided that spalling of concrete does not  
1030 occur. In the event new light can installation will interfere with the drilling and installation  
1031 of dowels, drilling shall be completed prior to the installation of light cans. Any damage of  
1032 the concrete shall be repaired by the Contractor in a method approved by the Project  
1033 Manager. Dowels or tie bars shall be bonded in the drilled holes using an epoxy resin  
1034 material. Installation procedures shall be adequate to insure that the area around dowels  
1035 is completely filled with epoxy grout. Epoxy shall be injected into the back of the hole  
1036 and displaced by the insertion of the dowel bar. Bars shall be completely inserted into  
1037 the hole and shall not be withdrawn and reinserted creating air pockets in the epoxy  
1038 around the bar. The Contractor shall furnish a template for checking the position and  
1039 alignment of the dowels. Dowel bars shall not be less than 10 inches (25 cm) from a  
1040 transverse joint and shall not interfere with dowels in the transverse direction.

1041  
1042 H. Sawing of Joints - Joints shall be cut as shown on the plans. Equipment shall be as  
1043 described in paragraph 4.01. The circular cutter shall be capable of cutting a groove in a  
1044 straight line and shall produce a slot at least 1/8 inch (3 mm) wide and to the depth  
1045 shown on the plans. The top portion of the slot shall be widened by sawing to provide  
1046 adequate space for joint sealers as shown on the plans. Sawing shall commence as  
1047 soon as the concrete has hardened sufficiently to permit cutting without chipping,  
1048 spalling, or tearing and before uncontrolled shrinkage cracking of the pavement occurs.  
1049 Sawing shall be carried on both during the day and night as required. The joints shall be  
1050 sawed at the required spacing, consecutively in sequence of the concrete placement.  
1051 Joints shall be cleaned using high pressure water or a vacuum immediately after sawing.  
1052 Curing compound, if being used as the cure type, shall be reapplied in the initial sawcut  
1053 and maintained for the remaining cure period.

1054  
1055 4.11 FINAL STRIKE-OFF, CONSOLIDATION, AND FINISHING

1056  
1057 A. Sequence. The sequence of operations shall be the strike-off, floating and removal of  
1058 laitance, straightedging, and final surface finish. The addition of superficial water to the  
1059 surface of the concrete to assist in finishing operations will not be permitted.

1060  
1061 B. Finishing at Joints. The concrete adjacent to joints shall be compacted or firmly placed  
1062 without voids or segregation against the joint material; it shall be firmly placed without  
1063 voids or segregation under and around all load-transfer devices, joint assembly units,  
1064 and other features designed to extend into the pavement. Concrete adjacent to joints  
1065 shall be mechanically vibrated as required in paragraph 4.08A. After the concrete has  
1066 been placed and vibrated adjacent to the joints, the finishing machine shall be operated  
1067 in a manner to avoid damage or misalignment of joints. If uninterrupted operations of the  
1068 finishing machine, to, over, and beyond the joints, cause segregation of concrete,  
1069 damage to, or misalignment of the joints, the finishing machine shall be stopped when  
1070 the screed is approximately 8 inches (20 cm) from the joint. Segregated concrete shall  
1071 be removed from the front of and off the joint; and the forward motion of the finishing  
1072 machine shall be resumed. Thereafter, the finishing machine may be run over the joint  
1073 without lifting the screed, provided there is no segregated concrete immediately between  
1074 the joint and the screed or on top of the joint.

1075  
1076 C. Machine Finishing. The concrete shall be spread as soon as it is placed, and it shall be  
1077 struck off and screeded by a finishing machine. The machine shall go over each area as  
1078 many times and at such intervals as necessary to give to proper consolidation and to  
1079 leave a surface of uniform texture. Excessive operation over a given area shall be  
1080 avoided. When side forms are used, the tops of the forms shall be kept clean by an  
1081 effective device attached to the machine, and the travel of the machine on the forms shall  
1082 be maintained true without lift, wobbling, or other variation tending to affect the precision  
1083 finish. During the first pass of the finishing machine, a uniform ridge of concrete shall be  
1084 maintained ahead of the front screed for its entire length. When in operation, the screed  
1085 shall be moved forward with a combined longitudinal and transverse shearing motion,

1086 always moving in the direction in which the work is progressing, and so manipulated that  
1087 neither end is raised from the side forms during the striking-off process. If necessary, this  
1088 shall be repeated until the surface is of uniform texture, true to grade and cross section,  
1089 and free from porous areas.

1090  
1091 D. Hand Finishing. Hand finishing methods will not be permitted, except under the following  
1092 conditions: in the event of breakdown of the mechanical equipment, hand methods may  
1093 be used to finish the concrete already deposited on the grade; in areas of narrow widths  
1094 or of irregular dimensions where operation of the mechanical equipment is impractical.  
1095 Concrete, as soon as placed, shall be struck off and screeded. An approved portable  
1096 screed shall be used. A second screed shall be provided for striking off the bottom layer  
1097 of concrete when reinforcement is used.

1098  
1099 The screed for the surface shall be a least 2 feet (0.6 m) longer than the maximum width  
1100 of the slab to be struck off. It shall be of approved design, sufficiently rigid to retain its  
1101 shape, and shall be constructed either of metal or of other suitable material covered with  
1102 metal. Consolidation shall be attained by the use of suitable vibrators.

1103  
1104 E. Floating. After the concrete has been struck off and consolidated, it shall be further  
1105 smoothed and trued by means of a longitudinal float using one of the following methods:

1106  
1107 (1) Hand Method. Long-handled floats shall not be less than 12 feet (3.6 m) in length  
1108 and 6 inches (15 cm) in width, stiffened to prevent flexibility and warping. The  
1109 float shall be operated from foot bridges spanning but not touching the concrete  
1110 or from the edge of the pavement. Floating shall pass gradually from one side of  
1111 the pavement to the other. Forward movement along the centerline of the  
1112 pavement shall be in successive advances of not more than one-half the length  
1113 of the float. Any excess water or laitance in excess of 1/8-inch (3 mm) thick shall  
1114 be removed and wasted.

1115  
1116 (2) Mechanical Method. The Contractor may use a machine composed of a cutting  
1117 and smoothing float(s), suspended from and guided by a rigid frame and  
1118 constantly in contact with, the side forms or underlying surface. If necessary,  
1119 long-handled floats having blades not less than 5 feet (1.5 m) in length and 6  
1120 inches (15 cm) in width may be used to smooth and fill in open-textured areas in  
1121 the pavement. When the crown of the pavement will not permit the use of the  
1122 mechanical float, the surface shall be floated transversely by means of a  
1123 long-handled float. Care shall be taken not to work the crown out of the  
1124 pavement during the operation. After floating, any excess water and laitance in  
1125 excess of 1/8-inch (3 mm) thick shall be removed and wasted. Successive drags  
1126 shall be lapped one-half the length of the blade.

1127  
1128 F. Straight-edge Testing and Surface Correction. After the pavement has been struck off  
1129 and while the concrete is still plastic, it shall be tested for trueness with a Contractor  
1130 furnished 16-foot (4.8 m) straightedge swung from handles 3 feet (1 m) longer than  
1131 one-half the width of the slab. The straightedge shall be held in contact with the surface  
1132 in successive positions parallel to the centerline and the whole area gone over from one  
1133 side of the slab to the other, as necessary. Advancing shall be in successive stages of  
1134 not more than one-half the length of the straightedge. Any excess water and laitance in  
1135 excess of 1/8-inch (3 mm) thick shall be removed from the surface of the pavement and  
1136 wasted. Any depressions, including areas around light cans, shall be immediately filled  
1137 with freshly mixed concrete, struck off, consolidated, and refinished. High areas shall be  
1138 cut down and refinished. Special attention shall be given to assure that the surface  
1139 across joints meets the smoothness requirements of paragraph 5.02E(3). Straightedge  
1140 testing and surface corrections shall continue until the entire surface is found to be free  
1141 from observable departures from the straightedge and until the slab conforms to the  
1142 required grade and cross section. The use of long-handled wood floats shall be confined

1143 to a minimum; they may be used only in emergencies and in areas not accessible to  
1144 finishing equipment.  
1145

1146 4.12 SURFACE TEXTURE. The surface of the pavement shall be finished with either a broom, burlap  
1147 drag, or artificial turf finish for all newly constructed concrete pavements. It is important that the  
1148 texturing equipment not tear or unduly roughen the pavement surface during the operation. Any  
1149 imperfections resulting from the texturing operation shall be corrected.  
1150

1151 A. Brush or Broom Finish. If the pavement surface texture is to be a type of brush or broom  
1152 finish, it shall be applied when the water sheen has practically disappeared. The  
1153 equipment shall operate transversely across the pavement surface, providing  
1154 corrugations that are uniform in appearance and approximately 1/16 of an inch (2 mm) in  
1155 depth.  
1156

1157 B. Burlap Drag Finish. If a burlap drag is used to texture the pavement surface, it shall be at  
1158 least 15 ounces per square yard (555 grams per square meter). To obtain a textured  
1159 surface, the transverse threads of the burlap shall be removed approximately 1 foot (0.3  
1160 m) from the trailing edge. A heavy buildup of grout on the burlap threads produces the  
1161 desired wide sweeping longitudinal striations on the pavement surface. The corrugations  
1162 shall be uniform in appearance and approximately 1/16 of an inch (2 mm) in depth.  
1163

1164 C. Artificial Turf Finish. If artificial turf is used to texture the surface, it shall be applied by  
1165 dragging the surface of the pavement in the direction of concrete placement with an  
1166 approved full-width drag made with artificial turf. The leading transverse edge of the  
1167 artificial turf drag will be securely fastened to a lightweight pole on a traveling bridge. At  
1168 least 2 feet of the artificial turf shall be in contact with the concrete surface during  
1169 dragging operations. A variety of different types of artificial turf are available and approval  
1170 of any one type will be done only after it has been demonstrated by the Contractor to  
1171 provide a satisfactory texture. One type that has provided satisfactory texture consists of  
1172 7,200 approximately 0.85-inches-long polyethylene turf blades per square foot. The  
1173 corrugations shall be uniform in appearance and approximately 1/16 of an inch (2 mm) in  
1174 depth.  
1175

1176 4.13 SAW-CUT GROOVES. Grooving shall not commence until all grinding has been completed, the  
1177 final profile completed, and the pavement surface has been accepted for smoothness in writing  
1178 by the Project Manger. At locations shown on the plans, new concrete pavements that have hard-  
1179 ened, transverse grooves shall be saw-cut in the pavement forming a 1/4 inch (6 mm) by 1/4 inch  
1180 (6 mm) deep by 1-1/2 inches (37 mm) center to center configuration. The grooves shall be  
1181 continuous for the entire pavement length. They shall be saw-cut transversely in the pavement to  
1182 within 10 feet (3 m) of the pavement edge to allow adequate space for equipment operation. The  
1183 maximum transverse saw-cut grooves shall not exceed 130 feet (40 m). The tolerances for the  
1184 saw-cut grooves shall meet the following:  
1185

1186 Alignment tolerance

1187 Plus or minus 1-1/2 inches (37 mm) in alignment for 75 feet (23 m)

1188 Groove tolerance

1189 Minimum depth 3/16 inch (5 mm), except that not more than 60 percent of the grooves shall  
1190 be less than 1/4 inch (6 mm)

1191 Maximum depth 5/16 inch (8 mm)

1192 Minimum width ¼ inch (6mm)

1193 Maximum width 5/16 inch (8 mm)  
1194  
1195  
1196  
1197  
1198  
1199

- 1200  
1201 Center-to-center spacing  
1202  
1203 Minimum spacing 1-3/8 inches (35 mm)  
1204  
1205 Maximum spacing 1-5/8 inches (38 mm).  
1206  
1207 Saw-cut grooves shall not be closer than 3 inches (76 mm) or more than 9 inches (229 mm) to  
1208 transverse paving joints. Grooves shall not be closer than 6 inches (152 mm) and no more than  
1209 18 inches (457 mm) from in-pavement light fixtures. If grooving damages in-pavement light cans  
1210 the can shall be replaced by removing the complete panel as detailed in paragraph 4.19 F.  
1211 Grooves shall be continued through longitudinal construction joints. Cleanup of waste material  
1212 shall be continuous during the grooving operation. Waste material shall be disposed of in an  
1213 approved manner. Waste material shall not be allowed to enter the airport storm or sanitary  
1214 sewer system.  
1215  
1216 4.14 CURING. Immediately after finishing operations are completed and marring of the concrete will  
1217 not occur, the entire surface of the newly placed concrete shall be cured in accordance with one  
1218 of the methods below. Failure to provide sufficient cover material of whatever kind the Contractor  
1219 may elect to use, or lack of water to adequately take care of both curing and other requirements,  
1220 shall be cause for immediate suspension of concreting operations. The concrete shall not be left  
1221 exposed for more than 1/2 hour during the curing period of 7 days. The use of fly ash or set-  
1222 retarding admixtures may delay the occurrence of bleed water. Curing shall be applied after the  
1223 bleed water is gone from the surface.  
1224  
1225 The sealant reservoir shall not be sawed until after the curing period has been completed. .  
1226  
1227 A. Impervious Membrane Method. The entire surface of the pavement shall be sprayed  
1228 uniformly with white pigmented curing compound immediately after the finishing of the  
1229 surface and before the set of the concrete has taken place. The curing compound shall  
1230 not be applied during rainfall. Curing compound shall be applied by mechanical sprayers  
1231 under pressure at the rate of 1 gallon (4 liters) to not more than 150 square feet (14  
1232 square meters). The spraying equipment shall be of the fully atomizing type equipped  
1233 with a tank agitator. At the time of use, the compound shall be in a thoroughly mixed  
1234 condition with the pigment uniformly dispersed throughout the vehicle. During application  
1235 the compound shall be stirred continuously by mechanical means. Hand spraying of odd  
1236 widths or shapes and concrete surfaces exposed by the removal of forms will be  
1237 permitted. The curing compound shall be of such character that the film will harden within  
1238 30 minutes after application. Should the film become damaged from any cause, including  
1239 sawing operations, within the required curing period, the damaged portions shall be  
1240 repaired immediately with additional compound or other approved means. Upon removal  
1241 of side forms, the sides of the exposed slabs shall be protected immediately to provide a  
1242 curing treatment equal to that provided for the surface.  
1243  
1244 B. Polyethylene Films. The top surface and sides of the pavement shall be entirely covered  
1245 with polyethylene sheeting. The units shall be lapped at least 18 inches (457 mm). The  
1246 sheeting shall be placed and weighted to cause it to remain in contact with the surface  
1247 and sides. The sheeting shall have dimensions that will extend at least twice the  
1248 thickness of the pavement beyond the edges of the pavement. Unless otherwise  
1249 specified, the sheeting shall be maintained in place for 7 days after the concrete has  
1250 been placed.  
1251  
1252 C. Waterproof Paper. The top surface and sides of the pavement shall be entirely covered  
1253 with waterproofed paper. The units shall be lapped at least 18 inches (457 mm). The  
1254 paper shall be placed and weighted to cause it to remain in contact with the surface  
1255 covered. The paper shall have dimensions that will extend at least twice the thickness of  
1256 the pavement beyond the edges of the slab. The surface of the pavement shall be

1257 thoroughly saturated prior to placing of the paper. Unless otherwise specified, the paper  
1258 shall be maintained in place for 7 days after the concrete has been placed.  
1259

1260 D. White Burlap-Polyethylene Sheets. The surface of the pavement shall be entirely covered  
1261 with the sheeting. The sheeting used shall be such length (or width) that it will extend at  
1262 least twice the thickness of the pavement beyond the edges of the slab. The sheeting  
1263 shall be placed so that the entire surface and both edges of the slab are completely  
1264 covered. The sheeting shall be placed and weighted to remain in contact with the surface  
1265 covered, and the covering shall be maintained fully saturated and in position for 7 days  
1266 after the concrete has been placed.  
1267

1268 E. Water Method. The entire area shall be covered with burlap or other water absorbing  
1269 material. The material shall be of sufficient thickness to retain water for adequate curing  
1270 without excessive runoff. The material shall be kept wet at all times for 7 days after the  
1271 concrete has been placed. When the forms are stripped, the vertical walls shall also be  
1272 kept moist. It shall be the responsibility of the Contractor to prevent ponding of the curing  
1273 water on the subbase.  
1274

1275 4.15 REMOVING FORMS. Unless otherwise specified, forms shall not be removed from freshly placed  
1276 concrete until it has hardened sufficiently to permit removal without chipping, spalling, or tearing.  
1277 After the forms have been removed, the sides of the slab shall be cured as outlined in one of the  
1278 methods indicated in paragraph 4.14. Major honeycombed areas shall be considered as  
1279 defective work and shall be removed and replaced in accordance with paragraph 5.02F.  
1280

1281 4.16 SEALING JOINTS. The joints in the pavement shall be sealed in accordance with the applicable  
1282 specifications.  
1283

1284 4.17 PROTECTION OF PAVEMENT. The Contractor shall protect the pavement and its  
1285 appurtenances against both public traffic and traffic caused by the Contractor's employees and  
1286 agents. This shall include workers to direct traffic and the erection and maintenance of warning  
1287 signs, lights, pavement bridges, crossovers, and protection of unsealed joints from intrusion of  
1288 foreign material, etc. Any damage to the pavement occurring prior to final acceptance shall be  
1289 repaired or the pavement replaced at the Contractor's expense. The Contractor shall have  
1290 available at all times, materials for the protection of the edges and surface of the unhardened  
1291 concrete. Such protective materials shall consist of rolled polyethylene sheeting at least 4 mils  
1292 (0.1 mm) thick of sufficient length and width to cover the plastic concrete slab and any edges.  
1293 The sheeting may be mounted on either the paver or a separate movable bridge from which it  
1294 can be unrolled without dragging over the plastic concrete surface. When rain appears imminent,  
1295 all paving operations shall stop and all available personnel shall begin covering the surface of the  
1296 unhardened concrete with the protective covering. Damaged pavements shall be removed and  
1297 replaced at the Contractor's expense. Slabs shall be removed to the full depth, width, and length  
1298 of the slab. The Project Manager may evaluate the damage to determine if diamond grinding can  
1299 correct the surface and provide the required smoothness, grade, and thickness required by the  
1300 Contract.  
1301

1302 All embedments in the pavement surface shall be made by diamond coring or sawing in a  
1303 manner that will not chip or spall the surface.  
1304

1305 A. Curing in Cold Weather. The concrete shall be maintained at a temperature of at least  
1306 50 degrees F (10 degrees C) for a period of 72 hours after placing and at a temperature  
1307 above freezing for the remainder of the curing time. The Contractor shall be responsible  
1308 for the quality and strength of the concrete placed during cold weather, and any concrete  
1309 injured by frost action shall be removed and replaced at the Contractor's expense.  
1310 Additional requirements for cold weather concreting can be found in ACI 306 R.  
1311

1312 B. Protection in Hot Weather. Requirements for hot weather concreting can be found in ACI  
1313 305 R.



1314  
1315 4.18 OPENING TO TRAFFIC. The pavement shall not be opened to traffic until test specimens  
1316 molded and cured in accordance with ASTM C 31 have attained a flexural strength of 550  
1317 pounds per square inch (3792 kPa) on Taxiways and around boarding gates and a flexural  
1318 strength of 700 pounds per square inch on all runways when tested in accordance with ASTM C  
1319 78. Prior to opening the pavement to construction or aircraft traffic the pavement shall be  
1320 cleaned, and all joints shall either be sealed or protected from damage to the joint edge and  
1321 intrusion of foreign materials into the joint. As a minimum, backer rod or tape may be used to  
1322 protect the joints from foreign matter intrusion. The pavement shall be cleaned before opening for  
1323 normal operations.  
1324

1325 4.19 REPAIR, REMOVAL, REPLACEMENT OF SLABS  
1326

1327 A. General. New pavement slabs that are broken or contain cracks shall be removed and  
1328 replaced or repaired, as specified hereinafter at no cost to the Owner. Spalls along joints  
1329 shall be repaired as specified. Removal of partial slabs is not permitted. Removal and  
1330 replacement shall be full depth, shall be full width of the slab, and the limit of removal  
1331 shall be normal to the paving lane and to each original joint. The Project Manager shall  
1332 determine whether cracks extend full depth of the pavement and shall require cores to be  
1333 drilled on the crack to determine depth of cracking. Such cores shall be 4-inch (100 mm)  
1334 diameter, shall be drilled by the Contractor and shall be filled by the Contractor with a  
1335 well consolidated concrete mixture bonded to the walls of the hole with epoxy resin, using  
1336 approved procedures. Drilling of cores and refilling holes shall be at no expense to the  
1337 Owner. All epoxy resin used in this work shall conform to ASTM C 881, Type V.  
1338

1339 (1) Cracks That Do Not Exceed 4 inches in depth (including plastic shrinkage  
1340 cracks). Cracks that do not exceed 4 inches in depth shall be cleaned and then  
1341 pressure injected with epoxy resin, Type IV, Grade 1, using procedures as  
1342 approved. Care shall be taken to assure that the crack is not widened during  
1343 epoxy resin injection. All epoxy resin injection shall take place in the presence of  
1344 the Project Manager. Cracks that are greater than 4 inches deep shall be treated  
1345 in accordance with paragraphs 4.19B and 4.19C.  
1346

1347 B. Slabs With Cracks through Interior Areas. Interior area is defined as that area more than  
1348 6 inches (600 mm) from any designed joint location. Slabs with any cracks greater than 4  
1349 inches deep, that extend into the interior area, regardless of direction, shall be removed  
1350 and replaced as specified in paragraph 4.19D.  
1351

1352 (1) Cracks That Do Not Extend Full Depth of Slab. These cracks, and similar cracks  
1353 within the areas 6 inches (600 mm) each side of transverse joints, shall be  
1354 cleaned and then pressure injected with epoxy resin, Type IV, Grade 1, using  
1355 procedures as approved by the Project Manager. Care shall be taken to assure  
1356 that the crack is not widened during epoxy resin injection. All epoxy resin  
1357 injection shall take place in the presence of the Project Manager. Any crack or  
1358 spall repairs on newly placed concrete shall have an extended warranty of seven  
1359 (7) years.  
1360

1361 (2) Cracks That Extend Full Depth of Slab. Where there is any full depth crack, the  
1362 full slab shall be removed and replaced at no cost to the Owner.  
1363

1364 C. Cracks Close To and Parallel To Transverse Joints. All cracks essentially parallel to  
1365 original joints, extending deeper than 4 inches, and lying wholly within 6 inches either  
1366 side of the joint shall be treated as specified in the following subparagraphs. Any crack  
1367 extending more than 6 inches (600 mm) from the transverse joint shall be treated as  
1368 specified above in subparagraph "Slabs With Cracks Through Interior Area." Any cracks  
1369 which do not extend 4 inches deep shall be treated as specified above in subparagraph  
1370 4.19A.(1). Any slab containing a crack greater than 4 inches deep is to be removed and  
1371

1371 replaced, regardless of location, when P-605 Compression Joint seals are used or if the  
1372 joint is reinforced.  
1373

1374 (1) Cracks Greater Than 4-inches in Depth Present, Original Joint Not Opened.  
1375 When the original uncracked joint has not opened, the crack shall be routed and  
1376 sealed, and the original joint filled with epoxy resin as specified below. The crack  
1377 shall be routed with an easily guided, wheel mounted, vertical shaft, powered  
1378 rotary router designed so the routing spindle will caster as it moves along the  
1379 crack. The reservoir for joint sealant in the crack shall be formed by routing to a  
1380 depth of 3/4 inch, plus or minus 1/16 inch, and to a width of 5/8 inch, plus or  
1381 minus 1/8 inch. Any equipment or procedure which causes raveling or spalling  
1382 along the crack shall be modified or replaced to prevent such raveling or spalling.  
1383 The joint sealant shall be a liquid sealant as specified. Installation of joint seal  
1384 shall be as specified for sealing joints or as directed. If the joint sealant reservoir  
1385 has been sawed out, the reservoir and as much of the lower saw cut as possible  
1386 shall be filled with epoxy resin, Type IV, Grade 2, thoroughly tooled into the void  
1387 using approved procedures. If only the original narrow saw cut has been made,  
1388 it shall be cleaned and pressure injected with epoxy resin, Type IV, Grade 1,  
1389 using approved procedures. If filler type material has been used to form a  
1390 weakened plane in the joint, it shall be completely sawed out and the saw cut  
1391 pressure injected with epoxy resin, Type IV, Grade 1, using approved  
1392 procedures. Where a parallel crack goes part way across paving lane and then  
1393 intersects and follows the original joint which is cracked only for the remainder of  
1394 the width, it shall be treated as specified above for a parallel crack, and the  
1395 cracked original joint shall be prepared and sealed as originally designed.  
1396

1397 (2) Cracks Greater Than 4-inches in Depth Present, Original Joint Also Cracked. At  
1398 a joint, if there is any place in the lane width where a parallel crack and a cracked  
1399 portion of the original joint overlap, the entire slab containing the crack shall be  
1400 removed and replaced for the full lane width and length.  
1401

1402 D. Removal and Replacement of Full Slabs. Where it is necessary to remove full slabs,  
1403 unless there are keys or dowels present, all edges of the slab shall be cut full depth with  
1404 a concrete saw. Sawcutting depth may vary nominally and no extra payment will be  
1405 allotted for varying depths. All saw cuts shall be perpendicular to the slab surface. If  
1406 keys, dowels, or tie bars are present along any edges, these edges shall be sawed full  
1407 depth 24 inches from the edge if only keys are present, or just beyond the end of the  
1408 dowels or tie bars if they are present. These joints shall then be carefully sawed on the  
1409 joint line to within 1 inch of the depth of the dowel or key. The main slab shall be further  
1410 divided by sawing full depth, at appropriate locations, and each piece lifted out and  
1411 removed. Suitable equipment shall be used to provide a truly vertical lift, and approved  
1412 safe lifting devices used for attachment to the slabs. The narrow strips along keyed or  
1413 doweled edges shall be carefully broken up and removed using light, hand-held  
1414 jackhammers, 30 LB (14 kg) or less, or other approved similar equipment. Care shall be  
1415 taken to prevent damage to the dowels, tie bars, or keys or to concrete to remain in  
1416 place. The joint face below keys or dowels shall be suitably trimmed so that there is not  
1417 abrupt offset in any direction greater than 1/2 inch and no gradual offset greater than 1  
1418 inch when tested in a horizontal direction with a 12 foot straightedge. No mechanical  
1419 impact breakers, other than the above hand-held equipment shall be used for any  
1420 removal of slabs. If underbreak between 1-1/2 and 4 inches deep occurs at any point  
1421 along any edge, the area shall be repaired as directed before replacing the removed  
1422 slab. Procedures directed will be similar to those specified for surface spalls, modified as  
1423 necessary. If underbreak over 4 inches deep occurs, the entire slab containing the  
1424 underbreak shall be removed and replaced. Where there are no dowels, tie bars, or keys  
1425 on an edge, or where they have been damaged, dowels of the size and spacing as  
1426 specified for other joints in similar pavement shall be installed by epoxy grouting them  
1427 into holes drilled into the existing concrete using procedures as specified. Original

1428 damaged dowels or tie bars shall be cut off flush with the joint face. Protruding portions of  
1429 dowels shall be painted and lightly oiled. All four edges of the new slab shall contain  
1430 dowels. Placement of concrete shall be as specified for original construction. Prior to  
1431 placement of new concrete, the underlying material (unless it is stabilized) shall be  
1432 recompacted and shaped as specified in the appropriate SECTION of these  
1433 specifications. The surfaces of all four joint faces shall be cleaned of all loose material  
1434 and contaminants and coated with a double application of membrane forming curing  
1435 compound as bond breaker. Care shall be taken to prevent any curing compound from  
1436 contacting dowels or tie bars. The resulting joints around the new slab shall be prepared  
1437 and sealed as specified.  
1438

1439 E. Repairing Spalls Along Joints. Spall repair material shall consist of either a cementitious  
1440 BASF 10-60, BASF 10-61, SikaQuick 2500, Set 45, or approved equal, or epoxy Silspec  
1441 Flexpatch or approved equal as directed in the field. Materials delivered in the field shall  
1442 be accompanied by the manufacturers' certification stating the material meets the  
1443 requirements of the specifications. All material shall be stored per the manufacturers'  
1444 recommendations. Where directed, spalls along joints of new slabs, and along parallel  
1445 cracks used as replacement joints, shall be repaired by first making a vertical saw cut at  
1446 least 1 inch (25 mm) outside the spalled area and to a minimum depth of 4 inches (50  
1447 mm) or as recommended by the Manufacturer, if more stringent. Saw cuts shall be  
1448 straight lines forming rectangular areas. The concrete between the saw cut and the joint,  
1449 or crack, shall be chipped out to remove all unsound concrete and at least 1/2 inch (12  
1450 mm) of visually sound concrete. The cavity thus formed shall be thoroughly cleaned with  
1451 high pressure water jets supplemented with compressed air to remove all loose material.  
1452 The cavity will be filled based on the manufacturer's instructions for bonding agent,  
1453 mixing, and finishing. Any repair material on the surrounding surfaces of the existing  
1454 concrete shall be removed before it hardens. Where the spalled area abuts a joint, an  
1455 insert or other bond-breaking medium shall be used to prevent bond at the joint face. A  
1456 reservoir for the joint sealant shall be sawed to the dimensions required for other joints,  
1457 or as required to be routed for cracks. The reservoir shall be thoroughly cleaned and  
1458 sealed in accordance with the appropriate materials as specified within these contract  
1459 documents. A Manufacturers representative must be present during the first days  
1460 production. If any spall penetrates half the depth of the slab or more, the entire slab shall  
1461 be removed and replaced as previously specified. Any spalls greater than 1 square foot  
1462 in area must be reinforced.  
1463

1464 F. Slabs with unacceptable light cans. If an installed light can is found to be out of tolerance  
1465 in the horizontal or vertical position, or any other problem is found that would require  
1466 replacement, the complete panel shall be removed and replaced as specified in section  
1467 4.19D. Prior to replacing the panel all grounding, conduit, subgrade, and any other items  
1468 damaged in the removal will be repaired and brought within specified tolerances and  
1469 inspected and approved by the Project Manager.  
1470

1471 4.20 EXISTING CONCRETE PAVEMENT REMOVAL AND REPAIR

1472 All operations shall be carefully controlled to prevent damage to the concrete pavement and to  
1473 the underlying material to remain in place. All saw cuts shall be made perpendicular to the slab  
1474 surface.  
1475

1476 A. Removal of Existing Pavement Slab. When it is necessary to remove existing concrete  
1477 pavement and leave adjacent concrete in place the joint between the removal area and  
1478 adjoining pavement to stay in place shall first be cut full depth with a standard diamond-  
1479 type concrete saw. Next, a full depth saw cut shall be made parallel to the joint at least  
1480 24 inches from the joint and at least 12 inches from the end of any dowels. All pavement  
1481 between this last saw cut and the joint line shall be carefully broken up and removed  
1482 using hand-held jackhammers, 30 lb. (14 kg) or less, or the approved light-duty  
1483 equipment which will not cause stress to propagate across the joint saw cut and cause  
1484

1485 distress in the pavement which is to remain in place. Dowels of the size and spacing  
1486 indicated shall be installed as shown on the drawings by epoxy resin bonding them in  
1487 holes drilled in the joint face as specified in paragraph "Placing Dowels and Tie Bars".  
1488 The joint face shall be sawed or otherwise trimmed so that there is no abrupt offset in any  
1489 direction greater than 1/2-inch and no gradual offset greater than 1 inch when tested in a  
1490 horizontal direction with a 12 ft. straightedge.

1491  
1492 B. Edge Repair. The edge of existing concrete pavement against which new pavement  
1493 abuts shall be protected from damage at all times. Areas which are damaged during  
1494 construction shall be repaired at not cost to the Owner; repair of previously existing  
1495 damage areas will be paid for as listed in the bid schedule.

1496  
1497 (1) Spall Repair. Spalls shall be repaired where indicated and where directed.  
1498 Repair materials and procedures shall be as previously specified in paragraph  
1499 4.19E.

1500  
1501 (2) Underbreak Repair. All areas that have underbreak shall be removed and  
1502 replaced at no cost to the owner.

1503  
1504 (3) Underlying Material. The underlying material adjacent to the edge of an under  
1505 the existing pavement which is to remain in place shall be protected from  
1506 damage or disturbance during removal operations and until placement of new  
1507 concrete, and shall be shaped as shown on the drawings or as directed.  
1508 Sufficient material shall be kept in place outside the joint line to prevent  
1509 disturbance (or sloughing) of material under the pavement which is to remain in  
1510 place. Any material under the portion of the concrete pavement to remain in  
1511 place which is disturbed or loses its compaction shall be carefully removed and  
1512 replaced with concrete as specified in paragraph 4.20B(2). The underlying  
1513 material outside the joint line shall be thoroughly compacted and moist when new  
1514 concrete is placed.

1515  
1516

1517 **PART 5 MATERIAL ACCEPTANCE**

1518  
1519 5.01 ACCEPTANCE SAMPLING AND TESTING. All acceptance sampling and testing, with the  
1520 exception of coring for thickness determination, necessary to determine conformance with the  
1521 requirements specified in this section will be performed by the Project Manager. Concrete shall  
1522 be accepted for strength and thickness on a lot basis.

1523  
1524 A lot shall consist of a day's production not to exceed 4235 square yards and shall represent only  
1525 one pavement type, i.e. Portland Cement Concrete Pavement (Non-Reinforced)(17") or Portland  
1526 Cement Concrete Pavement (Reinforced)(17"). All 17" to 21" tapered pavement shall be included  
1527 in the appropriate reinforced or non-reinforced 17" PCC lots and bid items.

1528  
1529 Testing organizations performing these tests shall meet the requirements of ASTM C 1077  
1530 including accreditation. The accreditation will include ASTM C 78. The Contractor shall bear the  
1531 cost of coring and filling operations, per paragraph 5.01.B(1).

1532  
1533 A prework meeting will be held between the Contractor, QC lab, QA lab, and Project Manager to  
1534 discuss the sampling and testing of the strength specimens. The meeting shall include, but not  
1535 limited to, procedures for sampling, fabrication, handling, initial and final curing, and testing of the  
1536 strength specimens (beams).

1537  
1538 A. Flexural Strength

1539  
1540 (1) Sampling. Each lot shall be divided into four equal sublots. One sample shall be  
1541 taken for each subplot from the plastic concrete delivered to the job site. Sampling

1542 locations shall be determined by the Project Manager in accordance with random  
1543 sampling procedures contained in ASTM D 3665. The concrete shall be sampled  
1544 in accordance with ASTM C 172.

1545  
1546 (2) Testing. Three (3) flexural strength specimens shall be made from each sample.  
1547 The flexural strength specimens shall be fabricated in steel molds in accordance  
1548 with ASTM C 31. If the flexural strength specimens are initially cured in the field,  
1549 they shall be transported to the laboratory (for final curing and testing) while in  
1550 the molds. The flexural strength specimens shall be standard cured including  
1551 storage, initial curing, and final curing (for beams) in accordance with ASTM C 31  
1552 and tested for flexural strength in accordance with ASTM C 78. The flexural  
1553 strength for each subplot shall be computed by averaging the results of the two  
1554 test specimens representing that subplot. If a specimen tests abnormally low in  
1555 strength indicating possible damage to that specimen, the hold specimen shall  
1556 be tested and its results used in the average. Slump, air content, unit weight, and  
1557 temperature tests in accordance with ASTM C 143, C 231, C 138 and C 1064 will  
1558 also be conducted by the quality assurance laboratory for each set of flexural  
1559 strength test samples.

1560  
1561  
1562  
1563 (3) Acceptance. Acceptance of pavement for flexural strength will be determined by  
1564 the Project Manager in accordance with paragraph 5.02.

1565  
1566 B. Pavement Thickness

1567  
1568 (1) Sampling. Each lot shall be divided into four equal sublots and one core shall be  
1569 taken by the Contractor for each subplot. Sampling locations shall be determined  
1570 by the Project Manager in accordance with random sampling procedures  
1571 contained in ASTM D 3665. Areas, such as thickened edges or transitional  
1572 thickness areas, with planned variable thickness, shall be excluded from sample  
1573 locations.

1574  
1575 Cores shall be neatly cut with a core drill. The Contractor shall furnish all tools,  
1576 labor, and materials for cutting samples and filling the cored hole. Core holes  
1577 shall be filled by the Contractor with a non-shrink grout approved by the Project  
1578 Manager within one day after sampling.

1579  
1580 (2) Testing. The thickness of the cores shall be determined by the Project Manager  
1581 by the average caliper measurement in accordance with ASTM C 174.

1582  
1583 (3) Acceptance. Acceptance of pavement for thickness shall be determined by the  
1584 Project Manager in accordance with paragraph 5.02C.

1585  
1586 C. Partial Lots. When operational conditions cause a lot to be terminated before the  
1587 specified number of tests have been made for the lot, or when the Contractor and Project  
1588 Manager agree in writing to allow overages or minor placements to be considered as  
1589 partial lots, the following procedure will be used to adjust the lot size and the number of  
1590 tests for the lot.

1591  
1592 Where three sublots have been produced, they shall constitute a lot. Where one or two  
1593 sublots have been produced, they shall be incorporated into the next lot or the previous  
1594 lot and the total number of sublots shall be used in the acceptance criteria calculation,  
1595 i.e.,  $n=5$  or  $n=6$ .

1596  
1597 D. Outliers. All individual flexural strength tests within a lot shall be checked for an outlier  
1598 (test criterion) in accordance with ASTM E 178, at a significance level of 5 percent.

1599 Outliers shall be discarded, and the PWL shall be determined using the remaining test  
1600 values.

1601  
1602 5.02 ACCEPTANCE CRITERIA

1603  
1604 A. General. Acceptance will be based on the following characteristics of the completed  
1605 pavement:

- 1606  
1607 (1) Flexural strength  
1608 (2) Thickness  
1609 (3) Smoothness  
1610 (4) Grade  
1611 (5) Edge slump  
1612 (6) Dowel bar alignment

1613  
1614 Flexural strength and thickness shall be evaluated for acceptance on a lot basis using  
1615 the method of estimating percentage of material within specification limits (PWL).  
1616 Acceptance using PWL considers the variability (standard deviation) of the material and  
1617 the testing procedures, as well as the average (mean) value of the test results to  
1618 calculate the percentage of material that is above the lower specification tolerance limit  
1619 (L).

1620  
1621 Acceptance for flexural strength will be based on the criteria contained in paragraph  
1622 5.02E(1). Acceptance for thickness will be based on the criteria contained in paragraph  
1623 5.02E(2). Acceptance for smoothness will be based on the criteria contained in  
1624 paragraph 5.02E(3). Acceptance for grade will be based on the criteria contained in  
1625 paragraph 5.02E(4).

1626  
1627 The Project Manager may at any time, notwithstanding previous plant acceptance, reject  
1628 and require the Contractor to dispose of any batch of concrete mixture which is rendered  
1629 unfit for use due to contamination, segregation, or improper slump. Such rejection may  
1630 be based on only visual inspection. In the event of such rejection, the Contractor may  
1631 take a representative sample of the rejected material in the presence of the Project  
1632 Manager, and if he can demonstrate in the laboratory, in the presence of the Project  
1633 Manager, that such material was erroneously rejected, payment will be made for the  
1634 material at the contract unit price.

1635  
1636 B. Flexural Strength. Acceptance of each lot of in-place pavement for flexural strength shall  
1637 be based on PWL. The Contractor shall target production quality to achieve 90 PWL or  
1638 higher.

1639  
1640 C. Pavement Thickness. Acceptance of each lot of in-place pavement shall be based on  
1641 PWL. The Contractor shall target production quality to achieve 90 PWL or higher.

1642  
1643 D. Percentage of Material Within Specification Limits (PWL). The percentage of material  
1644 within specification limits shall be determined in accordance with procedures specified in  
1645 Section 110 of the General Provisions.

1646  
1647 The lower specification limit (L) for flexural strength and thickness shall be:

1648  
1649 Lower Specification Limit (L)

1650  
1651 Flexural Strength =  $0.93 \times$  strength specified in paragraph 3.01.

1652  
1653 Thickness = Lot Plan Thickness in inches - 0.50 inches

1654  
1655 E. Acceptance Criteria

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- (1) Flexural Strength. If the PWL of the lot equals or exceeds 90 percent, the lot shall be acceptable. Acceptance and payment for the lot shall be determined in accordance with paragraph 8.01.
- (2) Thickness. If the PWL of the lot equals or exceeds 90 percent, the lot shall be acceptable. Acceptance and payment for the lot shall be determined in accordance with paragraph 8.01.
- (3) Smoothness. As soon as the concrete has hardened sufficiently, the pavement surface shall be tested in the transverse direction with a 16 foot straightedge or other specified device. Surface smoothness deviations shall not exceed 1/4 inch from a 16 foot straightedge at any location, including placement along and spanning any pavement joint or edge.
- Areas in the slab showing high spots of more than 1/4 inch but not exceeding 1/2 inch in 16 feet shall be marked and immediately ground down with an approved grinding machine to an elevation that falls within the tolerance of 1/4 inch or less. Where the departure from the correct cross section exceeds 1/2 inch, the pavement shall be removed and replaced at the expense of the Contractor when so directed by the Project Manager.
- The surface of the ground pavement shall have a texture consisting of grooves between 0.090 and 0.130 inches wide. The peaks and ridges shall be approximately 1/32 inch higher than the bottom of the grooves. The pavement shall be left in a clean condition. The removal of all of the slurry resulting from the grinding operation shall be continuous. The grinding operation should be controlled so the residue from the operation does not flow across other lanes of pavement.
- The Contractor shall perform straight edge testing, maintain all records, and provide measurements with deviations to the Project Manager on a daily basis.
- In addition to the 16 foot straight edge, the Contractor shall furnish a 25' wheel base California type profilograph and competent operator to be used to measure longitudinal pavement surface deviations. The profilograph shall be operated in a manner acceptable to the Project Manager and in accordance with the manufacturer's instructions. The profilograph shall be operated at a speed no greater than a normal walk. Original profilograms for the appropriate locations interpreted in accordance with ASTM E 1274 shall be furnished to the Project Manager. The profilograms shall be recorded on a scale of one inch equal to 25 feet longitudinally and one inch equal to one inch or full scale vertically. If additional profilograms are required to verify corrections have been made, the additional data shall be presented in such a format that the original and final profilograms may be viewed on the same sheet of paper.
- (a) The surface of Runway and Taxiway pavements of continuous placement of 50 feet or more shall be tested and evaluated as described herein. Two passes shall be made in each paving lane 20 feet or greater in width; each pass shall be six feet from and parallel with the centerline of the paving lane. The average of the two passes shall be considered as the profilograph result for the paving lane. For paving lanes less than 20 feet in width, one pass along the centerline shall be required. Tests shall be run the next working day following concrete placement. Runs shall be continuous through the days production. Each trace shall be completely labeled to show paving lane, wheel pass, and stationing.

- 1713 (b) The Contractor shall furnish paving equipment and employ methods that  
1714 produce a surface for each section of pavement having an average  
1715 profile index meeting the requirements of paragraph 8.01. A typical  
1716 subsection will be considered to be the width of the paving lane and 1/10  
1717 mile long. The profile index will be determined in accordance with ASTM  
1718 E 1274. A blanking band of 0.20 inches shall be used. Within each 1/10  
1719 mile subsection, all areas represented by high points having a deviation  
1720 in excess of 0.4 inch in 25 feet or less shall be removed by the contractor  
1721 using an approved grinding device or a device consisting of multiple  
1722 diamond blades. The use of a bush hammer or other impact devices will  
1723 not be permitted. After removing all individual deviations in excess of 0.4  
1724 inch, additional corrective work shall be performed if necessary to  
1725 achieve the quality. All corrective work shall be completed prior to  
1726 determination of pavement thickness.  
1727
- 1728 (c) On those pavement subsections where corrections were necessary,  
1729 second profilograph runs will be performed to verify that the corrections  
1730 have produced an average profile index of 15 inches per mile or less. If  
1731 the initial average profile index was less than 15, only those areas  
1732 representing greater than 0.4 inch deviation will be re-profiled for  
1733 correction verification.  
1734
- 1735 (d) When the average profile index does not exceed 7 inches per mile,  
1736 payment will be made for that section at the contract unit price for the  
1737 completed pavement. When the average profile index exceeds 7 inches  
1738 per mile, but does not exceed fifteen inches per mile, the Contractor may  
1739 elect to accept a contract unit price adjustment in lieu of reducing the  
1740 profile index.  
1741
- 1742 (e) Individual sections shorter than 50 feet, the last 15 feet of any section  
1743 where the Contractor is not responsible for the adjoining section, and 15  
1744 feet from any edge where the contractor is not responsible for the  
1745 adjoining section shall not be straight-edged. The DIA Project Manager  
1746 reserves the right to inspect and enforce smoothness criteria at the  
1747 interface between the new and existing pavement due to discrepancies  
1748 in the newly placed pavement including grinding and/or panel  
1749 replacement.  
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- 1751 (f) If there is a section of 250 feet or less, the profilogram for that section  
1752 shall be included in the evaluation of the previous section. If there is an  
1753 independently placed section of 50 to 250 feet in length, a profilogram  
1754 shall be made for that section and the pay adjustment factors for short  
1755 sections of paragraph 8.01 shall apply.  
1756
- 1757 (g) Any corrective work required shall be performed prior to joint sealing and  
1758 grooving operations.  
1759
- 1760 (h) All cost necessary to provide the profilograph and related to furnishing  
1761 the appropriate profilograms as required in this provision are incidental to  
1762 concrete pavement construction and no direct compensation will be  
1763 made therefore.  
1764
- 1765 (4) Grade. Grade shall be evaluated on the first day of placement and every 5 days  
1766 or less so adjustments can be made to paving operations if measurements do  
1767 not meet specification requirements. The Project Manager must compare the  
1768 surveyed grades with the grades shown on the contract drawings and document  
1769 the analysis.



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- An evaluation of the surface grade shall be made by the Project Manager for compliance to the tolerances contained below. The Contractor shall perform the survey and provide a comparison of as-built grades with the design grades for the Project Manager to analyze. Records shall be maintained showing all grade measurements.
- (5) Lateral Deviation. Lateral deviation from established alignment of the pavement edge shall not exceed plus or minus 0.10 foot (30 mm) in any lane.
- (6) Vertical Deviation. Vertical deviation from established grade shall not exceed plus or minus 0.04 foot (12 mm) at any point. Vertical survey shall be conducted on the high point of each joint intersection and compared to the plan elevations to determine the vertical deviation. The finished grade of each lot will be determined by running levels at all joint intersections to determine the elevation of the completed pavement. The Contractor shall pay the cost of surveying and shall be performed by a licensed surveyor. The documentation, stamped and signed by a licensed surveyor, shall be provided by the Contractor to the Project Manager. When more than 15 percent of all the measurements within a lot are outside the specified tolerance, or if any one shot within the lot deviates  $\frac{3}{4}$  inch or more from planned grade, the Contractor shall remove and replace the deficient slabs to the full width, length and depth of the slab. Patching shall not be permitted. Isolated high points may be ground off provided that the course thickness is not greater than  $\frac{1}{4}$  inch deficient in the design thickness.
- (7) Edge Slump. When slip-form paving is used, not more than 15 percent of the total free edge of each five hundred feet (500) (152 m) of pavement, or fraction thereof, shall have an edge slump exceeding 1/4-inch (6 mm), and none of the free edge of the pavement shall have an edge slump exceeding 3/8-inch (10 mm). (The total free edge of 500 feet (152 m) of pavement will be considered the cumulative total linear measurement of pavement edge originally constructed as nonadjacent to any existing pavement; i.e., 500 feet (152 m) of paving lane originally constructed as a separate lane will have 1,000 feet (305 m) of free edge, 500 feet (152 m) of fill-in lane will have no free edge, etc.). The area affected by the downward movement of the concrete along the pavement edge shall be limited to not more than 18 inches (457 mm) from the edge. When corrections for excessive edge slump or other edge related repairs are necessary, installation of suitable fixed forms and reconsolidation of the affected area is required. Consolidation shall be attained by the use of suitable vibrators. When excessive edge slump cannot be corrected before the concrete has hardened, the area with excessive edge slump shall be removed and replaced at the expense of the Contractor when so directed by the Project Manager.
- (8) Dowel Bar Alignment. Dowel bars and assemblies shall be checked for position and alignment. Vertical alignment of dowels shall be measured parallel to the designed top surface of the pavement, except for those across the crown or other grade change joints. Dowels across crowns and other joints at grade changes, shall be measured to a level surface. Horizontal alignment shall be checked perpendicular to the joint edge. The maximum permissible tolerance on dowel bar alignment in each plane, horizontal and vertical, shall not exceed 2 percent or 1/4 inch (6 mm) per foot of dowel bar.
- F. Removal and Replacement of Concrete. Any area or section of concrete that is removed and replaced shall be removed and replaced back to planned joints. The Contractor shall replace damaged dowels and the requirements for doweled longitudinal construction joints in paragraph 4.10 shall apply to all contraction joints exposed by concrete removal.

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**PART 6 CONTRACTOR QUALITY CONTROL**

6.01 QUALITY CONTROL PROGRAM. The Contractor shall develop a Quality Control Program in accordance with Section GP-100 of the General Provisions. Paving operations shall not commence until the quality control program is approved by the Project Manager. The program shall address all elements which effect the quality of the pavement including, but not limited to:

- A. Mix Design
- B. Aggregate Gradation
- C. Quality of Materials
- D. Stockpile Management
- E. Proportioning
- F. Mixing and Transportation
- G. Placing and Consolidation
- H. Joints
- I. Dowel Placement and Alignment
- J. Flexural or Compressive Strength
- K. Finishing and Curing
- L. Surface Smoothness

6.02 QUALITY CONTROL TESTING. The Contractor's Independent Testing Agency shall perform all quality control tests necessary to control the production and construction processes applicable to this specification and as set forth in the Quality Control Program. The Independent Testing Agency shall meet the requirements of Section 01401 including ASTM C 1077 and have been approved through the submittal process prior to performing testing. The testing program shall include, but not necessarily be limited to, tests for aggregate gradation, aggregate moisture content, slump, and air content.

A Quality Control Testing Plan shall be developed as part of the Quality Control Program.

A. Fine Aggregate

- (1) Gradation. A sieve analysis shall be made at least twice daily in accordance with ASTM C 136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.
- (2) Moisture Content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C 70 or ASTM C 566.

B. Coarse Aggregate

- (1) Gradation. A sieve analysis shall be made at least twice daily for each size of aggregate. Tests shall be made in accordance with ASTM C 136 from randomly sampled material taken from the discharge gate of storage bins or from the conveyor belt.
- (2) Moisture Content. If an electric moisture meter is used, at least two direct measurements of moisture content shall be made per week to check the calibration. If direct measurements are made in lieu of using an electric meter, two tests shall be made per day. Tests shall be made in accordance with ASTM C 566.

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- C. Slump. After the start of each day's production and after batch plant shut down, the first three truck loads of concrete shall be tested for slump until three consecutive loads meet the project requirements. In addition, slump tests shall be performed at a minimum frequency of one test for every 100 cubic. Slump tests shall also be performed in conjunction with the Project Manager's Quality Assurance Lab's sampling for flexural strength. The samples shall be obtained in accordance with ASTM C 172 from material discharged from trucks at the paving site and tested accordance with ASTM C 143.
  - D. Air Content. After the start of each day's production and after batch plant shut down, the first three truck loads of concrete shall be tested for air content until three consecutive loads meet the project requirements. In addition, air content tests shall be performed at a minimum frequency of one test for every 100 cubic yards. Air content tests shall also be performed in conjunction with the Project Manager's Quality Assurance Lab's sampling for flexural strength. The samples shall be obtained in accordance with ASTM C 172 from material discharged from trucks at the paving site and tested in accordance with ASTM C 231 for gravel and stone coarse aggregate and ASTM C 173 for slag or other porous coarse aggregate.
  - E. Unit Weight and Yield Tests. Unit weight and yield tests shall be made in conjunction with slump and air content tests. The samples shall be obtained in accordance with ASTM C 172 from material discharged from trucks at the paving site and tested in accordance with ASTM C 138.
  - F. Percent Cement and Fly Ash. Percent cement and fly ash shall be calculated in accordance with ASTM C 138 at the start of each day's production for the first three truck loads delivered until three consecutive loads meet slump and air content specifications, in conjunction with each yield test, and when material falls outside Suspension and Action limits for slump or air content. The samples shall be obtained in accordance with ASTM C 172.
- 6.03 CONTROL CHARTS. The Contractor shall maintain linear control charts for fine and course aggregate, gradation, slump, and air content. If an electronic moisture meter is used, a control chart shall be produced indicating moisture readings and calibration reports entered for the project records.
- Control charts shall be posted in a location satisfactory to the Project Manager and shall be kept up to date at all times. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits, or Specification limits, applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a potential problem and the Contractor is not taking satisfactory corrective action, the Project Manager may halt production or acceptance of the material.
- A. Fine and Coarse Aggregate Gradation. The Contractor shall record the running average of the last five gradation tests for each control sieve on linear control charts. Specification limits contained in Tables 1 and 2 shall be superimposed on the Control Chart for job control.
  - B. Slump and Air Content. The Contractor shall maintain linear control charts both for individual measurements and range (i.e., difference between highest and lowest of 2 consecutive test measurements) for slump and air content in accordance with the following Action and Suspension Limits.

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**CONTROL CHART LIMITS**  
 Individual Measurements

| Control Parameter          | Action Limit              | Suspension Limit            | Range Suspension Limit (Between Two Consecutive Tests) |
|----------------------------|---------------------------|-----------------------------|--------------------------------------------------------|
| Slip Form Paving:<br>Slump | +0/-1 inch<br>(0-25mm)    | +0.5/-1.5 inch<br>(13-38mm) | 1.5 inch<br>(38mm)                                     |
| Air Content                | +/- 1.2%                  | +/- 1.8%                    | 2.5%                                                   |
| Fixed Form:<br>Slump       | +0.5/-1 inch<br>(13-25mm) | +1/-1.5 inch<br>(25-38mm)   | 1.5 inch<br>(38mm)                                     |
| Air Content                | +/- 1.2%                  | +/- 1.8%                    | 2.5%                                                   |

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6.04 CORRECTIVE ACTION. The Quality Control Plan shall indicate that appropriate action shall be taken when a process is believed to be out of control. The Plan shall detail what action will be taken to bring a process into control and shall contain sets of rules to gauge when a process is out of control. As a minimum, a process shall be deemed out of control and corrective action taken if any one of the following conditions exists.

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A. Fine and Coarse Aggregate Gradation. When two consecutive averages of five tests are outside of the Tables 1 or 2 specification limits, immediate steps, including a halt to production, shall be taken to correct the gradation.

B. Fine and Coarse Aggregate Moisture Content. Whenever the moisture content of the fine or coarse aggregate changes by more than 0.5 percent, the scale settings for the aggregate batcher(s) and water batcher shall be adjusted.

C. Slump. The Contractor shall make appropriate adjustments whenever:

(1) one point falls outside the Action Limit line for individual measurements. The next load shall be tested. If it's test falls outside the Action and Suspension Limits this load may be placed however; production is in Suspension and the process shall be brought into control in accordance with the Quality Control Plan. As a minimum testing during Suspension shall be performed at both the batch plant and at the point of placement until three (3) subsequent loads in succession meet the slump specifications at the point of placement. Any load not meeting slump specifications under Suspension shall not be placed.

(2) one point falls outside the Suspension Limit line for individual measurements or range. This load may remain in place. The process shall be brought into control in accordance with the Quality Control Plan. As a minimum testing during Suspension shall be performed at both the batch plant and at the point of placement until three (3) subsequent loads in succession meet the specifications at the point of placement. Any load not meeting slump specifications under Suspension shall not be placed.

D. Air Content The Contractor shall adjust the amount of air-entraining admixture whenever:

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- (1) one point falls outside the Action Limit line for individual measurements, the next load shall be tested. If its test falls outside the Action and Suspension Limit this load may be placed however; production is in Suspension and the process shall be brought into control in accordance with the Quality Control Plan. As a minimum testing during Suspension shall be performed at both the batch plant and at the point of placement until three (3) subsequent loads in succession meet the air content specifications at the point of placement. Any load not meeting air content specifications under Suspension shall not be placed.
- (2) one point falls outside the Suspension Limit line for individual measurements or range. This load may remain in place. The process shall be brought into control in accordance with the Quality Control Plan. As a minimum testing during Suspension shall be performed at both the batch plant and at the point of placement until three (3) subsequent loads in succession meet the air content specifications at the point of placement. Any load not meeting air content specifications under Suspension shall not be placed.
- Whenever a point falls outside the Action Limits line, the air-entraining admixture dispenser shall be calibrated to ensure that it is operating correctly and with good reproducibility.

#### PART 7 METHOD OF MEASUREMENT

- 7.01 Refer to Appendix A for Method of Measurement.

#### PART 8 BASIS OF PAYMENT

- 8.01 Refer to Appendix A for Price Adjustment Schedules
- 8.02 Refer to Appendix A for Basis of Payment

#### PART 9 TESTING REQUIREMENTS

All testing shall be performed by approved standardized test procedures, but not limited to the following:

- ASTM C 31 Making and Curing Concrete Test Specimens in the Field
- ASTM C 39 Compressive Strength of Cylindrical Concrete Specimens
- ASTM C 70 Surface Moisture in Fine Aggregate
- ASTM C 78 Test for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
- ASTM C 88 Test for Soundness of Aggregates by Use of Sodium Sulfate & Magnesium Sulfate
- ASTM C 114 Chemical Analysis of Hydraulic Cement
- ASTM C 131 Test for Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine

|      |             |                                                                                                                                            |
|------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| 2033 | ASTM C 136  | Sieve Analysis of Fine and Coarse Aggregates                                                                                               |
| 2034 |             |                                                                                                                                            |
| 2035 | ASTM C 138  | Test for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete                                                                     |
| 2036 |             |                                                                                                                                            |
| 2037 | ASTM C 143  | Test for Slump of Portland Cement Concrete                                                                                                 |
| 2038 |             |                                                                                                                                            |
| 2039 | ASTM C 172  | Sampling Freshly Mixed Concrete                                                                                                            |
| 2040 |             |                                                                                                                                            |
| 2041 | ASTM C 173  | Test for Air Content of Freshly Mixed Concrete by the Volumetric Method                                                                    |
| 2042 |             |                                                                                                                                            |
| 2043 | ASTM C 174  | Measuring Length of Drilled Concrete Cores                                                                                                 |
| 2044 |             |                                                                                                                                            |
| 2045 | ASTM C 227  | Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)                                                           |
| 2046 |             |                                                                                                                                            |
| 2047 |             |                                                                                                                                            |
| 2048 | ASTM C 231  | Test for Air Content of Freshly Mixed Concrete by the Pressure Method                                                                      |
| 2049 |             |                                                                                                                                            |
| 2050 | ASTM C 289  | Potential Reactivity of Aggregates (Chemical Method)                                                                                       |
| 2051 |             |                                                                                                                                            |
| 2052 | ASTM C 295  | Petrographic Examination of Aggregates for Concrete                                                                                        |
| 2053 |             |                                                                                                                                            |
| 2054 | ASTM C 311  | Sampling and Testing Fly Ash for Use as an Admixture in Portland Cement Concrete                                                           |
| 2055 |             |                                                                                                                                            |
| 2056 |             |                                                                                                                                            |
| 2057 | ASTM C 535  | Test for Resistance to Abrasion of Large Size Coarse Aggregate by Use of the Los Angeles Machine                                           |
| 2058 |             |                                                                                                                                            |
| 2059 |             |                                                                                                                                            |
| 2060 | ASTM C 566  | Total Moisture Content of Aggregates by Drying                                                                                             |
| 2061 |             |                                                                                                                                            |
| 2062 | ASTM C 642  | Test for Density, Absorption, and Voids in Hardened Concrete                                                                               |
| 2063 |             |                                                                                                                                            |
| 2064 | ASTM C 1077 | Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation |
| 2065 |             |                                                                                                                                            |
| 2066 |             |                                                                                                                                            |
| 2067 | ASTM C 1260 | Potential Alkali Reactivity of Aggregates (Mortar- Bar Method)                                                                             |
| 2068 | ASTM C 1567 | Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).                |
| 2069 |             |                                                                                                                                            |
| 2070 |             |                                                                                                                                            |
| 2071 | ASTM D 3665 | Random Sampling of Construction Materials                                                                                                  |
| 2072 |             |                                                                                                                                            |
| 2073 | ASTM D 4791 | Test Method for Flat or Elongated Particles in Coarse Aggregate                                                                            |
| 2074 |             |                                                                                                                                            |
| 2075 | ASTM E 178  | Practice for Dealing with Outlying Observations                                                                                            |
| 2076 |             |                                                                                                                                            |
| 2077 | ASTM E 1274 | Profilograph Testing for Ride Smoothness                                                                                                   |
| 2078 |             |                                                                                                                                            |
| 2079 | AASHTO T 26 | Quality of Water to be Used in Concrete                                                                                                    |
| 2080 |             |                                                                                                                                            |

**PART 10 MATERIAL REQUIREMENTS**

|      |            |                                                                                 |
|------|------------|---------------------------------------------------------------------------------|
| 2082 |            |                                                                                 |
| 2083 |            |                                                                                 |
| 2084 | ASTM A 184 | Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement |
| 2085 |            |                                                                                 |
| 2086 |            |                                                                                 |
| 2087 | ASTM A 185 | Specification for Welded Steel Wire Fabric for Concrete Reinforcement           |
| 2088 |            |                                                                                 |
| 2089 | ASTM A 497 | Specification for Welded Deformed Steel Wire Fabric for Concrete Pavement       |

|      |              |                                                                                                                                                   |
|------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 2090 |              |                                                                                                                                                   |
| 2091 | ASTM A 615   | Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement                                                                 |
| 2092 |              |                                                                                                                                                   |
| 2093 |              |                                                                                                                                                   |
| 2094 | ASTM A 616   | Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement                                                                   |
| 2095 |              |                                                                                                                                                   |
| 2096 | ASTM A 617   | Specification for Axle-Steel Deformed and Plain Bars for Concrete Reinforcement                                                                   |
| 2097 |              |                                                                                                                                                   |
| 2098 |              |                                                                                                                                                   |
| 2099 | ASTM A 704   | Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement                                                                   |
| 2100 |              |                                                                                                                                                   |
| 2101 |              |                                                                                                                                                   |
| 2102 | ASTM A 714   | Specification for High-Strength Low-Alloy Welded and Seamless Steel Pipe                                                                          |
| 2103 |              |                                                                                                                                                   |
| 2104 | ASTM A 996   | Specification for Rail-Steel and Axle Steel Deformed Bar for Concrete Reinforcement                                                               |
| 2105 |              |                                                                                                                                                   |
| 2106 |              |                                                                                                                                                   |
| 2107 | ASTM C 33    | Specification for Concrete Aggregates                                                                                                             |
| 2108 |              |                                                                                                                                                   |
| 2109 | ASTM C 94    | Specification for Ready-Mixed Concrete                                                                                                            |
| 2110 |              |                                                                                                                                                   |
| 2111 | ASTM C 150   | Specification for Portland Cement                                                                                                                 |
| 2112 |              |                                                                                                                                                   |
| 2113 | ASTM C 171   | Specification for Sheet Materials for Curing Concrete                                                                                             |
| 2114 |              |                                                                                                                                                   |
| 2115 | ASTM C 260   | Specification for Air-Entraining Admixtures for Concrete                                                                                          |
| 2116 |              |                                                                                                                                                   |
| 2117 | ASTM C 309   | Specification for Liquid Membrane-Forming Compounds                                                                                               |
| 2118 |              |                                                                                                                                                   |
| 2119 | ASTM C 494   | Specification for Chemical Admixtures for Concrete                                                                                                |
| 2120 |              |                                                                                                                                                   |
| 2121 | ASTM C 595   | Specification for Blended Hydraulic Cements                                                                                                       |
| 2122 |              |                                                                                                                                                   |
| 2123 | ASTM C 618   | Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete                         |
| 2124 |              |                                                                                                                                                   |
| 2125 |              |                                                                                                                                                   |
| 2126 | ASTM C 881   | Specification for Epoxy-Resin Base Bonding System for Concrete                                                                                    |
| 2127 |              |                                                                                                                                                   |
| 2128 | ASTM C 989   | Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars                                                            |
| 2129 |              |                                                                                                                                                   |
| 2130 |              |                                                                                                                                                   |
| 2131 | ASTM D 1751  | Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) |
| 2132 |              |                                                                                                                                                   |
| 2133 |              |                                                                                                                                                   |
| 2134 | ASTM D 1752  | Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction                        |
| 2135 |              |                                                                                                                                                   |
| 2136 |              |                                                                                                                                                   |
| 2137 | AASHTO M 254 | Specification for Coated Dowel Bars                                                                                                               |
| 2138 |              |                                                                                                                                                   |
| 2139 | ACI 305R     | Hot Weather Concreting                                                                                                                            |
| 2140 |              |                                                                                                                                                   |
| 2141 | ACI 306R     | Cold Weather Concreting                                                                                                                           |
| 2142 |              |                                                                                                                                                   |
| 2143 | ACT 309      | Guide for Consolidation of Concrete                                                                                                               |
| 2144 |              |                                                                                                                                                   |
| 2145 | TT-P-644     | Federal Specification for Primer Coating, Alkyd, Corrosion-Inhibiting, Lead and Chromate Free,                                                    |
| 2146 | (Rev. D)     |                                                                                                                                                   |

2147 VOC-Compliant

2148

2149 MIL-DTL-24441 Paint, Epoxy-Polyamide, Green Primer, Formula 150. Type III

2150 /20a (1999) Dept. of Defense

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**END OF ITEM P-501**



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**ITEM P-603**  
**BITUMINOUS TACK COAT**

**PART 1 GENERAL**

1.01 DESCRIPTION This item shall consist of preparing and treating a bituminous or concrete surface with bituminous material in accordance with these specifications and in reasonably close conformity to the lines shown on the plans.

**PART 2 MATERIALS**

2.01 Bituminous Materials The bituminous material shall be emulsified asphalt and shall conform to the requirements of Table 1. The type, grade, controlling specification, and application temperature of bituminous material to be used shall be specified by the Project Manager.

**Table 1**  
**Bituminous Material**

| Type and Grade     | Application Specification | Temperature |        |
|--------------------|---------------------------|-------------|--------|
|                    |                           | Deg. F      | Deg. C |
| Emulsified Asphalt |                           |             |        |
| SS-1, SS-1h        | ASTM D 977                | 75-130      | 25-55  |
| CSS-1, CSS-1h      | ASTM D 2397               | 75-130      | 25-55  |

**PART 3 CONSTRUCTION METHODS**

3.01 Weather Limitations. The tack coat shall be applied only when the existing surface is dry and the atmospheric temperature is above 60°F (15°C). The temperature requirements may be waived, but only when so directed by the Project Manager.

3.02 Equipment. The Contractor shall provide equipment for heating and applying the bituminous material.

The distributor shall be designed, equipped, maintained, and operated so that bituminous material at even heat may be applied uniformly on variable widths of surface at the specified rate. The allowable variation from the specified rate shall not exceed 10 percent. Distributor equipment shall include a tachometer, pressure gages, volume-measuring devices or a calibrated tank, and a thermometer for measuring temperatures of tank contents. The distributor shall be self-powered and shall be equipped with a power unit for the pump and full circulation spray bars adjustable laterally and vertically.

A power broom and/or blower shall be provided for any required cleaning of the surface to be treated.

3.03 Application of bituminous material. Immediately before applying the tack coat, the full width of surface to be treated shall be swept with a power broom and/or airblast to remove all loose dirt and other objectionable material.

48  
49 Emulsified asphalt shall be diluted by the addition of water when directed by the Project Manager  
50 and shall be applied a sufficient time in advance of the paver to ensure that all water has  
51 evaporated before any of the overlying mixture is placed on the tacked surface.  
52

53 The bituminous material including vehicle or solvent shall be uniformly applied with a bituminous  
54 distributor at the rate of 0.05 to 0.15 gallons per square yard depending on the condition of the  
55 existing surface. The type of bituminous material and application rate shall be approved by the  
56 Project Manager prior to application.  
57

58 Following the application, the surface shall be allowed to cure without being disturbed for such  
59 period of time as may be necessary to permit drying out and setting of the tack coat. This period  
60 shall be determined by the Project Manager. The surface shall then be maintained by the  
61 Contractor until the next course has been placed. Suitable precautions shall be taken by the  
62 Contractor to protect the surface against damage during this interval.  
63

64 3.04 Bituminous Material-Contractor's Responsibility. Samples of the bituminous material that the  
65 Contractor proposes to use, together with a statement as to its source and character, must be  
66 submitted and approved before use of such material begins. The Contractor shall require the  
67 manufacturer or producer of the bituminous material to furnish material subject to this and all  
68 other pertinent requirements of the contract. Only satisfactory materials so demonstrated by  
69 service tests, shall be acceptable.  
70

71 The Contractor shall furnish the vendor's certified test reports for each carload, or equivalent, of  
72 bituminous material shipped to the project. The report shall be delivered to the Project Manager  
73 before permission is granted for use of the material. The furnishing of the vendor's certified test  
74 report for the bituminous material shall not be interpreted as a basis for final acceptance. All  
75 such test reports shall be subject to verification by testing samples of material received for use on  
76 the project.  
77

78 3.05 Freight and Weigh Bills. Before the final estimate is allowed, the Contractor shall file with the  
79 Project Manager receipted bills when railroad shipments are made, and certified weigh bills when  
80 materials are received in any other manner, of the bituminous materials actually used in the  
81 construction covered by the contract. The Contractor shall not remove bituminous material from  
82 the tank car or storage tank until the initial outage and temperature measurements have been  
83 taken by the Project Manager, nor shall the car or tank be released until the final outage has  
84 been taken by the Project Manager. Copies of freight bills and weigh bills shall be furnished to  
85 the Project Manager during the progress of the work.  
86  
87

88 **PART 4 MEASUREMENT AND PAYMENT**

89  
90 4.01 Refer to Appendix A for Method of Measurement.  
91  
92

93 **PART 5 BASIS OF PAYMENT**

94  
95 5.01 Refer to Appendix A for Basis of Payment.  
96  
97

98 **PART 6 MATERIAL REQUIREMENTS**

99  
100 ASTM D 633 Volume Correction Table for Road Tar

101  
102 ASTM D 977 Emulsified Asphalt

103  
104 ASTM D 1250 Petroleum Measurement Tables

- 105
- 106           ASTM D 2028   Liquid Asphalt (Rapid-Curing Type)
- 107
- 108           ASTM D 2397   Cationic Emulsified Asphalt
- 109
- 110           AASHTO M 52   Tar for Use in Road Construction
- 111
- 112           Asphalt Temperature-Volume Corrections for Emulsified
- 113           InstituteAsphalts
- 114           Manual MS-6
- 115           Table IV-3

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**END OF ITEM P-603**

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1  
2 **ITEM P-604A**

3  
4 **PREFORMED EXPANSION JOINT COMPRESSION SEALS**

5  
6 **PART 1 GENERAL**

7  
8 1.01 DESCRIPTION This item shall consist of a moisture tight sealing system for structural sealing of  
9 expansion joints in concrete pavement. The seal shall consist of an impermeable closed-cell,  
10 closed link, ethylene vinyl acetate, low-density polyethylene copolymer, nitrogen blown resilient,  
11 nonextrudable foam material with a Hindered Amine Light Stabilizer added (H.A.L.S.).

12  
13 **PART 2 MATERIALS**

14  
15 2.01 The material shall be Phyzite 380 E.S.P., Evazote 380 E.S.P., Wabo Evazote UV, or approved  
16 equal. The material must be jet fuel resistant and glycol compatible.

17  
18 2.02 ADHESIVE. Adhesive used for the preformed foam compression seal shall be as recommended  
19 by the manufacturer.

20  
21 2.03 DELIVERY AND STORAGE. Materials delivered to the job site shall be inspected for defects,  
22 unloaded, and stored with a minimum of handling to avoid damage. Storage facilities shall be  
23 provided at the job site to protect materials from weather and to maintain them at temperatures  
24 as recommended by the manufacturer.

25  
26 2.04 SUBMITTALS Certified copies of test results shall be provided in accordance with Section  
27 01300.

28  
29 A. Construction Equipment List. List of proposed equipment to be used in the performance  
30 of construction work, including descriptive data, shall be provided in accordance with  
31 Section 01300.

32  
33 B. Manufacturer's Instructions. Where installation procedures, or any part thereof, are  
34 required to be in accordance with the manufacturer's recommendations, printed copies of  
35 the recommendations shall be furnished in accordance with Section 01300. Installation  
36 of the material will not be allowed until the recommendations are received. Failure to  
37 furnish these recommendations can be a cause for rejection of the material.

38  
39 C. Samples. Regardless of testing responsibility, samples of the materials shall be  
40 submitted for approval in accordance with Section 01300. Written or printed directions  
41 from the manufacturer giving recommended criteria for installation shall be furnished at  
42 the same time, plus certification from the manufacturer that the seal selected is  
43 recommend for the installation involved on this project. No material will be allowed to be  
44 used until it has been approved.

45  
46 **PART 3 EQUIPMENT**

47  
48 3.01 Machines, tools, and equipment used in the performance of the work required by this section  
49 shall be approved before the work is started and shall be maintained in satisfactory condition at  
50 all times.

51  
52 Joint Cleaning Equipment:

53  
54 A. Concrete saw A self-propelled power saw with water-cooled diamond or abrasive saw  
55 blades shall be provided for cutting joints to the depths and widths specified and for

56 removing filler (existing old joint seal) or other material embedded in the joints or adhered  
57 to the joint faces.

58  
59 B. Sandblasting Equipment Sandblasting equipment shall include an air compressor, hose,  
60 and a long-wearing venturi-type nozzle of proper size, shape, and opening. The  
61 maximum nozzle opening should not exceed 1/4 inch. The air compressor shall be  
62 portable and shall be capable of furnishing not less than 150 cubic feet per minute and  
63 maintaining a line pressure of not less than 90 psi at the nozzle while in use. The  
64 compressor shall be equipped with traps that will maintain the compressed air free of oil  
65 and water. The height, angle of inclination, and the size of the nozzle shall be adjusted  
66 as necessary to ensure satisfactory results.

67  
68 C Waterblasting Equipment Waterblasting equipment shall include a trailer-mounted water  
69 tank, pumps, high-pressure hose, a wand with safety release cutoff controls, nozzle, and  
70 auxiliary water resupply equipment. The water tank and auxiliary water resupply  
71 equipment shall be sufficient capacity to permit continuous operations. The pumps,  
72 hoses, wand, and nozzle shall be of sufficient capacity to permit the cleaning of both  
73 walls of the joint and the pavement surface for a width of at least 1/2 inch on either side  
74 of the joint. The pump shall be capable of supplying a pressure of at least 3,000 psi. A  
75 pressure gauge mounted at the pump shall show at all times the pressure in pounds per  
76 square inch at which the equipment is operating.

77  
78

79 **PART 4 CONSTRUCTION METHOD**

80  
81 4.01 Installation of foam joint sealant shall comply with Manufacturer's instructions and  
82 recommendations for foam joint sealant installation, complete with a compatible epoxy adhesive  
83 for adhesion to all surfaces.

84  
85 Prior to installing foam joint sealant, make certain that surfaces to which adhesive will adhere are  
86 clean and free of dust, dirt and other residues that would inhibit a proper bond.

87  
88 The Contractor shall make arrangements for the Manufacturer's representative to meet with the  
89 Contractor and the City's Project Manager prior to the start of sealing operations to ensure the  
90 installation procedures are in accordance with the Manufacturer's direction. A representative of the  
91 joint sealant manufacturer shall visit the job-site a sufficient number of times during the sealing  
92 operations and after the sealing is completed to certify that the joint sealant was installed in  
93 accordance with the manufacturer's recommended methods and procedures.

94  
95 4.02 PREPARATION OF JOINTS Immediately before installation of the preformed joint seal, the  
96 joints shall be thoroughly cleaned full depth to remove all laitance, filler, old existing sealant,  
97 foreign material and protrusions of hardened concrete from the sides and upper edges of the joint  
98 space to be sealed. Any irregularity in the joint face, which would prevent uniform contact  
99 between the joint seal and the joint face shall be corrected prior to the installation of the joint seal.  
100 All joint faces shall be vertical.

101  
102 A. Sawing Joints shall be sawed to clean and to open them to the full specified width and  
103 depth. Immediately following the sawing operation, the joint faces and opening shall be  
104 thoroughly cleaned using a water jet to remove all saw cuttings or debris remaining on  
105 the faces or in the joint opening. Compression seal shall be installed within 3 calendar  
106 days of the time the individual joint cavity is sawed. Depth of sawing the cavity shall be  
107 between 3/4 and 1 inch deeper than the uncompressed depth of the seal, or otherwise  
108 recommended by the manufacturer. The saw cut for the joint seal cavity shall at all  
109 locations be centered over the joint line. The nominal width of the sawed joint seal cavity  
110 shall be as follows; the actual width shall be within a tolerance of plus or minus 1/16 inch  
111 or as noted in the details.

112  
113 The pavement temperature shall be measured in the presence of the Project Manager.  
114 Measurement shall be made each day before commencing sawing and at any other time  
115 during the day when the temperature appears to be moving out of the allowable sawing  
116 range.

117  
118 B. Sandblast Cleaning The concrete joint faces and pavement surfaces extending at least  
119 1/2 inch from the joint edges shall be sandblasted clean. A multiple pass technique shall  
120 be used until the surfaces are free of dust, direct curing compound, or any residue that  
121 might prevent ready insertion or uniform contact of the seal and bonding of the  
122 lubricant/adhesive to the concrete. After final cleaning and immediately prior to sealing,  
123 the joints shall be blown out with compressed air and left completely free of debris and  
124 water.

125  
126 C. Waterblast Cleaning The concrete joint faces and pavement surfaces extending at least  
127 1/2 inch from the joint edges shall be waterblasted clean. A multiple pass technique shall  
128 be used until the surfaces are free of dust, direct, curing compound, or any residue that  
129 might prevent ready insertion or uniform contact of the seal and bonding of the adhesive  
130 to the concrete. After final cleaning and immediately prior to sealing, the joints shall be  
131 blown out with compressed air and left completely free of debris and water. When  
132 waterblast cleaning is used, slurry residue must be removed to provide a relatively dust  
133 free concrete surface.

134  
135 D. Rate of Progress The stages of joint preparation which includes sandblasting or  
136 waterblasting of the joint faces and air pressure cleaning of the joints shall be limited to  
137 only the linear footage of joint that can be sealed during the same workday.

138  
139 4.03 TIME OF INSTALLATION Joints shall be sealed within 3 calendar days of sawing the joint seal  
140 cavity and immediately following concrete cure and the final cleaning of the joint walls. Open  
141 joints ready for sealing that cannot be sealed under the conditions specified herein shall be  
142 provided with an approved temporary seal to prevent infiltration of foreign material. When rain  
143 interrupts the sealing operations, the joints shall be washed, air pressure cleaned and allowed to  
144 dry prior to installing the lubricant/adhesive and preformed seal.

145  
146 4.04 CLEAN-UP Prior to Substantial Completion, all unused materials shall be removed from the site,  
147 any adhesive on the pavement surface shall be removed, and the pavement shall be left in clean  
148 condition.

149  
150 4.05 WARRANTY The Manufacturer shall provide a warranty on the materials furnished for a  
151 minimum of 5 years from the date of acceptance by the Project Manager. The Contractor shall  
152 provide a warranty on the installation for a minimum of 5 years from the date of acceptance by  
153 the Project Manager.

154  
155  
156 **PART 5 QUALITY CONTROL**

157  
158 5.01 PROCEDURES Quality control provisions shall be provided during the joint cleaning process  
159 to prevent or correct improper equipment and cleaning techniques that damage the concrete in  
160 any manner. Cleaned joints shall be approved by the Project Manager prior to installation of the  
161 adhesive and preformed joint seal.

162  
163  
164 5.02 PRODUCT The joint sealing system (preformed seal) shall be inspected for proper rate  
165 of cure and bonding to the concrete, cuts, twists, nicks, and other deficiencies. Seals exhibiting  
166 any defects, at any time prior to final acceptance of the project, shall be removed from the joint,

167 wasted, and replaced in a satisfactory manner.  
168  
169

170 **PART 6 METHOD OF MEASUREMENT**  
171

172 6.01 Refer to Appendix A for Method of Measurement.  
173  
174

175  
176 **PART 7 BASIS OF PAYMENT**  
177

178 7.01 Refer to Appendix A for Basis of Payment  
179  
180

181  
182 **PART 8 TESTING REQUIREMENTS**  
183

184 ASTM D 6211 Test Strength of Conventional Vulcanized Rubber and Thermoplastic  
185 Elastomers  
186

187 ASTM D 3575 Suffix T Flexible Cellular Materials Made from Olefin Polymers  
188

189 ASTM D 3575 Suffix S Flexible Cellular Materials Made from Olefin Polymers  
190

191 **END OF ITEM P-604A**



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**ITEM P-604B**

**POLYCHLOROPRENE COMPRESSION JOINT SEALS  
FOR CONCRETE PAVEMENTS**

**PART 1 GENERAL**

- 1.01 DESCRIPTION This item shall consist of performed polychloroprene compression seals used for sealing joints of rigid pavements.

**PART 2 MATERIALS**

- 2.01 PREFORMED SEALS. Preformed joint seal materials shall be a vulcanized elastomeric compound using polychloroprene as the only base polymer. The material and the manufactured seal itself shall conform to ASTM D 2628 and CRD C 548. The joint seal shall be a labyrinth type seal with the uncompressed depth of the seal greater than the uncompressed width of the seal. The actual width of the uncompressed seal shall be per manufacturer's recommendation for the widths of joint as shown on the Contract Drawings.
- 2.02 LUBRICANT/ADHESIVE. Lubricant/adhesive used for the preformed elastomeric joint seal shall be a one-component compound conforming to ASTM D 2835.
- 2.03 DELIVERY AND STORAGE. Materials delivered to the job site shall be inspected for defects, unloaded, and stored with a minimum of handling to avoid damage. Storage facilities shall be provided at the job site to protect materials from weather and to maintain them at temperatures as recommended by the manufacturer.
- 2.04 SUBMITTALS. Certified copies of test results shall be provided in accordance with Section 01300.
- A. Construction Equipment List. List of proposed equipment to be used in the performance of construction work, including descriptive data, shall be provided in accordance with Section 01300.
  - B. Manufacturer's Instructions. Where installation procedures, or any part thereof, are required to be in accordance with the manufacturer's recommendations, printed copies of the recommendations shall be furnished in accordance with Section 01300. Installation of the material will not be allowed until the recommendations are received. Failure to furnish these recommendations can be a cause for rejection of the material.
  - C. Samples. Regardless of testing responsibility, samples of the materials shall be submitted for approval in accordance with Section 01300. Written or printed directions from the manufacturer giving recommended criteria for installation shall be furnished at the same time, plus certification from the manufacturer that the seal selected is recommend for the installation involved on this project. No material will be allowed to be used until it has been approved.
- 2.05 TEST REQUIREMENTS. Each lot of preformed joint seal and lubricant/adhesive produced for this project shall be sampled, adequately identified, and tested for conformance with the referenced applicable material specification. No material shall be used at the project prior to receipt of written notice that the materials meet the laboratory requirements. The cost of testing the samples from each original lot supplied will be borne by the Contractor. If the sample fail to meet specification requirements, the materials represented by the sample shall be replaced and the new materials tested. Testing of the preformed joint and lubricant/adhesive material shall be the responsibility of the Contractor and shall be performed in an approved independent laboratory

58 and certified copies of the test reports shall be submitted for approval in accordance with Section  
59 01300, prior to the use of the materials at the job site. Samples of each lot of material shall also  
60 be submitted and will be retained by the Project Manager for possible future testing should the  
61 materials appear defective during or after application. The Contractor shall furnish additional  
62 samples of materials, in sufficient quantity to be tested, upon request. Conformance with the  
63 requirements-of the laboratory tests specified will not constitute final acceptance of the materials.  
64 Final acceptance will also be based on the performance of the in-place materials.  
65  
66

### 67 PART 3 EQUIPMENT

68  
69 3.01 Machines, tools, and equipment used in the performance of the work required by this section  
70 shall be approved before the work is started and shall be maintained in satisfactory condition at  
71 all times.

#### 72 A. Joint Cleaning Equipment

73  
74  
75 (1) Concrete saw. A self-propelled power saw with water-cooled diamond or  
76 abrasive saw blades shall be provided for cutting joints to the depths and widths  
77 specified and for removing filler (existing old joint seal) or other material  
78 embedded in the joints or adhered to the joint faces.  
79

80 (2) Sandblasting Equipment. Sandblasting equipment shall include an air  
81 compressor, hose, and a long-wearing venturi-type nozzle of proper size, shape,  
82 and opening. The maximum nozzle opening should not exceed 1/4 inch. The air  
83 compressor shall be portable and shall be capable of furnishing not less than 150  
84 cubic feet per minute and maintaining a line pressure of not less than 90 psi at  
85 the nozzle while in use. The compressor shall be equipped with traps that will  
86 maintain the compressed air free of oil and water. The height, angle of  
87 inclination, and the size of the nozzle shall be adjusted as necessary to ensure  
88 satisfactory results.  
89

90 (3) Waterblasting Equipment. Waterblasting equipment shall include a  
91 trailer-mounted water tank, pumps, high-pressure hose, a wand with safety  
92 release cutoff controls, nozzle, and auxiliary water resupply equipment. The  
93 water tank and auxiliary water resupply equipment shall be sufficient capacity to  
94 permit continuous operations. The pumps, hoses, wand, and nozzle shall be of  
95 sufficient capacity to permit the cleaning of both walls of the joint and the  
96 pavement surface for a width of at least 1/2 inch on either side of the joint. The  
97 pump shall be capable of supplying a pressure of at least 3,000 psi. A pressure  
98 gauge mounted at the pump shall show at all times the pressure in pounds per  
99 square inch at which the equipment is operating.  
100

101 B. Sealing Equipment. Equipment used to install the preformed seal shall place the  
102 preformed seal to the prescribed depths within the specified tolerances without cutting,  
103 nicking, twisting, or otherwise damaging the seal. The equipment shall not stretch or  
104 compress the seal more than 1.5 percent longitudinally during installation. The machine  
105 shall be an automatic self-propelled joint seal application equipment and shall be engine  
106 powered. The machine shall include a reservoir for the lubricant/adhesive, a device for  
107 conveying the lubricant/adhesive in the proper quantities to the sides of the preformed  
108 seal or the sidewalls of the joint. Material shall be manually fed into the machine. The  
109 equipment shall also include a guide to maintain the proper course along the joint being  
110 sealed. The machine shall at all times be operated by an experienced operator.  
111

112 Single-axle type seal application equipment will not be permitted.  
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**PART 4 CONSTRUCTION METHODS**

4.01 ENVIRONMENTAL CONDITIONS. The ambient temperature and the pavement temperature within the joint wall shall be at least 35 degrees F and rising at the time of installation of the materials or per manufacturer’s installation procedures. Sealant application will not be permitted if moisture or any foreign material is observed in the joint.

4.02 TRIAL JOINT SEAL AND LUBRICANT/ADHESIVE INSTALLATION. Prior to the cleaning and sealing of the joints for the entire project, a test section at least 200 feet long shall be prepared at a location directed in the project pavement using the specified materials and the approved equipment, so as to demonstrate the proposed joint preparation and sealing of all types of joints in the project. Following the completion of the trial length and before any other joint is sealed; the trial joints will be inspected by the Project Manager and Manufacturer’s representative to determine that the materials and installation meet the requirements specified. If materials or installation do not meet requirements the materials shall be removed, and the joints shall be recleaned and resealed at no cost to the owner. No other joints shall be sealed until the test installation has been approved. If the trial section is approved, it may be incorporated into the permanent work and paid for at the contract unit prices per linear foot for sealing items scheduled. All other joints shall be sealed in the manner approved for sealing the trial joints.

4.03 PREPARATION OF JOINTS. Immediately before installation of the preformed joint seal, the joints shall be thoroughly cleaned to remove all laitance, filler, old existing sealant, foreign material and protrusions of hardened concrete from the bottom, sides, and upper edges of the joint space to be sealed. Any irregularity in the joint face, which would prevent uniform contact between the joint seal and the joint face shall be corrected prior to the installation of the joint seal.

A. Sawing. Joints shall be sawed to clean and to open them to the full specified width and depth. Immediately following the sawing operation, the joint faces and opening shall be thoroughly cleaned using a water jet to remove all saw cuttings or debris remaining on the faces or in the joint opening. Compression seal shall be installed within 3 calendar days of the time the individual joint cavity is sawed. Depth of sawing the cavity shall be between 3/4 and 1 inch deeper than the uncompressed depth of the seal, or otherwise recommended by the manufacturer. The saw cut for the joint seal cavity shall at all locations be centered over the joint line. The nominal width of the sawed joint seal cavity shall be as follows; the actual width shall be within a tolerance of plus or minus 1/16 inch:

The pavement temperature shall be measured in the presence of the Project Manager. Measurement shall be made each day before commencing sawing and at any other time during the day when the temperature appears to be moving out of the allowable sawing range.

B. Sandblast Cleaning. The concrete joint faces and pavement surfaces extending at least 1/2 inch from the joint edges shall be sandblasted clean. A multiple pass technique shall be used until the surfaces are free of dust, direct curing compound, or any residue that might prevent ready insertion or uniform contact of the seal and bonding of the lubricant/adhesive to the concrete. After final cleaning and immediately prior to sealing, the joints shall be blown out with compressed air and left completely free of debris and water.

C. Waterblast Cleaning. The concrete joint faces and pavement surfaces extending at least 1/2 inch from the joint edges shall be waterblasted clean. A multiple pass technique shall be used until the surfaces are free of dust, direct, curing compound, or any residue that might prevent ready insertion or uniform contact of the seal and bonding of the lubricant/adhesive to the concrete. After final cleaning and immediately prior to sealing, the joints shall be blown out with compressed air and left completely free of debris and

170 water. When waterblast cleaning is used, slurry residue must be removed to provide a  
171 relatively dust free concrete surface.  
172

173 D. Rate of Progress. The stages of joint preparation which includes sandblasting or  
174 waterblasting of the joint faces and air pressure cleaning of the joints shall be limited to  
175 only the linear footage of joint that can be sealed during the same workday.  
176

177 4.04 INSTALLATION OF THE PREFORMED SEAL  
178

179 A. Time of Installation. Joints shall be sealed within 3 calendar days of sawing the joint  
180 seal cavity and immediately following concrete cure and the final cleaning of the joint  
181 walls. Open joints ready for sealing that cannot be sealed under the conditions specified  
182 herein shall be provided with an approved temporary seal to prevent infiltration of foreign  
183 material. When rain interrupts the sealing operations, the joints shall be washed, air  
184 pressure cleaned and allowed to dry prior to installing the lubricant/adhesive and  
185 preformed seal.  
186

187 B. Sequence of Installation. Longitudinal joints shall be sealed first, followed by transverse  
188 joints and then all other joints. Seals in longitudinal joints shall be cut so that all  
189 transverse joint seals will be intact from edge to edge of the pavement. Intersections  
190 shall be made monolithic by use of joint seal adhesive and care in fitting the intersection  
191 parts together. Extender pieces of seal shall not be used at intersections. Any seal  
192 falling short of the intersection shall be removed and replaced with new seal at no  
193 additional cost to the owner.  
194

195 4.05 SEALING OF JOINTS. The joint seal shall be installed using the equipment specified in  
196 paragraph Equipment. The sides of the joint seal or the sides of the joint shall be covered with a  
197 coating of lubricant/adhesive and the seal installed in such a manner as to conform to all  
198 requirements specified. Butt joints and seal intersections shall be sealed with sealant  
199 recommended by sealant Manufacturer. Lubricant/adhesive/sealant spilled on the pavement shall  
200 be removed immediately to prevent setting on the pavement. The in-place joint seal shall be in an  
201 upright position and free from twisting, distortion, cuts, and stretching or compression in excess  
202 of 1.5 percent. The joint seal shall be placed at a uniform depth within the tolerances specified.  
203 Inplace joint seal which fails to meet the specified requirements shall be removed and replaced  
204 with new joint seal in a satisfactory manner at no additional cost to the owner. The preformed  
205 joint seal shall be placed to a depth as shown on the Contract Drawings. For chamfered joints or  
206 joints with a radius at the surface, the preformed joint seal shall be installed at a depth of 1/8 inch,  
207 plus or minus 1/8 inch, below the bottom of the edge of the chamfer or radius. No part of the seal  
208 shall be allowed to project above the surface of the pavement or above the edge of the chamfer  
209 or radius. The seal shall be installed in the longest practicable lengths in longitudinal joints and  
210 shall be cut at the joint intersections so as to provide continuous installation of the seal in the  
211 transverse joints. The lubricant/adhesive in the longitudinal shall be allowed to set for 1 hour  
212 prior to cutting at the joint intersections to reduce the possibility of shrinkage. For all transverse  
213 joints, the minimum length of the preformed joint seal shall be the pavement width from edge to  
214 edge.  
215

216 4.06 CLEAN-UP. Prior to Substantial Completion, all unused materials shall be removed from the  
217 site, any lubricant/adhesive on the pavement surface shall be removed, and the pavement shall  
218 be left in clean condition.  
219

220 4.07 WARRANTY. The Manufacturer shall provide a warranty on the materisl furnished for a  
221 mimimum of 5 years from the date of acceptance by the Project Manager. The Contractor shall  
222 provide a warranty on the installation for a minimum of 2 years from the date of acceptance by  
223 the Project Manager.  
224

225  
226 **PART 5 QUALITY CONTROL**

227  
228 5.01 QUALITY CONTROL PROVISIONS  
229

230 A. Equipment. The application equipment shall be inspected to assure uniform application  
231 of lubricant/adhesive to the sides of the preformed joint seal or the walls of the joint. If  
232 any equipment causes cutting, twisting, nicking, excessive stretching or compressing of  
233 the preformed seal, or improper application of the lubricant/adhesive the operation shall  
234 be suspended until causes of the deficiencies are determined and corrected.

235  
236 B. Procedures

237  
238 (1) Quality control provisions shall be provided during the joint cleaning process to  
239 prevent or correct improper equipment and cleaning techniques that damage the  
240 concrete in any manner. Cleaned joints shall be approved by the Project  
241 Manager prior to installation of the lubricant/adhesive and performed joint seal.

242  
243 (2) Conformance to stretching and compression limitations shall be determined.  
244 After installation, the distance between the marks shall be measured on the  
245 pavement. If the stretching or compression exceeds the specified limit, the seal  
246 shall be removed and replaced with new joint seal at no additional cost to the  
247 owner. The seal shall be removed up to the last correct measurement. The seal  
248 shall be inspected a minimum of once per 100 feet of seal for compliance to the  
249 shrinkage or compression requirements. Measurements shall also be made as  
250 directed to determine conformance with depth and width installation  
251 requirements. All preformed seal that is not in conformance with specification  
252 requirements shall be removed and replaced with new joint seal at no additional  
253 cost to the owner.

254  
255 C. Product. The joint sealing system (preformed seal and lubricant/adhesive) shall be  
256 inspected for proper rate of cure and bonding to the concrete, cuts, twists, nicks, and  
257 other deficiencies. Seals exhibiting any defects, at any time prior to final acceptance of  
258 the project, shall be removed from the joint, wasted, and replaced in a satisfactory  
259 manner.

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261  
262 **PART 6 METHOD OF MEASUREMENT**

263  
264 6.01 Refer to Appendix A for Method of Measurement.

265  
266  
267 **PART 7 BASIS OF PAYMENT**

268  
269 7.01 Refer to Appendix A for Basis of Payment.

270  
271  
272 **PART 8 TESTING REQUIREMENTS**

273  
274 The publications listed below form a part of this specification to the extent referenced. The  
275 publications are referred to in this text by basic designation only.

276  
277 U.S. ARMY CORPS OF ENGINEERS

278  
279 CRD C 548 Standard Specification for Jet-Fuel and Heat Resistant Preformed  
280 Polychloroprene Elastomeric Joint Seals for Rigid Pavements.

281  
282 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

284                             ASTM D 2628             Preformed Polychloroprene Elastomeric Joint Seals for Concrete  
285                                                                     Pavements

286  
287                             ASTM D 2835             Lubricant for Installation of Preformed Compression Seals in  
288                                                                     Concrete Pavements.

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291                                                                     **END OF ITEM P-604B**

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**ITEM P-605**

**JOINT SEALING FILLER**

**PART 1 GENERAL**

1.01 DESCRIPTION. This item shall consist of providing and installing an approved non-sag silicone sealant material capable of effectively sealing joints in concrete pavements. This item shall also consist of preparing, cleaning and sealing cracks and joints in existing bituminous pavement.

**PART 2 MATERIALS**

2.01 JOINT SEALANTS, COLD APPLIED SEALANTS. The joint sealing material shall be a Dow product or approved equal, Type NS (Non-Sag) and shall comply with the following specifications.

ASTM D 5893 Cold Applied, Single Component, Chemically Curing  
Silicone Joint Sealant for Portland Cement Concrete  
Pavements

ASTM D 6690 Joint and Crack Sealants, Hot-Applied, for Concrete and  
Asphalt Pavements

The Contractor shall furnish Manufacturer's certified test results performed for each lot of sealant delivered to the job site. The Contractor must also furnish certifications by an independent testing laboratory that the material meets the requirements of the specifications.

Manufacturer shall provide product bulletins, material safety data sheets and other related data to indicate conformance to the aforementioned specification requirements.

The Contractor shall make arrangements for the Manufacturer's representative to meet with the Contractor and the City's Project Manager prior to the start of sealing operations to ensure the installation procedures are in accordance with the Manufacturer's direction. A representative of the joint sealant manufacturer shall visit the job-site a sufficient number of times during the sealing operations and after the sealing is completed to certify that the joint sealant was installed in accordance with the manufacturer's recommended methods and procedures. Adequate lighting must be provided during nighttime operations to ensure compliance with all applicable local, state and federal laws, rules and regulation. Also this lighting must be adequate to visually inspect the condition of the side walls of the joint prior to the installation of backer rod or joint sealant material.

2.02 CRACK SEALANT. Material for crack sealing shall meet the requirements of ASTM D 6690, Type II.

The Contractor shall furnish Manufacturer's certified test results performed for each lot of sealant delivered to the job site. The Contractor must also furnish certifications by an independent testing laboratory that the material meets the requirements of the specifications.

Manufacturer shall provide product bulletins, material safety data sheets and other related data to indicate conformance to the aforementioned specification requirements.

2.03 BACKER ROD. Backer rod materials shall be a non-moisture absorbing, closed-cell polyethylene foam rod that is compatible with the sealant material to act as a bond breaker and complies with the

48 sealant manufacturer's recommendation. The backer rod shall be approximately 25 percent larger  
49 than the joint width to provide a tight seal that prevents the sealant from flowing to the bottom of the  
50 joint. -- *The Contractor shall stock several sizes of backer rod and shall use the appropriate size, as*  
51 *recommended by the manufacturer, or as directed by the Project Manager, to provide a tight seal.*  
52

53 2.04 DELIVERY. Each shipment of joint sealant shall be delivered to the job site in the manufacturer's  
54 original sealed container. Each container shall be marked with the manufacturer's name, product  
55 name, batch or lot number, date of manufacture, shelf life, mixing instructions and storage  
56 instructions. Each shipment shall be accompanied by the manufacturer's certification stating that the  
57 joint sealant meets the requirements of this specification.  
58

59 2.05 STORAGE. The joint sealing material shall be stored out of weather and direct sunlight, in original,  
60 tightly sealed containers at a temperature between 50° F and 100° F or per the manufacturer's  
61 recommendations. The more stringent requirements shall apply.  
62

63  
64 **PART 3 EQUIPMENT**  
65

66 3.01 GENERAL. Equipment necessary for construction of this work shall be in first-class working  
67 condition. The equipment shall be as recommended by the manufacturer of the joint sealant material  
68 and shall be approved by the City's Project Manager prior to beginning work.  
69

70 3.02 INSTALLATION EQUIPMENT. The joint or crack sealant equipment shall consist of apparatus  
71 capable of extruding the material at a continuous feed. The extruding nozzle tip of the machine shall  
72 be designed to fill the joint uniformly.  
73

74 3.03 EQUIPMENT FOR CLEANING JOINTS OR ROUTING AND CLEANING CRACKS. The equipment  
75 for cleaning joint openings or cracks shall consist of powered and hand brooms, powered routing  
76 machines, air compressors, and sandblasters as required to produce a satisfactory clean and dry  
77 joint or crack.  
78

79 3.04 AIR COMPRESSOR. Air compressors shall be equipped with suitable traps capable of removing all  
80 free water and oil from the compressed air and shall be capable of furnishing air with a pressure  
81 greater than 100 psi.  
82

83  
84 **PART 4 CONSTRUCTION METHODS**  
85

86 4.01 TIME OF APPLICATION. In no case shall sealant be placed when surface temperatures are below  
87 50°F, as measured from the bottom of the joint or crack. Weather shall not be foggy or rainy at the  
88 time of installation of the joint sealing material and joints shall be dry.  
89

90 4.02 PREPARATION OF JOINTS. Existing joints that are to be sealed or resealed shall first be widened  
91 by saw cutting approximately 1/16" on each face and to a depth as shown on the details. The  
92 Contractor shall use a system having two saw blades with a properly-sized spacer between them to  
93 cut the joint to the specified width while sawing both faces of the joint simultaneously. The face of all  
94 joints shall be uniform in width and depth along the full length of the joint. Finished joint dimensions  
95 will correspond to that shown on the plans. The edges of all widened joints shall be chamfered as  
96 shown on the plans.  
97

98 The cut faces of the joints shall be thoroughly cleaned of all foreign materials, as may be required for  
99 proper installation and bonding of the joint sealer or filler by sandblasting as required. The use of a  
100 portable hand saws will not be permitted for cleaning of joint faces.



101  
102 After completely drying, the joints shall be thoroughly cleaned by sandblasting. The sandblast nozzle  
103 shall have only one opening, thus a pass will be required for each face to be cleaned.  
104

105 After sandblasting, the joints shall be blown out using oil and moisture free air at a minimum of 100  
106 psi and 150 cfm. Blowing out of the joint shall be accomplished by using a blow tube which will fit into  
107 the joint.  
108

109 All sand and debris shall be removed from the pavement by means of a power sweeper with  
110 vacuum pickup prior to the sealing operation beginning.  
111

112 After removal of all sand and debris, the joint shall be checked for any residual dust or coating. If any  
113 is found the sandblasting and cleaning operations shall be repeated until the joint is cleaned. The  
114 cleaned joint shall be sealed the same day as cleaned.  
115

116 In the event that the open joints prepared for installation of joint sealing materials become  
117 contaminated by traffic, or the result of weather conditions, they shall be re-cleaned as specified  
118 above or as approved by the Project Manager at no additional cost to the Owner.  
119

120 Prior to the placement of the sealant stop or sealant materials, the joints will be inspected for proper  
121 width (utilizing a spacer gauge), depth, alignment and cleanliness and shall be approved by both the  
122 Contractor's Quality Control Manager and the City's Quality Assurance Inspectors.  
123

124 The backer rod shall be installed immediately after approval is granted by the Contractor's Quality  
125 Control Manager and the City's Quality Assurance Inspectors. This backer rod shall be installed  
126 utilizing a device which minimizes elongation and insures placement at the proper depth.  
127

128 4.04 INSTALLATION OF SEALANTS. Joint sealing compound shall be applied uniformly solid from  
129 bottom to top, filling the joint space without the formation of voids. Equipment as recommended  
130 by the sealant manufacturer and approved by the Project Manager will be utilized to force the  
131 sealing material to the bottom of the joint and completely fill the joint without spilling the material  
132 on the surface of the pavement. Any excess sealant on the pavement surface shall be removed  
133 with the surface left in a clean condition acceptable to the Project Manager.  
134

135 Sealant which does not bond to the concrete surface of the joint walls, contains voids, or fails to  
136 set to a tack-free condition will be rejected and replaced by the Contractor at no additional cost.  
137

138 4.05 FIELD TEST. Before sealing the joints, the Contractor shall demonstrate that the equipment and  
139 procedures for preparing, mixing, and placing the sealant will produce a satisfactory joint seal.  
140 The demonstration shall include the preparation of at least two small batches and the application  
141 of the resulting material in five joints of at least 25 feet in length each. A representative of the  
142 joint sealant manufacturer shall be present at the demonstration to ensure that the installation  
143 procedures are in accordance with the manufacturer's recommended installation instructions.  
144

145 A. Testing For Cold Applied Silicone Sealants When checking for adhesions of silicone, a  
146 pull test may be performed on the job site 21 days after the sealant has been placed.  
147

148 (1) Make a knife cut horizontally across and through the silicone from one side of the  
149 joint to the other.  
150

151 (2) Make a vertical cut approximately 2-3 inches long on each side of the joint  
152 starting at the horizontal cut, keeping the cuts the same length on each side.  
153

154 (3) Hold the piece of silicone firmly and slowly pull at a 90° angle stretching the  
155 silicone not more than 10" per minute as if trying to pull the adhered silicone out  
156 of the joint.

157  
158 (4) If adhesion is proper, the silicone will not pull out of the joint, but will eventually  
159 tear cohesively across the joint at the base of the knife cut.

160  
161 If the silicone releases from the joint, adhesion has been affected. Several possible  
162 causes are:

163  
164 (1) Moisture in the joint during sealant application

165  
166 (2) Dirty or dusty joint sidewalls

167  
168 (3) Improper application (overfilling, etc.)

169  
170 (4) Spalling of the joint walls. (pieces of the concrete will be adhered to the silicone)

171  
172 B. Repair of sealant in areas of adhesion test The silicone sealant may be replaced by  
173 simply applying additional new silicone (normally using a tube of like silicone) in the same  
174 manner as it was originally placed, providing good adhesion was achieved. Proper  
175 preparation of the area should be performed prior to reapplying the silicone assuring the  
176 original silicone and the newly applied silicone are in good contact with each other.

177  
178 4.06 WARRANTY The manufacturer shall provide a warranty on the materials furnished for a  
179 minimum of 5 years from the date of acceptance by the Project Manager. The Contractor shall  
180 provide a warranty on the installation for a minimum of 2 years from the date of acceptance by  
181 the Project Manager.

182  
183 4.07 CRACK TREATMENT CRITERIA. Cracks less than 1/16 inch in width shall not be sealed. All  
184 cracks in excess of 1/16 inch shall be routed, cleaned and sealed.

185  
186 4.08 SURFACE PREPARATION All cracks that are to be sealed shall be thoroughly cleaned by  
187 blowing them out with an air compressor or air lance. The purpose of cleaning the cracks is to  
188 provide a sealant reservoir and to ensure good clean vertical asphalt surfaces to which the  
189 sealant can bond. The Contractor's operation will be monitored to ensure that these objectives  
190 are met.

191  
192 All cracks to be sealed shall have all dirt, old crack sealer, vegetation, and asphalt removed for  
193 the full depth to be filled with crack sealant.

194  
195 4.09 APPLICATION OF CRACK SEALANT. Cracks shall be filled with sealant to not less than 1/8  
196 inch below the pavement surface. After filling the cracks, the sealant may be squeegeed, only if  
197 necessary, to ensure that no sealant protrudes above the existing pavement surfaces. The  
198 crack-filling rate and squeegeeing shall be controlled so as to not have excessive material  
199 squeegeed on the surface of the pavement. Excessive material on the pavement surface shall  
200 be reason for the Project Inspector to stop the operation until the Contractor satisfactorily  
201 demonstrates a technique to avoid excessive material on the pavement surface.

202  
203 4.10 CLEANUP Cleanup shall be continuous throughout the routing, crack cleaning, filling and sealing  
204 operations. Waste materials shall be removed from the pavement surface and adjacent areas by  
205 sweeping and/or vacuuming. All waste materials shall be disposed of legally off-site at a location  
206 approved by the Owner and at the Contractor's expense, which is incidental to the crack sealing.

207  
208 All sand and debris shall be removed from the pavement by means of a power sweeper with  
209 vacuum pickup prior to the sealing operation beginning.  
210

211  
212

213 **PART 5 QUALITY CONTROL**

214  
215 5.01 Pull test shall be the means of verifying both the adhesion and elongation requirements of this  
216 Specification Section. Pull test shall be taken every 5,000 linear feet (LF) of sealant installed 21  
217 days after placement of sealant in accordance with Manufacturer's recommendation and  
218 witnessed by the Project Manager or his designated representative. Pull test must withstand  
219 400% elongation with no failure in adhesion and or material breakage. Any joint found to be  
220 unacceptable per the specifications shall be removed and replaced at no cost to the City. All  
221 sample areas shall be resealed by the Contractor in accordance with the joint preparation  
222 section.  
223

224 **PART 6 METHOD OF MEASUREMENT**

225  
226 6.01 Refer to Appendix A for Method of Measurement.  
227

228

229 **PART 7 BASIS OF PAYMENT**

230  
231 7.01 Refer to Appendix A for Basis of Payment..  
232

233

234 **PART 8 TESTING REQUIREMENTS**

235  
236 ASTM D412 Tests for Rubber Properties in Tension

237  
238 ASTM D1644 Tests for Nonvolatile Content of Varnishes

239

240

241 **PART 9 MATERIAL REQUIREMENTS**

242  
243 ASTM D2628 Preformed Polychloroprene Elastomeric Joint Seals for Concrete

244  
245 ASTM D3405 Joint Sealants, Hot Poured, For Concrete and Asphalt Pavements

246  
247 ASTM D6690 Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

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250 **END OF ITEM P-605**

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**ITEM P-606**

**ADHESIVE COMPOUNDS, TWO-COMPONENT FOR SEALING  
WIRE AND LIGHTS IN PAVEMENT**

**PART 1 GENERAL**

1.01 DESCRIPTION. This specification covers a liquid suitable for sealing light fixtures or bases in pavement. The material is a two-component filled formula with the characteristics specified in paragraph 2.04. Materials supplied for use with bituminous concrete pavements must be formulated so they are compatible with the bituminous concrete.

**PART 2 EQUIPMENT AND MATERIALS**

2.01 CURING. When pre-warmed to 77° F, mixed, and placed in accordance with manufacturer's directions, the materials shall cure at temperatures of 45° F or above without the application of external heat.

2.02 STORAGE. The adhesive components shall not be stored at temperatures over 86° F.

2.03 CAUTION. Installation and use shall be in accordance with the manufacturer's recommended procedures. Avoid prolonged or repeated contact with skin. In case of contact, wash with soap and flush with water. If taken internally, call doctor. Keep away from heat or flame. Avoid vapor. Use in well ventilated areas. Keep in cool place. Keep away from children.

2.04 CHARACTERISTICS. When mixed and cured in accordance with the manufacturer's directions, the materials shall have the following properties shown in Table 1.

2.05 Material shall be manufactured by ASTC Inc. or approved equal.

**PART 3 SAMPLING, INSPECTION, AND TEST PROCEDURES**

3.01 TENSILE PROPERTIES. Tests for tensile strength and elongation shall be conducted in accordance with ASTM D 638.

3.02 EXPANSION. Tests for coefficients for linear and cubical expansion shall be conducted in accordance with ASTM D 1168, Method B, except that mercury shall be used instead of glycerin. The test specimen(s) shall be mixed in the proportions specified by the manufacturer, and cured in a glass tub approximately 2 inches long by 3/8 inch in diameter. The interior of the tube shall be pre-coated with a silicone mold release agent. The hardened sample shall be removed from the tube and aged at room temperature for 1 week before conducting the test. The test temperature change shall be from 35° F to 140° F.

3.03 TEST FOR DIELECTRIC STRENGTH. Test of dielectric strength shall be conducted in accordance with ASTM D 149 for sealing compounds to be furnished for sealing fixture dam rings in pavement.

53

| TABLE 1. PROPERTY REQUIREMENTS               |                     |         |             |
|----------------------------------------------|---------------------|---------|-------------|
| Physical or Electric Property                | Minimum             | Maximum | ASTM Method |
| Tensile<br>Portland Cement Concrete          | 1,000 psi           |         | D 638       |
| Bituminous Concrete                          | 500 psi             |         |             |
| Elongation<br>Portland Cement Concrete       | 8% \1\              |         | D 638       |
| Bituminous Concrete                          | 50%                 |         | D 638       |
| Coef. of Cub. exp.<br>cu. cm/cu. cm/degree C | 0.00090             | 0.00120 | D 1168      |
| Coef. of lin. exp.<br>cm/cm/degree C         | 0.00030             | 0.00040 | D1168       |
| Dielectric Strength,<br>short time test      | 350 volts/mil.      |         | D 149       |
| Are resistance                               | 125 secs.           |         | D 495       |
| Adhesion to steel                            | 1,000 psi           |         |             |
| Adhesion to Portland Cement<br>Concrete      | 200 psi             |         |             |
| Adhesion to asphalt concrete                 | (no test available) |         |             |

54 \1\ 20% or more (without filler) for formulations to be supplied for areas subject to freezing

55

56 3.04 TEST FOR ARC RESISTANCE. Test for arc resistance shall be conducted in accordance with  
 57 ASTM D 495 for sealing compounds to be furnished for sealing fixture dam rings in pavement.

58

59 3.05 TEST FOR ADHESION TO STEEL. The ends of two smooth, clean, steel specimens of  
 60 convenient size (1 inch by 1 inch by 6 inches) would be satisfactory, are bonded together with  
 61 adhesive mixture and allowed to cure at room temperature for a period of time to meet  
 62 formulation requirements and then tested to failure on a Riehle (or similar) tensile tester. The  
 63 thickness of adhesive to be tested shall be 1/4 inch.

64

65 3.06 ADHESION TO PORTLAND CEMENT CONCRETE

66

67 A. Concrete Test Block Preparation. The aggregate grading shall be as shown in Table 2.

68

69 The coarse aggregate shall consist of crushed rock having a minimum of 75% of the  
 70 particles with at least one fractured face and having a water absorption of not more than  
 71 1.5%. The fine aggregate shall consist of crushed sand manufactured from the same  
 72 parent rock as the coarse aggregate. The concrete shall have a water-cement ratio of  
 73 5.5 gallons of water per bag of cement, a cement factor of 6, plus or minus 0.5, bags of  
 74 cement per cubic yard of concrete, and a slump of 2 1/2 inches, plus or minus 1/2 inch.  
 75 The ratio of fine aggregate to total aggregate shall be approximately 40% by solid  
 76 volume. The air content shall be 5.0% plus or minus 0.5%, and it shall be obtained by  
 77 the addition to the batch of air-entraining admixture such as vinsol resin. The mold shall

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be of metal and shall be provided with a metal base plate. Means shall be provided for securing the base plate to the mold. The assembled mold and base plate shall be watertight and shall be oiled with mineral oil before use. The inside measurement of the mold shall be such that several 1 inch by 2 inch by 3 inch test blocks can be cut from the specimen with a concrete saw having a diamond blade. The concrete shall be prepared and cured in accordance with ASTM C 192.

| TABLE 2 AGGREGATE FOR BOND TEST BLOCKS |            |                 |
|----------------------------------------|------------|-----------------|
| Type                                   | Sieve Size | Percent Passing |
| Coarse Aggregate                       | 3/4 inch   | 97 to 100       |
|                                        | 1/2 inch   | 63 to 69        |
|                                        | 3/8 inch   | 30 to 36        |
|                                        | No. 4      | 0 to 3          |
| Fine Aggregate                         | No. 4      | 100             |
|                                        | No. 8      | 82 to 88        |
|                                        | No. 16     | 60 to 70        |
|                                        | No. 30     | 40 to 50        |
|                                        | No. 50     | 16 to 26        |
|                                        | No. 100    | 5 to 9          |

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B. Bond Test. Prior to use, oven dry the test blocks to constant weight at a temperature 63.4 plus or minus 3° F in a desiccator, and clean the surface of the blocks of film or powder by vigorous brushing with a stiff bristled fiber brush. Two test blocks shall be bonded together on the 1 inch by 3 inch sawed face with the adhesive mixture and allowed to cure at room temperature for a period of time to meet formulation requirements and then tested to failure in a Riehle (or similar) tensile tester. The thickness of the adhesive to be tested shall be 1/4 inch.

3.07 COMPATIBILITY WITH ASPHALT CONCRETE. Test for compatibility with asphalt in accordance with ASTM D 3407.

3.08 ADHESIVE COMPOUNDS-CONTRACTOR'S RESPONSIBILITY. The Contractor shall furnish the vendor's certified Test reports for each batch of material delivered to the project. The report shall certify that the material meets specification requirements and is suitable for use with portland cement concrete and bituminous concrete pavements. The report shall be delivered to the Project Manager before permission is granted for use of the material. In addition, the Contractor shall obtain a statement from the supplier or manufacturer which guarantees the material for one year. The supplier or manufacturers shall furnish evidence that the material has performed satisfactorily on other projects.

3.09 APPLICATION. Adhesive shall be applied on a dry, clean surface, free of grease, dust and other loose particles. The method of mixing and application shall be in strict accordance with the manufacturer's recommendations.

A manufacturer's representative shall be present for the initial installation of the sealing material. The representative shall remain on site until the Project Manager is satisfied the installation crew is performing in accordance with the specifications and the manufacturer's guide lines.

**PART 4 METHOD OF MEASUREMENT**

4.01 Refer to Appendix A for Method of Measurement.

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**PART 5 BASIS OF PAYMENT**

5.01 Refer to Appendix A for Basis of Payment.

**PART 6 TESTING REQUIREMENTS**

- ASTM C 192 Making and Curing Concrete Compression of Flexure Test Specimens in the Laboratory.
- ASTM D 149 Test for Dielectric Breakdown Voltage and Dielectric Strength of Electrical Insulating Materials of Commercial Power Frequencies.
- ASTM D 495 Test for High Voltage, Low Current, Arc Resistance of Solid Electrical Insulating Materials.
- ASTM D 638 Test for Tensile Properties of Plastics
- ASTM D 1168 Testing Hydrocarbon Waxes Used for Electrical Insulation
- ASTM D 3407 Joint Sealant, Hot Poured, for Concrete and Asphalt Pavements

**END OF ITEM P-606**



ITEM P-610

STRUCTURAL PORTLAND CEMENT CONCRETE

PART 1 GENERAL

1.01 DESCRIPTION. This item shall consist of reinforced structural portland cement concrete, prepared and constructed in accordance with these specifications, at the locations and of the form and dimensions shown on the plans. All field-testing will be performed at the point of placement.

PART 2 MATERIALS

2.01 GENERAL. Only approved materials, conforming to the requirements of these specifications, shall be used in the work. They may be subjected to inspection and tests at any time during the progress of their preparation or use. The source of supply of each of the materials shall be approved by the Project Manager before delivery or use is started. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be scored and handled to insure the preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed therein.

In no case shall the use of pit-run or naturally mixed aggregates be permitted. Naturally mixed aggregate shall be screened and washed, and all fine and coarse aggregates shall be stored separately and kept clean. The mixing of different kinds of aggregates from different sources in one storage pile or alternating batches of different aggregates will not be permitted.

Aggregates shall be tested for deleterious reactivity with alkalis in the cement which may cause excessive expansion of the concrete. Tests shall be made for each source of fine and coarse aggregate in accordance with ASTM C 1260 Potential Alkali Reactivity of Aggregates (Mortar bar Method). Acceptance of aggregates shall be based upon satisfactory evidence furnished by the aggregate producer that the aggregates do not produce expansion in excess of 0.10% as indicated by certified by test results performed by a laboratory that meets the requirements of ASTM C 1077. Additional evidence for acceptance of the aggregates shall include service records of concrete of comparable properties under similar conditions or exposure. If the aggregates have been used at DIA provide the project name, project number, mix design number, and present condition of the concrete. If the aggregates have not been previously used at DIA, provide a list of projects, project locations, clients, client contact information and present condition of the concrete.

2.02 COARSE AGGREGATE. The coarse aggregate for concrete shall meet the requirements of ASTM C 33, Class 5S. Crushed stone aggregate shall have a durability factor meeting the criteria of ASTM C 33, Table 3 as determined by ASTM C 88.

Coarse aggregate shall be well graded from coarse to fine and shall meet one of the gradations shown in Table 1, using ASTM C 136.

2.03 FINE AGGREGATE. The fine aggregate for concrete shall meet the requirements of ASTM C 33.

The fine aggregate shall be well graded from fine to coarse and shall meet the requirements of Table 2, when tested in accordance with ASTM C 136:

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**TABLE 1  
 GRADATION FOR COARSE AGGREGATE**

| Sieve Designation<br>(Square Openings)            | Percentage by Weight Passing Sieves |        |        |        |        |       |       |       |
|---------------------------------------------------|-------------------------------------|--------|--------|--------|--------|-------|-------|-------|
|                                                   | 2"                                  | 1-1/2" | 1"     | 3/4"   | 1/2"   | 3/8"  | No. 4 | No. 8 |
| No. 4 to 1/2 inch<br>(Size No. 7)<br>(See Note 1) | ---                                 | ---    | ---    | 100    | 90-100 | 40-70 | 0-15  | 0-5   |
| No. 4 to 3/4 inch<br>(Size No. 67)                | ---                                 | ---    | 100    | 90-100 | ---    | 20-55 | 0-10  | 0-5   |
| No. 4 to 1 inch<br>(Size No. 57)                  | ---                                 | 100    | 95-100 | ---    | 25-60  | ---   | 0-10  | 0-5   |
| No. 4 to 1-1/2 inch<br>(Size No. 467)             | 100                                 | 95-100 | ---    | 35-70  | ---    | 10-30 | 0-5   | ----- |

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Note 1: The ASTM Size No. 7 aggregate may be used for repair of cement treated base course and shall not be used for any other mix.

**TABLE 2  
 REQUIREMENTS FOR GRADATION OF FINE AGGREGATE**

| Sieve Designation<br>(Square Openings) | Percentage by Weight<br>Passing Sieves |
|----------------------------------------|----------------------------------------|
| 3/8 inch                               | 100                                    |
| No. 4                                  | 95-100                                 |
| No. 8                                  | 80-100                                 |
| No. 16                                 | 50-85                                  |
| No. 30                                 | 25-60                                  |
| No. 50                                 | 5-30                                   |
| No. 100                                | 0-10                                   |

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Blending will be permitted, if necessary, in order to meet the gradation requirements for fine aggregate. Fine aggregate deficient in the percentage of material passing the No. 50 mesh sieve may be accepted, provided that such deficiency does not exceed 5 percent and is remedied by the addition of pozzolanic or cementitious materials other than portland cement, as specified in 2.06 on admixtures, in sufficient quantity to produce the required workability as approved by the Project Manager.

2.04 CEMENT. Cement shall conform to the requirements of Type I-II Low Alkali for 1,200 psi and 3,000 psi concrete and Type V, or equivalent, for 5,000 psi concrete.

77 Type I/II cement may be substituted for Type V providing it meets the following  
 78 requirements:

|     |                                                                          |             |                       |
|-----|--------------------------------------------------------------------------|-------------|-----------------------|
| 79  |                                                                          |             |                       |
| 80  | • Magnesium Oxide (MgO), max, %                                          | 6.0         | ASTM C 114            |
| 81  | • Sulfur trioxide (SO <sub>3</sub> ), <sup>A</sup> max, %                | 2.3         | ASTM C 114            |
| 82  | • Loss on Ignition, max, %                                               | 3.0         | ASTM C 114            |
| 83  | • Insoluble residue, max, %                                              | 0.75        | ASTM C 114            |
| 84  | • Equivalent alkalis (Na <sub>2</sub> O + 0.658K <sub>2</sub> O), max, % | 0.60        | ASTM C 114            |
| 85  | • Air content of mortar, max volume, %                                   | 12          | ASTM C 185            |
| 86  | • Fineness <sup>B</sup> , specific surface, m <sup>2</sup> /kg           |             |                       |
| 87  | (alternative methods):                                                   |             |                       |
| 88  |                                                                          |             |                       |
| 89  | Turbidimeter test:                                                       |             |                       |
| 90  | average value, min                                                       | 160         | ASTM C 115            |
| 91  | any one sample, min                                                      | 150         | ASTM C 115            |
| 92  | or                                                                       |             |                       |
| 93  | Air permeability test (Blain)                                            |             |                       |
| 94  | average value, min                                                       | 280         | ASTM C 204            |
| 95  | any one sample, min                                                      | 260         | ASTM C 204            |
| 96  |                                                                          |             |                       |
| 97  | • Autoclave expansion, max, %                                            | 0.80        | ASTM C 151            |
| 98  | • Strength, not less than the values shown                               |             |                       |
| 99  | for the ages indicated as follows:                                       |             |                       |
| 100 | Compressive strength, MPa (psi) @ 3 days                                 | 10.0 (1450) | ASTM C 109/<br>C 109M |
| 101 |                                                                          |             |                       |
| 102 | Compressive strength, MPa (psi) @ 7 days                                 | 17.0 (2470) | ASTM C 109/<br>C 109M |
| 103 |                                                                          |             |                       |
| 104 | Compressive strength, MPa (psi) @ 28 days                                | 21.0 (3050) | ASTM C 109/<br>C 109M |
| 105 |                                                                          |             |                       |
| 106 | • Time of setting; Vicat test: <sup>C</sup>                              |             |                       |
| 107 | Time of setting, min, not less than                                      | 45          | ASTM C 191            |
| 108 | Time of setting, min, not more than                                      | 375         | ASTM C 191            |
| 109 | • Sulfate Resistance <sup>D</sup> , 14 days, max, %                      |             |                       |
| 110 | expansion                                                                | 0.040       | ASTM C 452            |

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 113 <sup>A</sup> If the (SO<sub>3</sub>) requirement cannot be met, exceeding values will be acceptable provided it  
 114 has been demonstrated by Test Method C 1038 that the cement with the increased SO<sub>3</sub>  
 115 will not develop expansion in water exceeding 0.020% at 14 days. Supporting test data  
 116 must be provided.

117  
 118 <sup>B</sup> The testing laboratory shall select the fineness method to be used. However, when the  
 119 sample fails to meet the requirements of the air-permeability test, the Turbidimeter test  
 120 shall be used, and the requirements for the turbidimetric method shall govern.

121  
 122 <sup>C</sup> The time of setting is that described as initial setting time in Test Method C 191.

123  
 124 <sup>D</sup> ASTM C 1012 "Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate  
 125 Solution" test may be substituted for ASTM C 452 "Potential Expansion of Portland  
 126 Cement Mortars Exposed to Sulfate" test. For acceptance of the C 1012 results  
 127 expansion shall be less than 0.05% at 6 months or less than 0.1% at 1 year.

128  
 129 The Contractor shall furnish vendors' certified test reports for each carload, or equivalent, of  
 130 cement shipped to the project. The report shall be delivered to the Project Manager before

- 131 permission to use the cement is granted. All such test reports shall be subject to verification by  
132 testing sample materials received for use on the project.  
133
- 134 2.05 WATER. The water used in concrete shall be free from sewage, oil, acid, strong alkalis,  
135 vegetable matter, and clay and loam. If the water is of questionable quality, it shall be tested in  
136 accordance with AASHTO T 26.  
137
- 138 2.06 ADMIXTURES. The use of any material added to the concrete mix shall be approved by the  
139 Project Manager. Before approval of any material, the Contractor shall be required to submit the  
140 results of complete physical and chemical analyses made by an acceptable testing laboratory.  
141 Subsequent tests shall be made of samples taken by the Project Manager from the supply of the  
142 material being furnished or proposed for use on the work to determine whether the admixture is  
143 uniform in quality with that approved. The Contractor shall be responsible for any adverse  
144 chemical reactions caused by the use of different admixtures.  
145
- 146 Pozzolanic admixtures shall be fly ash or raw or calcined natural pozzolons meeting the  
147 requirements of ASTM C 618.  
148
- 149 Air-entraining admixtures shall meet the requirements of ASTM C 260. Air- entraining admixtures  
150 shall be added at the mixer in the amount necessary to produce the specified air content.  
151
- 152 Water-reducing, set-controlling admixtures shall meet the requirements of ASTM C 494, Type A,  
153 water-reducing or Type D, water-reducing and retarding. Water- reducing admixtures shall be  
154 added at the mixer separately from air-entraining admixtures in accordance with the  
155 manufacturer's printed instructions.  
156
- 157 2.07 TESTING LABORATORY. The laboratory used to develop the mix design shall meet the  
158 requirements of ASTM C 1077 including accreditation. Accreditation shall include all test  
159 procedures required to develop the mix design. A certification signed by the manager of the  
160 laboratory stating it meets these requirements shall be submitted to the Project Manager. The  
161 certification shall contain as a minimum:  
162
- 163 A. Qualifications of personnel; including the laboratory manager, supervising technician,  
164 and testing technicians involved in developing the mix design.  
165
- 166 B. Evidence of current accreditation by a nationally recognized laboratory accreditation  
167 organization for all test methods used in developing the mix design.  
168
- 169 2.08 MIX DESIGN SUBMITTALS. The Contractor shall submit a mix design submittals including all  
170 ~~the~~ proposed materials to the Project Manager for the Structural PCC at least thirty (30) days  
171 prior to use. The mix design and materials will not be approved when the laboratory trial mix is  
172 older than two (2) years and the Certificates of Compliance for the materials are the results from  
173 tests performed more than one (1) year in the past.  
174
- 175 A. Mix Design – Individual submittals shall be provided for each mix design and shall include:  
176
- 177 a. The weights and sources of all ingredients including cement, fly ash, aggregates,  
178 water, and admixtures.  
179
- 180 b. The laboratory trial mix data:  
181
- 182 • mix identification number
  - 183 • date mix was developed
  - 184 • developer of the mix
  - 185 • water/cement ratio (w/c); include the theoretical and trial batch water/cement ratios. Note: the trial batch water/cement ratio shall not be exceeded during production.

- 186 • yield
- 187 • coarse aggregate gradation
- 188 • fine aggregate gradation
- 189 • fineness modulus of the fine aggregate
- 190 • consistency
- 191 • air content
- 192 • compressive strength; at least 2 specimens at 7 days and three specimens at 28
- 193 days

194  
195 B. Fine Aggregate – Individual submittals shall be provided for each source of fine aggregate.  
196 The submittal packages shall include the source of the fine aggregate and Certified Certificates of  
197 Compliance including actual test results showing that the fine aggregate meets the requirements  
198 of 2.01, 2.03, and Table 2. ASTM C 1260 test results and proof of accreditation under ASTM C  
199 1077 of the laboratory performing the ASTM C 1260 tests shall also be included in the submittal.

200  
201 C. Coarse Aggregate – Individual submittals shall be provided for each source of coarse  
202 aggregate. The submittal packages shall include the source of the coarse aggregate and  
203 Certified Certificates of Compliance including actual test results showing that the coarse  
204 aggregate meets the requirements of 2.01, 2.02 and Table 1. ASTM C 1260 test results and  
205 proof of accreditation under ASTM C 1077 of the laboratory performing the ASTM C 1260 tests  
206 shall also be included in the submittal.

207  
208 D. Cement – Individual submittals shall be provided for each source and each Type of cement.  
209 The submittal packages shall include the source, type and Certified Certificates of Compliance  
210 including actual test results showing that the cement meets the requirements of 2.04.

211  
212 E. Fly Ash - Individual submittals shall be provided for each source of fly ash. The submittal  
213 packages shall include the source, class and Certified Certificates of Compliance including actual  
214 test results showing that the fly ash meets the requirements of ASTM C 618, Class F with  
215 exception to the loss of ignition where the maximum shall be less than 6%, the Calcium Oxide  
216 (CaO) content where the maximum shall be less than 13% and the total equivalent alkali content  
217 where maximum shall be less than 1.5%.

218  
219 F. Admixtures - Individual submittals shall be provided for each admixture including brand  
220 and/or manufacturer, Certified Certificates of Compliance, the manufacturer's recommend  
221 procedures for use and storage showing and that the admixtures meet the requirements of 2.06.

222  
223 G. Testing Laboratory Qualifications – Individual submittals shall be provided for each laboratory  
224 designing PCCP mixtures. All information required in 2.07 shall be provided.

225  
226 2.09 PREMOLDED JOINT MATERIAL. No premolded joint filler is allowed to remain in expansion  
227 joints if it abuts P-501 pavement. In other areas that specify premolded joint filler the material  
228 shall meet the requirements of ASTM D 1751 and as noted on Contract Drawings.

229  
230 2.10 JOINT FILLER. The filler for joints shall meet the requirements of Item P-605, unless otherwise  
231 specified in the proposal.

232  
233 2.11 STEEL REINFORCEMENT. Reinforcing shall consist of bar mats conforming to the  
234 requirements of ASTM A 184.

235  
236 2.12 COVER MATERIALS FOR CURING. Curing materials shall conform to one of the following  
237 specifications:

238  
239           Waterproof paper for curing concrete                           ASTM C 171

- 240 Polyethylene Sheeting for Curing Concrete ASTM C 171  
241 Liquid Membrane-Forming Compounds  
242 for Curing Concrete ASTM C 309, Type 2  
243  
244

245 **PART 3 CONSTRUCTION METHODS**  
246

247 3.01 GENERAL. The Contractor shall furnish all labor, materials, and services necessary for, and  
248 incidental to, the completion of all work as shown on the drawings and specified herein. All  
249 machinery and equipment owned or controlled by the Contractor, which he proposes to use on  
250 the work, shall be of sufficient size to meet the requirements of the work, and shall be such as to  
251 produce satisfactory work; all work shall be subject to the inspection and approval of the Project  
252 Manager.  
253

254 3.02 CONCRETE COMPOSITION. The concrete shall develop a compressive strength of:

- 255 A. 3000 psi for concrete encased lighting ducts and light cans under P-401 asphalt or P-501  
256 concrete paving, within econcrete/CTB or ATPB, and elsewhere as noted in the plans  
257 and specifications  
258  
259 B. 5,000 psi for structural concrete and elsewhere as noted in the plans and specifications  
260  
261 C. 1,200 psi at 7 days for repair of cement treated base course  
262

263  
264 in 28 days as determined by test cylinders made in accordance with ASTM C 31 and tested in  
265 accordance with ASTM C 39.  
266

267 The 5,000 PSI concrete shall contain not less than 470 pounds of cement per cubic yard.  
268

269 All concrete shall contain 5-8 percent entrained air as determined by ASTM C 231 and slump  
270 shall be in accordance with the approved mix design.  
271

272 If the mix design slump is not listed as a range, the range in the following table will be applied:  
273

MIX DESIGN SLUMP

|                  | If 3 Inches or less | If more than 3 inches |
|------------------|---------------------|-----------------------|
| Plus tolerance:  | 0 inches            | 0 inches              |
| Minus tolerance: | 1 ½ inches          | 2 ½ inches            |

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276 **NOTE: IN ORDER TO OBTAIN THE MINIMUM SPECIFIED STRENGTH THE**  
277 **MIX DESIGN STRENGTH SHOULD BE HIGH ENOUGH THAT ALL TESTS**  
278 **EXCEED THE MINIMUM; NOT JUST THE AVERAGE OF THREE**  
279 **CONSECUTIVE TESTS.**  
280

281 For specific structures detailed on the plans the strength requirement will be as specified on the  
282 plans for that specific detail. Submit a mix design in general conformance with this specification  
283 meeting the strength required in the detail.  
284

285 3.03 CONTRACTOR QUALITY CONTROL. The Contractor's Independent Testing laboratory shall  
286 test the first three truck loads of concrete placed each day for slump and air content until three  
287 consecutive loads meet the project requirements. In addition, every fifth truck load placed

288 thereafter on that same day shall be tested for slump and air content. The Independent Testing  
289 Agency shall meet the requirements of Section 01401 including ASTM C 1077 and have been  
290 approved through the submittal process prior to performing testing.

291  
292 3.04 ACCEPTANCE SAMPLING AND TESTING. All concrete will be accepted on the basis of the  
293 compressive strength specified in paragraph 3.02 The concrete shall be sampled at the point of  
294 placement in accordance with ASTM C 172. The first load of concrete, per mix, delivered each  
295 day will be sampled and tested.

296  
297 Concrete placed for structures will be sampled and tested for each additional 50 cubic yards per  
298 day with a minimum one test per structure. When a single load of concrete is used for more than  
299 one structure, that load will be sampled and tested once.

300  
301 Concrete placed for light cans will be sampled and tested for each additional 50 cubic yards per  
302 day.

303  
304 Lean concrete will be sampled and tested for each additional 50 cubic yards per day

305  
306 Concrete cylindrical test specimens shall be made in accordance with ASTM C 31 and tested in  
307 accordance with ASTM C 39. Concrete strengths for acceptance shall be the average of at least  
308 two 6 by 12 inch or at least three 4 by 8 inch cylinders tested at 28 days. Contractor shall provide  
309 the initial on-site storage facilities for the specimens. The on-site storage facilities shall be  
310 capable of maintaining a temperature range of 60 to 80°F (16 to 27°C). The Project Manager's  
311 Quality Assurance Laboratory will make the actual tests on the specimens at no expense to the  
312 Contractor.

313  
314 3.05 PROPORTIONING AND MEASURING DEVICES. When package cement is used, the quantity  
315 for each batch shall be equal to one or more whole sacks of cement. The aggregates shall be  
316 measured separately by weight. If aggregates are delivered to the mixer in batch trucks, the  
317 exact amount for each mixer charge shall be contained in each batch compartment. Weighing  
318 boxes or hoppers shall be approved by the Project Manager and shall provide means of  
319 regulating the flow of aggregates into the batch box so that the required and exact weight of  
320 aggregates can be readily obtained.

321  
322 3.06 BATCH TICKETS. A sample copy of the proposed batch ticket shall be submitted to the Project  
323 Manager for approval. Two copies of the batch ticket shall also be provided to the Project  
324 Manager or his representative for each batch of concrete prior to unloading at the site. Concrete  
325 delivered without a batch ticket containing complete information as specified shall be rejected.  
326 The Contractor shall collect and complete the batch ticket at the placement site and deliver all  
327 batch tickets to the Project Manager's representative on a daily basis. The Project Manager shall  
328 have access to the batch tickets at any time during the placement. The following information shall  
329 be provided on each batch ticket:

- 330  
331 1. Supplier's name and date  
332 2. Truck number  
333 3. Project number and location  
334 4. Concrete class designation and item number  
335 5. Cubic yards batched  
336 6. Time batched  
337 7. Mix design number  
338 8. Type, brand, and amount of each admixture  
339 9. Type, brand, and amount of cement and fly ash  
340 10. Weights of fine and coarse aggregate  
341 11. Moisture of fine and coarse aggregate  
342 12. Gallons of batch water (including ice)

- 343 13. Water cement ration  
344 14. Amount of water that can be added to the load prior to placement  
345  
346 The Contractor shall add the following information to the batch ticket at the placement site:  
347  
348 15. Gallons of water added by truck operator plus quantity of concrete in each truck  
349 each time water is added.  
350 16. Number of revolutions of drum at mixing speed (for truck mixed concrete)  
351 17. Discharge time  
352 18. Location of batch in placement.  
353
- 354 3.07 CONSISTENCY. The consistency of the concrete shall meet the requirements of 3.02 and shall  
355 be checked by the slump test specified in ASTM C 143.  
356
- 357 3.08 MIXING Concrete may be mixed at the construction site, at a central point, or wholly or in part in  
358 truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of  
359 ASTM C 94.  
360
- 361 3.09 MIXING CONDITIONS. The concrete shall be mixed only in quantities required for immediate  
362 use. Concrete shall not be mixed while the air temperature is below 40°F (4°C) without  
363 permission of the Project Manager. If permission is granted for mixing under such conditions,  
364 aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature  
365 not less than 50°F (10°C) nor more than 90°F (32°C). The Contractor shall be held responsible  
366 for any defective work, resulting from freezing or injury in any manner during placing and curing,  
367 and shall replace such work at his/her expense.  
368
- 369 If the slump or air content of the load is below the specified amount at the time of arrival, the load  
370 can be adjusted prior to placement at the approval of the Contractor's Superintendent or  
371 authorized agent. Additional mixing shall be required as specified in ASTM C 94. Once  
372 placement has begun, no further adjustment shall be made. When additional water is added to  
373 the load the design water cement ratio shall not be exceeded. The amount of water that can be  
374 added to the load shall also be included on the batch ticket. Retempering of concrete by adding  
375 water or any other material shall not be permitted.  
376
- 377 The delivery of concrete to the job shall be in such a manner that batches of concrete will be  
378 deposited at uninterrupted intervals after placement has begun.  
379
- 380 3.10 FORMS. Concrete shall not be placed until all the forms and reinforcements have been  
381 inspected and approved by the Project Manager. Forms shall be of suitable material and shall be  
382 of the type, size, shape, quality, and strength to build the structure as designed on the plans. The  
383 forms shall be true to line and grade and shall be mortar-tight and sufficiently rigid to prevent  
384 displacement and sagging between supports. The Contractor shall bear responsibility for their  
385 adequacy. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and  
386 holes.  
387
- 388 The internal ties shall be arranged so that, when the forms are removed, no metal will show in the  
389 concrete surface or discolor the surface when exposed to weathering. All forms shall be wetted  
390 with water or with a nonstaining mineral oil which shall be applied shortly before the concrete is  
391 placed. Forms shall be constructed so that they can be removed without injuring the concrete or  
392 concrete surface. The forms shall not be removed before the expiration of at least 30 hours from  
393 vertical faces, walls, slender columns, and similar structures; forms supported by falsework under  
394 slabs, beams, girders, arches, and similar construction shall not be removed until tests indicate  
395 that at least 60 percent of the design strength of the concrete has developed.  
396



- 397 3.11 PLACING REINFORCEMENT. All reinforcement shall be accurately placed, as shown on the  
398 plans, and shall be firmly held in position during concreting. Bars shall be fastened together at  
399 intersections. The reinforcement shall be supported by approved metal chairs. Shop drawings,  
400 lists, and bending details shall be supplied by the Contractor when required.  
401
- 402 3.12 EMBEDDED ITEMS. Before placing concrete, any items that are to be embedded shall be firmly  
403 and securely fastened in place as indicated. All such items shall be clean and free from coating,  
404 rust, scale, oil, or any foreign matter. The embedding of wood shall not be permitted. The  
405 concrete shall be spaded and vibrated around and against embedded items.  
406
- 407 3.13 PLACING CONCRETE. All concrete shall be placed during daylight, unless otherwise approved.  
408 The concrete shall not be placed until the depth and character of foundation, the adequacy of  
409 forms and falsework, and the placing of the steel reinforcing have been approved. Concrete shall  
410 be placed as soon as practical after mixing and in no case later than 90 minutes after water has  
411 been added to the mix. The method and manner of placing shall be such to avoid segregation  
412 and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in  
413 placing concrete when necessary. Dropping the concrete a distance of more than 5 feet, or  
414 depositing a large quantity at one point, will not be permitted. Concrete shall be placed upon  
415 clean, damp surfaces, free from running water, or upon properly consolidated soil.  
416
- 417 The concrete shall be compacted with suitable mechanical vibrators operating within the  
418 concrete. When necessary, vibrating shall be supplemented by hand spading with suitable tools  
419 to assure proper and adequate compaction. Vibrators shall be manipulated so as to work the  
420 concrete thoroughly around the reinforcement and embedded fixtures and into corners and  
421 angles of the forms. The vibration at any joint shall be of sufficient duration to accomplish  
422 compaction but shall not be prolonged to the point where segregation occurs. Concrete  
423 deposited under water shall be carefully placed in a compact mass in its final position by means  
424 of a tremie, a closed bottom dump bucket, or other approved method and shall not be disturbed  
425 after being deposited.  
426
- 427 3.14 CONTRACTION JOINTS. Contraction joints shall be installed at the locations and spacing as  
428 shown on the plans. Contraction joints shall be installed to the dimensions required by forming a  
429 groove or cleft in the top of the slab while the concrete is still plastic or by sawing a groove into  
430 the concrete surface after the concrete has hardened. When the groove is formed in plastic  
431 concrete the sides of the grooves shall be finished even and smooth with an edging tool. If an  
432 insert material is used, the installation and edge finish shall be according to the manufacturer's  
433 instructions. The groove shall be finished or cut clean so that spalling will be avoided at  
434 intersections with other joints. Grooving or sawing shall produce a slot at least 1/8 inch (3 mm)  
435 wide and to the depth shown on the plans.  
436
- 437 3.15 CONSTRUCTION JOINTS. When the placing of concrete is suspended, necessary provisions  
438 shall be made for joining future work before the placed concrete takes its initial set. For the  
439 proper bonding of old and new concrete, such provisions shall be made for grooves, steps, keys,  
440 dovetails, reinforcing bars or other devices as may be prescribed. The work shall be arranged so  
441 that a section begun on any day shall be finished during daylight of the same day. Before  
442 depositing new concrete on or against concrete which has hardened, the surface of the hardened  
443 concrete shall be cleaned by a heavy steel broom, roughened slightly, wetted, and covered with a  
444 neat coating of cement paste or grout.  
445
- 446 3.16 EXPANSION JOINTS. Expansion joints shall be constructed at such points and of such  
447 dimensions as may be indicated on the drawings. The premolded filler shall be cut to the same  
448 shape as that of the surfaces being joined. The filler shall be fixed firmly against the surface of  
449 the concrete already in place in such manner that it will not be displaced when concrete is  
450 deposited against it.  
451

- 452 3.17 DEFECTIVE WORK. Any defective work disclosed after the forms have been removed shall be  
453 immediately removed and replaced. If any dimensions are deficient, or if the surface of the  
454 concrete is bulged, uneven, or shows honeycomb, which in the opinion of the Project Manager  
455 cannot be repaired satisfactorily, the entire section shall be removed and replaced at the expense  
456 of the Contractor.  
457
- 458 3.18 SURFACE FINISH. All exposed concrete surfaces shall be true, smooth, free from open or  
459 rough spaces, depressions, or projections. The concrete in horizontal plane surfaces shall be  
460 brought flush with the finished top surface at the proper elevation and shall be struck-off with a  
461 straightedge and floated. Mortar finishing shall not be permitted, nor shall dry cement or  
462 sand-cement mortar be spread over the concrete during the finishing of horizontal plane  
463 surfaces.  
464
- 465 When directed, the surface finish of exposed concrete shall be a rubbed finish. If forms can be  
466 removed while the concrete is still green, the surface shall be pointed and wetted and then  
467 rubbed with a wooden float until all irregularities are removed. If the concrete has hardened  
468 before being rubbed, a carborundum stone shall be used to finish the surface. When approved,  
469 the finishing can be done with a rubbing machine.  
470
- 471 3.19 CURING AND PROTECTION. All concrete shall be properly cured and protected by the  
472 Contractor. The work shall be protected from the elements, flowing water, and from defacement  
473 of any nature during the building operations. The concrete shall be cured as soon as it has  
474 sufficiently hardened by covering with an approved material. Water-absorptive coverings shall be  
475 thoroughly saturated when placed and kept saturated for a period of at least 3 days. All curing  
476 mats or blankets shall be sufficiently weighted or tied down to keep the concrete surface covered  
477 and to prevent the surface from being exposed to currents of air. Where wooden forms are used,  
478 they shall be kept wet at all times until removed to prevent the opening of joints and drying out of  
479 the concrete. Traffic shall not be allowed on concrete surfaces for 7 days after the concrete has  
480 been placed.  
481
- 482 3.20 DRAINS OR DUCTS. Drainage pipes, conduits, and ducts that are to be encased in concrete  
483 shall be installed by the Contractor before the concrete is placed. The pipe shall be held rigidly  
484 so that it will not be displaced or moved during the placing of the concrete.  
485
- 486 3.21 COLD WEATHER PROTECTION. When concrete is placed at temperatures below 40°F (4°C),  
487 the Contractor shall provide satisfactory methods and means to protect the mix from injury by  
488 freezing. The aggregates, or water, or both, shall be heated in order to place the concrete at  
489 temperatures between 50°F and 100°F (10°C and 38°C). All cold weather protection shall be in  
490 accordance with ACI 306.  
491
- 492 3.22 FILLING JOINTS. All joints which require filling shall be thoroughly cleaned, and any excess  
493 mortar or concrete shall be cut out with proper tools. Joint filling shall not be started until after  
494 final curing and shall be done only when the concrete is completely dry. The cleaning and filling  
495 shall be carefully done with proper equipment and in a manner to obtain a neat looking joint free  
496 from excess filler.  
497  
498

#### 499 PART 4 METHOD OF MEASUREMENT

- 500  
501 4.01 Refer to Appendix A for Method of Measurement  
502

#### 503 PART 5 BASIS OF PAYMENT

- 504  
505  
506 5.01 Refer to Appendix A for Basis of Payment

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**PART 6 TESTING REQUIREMENTS**

- ASTM C 31 Making and Curing Test Specimens in the Field
- ASTM C 39 Compressive Strength of Cylindrical Concrete Specimens
- ASTM C 88 Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
- ASTM C 136 Sieve Analysis of Fine and Coarse Aggregate
- ASTM C 138 Unit Weight, Yield, and Air Content of Concrete
- ASTM C 143 Slump of Hydraulic Cement Concrete
- ASTM C 172 Practice for Sampling Freshly Mixed Concrete.
- ASTM C 231 Air Content of Freshly Mixed Concrete by the Pressure Method
- ASTM C 1260 Potential Alkali Reactivity of Aggregates (Mortar Bar Method).

**PART 7 MATERIAL REQUIREMENTS**

- ASTM A 184 Specification for Fabricated Deformed Steel Bar or Rod Mats for Concrete Reinforcement
- ASTM A 185 Steel Welded Wire Fabric Plain for Concrete Reinforcement
- ASTM A 497 Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement
- ASTM A 615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- ASTM C 33 Concrete Aggregates
- ASTM C 94 Ready-Mixed Concrete
- ASTM C 150 Portland Cement
- ASTM C 171 Sheet Materials for Curing Concrete
- ASTM C 260 Air-Entraining Admixtures for Concrete
- ASTM C 309 Liquid Membrane-Forming Compounds for Curing Concrete
- ASTM C 494 Chemical Admixtures for Concrete.
- ASTM C 595 Blended Hydraulic Cements
- ASTM C 618 Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
- ASTM D 1751 Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction

|     |             |                                                                                                                               |
|-----|-------------|-------------------------------------------------------------------------------------------------------------------------------|
| 565 | ASTM D 1752 | Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers<br>for Concrete Paving and Structural Construction |
| 566 |             |                                                                                                                               |
| 567 |             |                                                                                                                               |
| 568 | AASHTO T 26 | Quality of Water to be used in Concrete.                                                                                      |
| 569 |             |                                                                                                                               |
| 570 | ACI 305     | Hot Weather Concreting                                                                                                        |
| 571 |             |                                                                                                                               |
| 572 | ACI 306     | Cold Weather Concreting                                                                                                       |
| 573 |             |                                                                                                                               |
| 574 |             |                                                                                                                               |
| 575 |             |                                                                                                                               |
| 576 |             | <b>END OF ITEM P-610</b>                                                                                                      |
| 577 |             |                                                                                                                               |

ITEM D-705

PIPE UNDERDRAINS FOR AIRPORTS

PART 1 GENERAL

1.01 DESCRIPTION This item consists of subgrade underdrains of the type, classes, sizes and dimensions required on the plans, furnished and installed at the places designated on the plans and profiles, or by the Project Manager, in accordance with these specifications and with the lines and grades given.

PART 2 MATERIALS

2.01 GENERAL. The pipe shall be of the type called for on the plans or in the Contract Documents and shall be in accordance with the following appropriate requirements.

2.02 PERFORATED AND NON-PERFORATED PIPE

A. Corrugated Polyethylene Pipe. Corrugated polyethylene pipe shall conform to the requirements of ASTM F 405 or ASTM F 667, Type III, Grade P34, Class C as applicable for the size of pipe to be furnished.

B. Poly (Vinyl Chloride) (PVC) Pipe. PVC Schedule 40 pipe shall conform to the requirements of ASTM F 758, Type PS 46.

C. Elastomeric Seals. Elastomeric Seals shall conform to the requirements of ASTM F 477.

2.03 MORTAR Mortar for pipe connections to other drainage pipes or structures shall be composed of 1 part, by volume, of Portland cement and 2 parts of mortar sand. The Portland cement shall conform to the requirements of ASTM C 150, Type 1. The sand shall conform to the requirements of ASTM C 144. Hydrated lime may be added to the mixture of sand and cement in an amount equal to 15% of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C 6.

2.04 POROUS BACKFILL Porous backfill shall be free of clay, humus, or other objectionable matter, and shall conform to the gradation in Table 1 when tested in accordance with ASTM C 136.

TABLE 1  
GRADATION OF POROUS BACKFILL

| Sieve Designation<br>(square openings) | Percentage by Weight<br>Passing Sieves |
|----------------------------------------|----------------------------------------|
| 1-1/2 inch                             | 100                                    |
| 1 inch                                 | 90-100                                 |
| 1/2 inch                               | 25-60                                  |
| No. 4                                  | 0-10                                   |
| No. 8                                  | 0-5                                    |
| No. 16                                 |                                        |
| No. 50                                 |                                        |
| No. 100                                |                                        |

43  
44  
45 Aggregate shall be handled, stored, and placed in a manner that will prevent segregation of the  
46 mixture, as determined by the Project Manager.

47  
48 The Contractor shall furnish certification that the aggregate furnished meets the source and quality  
49 requirements specified herein.

50  
51 2.05 FILTER FABRIC. Filter fabric shall conform to requirements of Specification Item P-161 Geotextile.

52  
53 2.06 CONCRETE. Concrete shall conform to the requirements of Item P-610-3.02 B.

54  
55 2.07 CASTINGS Metal frames and covers for cleanouts shall be gray iron castings conforming to the  
56 requirements of ASTM A 48, Class 20.

57  
58  
59 **PART 3 CONSTRUCTION METHODS**

60  
61 3.01 EQUIPMENT. All equipment necessary and required for the proper construction of underdrains  
62 shall be on the project, in first-class working condition, and approved by the Project Manager before  
63 construction is permitted to start.

64  
65 The Contractor shall provide hand tampers and pneumatic tampers to obtain the required  
66 compaction of the pipe bed and backfill, as specified.

67  
68 3.02 EXCAVATION. The Contractor shall do all necessary excavation to the depth shown on the plans.  
69 The excavation shall be unclassified and shall be performed regardless of the material encountered.

70  
71 The width of the pipe trench shall be as shown on the plans. The width of pipe trench when porous  
72 backfill is not used shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping  
73 of the bedding material under and around the pipe, but shall not be less than the external diameter  
74 of the pipe plus 6 inches on each side. The trench walls shall be approximately vertical.

75  
76 Where rock, hardpan, or other unyielding material is encountered, it shall be removed below the  
77 pipe section's bell for a depth of at least 4 inches. The excavation below grade shall be backfilled  
78 with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers  
79 not over 6 inches in uncompacted depth to form a uniform but yielding foundation.

80  
81 Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other  
82 unstable soil, the unstable soil shall be removed and replaced with approved granular material for  
83 the full trench width. The Project Manager shall determined the depth of removal necessary. The  
84 granular material shall be compacted to provide adequate support for the pipe.

85  
86 Excavated material not required or acceptable for backfill shall be disposed of by the Contractor as  
87 directed by the Project Manager. The excavation shall not be carried below the required depth;  
88 when this is done, the trench shall be backfilled at the Contractor's expense with material approved  
89 by the Project Manager and compacted to the density of the surrounding earth material.

90  
91 The bed for the pipe shall be so shaped that at least the lower quarter of the pipe shall be in  
92 continuous contact with the porous backfill or the bottom of the trench. Spaces for the pipe bell shall  
93 be excavated accurately to size to clear the bell so that the barrel supports the entire weight of the  
94 pipe.

95  
96 The Contractor shall do such trench bracing, sheathing, or shoring necessary to perform and protect  
97 the excavation as required for safety and conformance to governing laws. Unless otherwise  
98 provided, the bracing, sheathing, or shoring shall be removed by the Contractor after the completion  
99 of the backfill to at least 12 inches (300 mm) over the top of the pipe. The sheathing or shoring shall  
100 be pulled as the granular backfill is placed and compacted to avoid any unfilled spaces between the

101 trench wall and the backfill material. The cost of bracing, sheathing, or shoring, and the removal of  
102 same, shall be included in the unit price bid per foot (meter) for the pipe. When rock or  
103 noncushioning material is encountered in trench excavation the bottom of the trench shall be  
104 excavated to a horizontal section as far as is practicable.

105  
106 3.03 LAYING AND INSTALLING PIPE PVC or polyethylene pipe shall be installed in accordance with  
107 the requirements of ASTM D 2321 or AASHTO Standard Specification for Highway Bridges Section  
108 30. Perforations shall meet the requirements of AASHTO M 252 or M 294 Class 2, unless  
109 otherwise indicated on the plans. The pipe shall be laid accurately to line and grade.

110  
111 The upgrade end of pipelines, not terminating in a structure, shall be plugged or capped as  
112 approved by the Project Manager.

113  
114 Unless otherwise shown on the plans, a 4-inch (100 mm) bed of granular backfill material shall be  
115 spread in the bottom of the trench throughout the entire length under all perforated pipe  
116 underdrains.

117  
118 Pipe outlets for the underdrains shall be constructed when required or shown on the plans. The  
119 pipe shall be laid with tight-fitting joints. Porous backfill is not required around or over pipe outlets  
120 for underdrains. All connections to other drainage pipes or structures shall be made as required and  
121 in a satisfactory manner. If connections are not made to other pipes or structures, the outlets shall  
122 be protected and constructed as shown on the plans.

123  
124 Underdrains shall be connected to existing concrete inlets at locations shown on the plans. Pipes  
125 shall be neatly sawed to the necessary lengths and openings into the existing inlet shall be cored or  
126 made in other approved manner to result in neatly formed holes. Joints shall be made with mortar  
127 as shown on the plans.

128  
129 3.04 MORTAR The mortar shall be of the desired consistency for making connections to other pipes or  
130 to structures. Mortar that is not used within 45 minutes after water has been added shall be  
131 discarded. Retempering of mortar shall not be permitted.

132  
133 3.05 FILTER FABRIC UNDERDRAINS Filter fabric underdrains shall be constructed as shown on the  
134 plans. Crushed aggregate backfill shall be placed and compacted in the trench to the dimensions  
135 shown. Filter fabric covering shall be laid carefully in place as shown, without unnecessary  
136 wrinkling and bunching of the fabric. Overlaps between sections of fabric shall be shingled about 24  
137 inches to carry water and silt downgrade across the lap. When ready for backfill the fabric shall  
138 show no gaps, tears, or other openings.

139  
140 3.06 BACKFILLING Porous backfill underdrain material is required in the trench as shown on the plans.  
141 Special care shall be taken in placing the material. The material shall be as specified and shall not  
142 contain foreign matter, nor shall earth from the sides of the trench or from the windrow be allowed to  
143 filter into the material. The material shall be placed in loose layers not exceeding 6 inches in depth  
144 and compacted by vibrator plate compactor. Methodology must be submitted and a test section  
145 must be performed to show that satisfactory densification can be achieved.

146  
147 When perforated pipe is specified, crushed aggregate backfill material shall be placed along the full  
148 length of the pipe. The position of the crushed aggregate shall be as shown on the plans.

149  
150 When porous backfill is to be placed in paved or adjacent areas prior to the completion of grading or  
151 subgrade operations, the backfill material shall be placed immediately after laying the pipe. The  
152 depth of this porous backfill shall be not less than 12 inches, measured from the top of the  
153 underdrain. During subsequent construction operations, this minimum backfill of 12 inches of depth  
154 shall not be disturbed until such time as the underdrains are to be completed. When the  
155 underdrains are to be completed, the unsuitable material shall be removed until the porous backfill  
156 is exposed. That part of the porous backfill which contains objectionable material shall be removed  
157 and replaced with suitable material. The cost of removing and replacing any such unsuitable  
158 material shall be borne by the Contractor.

- 159  
160  
161 3.07 CONNECTIONS When the plans call for connections to existing or proposed pipe or structures,  
162 these connections shall be watertight and made so that a smooth uniform flow line will be obtained  
163 throughout the drainage system.  
164  
165 3.08 CLEANING AND RESTORATION OF SITE After the backfill is completed, the Contractor shall  
166 dispose of all surplus material, dirt, and rubbish from the site. Surplus dirt may be deposited in  
167 embankments, shoulders, or as ordered by the Project Manager. The Contractor shall restore all  
168 disturbed areas to their original condition.  
169  
170 After all work is completed, the Contractor shall remove all tools and equipment, leaving the entire  
171 site free, clear, and in good condition.  
172  
173 Performance of the work described in this section is not payable directly but shall be considered as  
174 a subsidiary obligation of the Contractor, covered under the contract unit price for the underdrain.  
175  
176

177 **PART 4 METHOD OF MEASUREMENT**

- 178  
179 4.01 Refer to Appendix A for Method of Measurement.  
180  
181

182 **PART 5 BASIS OF PAYMENT**

- 183  
184 5.01 Refer to Appendix A for Basis of Payment.  
185  
186

187 **PART 6 MATERIAL REQUIREMENTS**

- 188  
189 ASTM C 136 Sieve or Screen Analysis of Fine and Coarse Aggregates  
190  
191 ASTM C 144 Aggregate for Masonry Mortar  
192  
193 ASTM C 150 Portland Cement  
194  
195 ASTM D 3034 Type PSMPoly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings  
196  
197 ASTM F 758 Smooth-Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for  
198 Highway, Airport, and Similar Drainage  
199  
200 ASTM F 949 Poly (Vinyl Chloride)(PVC) Corrugated Sewer Pipe with a Smooth Interior and  
201 Fittings  
202  
203 AASHTO M 252 Corrugated Polyethylene Drainage Tubing  
204  
205 AASHTO M 294 Corrugated Polyethylene Pipe, 12 to 24 in Diameter  
206  
207  
208

**END OF ITEM D-705**



ITEM D-710

ROCK RIPRAP

PART 1 GENERAL

1.01 DESCRIPTION This item shall govern the furnishing and placing of rock riprap as shown on the plans and called for in these specifications. Placing of riprap will include all bedding, fabric (if applicable), grout, and stones as indicated on the plans or directed by the Project Manager.

PART 2 MATERIAL

2.01 STONE All stone for rock riprap shall be sound, durable, and free from seams, cracks, and other defects and shall be as nearly rectangular as practicable. The stone shall have a specific gravity of at least 2.5. Broken concrete pieces obtained from the project may be used providing they meet the requirements contained herein.

CLASSIFICATION AND GRADATION OF RIPRAP

Maximum size for Type "M" shall be 1 cubic foot with the maximum dimension - 21 inches. Minimum dimension shall be 4 inches. The stone shall be well graded between 4 inches and 21 inches. Gradation shall meet the requirements of Table 1 below.

TABLE 1

| Riprap Designation | % Smaller Than Given Size By Weight | Intermediate Rock Dimension (Inches) | d <sub>50</sub> * (inches) |
|--------------------|-------------------------------------|--------------------------------------|----------------------------|
| Type M             | 70-100                              | 21                                   | 12                         |
|                    | 50-70                               | 18                                   |                            |
|                    | 35-50                               | 12                                   |                            |
|                    | 2-10                                | 4                                    |                            |

\*d<sub>50</sub> = Mean particle size

Maximum size for Type "H" shall be 1 cubic foot with the maximum dimension - 30 inches. Minimum dimension shall be 4 inches. The stone shall be well graded between 6 inches and 30 inches. Gradation shall meet the requirements of Table 2 below.

TABLE 2

| Riprap Designation | % Smaller Than Given Size By Weight | Intermediate Rock Dimension (Inches) | d <sub>50</sub> * (inches) |
|--------------------|-------------------------------------|--------------------------------------|----------------------------|
| Type H             | 100                                 | 30                                   | 18                         |
|                    | 50-70                               | 24                                   |                            |
|                    | 35-50                               | 18                                   |                            |
|                    | 2-10                                | 6                                    |                            |

\*d<sub>50</sub> = Mean particle size

Maximum size for Type "VH" shall be 1 cubic foot with the maximum dimension - 42 inches. Minimum dimension shall be 9 inches. The stone shall be well graded between 9 inches and 42 inches. Gradation shall meet the requirements of Table 3 below.

TABLE 3

| Riprap Designation | % Smaller Than Given Size By Weight | Intermediate Rock Dimension (Inches) | d <sub>50</sub> * (inches) |
|--------------------|-------------------------------------|--------------------------------------|----------------------------|
| Type VH            | 100                                 | 42                                   | 24                         |
|                    | 50-70                               | 33                                   |                            |
|                    | 35-50                               | 24                                   |                            |
|                    | 2-10                                | 9                                    |                            |

\*d<sub>50</sub> = Mean particle size

Minimum dimension for Type L shall be 3 inches. Gradation shall meet the requirements of Table 4 below.

**TABLE 4**

| Riprap Designation | % Smaller Than Given Size By Weight | Intermediate Rock Dimension (Inches) | d <sub>50</sub> * (inches) |
|--------------------|-------------------------------------|--------------------------------------|----------------------------|
| Type L             | 70-100                              | 15                                   | 9                          |
|                    | 50-70                               | 12                                   |                            |
|                    | 35-50                               | 9                                    |                            |
|                    | 2-10                                | 3                                    |                            |

\*d<sub>50</sub> = Mean particle size

Broken concrete pieces may be used in lieu of natural rock provided the dimensional requirements above are met, the pieces are sound and durable, and the material is approved by the Project Manager prior to placing.

The nominal thickness of the completed riprap section, regardless of the type specified, shall be 1.5 times the mean diameter of the rock specified in Tables 1, 2, 3 and/or 4 of this specification.

2.02 **BEDDING MATERIAL** The free draining material shall consist of a Colorado Highway Specification; Class B or Class C filter material, reference Table 5 below. Type L riprap shall use Colorado Highway Class A bedding material, referenced in Table 5 below.

**TABLE 5  
 GRADATION SPECIFICATIONS FOR FILTER MATERIAL**

| Sieve Size       | Mass Percent Passing square Mesh Sieves |         |         |
|------------------|-----------------------------------------|---------|---------|
|                  | Class A                                 | Class B | Class C |
| 75 mm (3")       | 100                                     |         |         |
| 37.5 mm (1 1/2") |                                         | 100     |         |
| 19.0 mm (3/4")   | 20-90                                   |         | 100     |
| 4.75 mm (No. 4)  | 0-20                                    | 20-60   | 60-100  |
| 1.8 μm (No.16)   |                                         | 10-30   |         |
| 300 μm (No. 50)  |                                         | 0-10    | 10-30   |
| 150 μm (No. 100) |                                         |         | 0-10    |
| 75 μm (No. 200)  | 0-3                                     | 0-3     | 0-3     |

2.03 **FILTER FABRIC** The filter fabric material to be placed under the non-grouted rock riprap shall be a non-woven polypropylene fabric such as Propex Geotex 801 or approved equal, having the following properties:

- A. Weight 8 ounces/square yard
- B. Tensile strength, wet Warp direction - 200 pounds  
Fill direction - 275 pounds

- 73 C. Mullen Burst (ASTM D 751) 400 psi
- 74 D. Elongation-at-break 75 percent
- 75

76 2.04 CEMENT GROUT Grout shall be composed of 560 pounds cement per cubic yard conforming  
77 to the requirements of ASTM C 150 Type I/II, 70 percent fine aggregate conforming to the  
78 requirements of ASTM C 33, and 30 percent No. 8 coarse aggregate conforming to the  
79 requirements of ASTM C 33, Class 4S.

80  
81 The grout shall have an air content of 6 – 9% when tested in accordance with ASTM C 231, a  
82 slump of 5 – 9 inches when tested in accordance with ASTM C 143, and a minimum 28 day  
83 compressive strength of 2000 psi when sampled in accordance with ASTM C 31 and tested in  
84 accordance with ASTM C 39.

85  
86 2.05 TESTING LABORATORY The laboratory used to develop the grout mix design shall meet the  
87 requirements of ASTM C 1077 including accreditation. Accreditation shall include all test  
88 procedures required to develop the mix design. A certification signed by the manager of the  
89 laboratory stating it meets these requirements shall be submitted to the Project Manager. The  
90 certification shall contain as a minimum:

- 91
- 92 A. Qualifications of personnel; including the laboratory manager, supervising technician,  
93 and testing technicians involved in developing the mix design.
- 94
- 95 B. Evidence of accreditation by a nationally recognized laboratory accreditation organization  
96 for all test methods used in developing the mix design.
- 97

98 2.06 SUBMITTALS Contractor shall submit certification that the product delivered to the project site  
99 will have values equal to or greater than those specified above.

- 100
- 101 A. Stone – Certification of Compliance detailing gradation and specific gravity.
- 102
- 103 B. Bedding Material – Certification of Compliance showing gradation.
- 104
- 105 C. Filter Fabric – Certification of Compliance.
- 106
- 107 D. Grout – The Contractor shall submit a mix design including all proposed materials to the  
108 Project Manager for the Grout at least thirty (30) days prior to use. The mix design and  
109 materials will not be approved when the laboratory trial mix is older than two (2) years  
110 and the Certificates of Compliance for the materials are the results from tests performed  
111 more than one (1) year in the past.
- 112

113 **PART 3 EXCAVATION**

114  
115 3.01 The slopes shall be finished to a reasonably smooth and compact surface within 2 inches of the  
116 lines, surfaces, and elevations shown on the plans.

117  
118 **PART 4 CONSTRUCTION METHODS**

119  
120 4.01 ROCK RIPRAP The filter fabric shall be spread on the prepared subgrade to provide a  
121 continuous, smooth, surface. After placing bedding material, the stone shall be spread on the  
122 filter fabric so as to produce a compact, well graded mass of minimum voids. Spreading shall be  
123 done so as to cause as little disturbance to the filter fabric as possible. Some rearranging of in-  
124 dividual pieces may be required, either by hand or equipment, to obtain a reasonably uniform  
125 surface.

126  
127 4.02 GROUTED RIPRAP. When grouted riprap is specified, the stone shall be laid as set forth above  
128 for rock riprap, except that filter fabric is not required. The spaces between the stones shall then  
129 be filled with grout. Sufficient grout shall be used to completely fill all voids, except that the face

surface of the stone shall be left exposed. After grouting is completed, the surface shall be cured for a period of at least three days.

4.03 BATCH TICKETS A sample copy of the proposed batch ticket shall be submitted to the Project Manager for approval. Two copies of the batch ticket shall also be provided to the Project Manager or his representative for each batch of concrete prior to unloading at the site. Grout delivered without a batch ticket containing complete information as specified shall be rejected. The Contractor shall collect and complete the batch ticket at the placement site and deliver all batch tickets to the Project Manager's representative on a daily basis. The Project Manager shall have access to the batch tickets at any time during the placement. The following information shall be provided on each batch ticket:

1. Supplier's name and date
2. Truck number
3. Project number and location
4. Cubic yards batched
5. Time batched
6. Mix design number
7. Type, brand, and amount of each admixture
8. Type, brand, and amount of cement
9. Weights of fine and coarse aggregate
10. Moisture of fine and coarse aggregate
11. Gallons of batch water (including ice)
12. Water cement ration
13. Amount of water that can be added to the load prior to placement

The Contractor shall add the following information to the batch ticket at the placement site:

14. Gallons of water added by truck operator plus quantity of concrete in each truck each time water is added.
15. Number of revolutions of drum at mixing speed (for truck mixed concrete)
16. Discharge time
17. Location of batch in placement.

4.04 MIXING CONDITIONS The grout shall be mixed only in quantities required for immediate use. Grout shall not be mixed while the air temperature is below 40°F (4°C) without permission of the Project Manager. If permission is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the grout shall be placed at a temperature not less than 50°F (10°C) nor more than 90°F (32°C). The Contractor shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his/her expense.

If the slump or air content of the load is below the specified amount at the time of arrival, the load can be adjusted prior to placement at the approval of the Contractor's Superintendent or authorized agent. Additional mixing shall be required as specified in ASTM C 94. Once placement has begun, no further adjustment shall be made. When additional water is added to the load the design water cement ratio shall not be exceeded. The amount of water that can be added to the load shall also be included on the batch ticket. Retempering of concrete by adding water or any other material shall not be permitted.

The delivery of grout to the job shall be in such a manner that batches of grout will be deposited at uninterrupted intervals after placement has begun.

4.05 ACCEPTANCE SAMPLING AND TESTING Grout will be accepted on the basis of the compressive strength specified in paragraph 2.04. The grout shall be sampled at the point of placement in accordance with ASTM C 172. Concrete cylindrical test specimens shall be made in accordance with ASTM C 31 and tested in accordance with ASTM C 39. Concrete strengths

187 for acceptance shall be the average of at least two 6 by 12 in. or at least three 4 by 8 in. cylinders  
188 tested at 28 days. The grout shall be sampled every fifty cubic yards, or fraction thereof, per day.  
189 The contractor shall provide a suitable area or container at the project site for initial storage and  
190 curing (up to the first 48 hours after molding) of specimens cast for acceptance purposes. The  
191 container shall be capable of maintaining a temperature range of 60 to 80°F (16 to 27°C). The  
192 Project Manager's Quality Assurance Laboratory will make the actual tests on the specimens at  
193 no expense to the Contractor.  
194

195 **PART 5 METHOD OF MEASUREMENT**

196  
197 5.01 Refer to Appendix A for Method of Measurement  
198

199 **PART 6 BASIS OF PAYMENT**

200  
201 6.01 Refer to Appendix A for Basis of Payment  
202

203 **PART 7 TESTING REQUIREMENTS**

204

|     |            |                                                              |
|-----|------------|--------------------------------------------------------------|
| 205 | ASTM C 31  | Making and Curing Test Specimens in the Field                |
| 206 |            |                                                              |
| 207 | ASTM C 39  | Compressive Strength of Cylindrical Concrete Specimens       |
| 208 |            |                                                              |
| 209 | ASTM C 138 | Unit Weight, Yield, and Air Content of Concrete              |
| 210 |            |                                                              |
| 211 | ASTM C 143 | Slump of Hydraulic Cement Concrete                           |
| 212 |            |                                                              |
| 213 | ASTM C 172 | Practice for Sampling Freshly Mixed Concrete.                |
| 214 |            |                                                              |
| 215 | ASTM C 231 | Air Content of Freshly Mixed Concrete by the Pressure Method |
| 216 |            |                                                              |

217 **PART 7 MATERIAL REQUIREMENTS**

218

|     |            |                                        |
|-----|------------|----------------------------------------|
| 219 | ASTM C 33  | Concrete Aggregates                    |
| 220 |            |                                        |
| 221 | ASTM C 94  | Ready-Mixed Concrete                   |
| 222 |            |                                        |
| 223 | ASTM C 150 | Portland Cement                        |
| 224 |            |                                        |
| 225 | ASTM C 260 | Air-Entraining Admixtures for Concrete |
| 226 |            |                                        |
| 227 | ASTM D 751 | Coated Fabric                          |
| 228 |            |                                        |

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231 **END OF ITEM D-710**  
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**ITEM D-751**

**MANHOLES, CATCH BASINS, INLETS AND INSPECTION HOLES**

**PART 1 GENERAL**

1.01 DESCRIPTION. This item shall consist of construction of manholes, catch basins, inlets, and inspection holes, in accordance with these specifications, at the specified locations and conforming to the lines, grades, and dimensions shown on the plans or required by the Project Manager. All structures, castings, etc. in the Runway and Taxiway safety areas shall comply with FAA Advisory Circular 150/5320-6, Latest Edition and shall be aircraft rated. All other structures shall conform to these specifications and plans.

**PART 2 MATERIALS**

2.01 MORTAR. Mortar shall consist of one part portland cement and two parts sand. The portland cement shall conform to the requirements of ASTM C 150, Type V, or equivalent. The sand shall conform to the requirements of ASTM C 144.

2.02 CONCRETE. Plain and reinforced concrete used in structures, connections of pipes with structures, and the support of structures or frames shall conform to the requirements of Item P-610-3.02 B, minimum of 4000 psi.

2.03 PRECAST CONCRETE PIPE MANHOLE RINGS. Precast concrete pipe manhole rings shall conform to the requirements of ASTM C 478. Unless otherwise specified, the risers and offset cone sections shall have an inside diameter of not less than 36 inches (90 cm) nor more than 48 inches (120 cm).

2.04 FRAMES, COVERS, AND GRATES. The castings shall conform to one of the following requirements:

- A. Gray iron castings shall meet the requirements of ASTM A 48, Class 30B and 35B.
- B. Malleable iron castings shall meet the requirements of ASTM A 47.
- C. Steel castings shall meet the requirements of ASTM A 27.
- D. Structural steel for grates and frames shall conform to the requirements of ASTM A 283, Grade D.
- E. Ductile iron castings shall conform to the requirements of ASTM A 536.
- F. Austempered ductile iron castings shall conform to the requirements of ASTM A897.

All castings shall be designed to withstand a 250 psi tire pressure when the structure is inside the runway, taxiway or apron safety area.

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover or grate unit shall be provided with fastening members to prevent it from being dislodged by traffic but which will allow easy removal for access to the structure.

The frame and cover or grate unit shall be cast flush with the top of the manhole slab. The frame and cover or grate unit manufacturer shall certify that the cover or unit is rated to exceed the requirements

58 of the 250 psi tire pressure or HS-20 loading. Each cover shall have the word "Storm Drainage" or  
59 "Underdrain" or other approved designation cast on one piece.

60  
61 All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to  
62 meet the requirements of ASTM A 123.

63  
64 2.05 STEPS. The steps or ladder bars shall be gray or malleable cast iron, galvanized steel or steel  
65 reinforced co-polymer polypropylene. The steps shall be the size, length, and shape shown on the  
66 plans and those steps that are not galvanized shall be given a coat of bituminous paint, when  
67 directed.

68  
69 2.06 REINFORCING STEEL. All reinforcing steel shall conform to ASTM A-615, grade 60.

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### 72 PART 3 CONSTRUCTION METHODS

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#### 74 3.01 UNCLASSIFIED EXCAVATION.

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77 A. The Contractor shall do all excavation for structures and structure footings to the lines and  
78 grades or elevations, shown on the plans, or as staked by the Project Manager. The  
79 excavation shall be of sufficient size to permit the placing of the full width and length of the  
80 structure or structure footings shown. The elevations of the bottoms of footings, as shown on  
81 the plans, shall be considered as approximately only; and the Project Manager may order, in  
82 writing, changes in dimensions or elevations of footings necessary to secure a satisfactory  
83 foundation.

84 B. Boulders, logs, or any other objectionable material encountered in excavation shall be  
85 removed. All rock or other hard foundation material shall be cleaned of all loose material and  
86 cut to a firm surface either level, stepped, or serrated, as directed by the Project Manager.  
87 All seams or crevices shall be cleaned out and grouted. All loose and disintegrated rock and  
88 thin strata shall be removed. When concrete is to rest on a surface other than rock, special  
89 care shall be taken not to disturb the bottom of the excavation, and excavation to final grade  
90 shall not be made until just before the concrete or reinforcing is to be placed.

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93 C. The Contractor shall do all bracing, sheathing, or shoring necessary to implement and  
94 protect the excavation and the structure as required for safety or conformance to governing  
95 laws. The cost of bracing, sheathing, or shoring shall be included in the unit price bid for the  
96 structure.

97 D. Unless otherwise provided, bracing, sheathing, or shoring involved in the construction of this  
98 item shall be removed by the Contractor after the completion of the structure. Removal shall  
99 be effected in a manner which will not disturb or mar finished masonry. The cost of removal  
100 shall be included in the unit price bid for the structure.

101  
102

103 E. After each excavation is completed, the Contractor shall notify the Project Manager to that  
104 effect; and concrete or reinforcing steel shall be placed after the Project Manager has  
105 approved the depth of the excavation and the character of the foundation material.

106 3.02 CONCRETE STRUCTURES. Concrete structures shall be built on prepared foundations,  
107 conforming to the dimensions and form indicated on the plans. When claystone (undisturbed natural  
108 or fill) is encountered in the base of the excavation within paved areas as determined by the Project  
109 Manager, the material shall be over-excavated to a depth of 3 feet below and 3 feet beyond the sides  
110 of the base of the structure. The over-excavation shall be replaced with Select Embankment material  
111 meeting the requirements for the lower 4.5 feet as specified in Item P-152, 2.03. The Select  
112 Embankment material shall be placed in 8 inch thick loose lifts, moisture conditioned and compacted  
113 to the requirements of Item P-152, 3.05 and tested in accordance with Item P-152, 6.01, 3. (c). The  
114 construction shall conform to the requirements specified in Item P-610. Any reinforcement required



115 shall be placed as indicated on the plans and shall be approved by the Project Manager before the  
116 concrete is poured.

117  
118 All invert channels shall be constructed and shaped accurately so as to be smooth, uniform, and  
119 cause minimum resistance to flowing water. The interior bottom shall be sloped downward toward  
120 the outlet.

121  
122 3.03 PRECAST CONCRETE PIPE STRUCTURES. Precast concrete pipe structures shall be  
123 constructed on prepared, or previously placed slab, foundations and shall conform to the dimensions  
124 and locations shown on the plans. All precast concrete pipe sections necessary to build a completed  
125 structure shall be furnished by the Contractor. The different sections shall fit together readily, and all  
126 jointing and connections shall be cemented with mortar. The top of the upper precast concrete pipe  
127 member shall be suitably formed and dimensioned to receive the metal frame and cover or grate, or  
128 other cap, as required. Provision shall be made for any connections for lateral pipe, including drops  
129 and leads that may be installed in the structure. The flow lines shall be smooth, uniform, and cause  
130 minimum resistance to flow. The steps which are embedded or built into the side walls shall be  
131 aligned and placed at vertical intervals of 12 inches (300 mm). When a ladder replaces the steps, it  
132 shall be securely fastened into position.

133  
134 When required by the Project Manager, the precast manufacturer shall provide detailed structural  
135 analysis of the structure being provided that considers the live and dead loads exposed to the  
136 structure. The analysis shall be signed and sealed by an engineer registered in the state of  
137 installation normally performing structural engineering.

138  
139 3.04 INLET AND OUTLET PIPES. Inlet and outlet pipes shall extend through the walls of the structures  
140 for a sufficient distance beyond the outside surface to allow for connections but shall be cut off flush  
141 with the wall on the inside surface, unless otherwise directed. For concrete structures, mortar shall  
142 be placed around these pipes so as to form a tight, neat connection.

143  
144 3.05 PLACEMENT AND TREATMENT OF CASTINGS, FRAMES, AND FITTINGS. All castings, frames,  
145 and fittings shall be placed in the positions indicated on the plans or as directed by the Project  
146 Manager, and shall be set true to line and to correct elevation. Extra precautions shall be taken  
147 during the frame installation to avoid racking so that grates fit properly into the framework to avoid  
148 point loading. Grates must be securely bolted to frames prior to concrete placement. If frames or  
149 fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position  
150 before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete  
151 has set.

152  
153 After the frames or fittings have been set in final position and the concrete has been allowed to  
154 harden for 7 days, then the grates or covers shall be placed and fastened down. The grates or  
155 covers shall be set in such a manner that full bearing on the concrete is achieved. Shims or other  
156 single point bearing devices shall be removed.

157  
158 3.6 INSTALLATION OF STEPS. The steps shall be installed as indicated on the plans or as directed by  
159 the Project Manager. When the steps are to be set in concrete, they shall be placed and secured in  
160 position before the concrete is poured. The steps shall not be disturbed or used until the concrete  
161 has hardened for at least 7 days. After this period has elapsed, the steps shall be cleaned and  
162 painted, unless they have been galvanized or co-polymer steps are used, in which case the co-  
163 polymer steps are to be cleaned only.

164  
165 When steps are required with precast concrete pipe structures, they shall be cast into the sides of the  
166 pipe at the time the pipe sections are manufactured or set in place after the structure is erected by  
167 drilling holes in the concrete and cementing the steps in place.

168  
169 In lieu of steps, prefabricated ladders may be installed. The ladder shall be held in place by grouting  
170 the supports in drilled holes.

171

172 3.07 BACKFILLING.

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A. After a structure has been completed, the area around it shall be filled with approved material, in horizontal layers not to exceed 8 inches (200 mm) in loose depth, and compacted to the density required in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Project Manager.

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B. Backfill shall not be placed against any structure until 75% of the design strength has been obtained.

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C. Backfill shall not be measured for direct payment. Performance of this work shall be considered as a subsidiary obligation of the Contractor covered under the contract unit price for the structure involved.

187

3.08 CLEANING AND RESTORATION OF SITE. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site to the satisfaction of the Project Manager. Surplus dirt may be deposited in embankments, shoulders, or as ordered by the Project Manager. The Contractor shall restore all disturbed areas to their original condition.

188

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191

After all work is completed, the Contractor shall remove all tools and equipment, leaving the entire site free, clear, and in good condition.

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**PART 4 QUALITY ASSURANCE/QUALITY CONTROL**

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197

4.01 Quality Assurance/Quality Control

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199

A. Qualifications. The Contractor shall meet the same qualifications for precast pipe structures as are identified in Item D-701 and shall impose all qualifications on its pipe manufacturer.

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Should the Contractor elect to cast-in-place junction structures, the Contractor shall be able to demonstrate experience with similar structures.

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B. Tests. Tests for precast concrete pipe structures (including pipe joints) shall have imposed the same tests as for precast pipe in Item D-701. Refer to Item P-610 for cast-in-place concrete test requirements.

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209

All backfill material shall be tested for compaction in accordance with Items D-701 and P-152.

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211

212

C. Inspections. Inspection for precast concrete pipe structures shall follow inspection procedures identified in Item D-701 for precast pipe and those of Item P-152 for excavation.

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215

Inspection for cast-in-place concrete structures shall follow Item P-610.

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217

D. Submittals.

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219

1. Materials. Materials shall be submitted in accordance with Items P-610 and D-701.

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221

2. Designs and Drawings. If the Contractor elects to use an alternative pipe, then the Contractor shall design or cause the pipe manufacturer to design all precast pipe structures to the specified criteria. The Contractor shall submit support calculations, installation drawings, and detail drawings for review and approval by the Project Manager prior to proceeding with fabrication of structures. Calculations, drawings, and details shall be sealed and signed by a Professional Engineer currently registered in the State of Colorado.

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230 Should the Contractor elect to substitute and construct precast and/or cast-in-place  
231 concrete structures, the Contractor shall submit full designs and details, as above,  
232 sealed and signed by a Professional Engineer currently registered in the State of  
233 Colorado.  
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235

236 **PART 5 METHOD OF MEASUREMENT**

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238 5.01 Refer to Appendix A for Method of Measurement.  
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241 **PART 6 BASIS OF PAYMENT**

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243 6.01 Refer to Appendix A for Basis of Payment.  
244

245

246 **PART 7 MATERIAL REQUIREMENT**

247

248 ASTM A 27 Mild to Medium-Strength Carbon-Steel Castings for General Application

249

250 ASTM A 47 Malleable Iron Castings

251

252 ASTM A 48 Gray Iron Castings

253

254 ASTM A 123 Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed,  
255 and Forged Steel Shapes, Plates, Bars and Strip

256

257 ASTM A 283 Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes, and Bars

258

259 ASTM A 536 Ductile Iron Castings

260

261 ASTM A 897 Austempered Ductile Iron Castings

262

263 ASTM C 150 Portland Cement

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265 ASTM C 478 Precast Reinforced Concrete Manhole Sections  
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268 **END OF ITEM D-751**  
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ITEM L-100

LIGHTING AND ELECTRICAL WORK

PART 1 DESCRIPTION

1.01 GENERAL

- A. The airfield electrical work to be done under this contract shall include the furnishing of all supervision, labor, materials, tools, equipment, and incidentals necessary to provide new airfield lighting system and other electrical work as shown on the drawings.
- B. Work shall be in accordance with Federal Aviation Administration Advisory Circular No. 150 5370-10, Standards for Specifying Construction of Airports, as modified herein, other FAA Advisory Circulars and Specifications referred to herein, and other requirements as specified herein. All FAA Advisory Circulars shall be as specified, or the latest adopted edition if revised.
- C. The electrical work shall comply with latest adopted editions, codes and standards applicable to this Contract as follows:
  - ICEA Insulated Cable Engineers Association
  - ANSI C2 National Electrical Safety Code
  - ASTM, American Society of Testing and Materials
  - FAA Advisory Circulars
  - FAA Orders
  - NFPA No. 70 National Electrical Code
  - NECA Standard for Installation
  - NEMA Standard for Materials and Products
  - NFPA No. 101 Life Safety Code
  - OSHA Occupational Safety and Health Administration, as Amended
  - UL Underwriters Laboratories
- D. All work shall be performed in strict accordance with these contract specifications, drawings, and any instructions that may be furnished by the DIA Project Manager during execution of the work to aid in interpretation of said drawings and specifications. Installation details and material and equipment specifications shall be in conformance with all applicable FAA Advisory Circulars. The Contractor shall furnish written proof of FAA approval on all equipment covered by FAA specifications as part of the submittal package. The Contractor shall keep these specifications on file at their airport construction office.

1.02 RELATED DOCUMENTS

- A. The general provisions of the contract apply to the work specified in Items L-100, L-108, L-110, L-122A, L-122C, L-125, L-127, L-139 L-140, 01300, 13410A and 13410C.

1.03 SUMMARY OF WORK

- A. The work to be performed includes furnishing all labor, supplies, materials, equipment, transportation, and services required to augment, move, install, and complete electrical work as specified herein and as shown on the contract drawings.

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- B. The work includes, but is not limited to, the following:
- (1) Maintain in operation, all existing field electrical facilities and circuits while this improvement work is in progress, including protection of airport personnel, aircraft, and vehicles; furnish and maintain temporary circuits, and place augmented airport lighting into operation. Field lighting shall be operable each night, each day when fog conditions exist, and when the airport calls an emergency.
  - (2) Provide underground cable (L-824) in accordance with specifications, at the locations shown on the plans. Test all circuit loops before and after installation of new cables to verify that no damage was caused by the Contractor.
  - (3) Provide new taxiway lighting and signing systems.
  - (4) Return to Owner or remove from the site, as directed by the DIA Project Manager, existing equipment that is to be removed or replaced.
  - (5) Ground all equipment, enclosures, and conduits installed under this contract as shown on the plans or in accordance with the NEC whichever is more stringent.
  - (6) Adjust finished grade as necessary to accommodate existing and new airfield equipment.
  - (7) Other items required to complete foregoing. The omission of expressed reference to any parts necessary for or reasonably incidental to the complete installation shall not be construed as releasing the Contractor from furnishing and installing such parts.
  - (8) In P-501 panel removal, asphalt removal or grading areas, the counterpoise conductor shall be tested prior to any work. The resistive value shall be documented and provided to the DIA Project Manager. At the completion of panel placement, the counterpoise shall be measured to be less than or equal to the value measured prior to demolition and witnessed by the DIA Project Manager. Counterpoise shall be found to be continuous base on the resistive value (size and length) between locations such as (light can to light can, manhole to light can, manhole to manhole, light can to ground rod, etc.). Measurements shall be completed and demonstrated to the DIA Project Manager or designated representative before work is to proceed. Non-continuous counterpoise conductors shall be subject to removal of completed work and counterpoise repaired at no additional cost to the owner.
  - (9) The contractor shall inspect the conduit system prior to paving to assure the conduit is not damaged. The contractor shall use an approved mandrel to proof the conduit system that runs through any panel replacement area; once panel replacement is completed the conduit shall have mandrel pulled through the duct prior to re-installation of cable. New cable shall be installed under any panel replacement area including locations that do not include base cans within the P-501 panels.
- C. All items of general work required, such as excavation, cutting, patching, etc. shall be included in this Contract.

109 1.04 WORK REQUIREMENTS

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162

- A. The general work requirements are as follows:
  - (1) All work shall be scheduled to minimize the impact and duration of shutdowns. The Contractor shall keep the DIA Project Manager informed of scheduled work which will affect existing equipment and operations. Minimum 10 working days advance notice shall be given to the DIA Project Manager and approval received for any disconnections or shutdowns.
  - (2) Existing lighting systems shall be operational at the end of each working day prior to nightfall except as permitted by the DIA Project Manager. Poor weather visibility or an emergency situation may require postponement of a scheduled shutdown on any given day.
  - (3) The plans are diagrammatic. Locations of equipment to be installed are shown in the plans, but the actual installation will depend on field conditions and the nature of the equipment furnished. When conditions which will adversely affect the installation become apparent, the DIA Project Manager shall be notified in writing.
  - (4) Locations and quantities of materials shown on the plans and in these specifications are approximate and shall be used for estimating purposes only. Actual locations and quantities of materials shall be reviewed by the Contractor through field investigation. No additional payment will be made for discrepancies between estimated quantities and locations of materials as shown in these documents and the actual field conditions.
- B. The Contractor shall at all times keep the construction areas free from accumulations of waste material and rubbish, and prior to completion of work shall remove any rubbish from the project, as well as all tools, reels, equipment, and materials not a part of the project. Upon completion of the construction, the Contractor shall leave the work and premises in a clean, neat, and safe condition satisfactory to the DIA Project Manager. The Contractor shall be responsible for the proper performance in all respects, in whole and in part, of the electrical equipment and for the mechanical installation of electrical equipment until acceptance of the entire work by the DIA Project Manager.

1.05 SUBMITTALS

- A. Submittals of all equipment and materials shall meet the requirements of Section 01300, Section 01340 and in accordance with this specification. Each submittal shall include no more than one spec section, i.e., each spec section shall be submitted under a separate submittal form as per section 01300. One bound copy inclusive of L-125 shall be included with all incidentals for review. This book shall include all fixtures and appropriate incidentals for each fixture to indicate to the project manager that the contractor comprehends the airfield lighting installation process. This item shall only include items submitted for approval.
- B. The Contractor shall include wiring diagrams, cut sheets, brochures, etc. of all equipment used on the job, including, but not limited to the items listed in these specifications and in the format described herein. The submittal package will not be reviewed unless 100% complete.
- C. The submittal shall consist of manufacturer's brochures and cut sheets describing the

163 equipment and materials the Contractor plans to incorporate in the work. These sheets  
164 shall be sequentially ordered by specification number with the reference specification  
165 number shown on the bottom right of each sheet. Each cut sheet shall show the  
166 complete specification or drawing number which the item must comply with (i.e., L-  
167 108.2.3 and/or detail 3 on page E-4). In the one bound book, the cut sheets shall be  
168 organized by the specification item number (L-100, L-108, etc.) with a tabbed divider  
169 sheet separating each item section. The submitted cut sheet shall clearly show the  
170 equipment manufacturer's name, catalog number, size, type, and/or rating as required by  
171 these specifications or drawings by underlining or circling the information. The  
172 conformance to FAA criteria or other standards where called for shall be clearly indicated  
173 for each item. Each sheet shall be dedicated to one piece of equipment, and all sheets  
174 shall be sequentially numbered (i.e., 1/50; indicating page 1 of 50 total pages). One  
175 manufacturer's cut sheet shall be submitted for each item. All sheets shall be 8-1/2" x  
176 11" or 17" x 11". When these sizes are unpractical, a folded 24" x 36" drawing may be  
177 substituted. All drawings shall be to scale. All sheets shall be bound in a 3-ring binder.  
178 Each submittal shall show on the cover the complete job name and number, date,  
179 contractor's name, and the words: "Electrical Submittal." The checklist shown in this  
180 specification shall be included as the first sheet of each submittal and shall show the  
181 page number of each item included in the submittal. Additional items to be submitted  
182 which are not on the list shall be added to the bottom of the table.  
183

- 184 D. Samples of conduit, duct, fittings, cables, tapes, fixtures, etc., may be requested by the  
185 DIA Project Manager or required in these specifications. After they have been reviewed,  
186 samples will be returned in tested condition to the Contractor. In the event any items of  
187 material or equipment contained in the list fail to comply with specification requirements,  
188 such items will be rejected. All rejected items shall be amended to meet the criteria and  
189 then resubmitted for approval by the DIA Project Manager.  
190
- 191 E. Substitutions of materials referenced herein is allowed when "or equal" is referenced.  
192 Any substitution shall be included in the submittal package and contain additional  
193 information as required by Section 01630.  
194
- 195 F. All methods and shop drawings of installations shall be submitted and approved prior to  
196 the start of installation for each phase of work.  
197 Contractor's liability to the City, in case of variations in the submittal document from the  
198 requirements of the contract documents is not relieved by the City's review and  
199 acceptance of submittals containing variations unless the City expressly approves the  
200 deviations in writing, in which the City describes the variation.  
201

## 202 1.06 DRAWINGS

203

- 204 A. The plans, which constitute an integral part of this Contract, shall serve as the working  
205 drawings. They indicate the extent and general layout of the lighting and signing system,  
206 arrangement of circuits, cables through ducts, and connections to existing circuit cables,  
207 and other work. Field verification of scale dimensions is required to determine actual  
208 locations, distances, and levels. The Contractor shall research in the field the exact  
209 routing and identification of all circuits which extend through, serve, or are affected by the  
210 area where work is to commence. No extra compensation will be allowed because of  
211 minor differences between work shown on the drawings and field conditions. The  
212 Contractor shall check the plans and specifications and, if any portion of the work is  
213 found to be omitted, unclear, or in error, the Contractor shall immediately notify the DIA  
214 Project Manager. The directions of the DIA Project Manager shall be followed and the  
215 work completed accordingly. The design drawings may be utilized in the preparation of  
216 the shop or working drawings showing the permanent construction, as described in L-



- 217 100.  
218  
219 B. The plans and specifications are complementary and what is called for in either one shall  
220 be as binding as if called for in both.  
221  
222 C. Where a disagreement exists between the plans and specifications, the item or  
223 arrangements of better quality, greater quantity, or higher cost shall be included in the  
224 bid.  
225  
226 D. Any discrepancies between the drawings, Advisory Circulars, and field conditions must  
227 be resolved with the DIA Project Manager before proceeding. All agreements shall be  
228 verified in writing.  
229  
230 E. 'Record' drawings covering equipment installed under previous contracts and which  
231 relate to this contract will be available for the Contractor. The airport cannot, however,  
232 guarantee the accuracy of these drawings. Those conditions which will affect the work  
233 under this contract should be verified prior to any design/fabrication/installation  
234 commitment.  
235  
236 F. Detail dimensions shown on the plans are approximate and shall be field verified before  
237 construction. All differences shall be submitted to the DIA Project Manager in writing  
238 before construction begins.  
239

240 1.07 RECORD DRAWINGS

- 241  
242 A. The Contractor shall mark up a set of blue line prints to show the as-built conditions  
243 which differ from the contract plans. All changes shall be recorded by a skilled draftsman  
244 with at least three years of CAD experience. The DIA Project Manager will furnish a  
245 newly printed set of blue line drawings to be used for this purpose. Record drawings will  
246 be checked periodically for accurateness and partial payments will be withheld until the  
247 record drawings are completely updated. The mark-up set shall be kept at the site, and  
248 any changes, discoveries, or deviations shall be recorded daily. The Contractor shall  
249 furnish one newly printed as-built drawing set to the DIA Project Manager upon  
250 completion. This work shall be completed and accepted by the DIA Project Manager  
251 before approval of final payment. The contractor shall include complete asbuilt drawings  
252 with Northern, Eastern and elevations of duct banks installed. The contractor shall  
253 document all return splice locations and complete wiring diagrams including the actual  
254 field configuration of circuits.  
255

256 1.08 MAINTENANCE AND OPERATING INSTRUCTIONS

- 257  
258 A. The Contractor shall provide the Owner with complete instructions in the proper care and  
259 operation of the equipment installed under this contract. This is considered as part of the  
260 final inspection, and final acceptance will not be given until the Owner's representative is  
261 knowledgeable about the system.  
262  
263 B. The Contractor shall also collect and assemble into each of six hardcover books the  
264 installation details, instructions, parts list, source of local supply, schematics of actual  
265 equipment and operations, and directions supplied by the manufacturer with all  
266 equipment. If cut sheets are included showing various models and features of the  
267 equipment supplied, the specific model and features shall be clearly indicated to show  
268 only the options of the equipment that are actually provided and installed. Final  
269 acceptance of the work will be withheld until such data has been presented complete to  
270 the DIA Project Manager for transmission to the Owner. The contractor shall comply with

271 section 01730 operation and maintenance data  
272

- 273 C. The Contractor shall install all equipment according to the manufacturers' instructions  
274 and as shown in the drawings and specifications. The Contractor shall notify the DIA  
275 Project Manager in writing if any discrepancies exist between the aforementioned  
276 documents. Work shall be suspended until resolved and approval to proceed has been  
277 granted by the DIA Project Manager.  
278

279 1.09 SAFETY RULES  
280

- 281 A. The Electrical Safety Rules shall be observed and complied with in every detail, and any  
282 violation thereof shall be cause for immediate termination of the Contractor's authority to  
283 proceed with the work and recourse to their Surety for completion of the Project. The  
284 Electrical Safety Rules are as follows:  
285

- 286 B. The Contractor shall be responsible for conforming to the safety requirements of AC 150-  
287 5370-2.  
288

- 289 C. Electrical circuits, operating over 300 volts, phase-to-ground shall be de-energized  
290 before work is accomplished thereon. Work on energized systems shall be accomplished  
291 by trained personnel, properly insulated, and done with extreme caution.  
292

- 293 D. Electrical circuits shall be considered de-energized only when one of the following  
294 conditions exists:  
295

296 (1) Switches connecting subject circuit to the electrical supply are observed in the  
297 OPEN position, with an air break, and safety-tagged (padlocked) in the OPEN  
298 position;  
299

300 (2) Electrically operated switches are visibly OPEN, blocked or racked in the OPEN  
301 position, and safety-tagged OPEN;  
302

303 (3) Whenever the supply circuit breaker is not visible and clearly identified, the circuit  
304 shall be grounded. The ground connection shall be safety-tagged before work  
305 thereon, when the ground connection is not within sight of the work area.  
306

307 (4) Oil switches observed OPEN in a sight window, and tagged OPEN; or oil fuse  
308 cutouts with fuse carrier removed and tagged OPEN.  
309

310 (5) For airfield lighting circuits fed by constant current regulators, the disconnects  
311 feeding all affected regulators and power circuits leaving the vault shall be locked  
312 in the OPEN position. When working in manhole housings, additional circuits not  
313 a part of the project, those circuits shall be locked in the OPEN position as well.  
314 The circuits shall be put into maintenance lock out on the control system with the  
315 assistance of the project management team prior to lock out of the regulator.  
316

- 317 E. Use of Red Safety Tags:  
318

319 (1) Safety tags shall be filled out daily and connected to any switch or equipment  
320 opened for protection of personnel working upon circuits connected thereto.  
321

322 (2) Safety tags shall be removed only by the employee who placed the tag, or by  
323 another employee designated in writing by the employee who placed the tag, to  
324 remove the tag. Removal of a safety tag placed by an employee not available at

- 325 the time of need to remove may be authorized by the Electrical Superintendent  
326 or his designated representative, only after carefully checking that the circuit is  
327 ready to be energized.  
328
- 329 (3) Equipment with a safety tag attached shall not be operated, and connections with  
330 a safety tag attached shall not be changed.  
331
- 332 (4) Insulated cables, operated at over 300 volts to ground shall be handled, when  
333 energized, only with rubber gloves tested to 15,000 volts.  
334
- 335 (5) Insulated cables, which have been in operation, shall be cut only with a grounded  
336 cable shears, or shall be grounded by driving a grounded sharp tool through the  
337 shielding and the conductors before cutting.  
338
- 339 (6) All personnel working around energized electrical equipment operating at over  
340 600 volts shall wear standard insulated, non-conducting hard hats, and shall  
341 wear no garments with metallic zipper fasteners, and remove all jewelry.  
342
- 343 (7) Ladders used in any electrical work shall be of wood or fiberglass construction.  
344
- 345 (8) The Contractor shall designate a supervisor for all contract personnel and  
346 operations; said supervisor shall be on the job wherever contract operations are  
347 in progress.  
348  
349

## 350 PART 2 EQUIPMENT AND MATERIALS

### 351 2.01 GENERAL

- 352  
353
- 354 A. Airport lighting equipment and materials covered by Federal Aviation Administration  
355 (FAA) specifications shall be certified by independent laboratory testing to be in  
356 compliance with the specification, at the date of the contractor's bid submission.  
357
- 358 B. Equipment and materials covered by other referenced specifications shall be subject to  
359 acceptance through manufacturer's certification of compliance with the applicable  
360 specification when requested by the DIA Project Manager. Whenever Underwriters  
361 Laboratories has a published standard applicable to the equipment furnished for this  
362 contract, the furnished equipment shall be listed by UL. The term 'Equipment' shall be as  
363 defined in the NEC.  
364
- 365 C. Materials and equipment shall be as specified herein. When materials are used that are  
366 not specifically designated herein, they shall be in accordance with the best industry  
367 standards and practices for equipment of this type. All components and parts shall be  
368 suitable for operation under the environmental conditions specified herein. Metal parts  
369 shall be either inherently corrosion-resistant or shall be suitably protected to resist  
370 corrosion or oxidation during extended service life.  
371

### 372 2.02 HARDWARE AND CORROSION PROTECTION

- 373
- 374 A. In order to prevent deterioration due to corrosion, all bolts, nuts, studs, washers, pins,  
375 terminals, springs, hangers and similar fastenings and fittings shall be of an approved  
376 corrosion-resisting material and/or be treated in an approved manner to render it  
377 adequately resistant to corrosion. All hardware such as cap screws, set screws, tap  
378 bolts, nuts, washers, etc., shall be of stainless steel type 304, SAE grade 2, if they are

379 used outdoors unless specified otherwise on the plans. Brass, bronze, or hot-dip  
380 galvanized ferrous hardware (per ASTM, Specification A1530) will be considered for  
381 indoor use. All stainless steel and galvanized steel bolts, screws, nuts, etc., shall be  
382 coated with a layer of "Neverseize" compound.  
383

384 B. All ferrous metalwork shall be hot-dip galvanized. If any galvanizing is damaged, the  
385 metal work shall be refinished by cleaning, treating with one coat of wash primer  
386 conforming to Federal (military) Specification MIL-P-152388, and shall be given one shop  
387 coat of zinc-rich base paint (zinc dust paint) conforming to Federal Specification TT-P-  
388 641F Type II, immediately when the wash primer is dry.  
389

390 2.03 PARTS RATING

391  
392 A. All parts shall be of adequate rating for the application and shall not be operated above  
393 the parts manufacturer's recommended ratings.  
394

395 2.04 ENVIRONMENTAL CONDITIONS

396  
397 A. The equipment installed outdoors shall be designated for continuous outdoor operation  
398 under the following environmental conditions unless specified elsewhere:  
399

400 (1) Temperature: Any ambient temperature from minus 20°F to plus 120°F.

401  
402 (2) Altitude: 6000 MSL.

403  
404 (3) Humidity: Up to 100 percent.

405  
406 (4) Sand and Dust: Exposure to windblown sand and dust particles.

407  
408 (5) Wind: Operation at wind velocities up to 200 miles per hour.

409  
410 (6) Water: Components provided for underground installation, direct buried or  
411 installed in underground housing, shall be suitable for continuous operation,  
412 continuously or intermittently submerged in water.  
413

414 (7) Chemical: Shall be rated for exposure to all de-icing and anti-icing agents.  
415

416 2.05 SALVAGE

417  
418 A. Except as otherwise specified or indicated on the drawings, all electrical materials and  
419 equipment to be salvaged, removed, or "stored" shall become the property of the Airport,  
420 and shall be moved by the Contractor to a site at the airport or within 5 miles of the  
421 airport designated by the DIA Project Manager. All wastes such as removed asphalt,  
422 concrete, excess dirt, conductors, damaged base cans, etc., shall become property of  
423 the Contractor and shall be disposed of off site by the Contractor.  
424

425 2.06 TESTING

426  
427 A. All materials and finishes are subject to testing. Material inspection and testing, and  
428 strength tests on the concrete will be performed by the Contractor at no expense to the  
429 Airport other than material used. The Contractor shall assist the DIA Project Manager in  
430 obtaining samples during the course of construction work. The testing of electrical  
431 equipment shall conform to the description of the individual specification sections.  
432

433 2.07 INSPECTION  
434

- 435 A. Provide for electrical inspections by the DIA Project Manager. No work shall be  
436 concealed or enclosed until after inspections. If work is concealed or enclosed without  
437 inspection and approval, the Contractor shall be responsible for all expense and work  
438 required to open and restore the concealed area in addition to all required modifications.  
439
- 440 B. Mill inspection will be waived, and the materials accepted upon certified copies of mill  
441 reports identifying the material specification requirements. Copies of order bills and test  
442 reports shall be furnished as requested.  
443

444 2.08 WARRANTY  
445

- 446 A. The Contractor shall provide a written 2-year warranty guaranteeing all work installed  
447 under this contract. It shall cover all parts and labor against defective parts, corrosion or  
448 workmanship necessary to repair or bring into proper operation any equipment including,  
449 but not limited to, isolation transformers, lamps, edge lights, lighting fixtures, poles,  
450 conduit system, and junction boxes. This warranty work includes the Contractor to be on-  
451 site to remove, replace and ship any defective equipment discovered during the warranty  
452 period. At the end of the 2-year warranty period, the insulation resistance of each circuit  
453 shall be measured to a minimum of 750Mohms according to the testing requirements per  
454 Item L-108. The warranty shall start upon the final acceptance of all work as accepted by  
455 the DIA Project Manager. Final payment will be withheld until receipt of the warranty by  
456 the DIA Project Manager.  
457
- 458 B. LED fixtures shall have a written 5 year warranty provided.  
459  
460

461 **PART 3 CONSTRUCTION METHODS**  
462

463 3.01 GENERAL  
464

- 465 A. Installation shall be performed by experienced and skilled persons to obtain only the best  
466 workmanship. All equipment shall be set square and true with construction. The work  
467 shall be under constant supervision by the Contractor, or by an authorized and  
468 competent foreman with five years airfield experience, until completion. The installation  
469 and adjustments shall be by competent Colorado State recognized license journeyman  
470 electricians. The contractor shall include no more than one certified apprentice per  
471 journeyman electrician. Apprentice shall be under the direct supervision of a licensed  
472 electrician at all times.  
473  
474  
475
- 476 B. All work shall be inspected by the Contractor's electrical QC. The electrical QC shall be  
477 responsible to correct or stop work when items of installation are found not to the  
478 contract documents. The number of inspectors shall be adequate to cover all work areas  
479 during all phases of construction. The electrical QC inspector shall be submitted under  
480 the electrical QC Manager Plan, per Section 01403.  
481

482 3.02 INSTALLATION METHOD  
483

- 484 A. The methods used for the installation of electrical system and equipment shall conform to  
485 the National Electric Contractors Association (NECA) published "Standard of Installation"  
486 except where specifically specified or shown otherwise, and to the requirements of the

- 487 National Electrical Code (NEC) and its revisions.  
488  
489 B. All electrical materials, construction methods, and installation shall be in accordance with  
490 applicable Federal Aviation Administration's advisory circulars including amendments,  
491 the National Electrical Code, and the American National Standards Institute Standard C2.  
492  
493  
494 C. Workmanship shall be consistent with the best commercial practices for installation of  
495 this type. The workmanship shall be first class and in accordance with the highest  
496 standards of the electrical industry.  
497  
498 D. The responsibility for the correct and satisfactory installation and operation of all  
499 materials and equipment required herein shall rest with the Contractor. Before any  
500 equipment is ordered, a complete schedule of materials and detailed shop drawings  
501 covering all items of equipment and brochures of the materials proposed for installation  
502 shall be submitted for approval by the DIA Project Manager as described in Item L-100.  
503

### 504 3.03 SITE CONDITIONS

- 505  
506 A. At least five working days prior to commencing construction operations in an area which  
507 may involve underground utility facilities, the Contractor shall notify the DIA Project  
508 Manager and the owners of each underground utility facility shown on the plans. The  
509 FAA will assist the Contractor in locating FAA cables. Please contact Sarah Earwood for  
510 any FAA coordination.  
511  
512 B. The existence of any known buried wires, conduits, junction boxes, ducts, or other  
513 facilities is shown in a general way only. It will be the duty of the Contractor, with the  
514 help of airport personnel, to visit the site and make exact determination of the existence  
515 and location of any facilities prior to commencing any work. It is understood that the  
516 Contractor will be responsible for making the exact determination of the location and  
517 condition of such facilities. Any costs shall be paid for by the Contractor. The Contractor  
518 shall obtain from the DIA Project Manager copies of contract drawings from previous  
519 construction projects, and examine these drawings and verify at the site the location of all  
520 below grade utilities in the vicinity of the work performed under this contract.  
521  
522 C. All items damaged by the Contractor's workers or equipment shall be replaced  
523 immediately at the Contractor's expense.  
524

### 525 3.04 INTERRUPTIONS

- 526  
527 A. Interruptions of lighting circuits may be necessary during construction. The Contractor  
528 shall provide a reliable shunt cable to provide temporary continuity of circuit service to  
529 runway and taxiway lights and signs during construction where required. The Contractor  
530 shall not interrupt any circuit or perform any work that might endanger any circuit until  
531 approval of the DIA Project Manager has been received. Temporary cables shall be  
532 protected by conduit and identified as a hazard.  
533  
534 B. The Contractor shall be responsible for installing, maintaining, protecting, and removing  
535 all required temporary jumper cables used to maintain power to electrical circuits.  
536  
537 C. For the permanent installation, all temporary connections and rerouting of circuits shall  
538 be replaced with new materials installed in accordance with the specifications and as  
539 shown on the plans.  
540

541 D. See Item L-100, paragraph SAFETY RULES. Payment for this work will be made under  
542 Item L-108, Temporary Electrical Work/Jumpers.

543  
544 E. If requested by the Project Manager, Contractor shall submit for approval an Operational  
545 Safety Plan (OSP) including circuits to be locked off and signs to be covered during  
546 construction.

547  
548 3.05 CODES

549  
550 A. The Contractor shall comply with all ordinances, laws, regulations, and codes applicable  
551 to the work involved and as referenced in these specifications. This does not relieve the  
552 Contractor from furnishing and installing work shown or specified which may be beyond  
553 the requirements of such ordinances, laws, regulations, and codes.

554  
555 3.06 Safety Area

556  
557 A. The contractor shall abide by the requirements of the contract specifications when  
558 working within the runway or taxiway safety areas or as directed by the DIA Project  
559 Manager.

560  
561  
562 **PART 4 METHOD OF MEASUREMENT**

563  
564 4.01 Refer to Appendix A for Method of Measurement.

565  
566  
567 **PART 5 BASIS OF PAYMENT**

568  
569 5.01 Refer to Appendix A for Basis of Payment.

570  
571  
572 **PART 6 MATERIAL REQUIREMENTS**

573  
574 AC 150/5370-2 Operational Safety on Airports During Construction  
575 AC 150/5370-10 Standards for Specifying Construction of Airports  
576 MIL-P-152388 Wash Primer Specification  
577 TT-P-641F Type II, Base Paint, Zinc-Rich

578  
579  
580 **END OF ITEM L-100**

581

582  
583  
584

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ITEM L-108

AIRPORT UNDERGROUND CABLE

PART 1 DESCRIPTION

1.01 GENERAL This item shall consist of furnishing and installing underground cable in accordance with these specifications at the locations shown in the Drawings. This item shall include the installation of cable and counterpoise wire in trench, duct or conduit. It shall include splicing, cable marking, and testing of the installation and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the DIA Project Manager. It shall include temporary electrical work and jumper cables to maintain operating or series lighting circuits during construction at the direction of the DIA Project Manager. This item shall not include the installation of the duct or conduit.

This item shall also include removal of existing wire and/or cable when applicable. Any wire or cable, installed in duct or conduit, which is abandoned by this project, shall be completely removed, and the scrap shall be full compensation to the Contractor for removing said excess wire or cable unless a cable removal item is included in the proposal.

1.02 SUBMITTALS Shall comply with specification L-100, Lighting and Electrical Work. Data sheets for each airfield lighting component called for in this section, indicating FAA approval, shall be submitted for approval and be approved prior to ordering any materials for this section. This submittal shall include the proposed method of installation and detail sufficient, in the opinion of the DIA Project Manager, to determine compliance with the contract documents. Cold temperature methods, procedures and limitations shall be included in the submittal.

1.03 SUBMITTALS REFERENCED Additional information pertaining to the items covered in this section are contained in the Federal Aviation Administration (FAA) Advisory Circulars (AC's), latest edition, listed below:

|             |                                                                                    |
|-------------|------------------------------------------------------------------------------------|
| 150/5345-7  | Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits |
| 150/5345-26 | Specification for L-823 Plug and Receptacle, Cable Connectors                      |
| 150/5345-53 | Airport Lighting Equipment Certification Program                                   |
| 150/5370-10 | Standard for Specifying Construction of Airports                                   |
| 150/5370-2  | Operational Safety on Airports During Construction                                 |
| 150/5370-10 | Standard for Specifying Construction of Airports                                   |

The contractor is responsible for obtaining and using the latest edition of the referenced FAA Advisory Circulars. This list is not all inclusive but is offered as a convenience to the Contractor.

PART 2 EQUIPMENT AND MATERIALS

2.01 GENERAL.

- 57 A. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA)  
58 specifications shall have the prior approval of the FAA, and are listed in Advisory Circular  
59 (AC) 150/5345-53 latest edition, Airport Lighting Equipment Certification Program, Appendix  
60 3.  
61  
62 B. All other equipment and materials covered by other referenced specifications shall be  
63 subject to acceptance through manufacturer's certification of compliance with the applicable  
64 specification, when requested by the DIA Project Manager.  
65  
66 C. Manufacturer's certifications shall not relieve the Contractor of their responsibility to provide  
67 materials acceptable to these specifications and to the DIA Project Manager. Materials  
68 supplied and/or installed that do not materially comply with these specifications shall be  
69 removed, when directed by the DIA Project Manager, at the sole cost of the Contractor.  
70  
71 D. The series lighting circuit shall be a 6.6 amp.

72  
73 2.02 CABLE Underground cable shall conform to the requirements of AC 150/5345-7, Specification for  
74 L-824 Underground Electrical Cable for Airport Lighting Circuits. The following types are covered in  
75 Specification L-824 and for control cable:

- 76  
77 A. Type A. (Not Used)  
78  
79 B. Type B. (Not Used)  
80  
81 C. Type C. Unshielded single conductor 19 strand copper cable rated at five thousand volts at  
82 100% of the insulation rating. Provide with a semiconducting tape between the insulation  
83 and conductors to ease stripping.  
84  
85 D. All cable for airport lighting service shall be stranded i.e.: six hundred volt, seven strand and  
86 for five thousand volt, nineteen strand.  
87  
88 E. The L-824 return conductor shall be black with white strip. The white strip shall be printed at  
89 the wire manufacturing facility prior to installing on reels. This is from the last fixture (light,  
90 sign, etc.) in the series circuit to the regulator in the vault or selector switch.  
91  
92 F. Circuits other than airport lighting service shall conform to one of the following insulation  
93 types: UL Standard 83, Thermoplastic Insulated Wires and Cables – THW or THWN  
94 UL Standard 44, Rubber Insulated Wires and Cables – XHHW  
95

96 The conductors shall be seven stranded copper with 600V rate insulation. Multiple conductor cables  
97 shall have a thermoset rubber overall jacket. For power cable, conductor size shall not be smaller  
98 than No. 12 AWG. Control cable, conductor size shall be not less than No. 16 AWG unless noted  
99 otherwise. These limits on conductor sizes shall not apply to leads furnished by manufacturers on  
100 transformers and fixtures.

101  
102 Where counterpoise conductors are to be installed and where soil conditions would adversely affect  
103 bare copper wire, thermoplastic wire conforming to Fed. Spec. A-A-59544 Type TW, 600 volt, shall  
104 be used, at no additional cost.  
105

106 Cable type, size, number of conductors, strand and service voltage shall be specified in the Drawings  
107 and/or Proposal.  
108

109 2.03 BARE COPPER WIRE (COUNTERPOISE) Bare copper wire for counterpoise installations shall be  
110 bare stranded wire conforming to ASTM Specifications B 3 and B 8. Counterpoise conductor is  
111 incidental to other work.  
112

- 113 2.04 CABLE CONNECTIONS In-line connections of underground primary cables shall be of the type  
114 called for in the Drawings and shall be listed below.  
115  
116 A. Not Used.  
117  
118 B. The Vulcanized Splice. Not used.  
119  
120 C. The Field Attached L-823 Plug-In Connector. Figure 3 of Specification for L-823 (A/C  
121 150/5345-26) Plug and Receptacle, Cable Connectors, employing connector kits, is  
122 approved for field attachment to single conductor cable when provided with an integrated  
123 boot to seal the joint between the male and female connectors. It shall be the Contractor's  
124 responsibility to determine the outside diameter of the cable to be spliced and to furnish  
125 appropriately sized connector kits and/or adapters. Prior to final cable termination, new  
126 connectors shall be installed on all cable new and existing..  
127  
128 Scotch 130C or approved equal rubber tape shall be half lapped a minimum of 3" centered  
129 over field made joints.  
130  
131 For the 2,400V control power circuits only, provide the L-823 three-way connector from  
132 Amerace T cable, 54MT or approved equal.  
133  
134 D. The Factory-Molded L-823 Plug-in Connector. Specification for L-823 Connectors,  
135 Factory-Molded to Individual Conductors, are approved.  
136  
137 E. The Taped Splice. Not used.  
138  
139 F The Exothermic Splice. Furnish proper configuration and sizes for counterpoise and ground  
140 rod connections.  
141  
142 G. Low Voltage Power and Lighting Cable Splices shall be made using a compression sleeve  
143 applied with a tool which must be fully activated before it can be removed. The splice shall  
144 be insulated to at least the voltage rating of the cable. The insulating material shall be a  
145 product equal to 3M ITCSN heat shrinkable tubing with the sealing/insulating material factory  
146 applied to the inside of the tubing. The splice shall have two layers of heat shrinkable tubing.  
147 The first layer shall be the length of the compression sleeve. The length of the second heat  
148 shrinkable tubing shall extend at least 10 diameters to both sides of the compression sleeve.  
149  
150 Insulated spring wire connectors with plastic caps for copper conductor splices and taps may  
151 be used for 10 AWG and smaller conductor connections.  
152

153 2.05 FIBER OPTIC CABLE Refer to Section 16742 for fiber optic cable requirements.  
154  
155

### 156 PART 3 CONSTRUCTION METHODS

- 157  
158 3.01 GENERAL The Contractor shall install the specified cable at the approximate locations indicated in  
159 the airport lighting layout Drawings. The DIA Project Manager shall approve specific location plan  
160 submitted by the Contractor.  
161  
162 L-823 connectors shall be installed on all cables in each manhole, base can or other accessible  
163 locations except as modified below. Connectors are not required in cables passing through a light  
164 base with a fixture and not feeding that fixture. These cables shall have the required slack and cable  
165 ID tags in each base can. Connectors are required in all cables in all manholes and light base cans  
166 that are used only as pull-cans (with no fixture.) L-823 connectors are required in sign circuits  
167 passing through a manhole or base can that has a stub out for a future sign. L-823 connectors shall  
168 be installed so a portion of the loop can be bypassed. See connector details (the female connector

169 shall be on the regulator supply cable.) The Contractor shall identify all L-824 cables at all  
170 accessible locations with approved plastic tags with black letters on white background a minimum of  
171 1/8 inch thick and as described on the Drawings.

172  
173 The underground cable work to be performed under this Contract shall consist of furnishing and  
174 installing new cables as shown in the Drawings and as directed by the DIA Project Manager.

175  
176 All primary cable and secondary wiring connections to the isolation transformers and light assemblies  
177 shall be made by means of factory-attached plug-in connector kits in accordance with FAA  
178 Specification L-823 of Advisory Circular No. 150/5345-26. Connectors shall be compatible for  
179 insulation used. The various type connector kits to be used shall be as described in FAA Advisories.  
180 Airfield lighting circuits shall not be intermixed except as shown on the circuitry Drawings.

181  
182 Where existing cable and new cable will be connected, install a new connector on the existing and  
183 new cable, as stated above.

184  
185 3.02 INSTALLATION IN DUCT OR CONDUIT This item includes the installation of the cable in duct or  
186 conduit as described below. The maximum number and voltage ratings of cables installed in each  
187 single duct and conduit, and the current-carrying capacity of each cable shall be in accordance with  
188 the latest National Electric Code, and the code of the local agency having jurisdiction.

189  
190 The Contractor shall not install in conduits or ducts any connections or splices of any kind.

191  
192 The duct or conduit shall be installed as a separate item in accordance with Item L-110, "Installation  
193 of Airport Underground Electrical Duct." The Contractor shall make sure that the duct is open,  
194 continuous, and clear of debris before installing cable. The contractor shall provide and comply with  
195 approved methods prior to clearing of debris. The cable shall be installed in a manner to prevent  
196 harmful stretching of the conductor, injury to the insulation, or damage to the outer protective  
197 covering. The ends of all cables shall be sealed with moisture-seal tape before pulling into the  
198 conduit and it shall be left sealed until connections are made. Where cable is to be installed in a duct  
199 all cable shall be pulled in the duct at the same time. The pulling of a cable through ducts or conduits  
200 shall be accomplished by hand, hand winch or power winch with the use of cable grips or pulling  
201 eyes. Provide mechanical equipment or adequate personnel to feed cables into the conduits or  
202 ducts to minimize tension at the point of feed. Pulling tensions shall be monitored by means  
203 recommended by the manufacturer for straight pulls or bends and at no time exceed the  
204 manufacturer's recommendations. The cable pull tension shall be monitored on every pull exceeding  
205 300 feet in length or if mechanical methods are used. The pulling tension shall be monitored using a  
206 dynamometer. Reading output shall be continuously monitored. If the pulling tension registers  
207 greater than 90% of the manufacturer recommended pulling tension, the contractor shall cease  
208 pulling and notify the DIA Project Manager. A lubricant recommended for the type of cable being  
209 installed shall be used where pulling lubricant is required. The manufacturer's minimum bend radius  
210 or the NEC or local requirements, whichever is greater shall apply. Cable removed from the duct  
211 shall be considered used and not be reused for permanent application. Existing ducts may have  
212 sediment and may require power washing of conduit to allow for a swab and mandrel to be pulled  
213 through.

214  
215 Cables installed within ductbanks between manholes shall be run between individual manholes only.  
216 Connectors shall be installed on each cable within each manhole. Cable pulling through a manhole  
217 and then coming back to make up connections will not be allowed. Any wire lost or that is found not  
218 to have sufficient insulation resistance, shall require all conductors within a conduit to be removed  
219 and replaced at the expense of the Contractor.

220 Cable installation, handling, and storage shall be per manufacturer's recommendations. During cold  
221 weather, particular attention shall be paid to the manufacturer's minimum installation temperature.  
222 The manufacturer's cold weather handling and installation information shall be included in the  
223 submittal. Cable shall not be installed when the temperature is at or below the manufacturer's  
224 minimum installation temperature.

225  
226 Not less than three feet (3') or more than four feet (4') of cable slack shall be left on each side of all  
227 connections from conduit entrance, isolating transformers, light units and at all other points where  
228 cable is connected to field equipment. In base cans and handholes cables without connectors shall  
229 have six feet (6') of slack from conduit entrance. In manholes the cable shall have enough slack to  
230 neatly install on racking system with connectors on highest rack possible and two-foot drip loops at  
231 corners of the manhole. Approved cable ties shall be used to separate each circuit and support the  
232 cables on the arms of the racking system. Each circuit shall be tie wrapped every two feet between  
233 conduit entrance and exit.

234  
235 The return splice shall be as-built. When installation allows, splice the return conductor in base cans  
236 with identification numbers ending with "0" or "5" only.

237  
238 3.03 SPLICING Connections of the type shown in the Drawings shall be made by experienced personnel  
239 regularly engaged in this type of work and shall be made as follows:

240  
241 A. Cast Splices. These shall be made by using crimp connectors for joining conductors. Molds  
242 shall be assembled, and the compound shall be mixed and poured in accordance with the  
243 manufacturer's instructions and to the satisfaction of the DIA Project Manager.

244  
245 B. Vulcanized Splices. Not used.

246  
247 C. Field-Attached L-823 Plug-In Connectors. Submit for review and acceptance the tools  
248 proposed for stripping and crimping of cable connections. These connectors shall be  
249 assembled in accordance with manufacturer's instructions. Strip the insulation from the L-  
250 824 cable so the copper conductor is not damaged (ringed or nicked) in any way. Crimp  
251 conductors firmly in place with crimping tool that requires a complete crimp before tool can  
252 be removed. Crimp twice at 90° opposite. Test the crimped connection by pulling on the  
253 cable. These connections shall be made by plugging directly into mating connectors. All  
254 surfaces covered by the L-823 connector shall be thoroughly cleaned with airport approved  
255 electrical cleaning wipes prior to the installation of the connector. The joint shall be securely  
256 mated and integral boot rolled over the joint. The Contractor shall not use mechanical  
257 means to pull flap over joint. In all cases, the joint where the connectors come together and  
258 the area where the cable enters the connector shall be half-lapped with 3" of Scotch 130C  
259 or approved equal rubber tape, 1-1/2" on each side of the joint..

260  
261 Where Amerace 54Super kits are installed, the cable spreaders shall be removed prior to  
262 installation of the connector or the spreader shall be held in-place with the cable ID zip tie.

263  
264 All contractor personnel that will be installing the L-823 connectors shall be trained and  
265 certified for installing the L-823 connector by the manufacturer of the L-823 connector.  
266 Proposed training course syllabus shall be submitted to the airport for review and approval.  
267 Personnel that have been previously trained shall provide documentation to the airport to  
268 verify that they have been previously within two (2) years prior to the start of construction.  
269 Training and certification cost shall be incidental to the cost of the L-823 connector  
270 installation.

271  
272 The L-823 connectors shall meet Buy American requirements or be included in BA  
273 calculation for larger component.

274  
275 D. Factory-Molded Plug-In Splices. These shall be made by plugging directly into mating  
276 connectors. In all cases, the joint where the connectors come together shall be covered by  
277 rubber tape, except when connecting to an elevated fixture.

278  
279 E. Taped Splices. Not used.

280

281 F. Exothermic connections shall be used for all counterpoise splices and connections to ground  
282 rods.

283  
284 G. Power and Lighting Cable Splices. These shall be made using a procedure similar to the  
285 one shown above for field-attached L-823 plug-in connectors. The crimp sleeve shall be  
286 designed for the wire size and the tool shall apply the correct pressure before it can be  
287 released. The insulation shall be cleaned before the heat shrink tubing is installed. A non-  
288 extruding insulating compound shall be used to build the diameter at the crimp sleeve to the  
289 approximate diameter of the cable insulation.

290  
291 H. EXISTING CIRCUITS. Whenever the scope of work requires connection to an existing  
292 circuit, the complete circuit's insulation resistance shall be tested, in the presence of the  
293 Engineer. The test shall be performed prior to any activity affecting the respective circuit.  
294 Where portions of the existing cable is to be put back in service, the existing cable portion  
295 shall be tested at the time the circuit is broken and again just prior to connecting to the new  
296 portion. This will verify any degradation of the existing portion, if any, during the time of  
297 construction. The Contractor shall record the results on forms acceptable to the engineer.  
298 The forms shall include all information required per section L-108 3.05 and be submitted  
299 within 48 hours of test taken. When the work affecting the circuit is complete, the circuit's  
300 insulation resistance shall be tested at all new installation locations to meet testing  
301 requirements of section L-108 3.05, in the presence of the engineer. The Contractor shall  
302 record the results on forms acceptable to the engineer and submit within 48 hours. The  
303 Contractor shall then test the entire existing circuit. If the reading is not equal to or greater  
304 than the first entire circuit reading and the Contractor has confirmed new cable locations  
305 have not created the lower meg readings, the contractor shall notify the owner's  
306 representative immediately. All test results shall be submitted within 48 hours of test time  
307 and all test results shall be submitted in the Operations and Maintenance (O&M) manual.

308  
309 The Contractor shall have on-site connectors that will meet with the various outside diameter  
310 cables that may exist on site.

311  
312  
313 3.04 BARE COUNTERPOISE WIRE INSTALLATION AND GROUNDING FOR LIGHTNING  
314 PROTECTION A stranded bare copper wire, No. 6 AWG, shall be installed for lightning protection  
315 of the underground cables. The insulated cables for the taxiway and runway circuits shall be  
316 protected by a bare counterpoise wire installed in the same trench above the conduit or cable for the  
317 entire length of cables as indicated on the Drawings. The counterpoise wire shall be securely  
318 bonded to each light fixture base, reinforcing cage and to ground rods located not more than 500 feet  
319 along the conduit path. Ground rods are not required for the centerline lighting system. The  
320 centerline counterpoise wire shall be connected to the edge light counterpoise wire at every 500 feet  
321 or less and as shown on the plans. These connections shall be made with a No 6 AWG stranded  
322 bare copper wire and exothermic welds. Ground rods shall be copper clad steel, 3/4 inch diameter  
323 and 10 feet long and shall be installed with an inspection pit so each ground rod installed is  
324 accessible. Ground rods shall meet testing requirements specified in 108-3.05, G. All ground rods  
325 and counterpoise conductor shall be tested prior to connection to grounding conductor. The  
326 Contractor shall perform the necessary inspection and tests for these items concurrently with the  
327 installation because of subsequent inaccessibility of some components. Submit test results to the  
328 Project Manager.

329  
330 The counterpoise system shall terminate at the transformer vault or at the power source. It shall be  
331 securely attached to the vault or equipment grounding system. The connections shall be made by  
332 exothermic process and shall be incidental to other work.

333  
334 3.05 TESTING The Contractor shall furnish all necessary equipment and appliances for performing all  
335 the tests referenced in the specification and this section. The Contractor shall measure and record  
336 operating voltage, current, circuit resistance, insulation resistance, ground rod resistance in the

presence of the DIA Project Manager or his appointed representative. Tests include the following.

- A. That all lighting power and control circuits are continuous and free from short circuits. (circuit resistance)
- B. That all circuits are free from unspecified grounds.
- C. Prior to and after any work on airfield circuitry the contractor shall test and document the continuity (ohm) and insulation resistance (Mohm).

That the insulation resistance to ground of all new and newly retrofitted non-grounded series circuits is not less than 1,000 megohms when tested at 1,000 volts DC-applied for three minutes.

- D. Prior to energizing, all building service cables, feeders to and/or from transformers, switchboards, panelboards are to be tested with a 1000-volt DC insulation megohm meter to determine insulation resistance levels. Test cables one minute with a 1000 volt megohm meter or as recommended by the manufacturer. All field test data is to be recorded, corrected to a baseline temperature and furnished to the Project Manager. A test is to include meggering for three minutes between conductors and between each conductor and ground. Cables are to be meggered after installation with cables disconnected at both ends. Insulation test values shall meet or exceed the values given below.

| Conductor Size<br>(AWG or kCMIL) | Resistance<br>(Megohms – 1,000 ft) |
|----------------------------------|------------------------------------|
| 12-8                             | 200                                |
| 6-2/0                            | 100                                |
| 3/0-500                          | 100                                |

- E. That all circuits are properly connected in accordance with applicable wiring diagrams.
- F. That all circuits are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 4 hours.
- G. That all ground rods are 25 ohms or less to ground. When the contact resistance to earth exceeds 5 OHMS, provide location and resistance value to the project manager. Project Manager shall direct corrective action when needed to reduce the resistance to 5 OHMS or less.
- H. That all counterpoise is continuous as determined by the resistive value (size and length) as routed with the circuit conductors. (light can to light can, manhole to light can, manhole to manhole, light can to ground rod)
- I. Final test shall be made before and after all work is complete and the typed results submitted to the DIA Project Manager in bound form. The information shall include the type of meter used, manufacturer, model, serial number and the last time the meter was calibrated and calibration due date.

3.06 LOW VOLTAGE POWER CABLE All cables shall be tagged in each equipment enclosure. Tags shall be attached to cables immediately after installation.

Tags shall be large enough to accommodate all required lettering (1/4-inch high and appropriate width). All characters shall be legibly written on material which is not affected by water, solvents or other severe conditions. Tags shall be non-metallic and attached securely with non-metallic fastener.

388 Marking of the tags shall consist of an abbreviation of the name of the facility or facilities served by  
389 the cable and panelboard branch circuit connected to.  
390

391 Wires for three phase circuits shall be color coded by insulation or with a band of tape at each  
392 termination and at the entrance and exit from each conduit, box, or other device. The wire tag shall  
393 also indicate the phase by letter A (black), B (red), C (blue), neutral (white) for 120/208 volts or A  
394 (brown), B (orange), C (yellow) and neutral (natural gray) for 277/480 volt circuits. Ground wires shall  
395 have green insulation or be bare copper. Tape shall not be used to identify neutral or ground wires  
396 unless specifically permitted by the NEC. Conductors #6AWG and smaller shall have a colored  
397 insulation.  
398

399 Where more than one identical cable is used to serve the same facility, they may be bundled under  
400 one tag, unless the plans state otherwise.  
401

402 **PART 4 METHOD OF MEASUREMENT**

403  
404  
405 4.01 Refer to Appendix A for Method of Measurement.  
406  
407

408 **PART 5 BASIS OF PAYMENT**

409  
410 5.01 Refer to Appendix A for Basis of Payment.  
411  
412

413 **FAA SPECIFICATIONS**

414  
415 A/C 150/5345-7 Specification for L-824 Underground Electrical Cables for  
416 Airport Lighting Circuits.  
417  
418 A/C 150/5345-26 Specification for L-823 Plug & Receptacle Cable Connectors  
419  
420 A-A-59544 Cable and Wire, Electrical Power, Fixed Insulation  
421  
422

423 **ASTM SPECIFICATIONS**

424  
425 B3 Soft or Annealed Copper Wire.  
426  
427 B8 Concentric-Lay-Stranded Copper Conductor, Hard, Medium-Hard, or  
428 Soft.  
429  
430

431 **UL SPECIFICATIONS**

432  
433 ANSI/UL 44 Thermoset-Insulated Wires and Cables  
434  
435 ANSI/UL 83 Thermoplastic-Insulated Wires and Cables  
436  
437

438 **END OF ITEM L-108**  
439



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**ITEM L-110**

**AIRPORT UNDERGROUND ELECTRICAL DUCT**

**PART 1 DESCRIPTION**

- 1.01 This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete) installed in accordance with this specification at the locations and in accordance with the dimensions, designs, and details shown in the Drawings. This item shall include furnishing and installing of all underground electrical duct banks, individual, and multiple underground conduits. It shall also include all trenching, backfilling, removal, and restoration of any paved areas or turfed area; manholes, concrete encasement, mandreling, installation of the pull line, detectable tape, and duct markers, plugging of conduits, and the testing of the installation as a completed duct system ready for installation of cables in accordance with the plans and specifications, to the satisfaction of the DIA Project Manager. This item shall also include furnishing and installing conduits and all incidentals for the providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.
- 1.02 SUBMITTALS Shall comply with specification L-100 Lighting and Electrical Work.

**PART 2 EQUIPMENT AND MATERIALS**

- 2.01 GENERAL. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification.
- 2.02 NOT USED.
- 2.03 CONCRETE. Concrete shall conform to Item P-610, Structural Portland Cement Concrete, using 1-inch maximum size coarse aggregate.
- 2.04 PLASTIC CONDUIT. Plastic conduit and fittings shall conform to the requirements of NEMA TC 2 (PVC conduit), NEMA TC 3 (PVC fittings), UL 514B, and UL 651:
- Type II (Schedule 40). Heavy-wall polyvinyl chloride (PVC) conduit listed by an independent testing laboratory for Above Ground Exposed, Underground Concrete Encased (CE) and Underground Direct Earth Burial (DEB) for applications as described in Article 352 of the current National Electrical Code.
- All joints shall be solvent welded in accordance with the recommendation of the conduit manufacturer. Solvent shall be brushed on the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. The plastic conduit, fittings, expansion joints and joint adhesive shall be products of one manufacturer to assure compatibility.
- Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using approved manufactured sweep bends.
- 2.05 ELBOWS. All elbows (bends) 90 degrees or less used in PVC duct system to be schedule 80 or schedule 40, with P-610 encasement, PVC. A bend exceeding 90 degrees is not acceptable.
- 2.06 DETECTABLE TAPE. Detectable tape shall be a red polyethylene film with a metallized foil core and shall be 3-inch wide. The tape shall read "Caution - Electric Line Below". The tape shall be manufactured by Reef Industries, Inc., or approved equal.

**PART 3 CONSTRUCTION METHODS**

59  
60 3.01 GENERAL. The Contractor shall install underground duct banks and conduits at the approximate  
61 locations indicated in the Drawings. The DIA Project Manager shall approve the Contractor's specific  
62 locations plan as the work progresses if required to differ from the plans. Duct banks and conduits  
63 shall be of the size, material, and type indicated in the Drawings or Specifications. Where no size is  
64 indicated in the Drawings or Specifications, the ducts shall be not less than 2 inches inside diameter  
65 or comply with the National Electrical Code based on cable to be installed whichever is larger. All  
66 duct lines shall be laid so as to grade toward handholes, manholes and duct ends for drainage.  
67 Unless shown otherwise on the plans. Grades shall be at least 3 inches per 100 feet. On runs where  
68 it is not practicable to maintain the grade all one way, the duct lines shall be graded from the center  
69 in both directions toward manholes, handholes, or duct ends, with a drain into the storm drainage  
70 system. Pockets or traps where moisture may accumulate shall be avoided.

71  
72 The Contractor shall mandrel each individual conduit. An approved rubber gasket mandrel, not more  
73 than 1/4-inch smaller than the bore of the duct shall have a rope secured at both ends and pulled  
74 through each duct. The Contractor shall cease pulling the mandrel through existing duct system if  
75 the mandrel does not move freely and notify the Project Manager of the condition. The mandrel shall  
76 have a rubber gasket slightly larger than the inside diameter of the conduit.

77  
78 The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc.  
79 interiors IMMEDIATELY prior to pulling cable. Once cleaned and swabbed the base cans,  
80 manholes, pull boxes, etc. and all accessible points of entry to the duct/conduit system shall be kept  
81 closed except when installing cables. All raceway systems left open, after initial cleaning, for any  
82 reason shall be cleaned again at the contractors expense. All accessible points shall be kept closed  
83 when not installing cable. The contractor shall verify existing ducts proposed for use in this project  
84 as clear and open. The Contractor shall notify the Project Manager of any blockage in the existing  
85 ducts.

86  
87 All ducts installed shall be provided with a 200-pound polypropylene line for pulling the permanent  
88 wiring. Sufficient length shall be left in manholes or handholes and securely attached to the pulling  
89 iron to prevent it from slipping back into the duct. Where spare ducts are installed, as indicated on  
90 the Drawings, the open ends shall be plugged with removable tapered plugs, designed for this  
91 purpose.

92  
93 All conduits shall be securely fastened in place during construction and progress of the work. All  
94 ducts shall be plugged to prevent contaminate, seepage of grout, water, or dirt. Any duct section  
95 having a defective joint shall be removed and replaced at the Contractors expense. Ducts shall be  
96 supported and separated using approved spacers at intervals not to exceed 5 feet.

97  
98 All ducts installed under runways, taxiways, aprons, and other paved areas including asphalt  
99 shoulders, shall be encased in a concrete envelope meeting Item P-610.

100  
101 Trenches for ducts may be excavated manually or with mechanical trenching equipment. Walls of  
102 trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of  
103 road patrols or graders shall not be used to excavate the trench. The Contractor shall ascertain the  
104 type of soil or rock to be excavated before bidding. All excavation shall be unclassified and shall be  
105 paid for as a part of Item L-110.

106  
107 3.02 DUCTS ENCASED IN CONCRETE. Unless otherwise shown in the Drawings all ducts shall be  
108 encased in concrete. Concrete-encased ducts shall be installed so that the top of the concrete  
109 envelope is not less than 24 inches below the finished subgrade where installed under runways,  
110 taxiways, aprons, or other paved areas, and not less than 36 inches below finished grade where  
111 installed in unpaved areas. Duct encasement under paved areas shall extend at least 5 feet beyond  
112 the edges of the pavement or 5 feet beyond any underdrain which may be installed alongside the  
113 paved area whichever distance is greater. Trenches for concrete-encased ducts shall be opened the  
114 complete length before concrete is laid so that if any obstructions are encountered, proper provisions  
115 can be made to avoid them. All ducts for concrete encasements shall be placed using approved  
116 spacers no more than 5 feet apart. Where two or more ducts are encased in concrete, the

117 Contractor shall space them not less than 2 inches apart (measured from outside wall to outside  
118 wall) using spacers applicable to the type of duct. As the duct installation progresses, concrete not  
119 less than 3 inches thick shall be placed on top, bottom and sides of the duct bank. End bells or  
120 couplings shall be installed flush with the concrete encasement where required.

121  
122 When specified, the Contractor shall reinforce the bottom side and top of encasements with steel  
123 reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor  
124 shall supply additional supports where the ground is soft and boggy, where ducts cross under  
125 roadways, or where otherwise shown on the Drawings. Under such conditions, the complete duct  
126 structure shall be supported on reinforced concrete footings, piers, or piles located at approximately  
127 5-foot intervals. All construction joints in the concrete encased ducts shall have a minimum of four  
128 steel dowels evenly spaced and installed at the joint. The dowels shall be deformed steel reinforcing  
129 bars, 1 inch in diameter and 24 inches long, with one-half of the length embedded in the plastic  
130 concrete that is constructed initially. If conduits transverse more than one paving lane, the adjacent  
131 cans must be surveyed for location and elevation to assure proper location of conduits.

132  
133 3.03 DUCTS WITHOUT CONCRETE ENCASEMENT. Trenches for single duct lines shall be not less  
134 than 6 inches nor more than 12 inches wide, and the trench for 2 or more ducts installed at the same  
135 level shall be proportionately wider. Trench bottoms for ducts without concrete encasement shall be  
136 made to conform accurately to grade so as to provide uniform support for the duct along its entire  
137 length. Any loose material in the bottom of the trench shall be removed or compacted to specified  
138 requirement.

139  
140 Unless otherwise shown in Drawings, ducts for installation in soil shall be installed so that the tops of  
141 all ducts are at least 36 inches below the finished grade. Back fill of trenches shall be P-162 flowable  
142 backfill material with red dye to within 10 inches of finished grade to allow for growth of vegetation.

143  
144 When two or more ducts are installed in the same trench without concrete encasement, they shall be  
145 spaced not less than 2 inches apart (measured from outside wall to outside wall) in a horizontal  
146 direction.

147  
148 Trenches shall be opened the complete length before duct is installed so that if any obstructions are  
149 encountered, proper provisions can be made to avoid them.

150 3.04 DUCT MARKERS. The location of the ends of all ducts shall be marked by a concrete slab marker  
151 2 feet square and 6 inches thick which has a 12-inch diameter by 12-inch deep anchor attached.  
152 The top of the marker shall extend approximately 1-inch above the surface. The markers shall be  
153 located above the ends of all ducts or duct banks, except where ducts terminate in a light can,  
154 handhole, manhole, underdrain, or building.

155  
156 The Contractor shall impress the word "duct" on each marker slab. They shall also impress on the  
157 slab the number and size of ducts beneath the marker. The letters shall be 4 inches high and  
158 3 inches wide with width of stroke 1/2-inch and 1/4-inch deep or as large as the available space  
159 permits.

160  
161 3.05 BACKFILLING. P-162 flowable backfill material with red dye shall be used to backfill all trenches for  
162 ducts encased in concrete under new concrete or asphalt pavement. Under pavement the flowable  
163 backfill shall be level with the subgrade. The Contractor shall reference section P-162 of these  
164 specifications, and shall be responsible for material and placement.

165  
166 The excavated material shall be removed and disposed of in accordance with instructions issued by  
167 the DIA Project Manager.

168  
169 3.06 DETECTABLE TAPE. Detectable tape shall be placed above all conduits, ducts, and duct banks not  
170 installed under pavement in accordance with manufacturer's installation instructions.

171  
172 3.07 DUCTS INSTALLED BY DRILLING UNDER PAVEMENT. When required by the plans, the  
173 Contractor shall install three inch rigid steel conduit duct in a void under pavement created by drilling.  
174 The diameter of the void shall be kept to a minimum. Waterjet excavation will not be permitted.

175 Drilling shall be completed by a dry process or with a water cooled cutting head. A locator system  
176 shall be used in conjunction with the cutting head to provide for true-line drilling and to prevent water  
177 from collecting in the pavement subgrade. Depth of the duct below pavement grade should be as  
178 close to 24 inches as possible.  
179

180  
181 **PART 4 METHOD OF MEASUREMENT**

182  
183 4.01 Refer to Appendix A for Method of Measurement.  
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186 **PART 5 BASIS OF PAYMENT**

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188 5.01 Refer to Appendix A for Basis of Payment.  
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190  
191 **PART 6 MATERIAL REQUIREMENTS**

192  
193 NEMA TC 2 Polyvinyl Chloride (PVC) Conduit  
194  
195 NEMA TC 3 Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing  
196  
197 UL 514B Conduit Accessories  
198  
199 UL 651 Schedule 40 and 80 Rigid PVC Conduit  
200  
201 UL 651A Rigid PVC Conduit and HDPE Conduit  
202  
203 UL 651B Continuous Length HDPE Conduit  
204  
205 Rigid Metal Conduit  
206  
207 Fittings for Conduit  
208

209  
210 **END OF ITEM L-110**

ITEM L-122A

PROCURE CONSTANT CURRENT REGULATORS

PART 1 DESCRIPTION

- 1.01 GENERAL. This item shall consist of procuring constant current regulators in accordance with this specification and the applicable FAA Advisory Circulars.
- 1.02 SUBMITTALS. Shop drawings shall be submitted to the DIA Project Manager for review and approval and be approved prior to ordering any materials for this item. The data submitted shall be sufficient, in the opinion of the DIA Project Manager, to determine compliance with the contract documents. The Contractor's submittals shall be in accordance with Item L-100, Lighting and Electrical Work.
- 1.03 QUALIFICATIONS. The DIA Project Manager reserves the right to reject any and all equipment, materials or procedures, which, in the DIA Project Manager's opinion, does not meet the system design and the standards and codes, specified herein.

PART 2 MATERIALS

- 2.01 GENERAL.
- A. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified and listed under Advisory Circular (AC) 150/5345-53, Airport Lighting Equipment Certification Program, Appendix 3, latest edition. All items that are FAA Testing Laboratory and DIA Project Manager approved at the time of bidding are acceptable.
- B. The data submitted shall be sufficient, in the opinion of the DIA Project Manager, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section.
- 2.02 GUARANTEES. Except as modified below, all equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of twenty-four (24) months or the manufacturer's standard guarantee period whichever is greater, from final acceptance by the DIA Project Manager. Any defective materials and/or equipment shall be repaired or replaced, at the DIA Project Manager's discretion, with no additional cost to the Owner.
- 2.03 CONSTANT CURRENT REGULATORS. Constant Current Regulators (CCR) shall conform to specifications for L-829 constant current regulators as set forth in FAA Advisory Circular 150/5345-10, latest edition. Regulators shall be individual, stand-alone units. The CCRs shall be air-cooled, dry type, ferro-resonant with internally mounted CCR/ALCMS interface unit and insulation resistance monitoring. The input power for all regulators shall be 60 Hz, 480V single phase, size as shown on the Drawings. The output power shall be rated 6.6A (taxiways and runways) as shown on the drawings.
- Regulators associated with taxiways and signage shall be equipped with three brightness steps, 4.8/5.5/6.6A. The CCR(s) for sign circuits shall be modified to operate as a single step 5.5A output circuit. Regulators associated with runways shall possess five (2.8/3.2/4.1/5.2/6.6A) brightness steps. See Table 1 below for the CCRs to be provided.

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The regulators shall be equipped with an integral contactor for primary switching. The regulators shall have switches for remote/local function switch, local ON/OFF, and all brightness steps. The regulator must be capable of operation on 'local' control without the remote control cable connected and capable of local operation for emergency if remote switch or leads become inoperative.

Regulators shall have a direct reading, digital output RMS ammeter of +/-1% accuracy and a digital output RMS voltmeter of +/-1% accuracy. The regulator shall have automatic input voltage compensation for -5 to +10% variations.

Each regulator shall have integral input and output lightning protection. Output lightning arrestors shall be of the distribution type, door knob and similar type lightning arrestors are not acceptable.

Each CCR shall be provided with door safety interlocks with a maintenance bypass position. The interlock shall be wired to turn the CCR off should the door be opened.

Each CCR shall be provided with a metal drawing pocket for the instruction book. A laminated wiring diagram and troubleshooting charts shall be provided for each regulator, attached to the door interior or located in the metal drawing pocket.

Each CCR shall be provided with a metal nameplate with the following data stamped into the nameplate:

Input: \_\_\_\_\_ Volts \_\_\_\_\_ Hertz \_\_\_\_\_ Amperes  
Control: \_\_\_\_\_ Volts \_\_\_\_\_ Hertz  
Output: \_\_\_\_\_ kW at \_\_\_\_\_ Amperes  
Output Current: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  
Gallons of Oil: \_\_\_\_\_  
FAA-L-829 Serial No. \_\_\_\_\_

Manufacturer: ADB Airfield Solutions.

Constant Current Regulators must be compatible with the existing ALCMS and exactly duplicate all monitoring and control functions that currently exist at the East Vault.

Dry-contacts within the regulator shall be supplied for the following information:

- a. Brightness Step of CCR
- b. Loss of Input Power to CCR
- c. Incorrect Output Current
- d. Remote/Local Status
- e. Number of Lamp Failures (Accurate to one (1) lamp) (4 contacts coded in binary form 1,2,4,8)
- f. Overcurrent
- g. Open Circuit
- h. Low VA

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The CCR shall not exceed a 36-inch square foot print and shall not be taller than 42-inches. CCRs shall have internal distributive control equipment and monitoring devices for ALCMS interface (ADB ACE 2). The control equipment will be supplied power from the same source as the ALCMS.

TABLE 1: RUNWAY 8-26 CCRs

| CCR NO. | CIRCUIT    | SIZE (kW) | VOLTAGE (V) | STYLE  | CLASS | ADB PART NO.   |
|---------|------------|-----------|-------------|--------|-------|----------------|
| CCR31   | R8E        | 30        | 480         | 5 Step | 6.6A  | CSF6630-635G/A |
| CCR32   | R8C1       | 20        | 480         | 5 Step | 6.6A  | CSF6620-635G/A |
| CCR33   | R8C2       | 20        | 480         | 5 Step | 6.6A  | CSF6620-635G/A |
| CCR34   | R8RDRWC    | 20        | 480         | 3 Step | 6.6A  | CSF6620-435G/A |
| CCR35   | R8TDZ      | 20        | 480         | 5 Step | 6.6A  | CSF6620-635G/A |
| CCR36   | TRE1, TRE2 | 30        | 480         | 3 Step | 6.6A  | CSF6630-435G/A |
| CCR37   | TRC1       | 30        | 480         | 3 Step | 6.6A  | CSF6630-435G/A |
| CCR38   | TRC2       | 20        | 480         | 3 Step | 6.6A  | CSF6620-435G/A |
| CCR39   | TRC3       | 30        | 480         | 3 Step | 6.6A  | CSF6630-435G/A |
| CCR59   | TRC4       | 20        | 480         | 3 Step | 6.6A  | CSF6620-435G/A |
| CCR65   | TEEC1      | 20        | 480         | 3 Step | 6.6A  | CSF6620-435G/A |
| CCR42   | TRSB       | 30        | 480         | 3 Step | 6.6A  | CSF6630-435G/A |
| CCR43   | TRWW       | 10        | 480         | 3 Step | 6.6A  | CSF6610-435G/A |
| CCR40   | TRS1, TRS2 | 20        | 480         | 1 Step | 5.5A  | CSF6620-435G/A |
| CCR41   | TAC1       | 30        | 480         | 3 Step | 6.6A  | CSF6630-435G/A |
| CCR67   | TAC2       | 30        | 480         | 3 Step | 6.6A  | CSF6630-435G/A |
| CCR66   | TAS1       | 10        | 480         | 3 Step | 6.6A  | CSF6610-435G/A |

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2.04 DELIVERY, STORAGE AND HANDLING. Ship CCRs disassembled only to the extent necessary for reasons of shipping limitations, handling facilities, and to avoid damage during shipment. Maintain materials and equipment in new condition. This shall include the use of heat lamps, suitable coverings, indoor storage, etc. to properly protect the equipment and materials. Any equipment or materials, in the opinion of the DIA Project Manager, damaged during shipment or storage periods shall be replaced by and at the expense of the Contractor. Delivery shall be to a location on-site once the Contractor’s storage location is determined.

2.05 SPARE PARTS. The following table lists the electrical spare parts required to be furnished by the Contractor. All spare parts shall be identical to the same parts approved and installed in the project. The cost of all defined spare parts to be furnished to the Owner shall be included in the various unit bid items for which the spare parts are provided.

SPARE PARTS LIST

| Category Description                                                      | Quantity |
|---------------------------------------------------------------------------|----------|
| Spare fuses of each fuse type and size required for each regulator        | 3        |
| Control assembly for each regulator size and type to be provided          | 1        |
| Control power transformer for each regulator size and type to be provided | 1        |

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**PART 3 METHOD OF MEASUREMENT**

3.01 Refer to Appendix A for Method of Measurement.

**PART 4 BASIS OF PAYMENT**

4.01 Refer to Appendix A for Basis of Payment

**END OF ITEM L-122A**



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**ITEM L-122C**

**CONSTANT CURRENT REGULATOR CONSTRUCTION**

**PART 1 DESCRIPTION**

1.01 GENERAL. This item shall consist of constant current regulators and associated equipment installed in accordance with this specification, any referenced specifications, and the applicable FAA Advisory Circulars. The equipment shall be installed at the location and in accordance with the dimensions, layout, design, and details shown in the plans. This item shall include furnishing and installing all equipment, wiring, electrical busway equipment, cable, conduit, grounding systems, cable connections, marking and labeling of equipment, labeling or tagging of wires, testing of the installation and all incidentals and appurtenances necessary to place the systems in operation as completed units to the satisfaction of the DIA Project Manager.

1.02 REFERENCED MATERIALS. Additional details pertaining to specific systems covered in this section are contained in the Federal Aviation Administration (FAA) Advisory Circulars (AC's), latest edition, listed below:

- |             |                                                                                    |
|-------------|------------------------------------------------------------------------------------|
| 150/5340-26 | Maintenance of Airport Visual Aid Facilities                                       |
| 150/5340-30 | Design And Installation Details For Airport Visual Aids                            |
| 150/5345-7  | Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits |
| 150/5345-10 | Specification for Constant Current Regulators and Regulator Monitors               |
| 150/5345-26 | FAA Specification for L-823 Plug and Receptacle, Cable Connectors                  |
| 150/5370-2  | Operational Safety on Airports During Construction                                 |

The Contractor is responsible for obtaining and using the latest edition of the referenced FAA Advisory Circulars. This is not all inclusive but is offered as a convenience to the Contractor.

1.03 SUBMITTALS. Shop drawings of each component, indicating FAA approval, shall be submitted to the DIA Project Manager for review and approval and be approved prior to ordering any materials for this item. This submittal shall include the proposed method of installation for each component. The submittal shall include data on all component parts of the item or system, and shall include the manufacturers list of recommended spare parts for one years' use. The data submitted shall be sufficient, in the opinion of the DIA Project Manager, to determine compliance with the contract documents. The Contractor's submittals shall be in accordance with Item L-100, Lighting and Electrical Work.

1.04 QUALIFICATIONS. The DIA Project Manager reserves the right to reject any and all equipment, materials or procedures, which, in the DIA Project Manager's opinion, does not meet the system design and the standards and codes, specified herein.

**PART 2 MATERIALS**

2.01 GENERAL.

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- A. All equipment and materials covered by other than FAA referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specifications. The Contractor shall submit the manufacturer's certificate of compliance and the applicable specification sections to the DIA Project Manager for approval before the equipment and material are ordered.
  - B. Manufacturers certifications shall not relieve the Contractor of their responsibility to provide materials in accordance with these specifications and acceptable to the DIA Project Manager. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the DIA Project Manager, and replaced with materials which do comply with these specifications at the sole cost of the Contractor.
  - C. All materials and equipment used to construct this item shall be submitted to the DIA Project Manager for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be boldly and clearly made with arrows or circles, highlighting is not acceptable. Contractor is solely responsible for delays in project accruing directly or indirectly from late submissions or resubmissions of submittals.
  - D. The data submitted shall be sufficient, in the opinion of the DIA Project Manager, to determine compliance with the plans and specifications. The Contractor's submittals shall be neatly bound in a properly sized 3-ring binder, tabbed by specification section.
- 2.02 GUARANTEES. Except as modified below, all equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of twenty-four (24) months or the manufacturer's standard guarantee period whichever is greater, from final acceptance by the DIA Project Manager. Any defective materials and/or equipment shall be repaired or replaced, at the DIA Project Manager's discretion, with no additional cost to the Owner.
- 2.03 CONDUIT. Rigid steel conduit and fittings shall be in accordance with Underwriters Laboratories (UL) Standard 6 and 514B. Liquidtight Flexible metal conduit (LFMC) and fittings shall be in accordance with UL Standard 360 and 514B. LFMC metal shall be steel.
- 2.04 PAINT. Paint shall be as required by these specifications or as recommended by the manufacturer.
- A. Priming paint for ungalvanized metal surfaces shall be a high solids alkyd primer conforming to Federal Standard TT-P-664D.
  - B. White paint for body and finish coats on metal and wood surfaces shall be ready-mixed paint conforming to the Master Painter's Institute, Reference #9, Exterior Alkyd, Gloss, VOC Range E2.
- 2.05 BUS PLUGS. The existing busway is a General Electric, Spectra Series. Provide bus plugs with 3-pole circuit breakers, 480 VAC, current rating as shown on the Drawings. Only two phases will be used for circuiting of the Constant Current Regulators (CCRs).

- 111  
112 2.06 OTHER ELECTRICAL EQUIPMENT. Distribution transformers, oil switches, cutouts, relays,  
113 terminal blocks, transfer relays, circuit breakers, and all other regularly used commercial items of  
114 electrical equipment not covered by FAA equipment specifications shall conform to the applicable  
115 rulings and standards of the Institute of Electrical and Electronic Engineers (IEEE) or the National  
116 Electrical Manufacturers Association (NEMA). When specified, test reports from a testing  
117 laboratory indicating that the equipment meets the specifications shall be supplied. In all cases,  
118 equipment shall be new and a first-grade product. This equipment shall be supplied in the  
119 quantities required for the specific project and shall incorporate the electrical and mechanical  
120 characteristics specified in the proposal and plans.  
121  
122 2.07 WIRE. Airfield lighting cable, 600V rated power cable, and ground conductors shall comply with  
123 L-108, Underground Power Cable for Airports. Communications cable shall comply with Item  
124 13410C, Airfield Lighting Control and Monitoring System Modifications.  
125  
126 2.08 CONSTANT CURRENT REGULATORS. CCRs shall be procured from ADB according to Item L-  
127 122A, Procure Constant Current Regulators.  
128  
129 2.09 L-823 CONNECTORS. Connectors shall comply with Item L-108 Underground Power Cable for  
130 Airports.  
131  
132 2.10 PLUG CUTOUTS. The S-1 plug cutouts shall be three position-operation, maintenance and test  
133 with key lock for normal and maintenance positions, rated 5,000V AC at 20A.  
134  
135 2.11 TAPE. Plastic electrical tapes shall be Scotch Electrical Tape number 88 as manufactured by the  
136 Minnesota Mining and Manufacturing Company, or approved equal. Electrical coating shall be  
137 Scotchkote as manufactured by the Minnesota Mining and Manufacturing Company, or approved  
138 equal.  
139  
140 2.12 BOLTING HARDWARE. All hardware shall be stainless steel and shall meet FAA requirements.  
141 Strut shall be galvanized steel. Brackets for connecting strut shall be galvanized steel.  
142  
143 2.13 DELIVERY, STORAGE AND HANDLING. Ship materials and equipment disassembled only to  
144 the extent necessary for reasons of shipping limitations, handling facilities, and to avoid damage  
145 during shipment. Maintain materials and equipment in new condition. This shall include the use  
146 of heat lamps, suitable coverings, indoor storage, etc. to properly protect the equipment and  
147 materials. Any equipment or materials, in the opinion of the DIA Project Manager, damaged  
148 during construction or storage periods shall be replaced by and at the expense of the Contractor.  
149  
150 Shipment of the CCRs will be to an on-airport site created by the Contractor. Refer to Item L-  
151 122A.  
152  
153

### 154 PART 3 CONSTRUCTION METHODS

- 155  
156 3.01 GENERAL. The Contractor shall furnish, install, and connect all equipment, equipment  
157 accessories, conduit, cables, bus plugs, grounds, internal interface units and support necessary  
158 to insure a complete and operable electrical distribution for the airport lighting system as specified  
159 herein and shown in the Plans.  
160  
161 The equipment installation and mounting shall comply with the requirements of the National  
162 Electrical Code and local code agency having jurisdiction.  
163  
164 3.02 CONTRACT DRAWINGS. Where the electrical drawings indicate (diagrammatically or otherwise)  
165 the work intended and the functions to be performed, even though some minor details are not

166 shown, the Contractor shall furnish all equipment, material, and labor to complete the installation  
167 work, and accomplish all the indicated functions of the electrical installation. Further, the Contractor  
168 shall be responsible for taking the necessary actions to ensure that all electrical work is coordinated  
169 and compatible with the civil plans.  
170

171 3.03 MINOR DEPARTURES. Minor departures from exact dimensions shown in the electrical plans may  
172 be permitted where required to avoid conflict or unnecessary difficulty in placement of a dimensional  
173 item, provided contract requirements are met. The Contractor shall promptly obtain approval from  
174 the DIA Project Manager prior to undertaking any such proposed departure.  
175

176 3.04 POWER SUPPLY EQUIPMENT. Transformers, regulators, booster transformers, and other  
177 power supply equipment items shall be furnished, installed, or removed at the locations shown in  
178 the Plans or as directed by the DIA Project Manager. The power supply equipment shall be set  
179 on steel "H" sections, "I" beams, or channels to provide a minimum space of 1-1/2-inches  
180 between the equipment and the floor. The equipment shall be placed so as not to obstruct name-  
181 plates. Power supply equipment noted to be removed shall be transported to a location on  
182 Airport property as directed by the DIA Project Manager.  
183

184 3.05 WIRING AND CONNECTIONS. The Contractor shall make all necessary electrical connections  
185 in accordance with the wiring diagrams furnished and as directed by the DIA Project Manager.  
186

187 A. General. Unless otherwise indicated, wiring shall consist of insulated copper conductors  
188 installed in rigid galvanized steel conduit or liquid tight flexible metal conduit as shown on the  
189 Drawings. All neutral conductors shall extend from the neutral bus in the device where the  
190 active conductors originate. Device terminals for connection of more than one conductor  
191 shall be specifically designed for that purpose.  
192

193 B. Raceway System. Minimum conduit size shall be 3/4-inch. Each run shall be complete,  
194 and shall be finished and swabbed before conductors are installed. Ends of conduit  
195 systems not terminated in boxes or cabinets shall be capped. Existing conduits shall be  
196 cleaned and swabbed before cables are pulled.  
197

198 (1) Field Cutting. Where conduit has to be cut in the field, it shall be cut square using a  
199 hand or power hacksaw or approved pipe cutter using cutting knives. The cut ends  
200 of the field-cut conduit shall be reamed to remove burrs and sharp edges. Where  
201 threads have to be cut on conduit, the threads shall have the same effective length  
202 and shall have the same thread dimensions and taper as specified for factory cut  
203 threads on conduit. If field threaded conduits are to be installed underground, oil  
204 shall be cleaned from threads before applying a cold galvanizing compound.  
205 Conduits installed with threads not complying with these requirements shall be  
206 removed and replaced with conduits that comply.  
207

208 (2) Conduit Installation. Conduit shall be installed parallel to or at right angles with the  
209 lines of the structures unless shown otherwise on the Drawings. Field bends shall  
210 be avoided where possible, but, where necessary, shall be made with approved  
211 conduit-bending device. Radius of field bends shall be not less than 10 times the  
212 inside diameter of the conduit.  
213

214 Conduits shall be plugged during construction to prevent entrance of foreign  
215 material. Both ends of all conduits entering a junction box from below grade shall  
216 be sealed with 3M "Ductseal" or approved equivalent.  
217

218 (3) Rigid Galvanized Steel Conduit. Rigid galvanized steel conduit shall be used in all  
219 locations. All fittings for use with rigid galvanized steel conduit shall be of the  
220 threaded type of the same material as the conduit. Where conduits enter boxes or

221 cabinets without threaded hubs, double locknuts shall be used plus an insulated  
222 metallic bushing on the open end.

223  
224 (4) Flexible Steel Conduit. Flexible steel conduit shall not be allowed. Liquid tight  
225 flexible conduit shall be used outdoors/indoors or in wet locations. A separate  
226 ground conductor shall be provided across all flexible connections in addition to the  
227 green wire ground.

228  
229 C. Conductors

230  
231 (1) Color-Coding. All branch circuit and feeder conductors shall be color coded as  
232 specified in the National Electrical Code. The color-coding shall be continuous  
233 throughout the facility on each phase conductor to its point of utilization so that the  
234 conductor phase connection is readily identifiable in any part of the installation. The  
235 equipment-grounding conductor shall be covered with green insulation or shall be  
236 bare copper as specified herein. Neutral conductors shall be continuous white  
237 unless more than one system is run in the same raceway, box, or other type  
238 enclosure. Where color-coding is not available in the larger size conductors (larger  
239 than #6 AWG), the conductors shall be color-coded by use of color-coded tape, half  
240 lapped for a minimum length of 3-inches. Where conductors are color-coded in this  
241 manner, they shall be color-coded in all junction boxes, outlets, and switches, as  
242 well as at all terminations.

243  
244 (2) Conductor Identification. In addition to color coding, all line, phase, and neutral  
245 conductors shall be identified by plastic-coated, self-sticking printed markers,  
246 permanently attached stamped metal foil markers, or equivalent means as  
247 approved by the DIA Project Manager. Panel and circuit numbers shall be  
248 identified. Conductor identification shall be provided at all terminations, and in all  
249 junction boxes through which these conductors pass. In addition to color-coding,  
250 control circuit conductor identification shall be made by plastic-coated self-sticking  
251 printed markers, permanently attached stamped metal foil markers, or equivalent  
252 means as approved by the DIA Project Manager. Conductor identification shall be  
253 provided within each enclosure where a tap, splice, or termination is made. Control  
254 circuit terminals of equipment shall be properly identified. Terminal and conductor  
255 identification shall match that shown on approved shop drawings. Hand lettering or  
256 marking is not acceptable.

257  
258 D. Quality Control Provisions

259  
260 (1) Cable Tests. All cable testing shall be done by the Contractor in the presence of  
261 the DIA Project Manager. The Contractor shall provide all test equipment and  
262 power. Equipment shall have been calibrated within 2 years. Cables shall be  
263 tested in the following order: upon delivery to the site; again prior to installation; after  
264 each splice during installation; and again upon completion of backfill operations.  
265 The Contractor shall immediately report any physical defects detected by cable  
266 testing to the DIA Project Manager.

267  
268 (a) 600-Volt Cable Test. Conductors, splices, and insulation shall be  
269 tested at not less than 500 volts. The minimum resistive value shall be  
270 30 megohms between conductors and between conductors and  
271 ground.

272  
273 (b) Control Cable Tests. Control cables shall be tested at not less than  
274 500 volts. The minimum resistive value between conductors and from  
275 each conductor to grounded shield shall be 50 megohms.

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- (2) Failure of Cable Under Test. Cable failing tests prior to installation shall not be installed. Cables which pass the initial, upon delivery testing, but, which fail after Contractor takes possession shall be repaired or replaced by the Contractor at no additional cost.
  - (3) Ground Resistance Test. Ground resistance of the ground rod system shall not exceed 10 ohms. Ground resistance measurements shall be made in normally dry weather and not less than 72 hours after rainfall. If the desired resistance value is not obtained, additional rods shall be driven at least 10-feet apart until resistance values are obtained. Testing shall be by "fall of potential" method using Biddle Earth Tester, or approved equivalent.
  - (4) Quality Assurance. All electrical equipment and materials provided by the Contractor shall be in accordance with this specification and be approved by Underwriters' Laboratories (UL), Inc. Original and two copies of tabulated results of all cable tests and ground resistance test performed under this section shall be forwarded to the DIA Project Manager for approval.

295 3.06 MOUNTING HARDWARE. The Contractor shall provide all required mounting hardware in  
296 conformance with the details included in the drawings and as directed by the DIA Project  
297 Manager required to secure all conduit, S-1 cutouts and other items as required for a complete  
298 and operational system.

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306
- A. General. All strut shall be connected using factory supplied brackets, bolts, washer, nuts and strut clamps. All hardware shall be installed plumb and in-line with each regulator. Strut shall be secure. All strut shall be grounded to meet the requirements of the NEC. Where strut has to be cut in the field, it shall be cut square using a hand or power hacksaw or other airport approved methods. The cut ends of the field-cut strut shall be reamed to remove burrs and sharp edges. Protective caps shall be installed over the exposed ends.

307 3.07 GROUNDING

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312
- A. General. The grounding system for the facility shall be as indicated on the contract Drawings and as specified herein. The National Electrical Code, except where otherwise indicated hereinafter, shall govern, but in no case shall the Code be violated.

313 B. Equipment Grounding Conductor

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321
- (1) All metallic non-current carrying parts of electrical equipment shall be grounded with an equipment-grounding conductor whether or not shown on the Drawings. The equipment-grounding conductor shall be a green insulated copper conductor unless otherwise indicated. When this conductor is not sized, or shown on the drawings, it shall be sized in accordance with the applicable sections of the National Electrical Code and in no case shall it be smaller than #10 AWG.

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325
- (2) The equipment grounding conductor shall be connected to the grounded conductor in the busway. The equipment ground shall be securely bonded to the existing ground bus located behind each CCR lineup.

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- C. Other Grounding System. Any additional grounding system used for electronic equipment shall be connected directly to the exterior earth electrode system unless otherwise indicated on the Drawings. Other grounding systems shall not be used in place of the equipment grounding conductor system.

- 331 3.08 MARKING AND LABELING. Marking and labeling shall be in accordance with Item L-100,  
332 Lighting and Electrical Work. All equipment, control wires, terminal blocks, etc., shall be tagged,  
333 marked, or labeled as specified below:  
334
- 335 A. Labels. The Contractor shall stencil identifying labels and circuit data on the cases of  
336 CCRs, bus plugs, and distribution and control relay cases as directed by the DIA Project  
337 Manager. The letters and numerals shall be not less than 1-inch in height and shall be of  
338 proportionate width. The Contractor shall mark the correct circuit designations in  
339 accordance with the wiring diagram. Equipment and conduit identification shall comply  
340 with Item L-100, Lighting and Electrical Work.  
341
  - 342 B. The Contractor shall identify all communication and control wiring with heat shrink or self-  
343 laminating labels. The print-on area shall be not less than 0.25 inches in height. The  
344 information shall be imprinted on the label using a thermal transfer printer. The  
345 Contractor shall print the termination points for each individual length of control wiring.  
346 All labeling shall be approved by the DIA Project Manager.  
347
- 348 3.09 CONSTANT CURRENT REGULATORS. All constant current regulators shall be installed as  
349 shown in the Plans or approved shop drawings and in accordance with the applicable FAA  
350 Advisory Circulars and manufacturers' recommendations. Items not installed in accordance with  
351 the FAA Advisory Circulars, these specifications and plans shall be removed and replaced by and  
352 at the expense of the Contractor.  
353
- 354 Secure CCRs to the floor with stainless hardware as recommended by the manufacturer. All  
355 CCRs shall be installed such that the fronts of each regulator is lined up with other regulators and  
356 parallel with the existing structure.  
357
- 358 Painted and galvanized surfaces that are damaged shall be repaired according to the  
359 manufacturer's recommendations, to the satisfaction of the DIA Project Manager. Obtain paint  
360 and primer, of same batch number, from the equipment manufacturer to repair painted surfaces.  
361
- 362 Connections shall be provided to connect new regulator interface units to the existing ALCMS,  
363 and the primary and backup vault networks. Refer to Item 13410C, Airfield Lighting Control and  
364 Monitoring System Modifications for this work.  
365
- 366 3.10 TESTING. This section describes the testing and demonstrations furnished by the Contractor.  
367 All items furnished and/or installed by the Contractor shall be tested and demonstrated in  
368 accordance with these specifications, the FAA advisory circulars, and the manufacturer's  
369 recommendations. All equipment and labor required for testing and demonstrations shall be  
370 furnished by the Contractor.  
371
- 372 A. Fully test the installation by continuous operation for a period of not less than seventy-two  
373 (72) hours as a completed unit, prior to acceptance by the Owner.  
374
  - 375 B. Up to two (2) walk-throughs may be initiated by the DIA Project Manager during which  
376 the airfield lighting equipment would be required to be in operation. Additional walk-  
377 throughs may be necessary depending upon the number of discrepancies found on the  
378 previous walk-throughs.  
379
  - 380 C. The Contractor is responsible for lamp replacements and necessary maintenance of  
381 airfield items during the testing, construction and walk-through periods.  
382
  - 383 D. Test cabling per Item L-108, Underground Power Cable for Airports.  
384
  - 385 E. Demonstrate all features and functions of all systems and instruct the Owner's personnel

386 in the proper and safe operation of the systems.

387  
388 F. The Contractor shall perform the necessary inspection and tests for some items  
389 concurrently with the installation because of subsequent inaccessibility of some  
390 components. The DIA Project Manager shall be notified by the Contractor forty-eight (48)  
391 hours in advance of any testing.

392  
393 There are no approved "repair" procedures for items that have failed testing other than  
394 complete replacement. Any other corrective measures shall be approved in writing by  
395 the DIA Project Manager.

396  
397 3.11 OPERATION AND MAINTENANCE MANUALS. The Contractor shall provide data for all  
398 equipment, material and components supplied or furnished under this section in the Operation  
399 and Maintenance Manuals. This data shall include cut sheets from the manufacturer and the  
400 manufacturer's installation, operation and maintenance manuals, recommended spare parts lists,  
401 any required test results, and other data as required by Item L-100 Lighting and Electrical Work.  
402 The manuals shall be in accordance with Item L-100. Final payment for any contract amounts  
403 shall not be processed without proper submittal of these manuals and review and approval by the  
404 DIA Project Manager.

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407 **PART 4 METHOD OF MEASUREMENT**

408  
409 4.01 Refer to Appendix A for Method of Measurement.

410  
411  
412 **PART 5 BASIS OF PAYMENT**

413  
414 5.01 Refer to Appendix A for Basis of Payment

415  
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417  
418 **END OF ITEM L-122C**

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ITEM L-125

AIRPORT LIGHTING SYSTEMS

PART 1 DESCRIPTION

1.01 GENERAL. This item shall consist of airport lighting systems furnished and installed in accordance with this specification, the referenced specifications, and the applicable Federal Aviation Administration Advisory Circulars. The systems shall be installed at the location and in accordance with the dimensions, layout, design, and details shown in the drawings. This item shall include furnishing and installing all lights, signs, transformers, bases, mounting assemblies, base plates, adapter rings, concrete work, sealing filler, adhesive sealant, cable connections, all lamps, ground rod and inspection pits, testing of the installation and all incidentals and appurtenances necessary to place the systems in operation as completed units to the satisfaction of the DIA Project Manager. The contractor shall not place an order for any electrical, lighting, or signing material until specific approval is received from the DIA Project Manager for each order on an individual basis.

1.02 REFERENCED MATERIALS. Additional details pertaining to specific systems covered in this item are contained in the Advisory Circulars (latest edition) listed below:

- 150/5340-1 Standards for Airport Markings
- 150/5340-4 Installation Details for Runway Centerline and Touchdown Zone Lighting Systems
- 150/5340-18 Standards for Airport Sign Systems
- 150/5340-28 Low Visibility Taxiway Lighting Systems
- 150/5340-24 Runway and Taxiway Edge Lighting System
- 150/5345-53 Airport Lighting Equipment Certification Program, Appendix 3
- 150/5345-7 Specification for L-824 underground Electrical Cable for Airport Lighting Circuits.
- 150/5345-42 Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
- 150/5345-43 Specification for Obstruction Lighting Equipment
- 150/5345-26 Specification for L-823 Plug and Receptacle, Cable Connectors
- 150/5345-44 Specification for Taxiway and Runway Signs
- 150/5345-46 Specification for Runway and Taxiway Light Fixtures
- 150/5345-47 Isolation Transformers for Airport Lighting Systems

The Contractor is responsible for using the latest edition of the referenced FAA Advisory Circulars.

1.03 SUBMITTALS. Submittals shall comply with Item L-100, Lighting and Electrical Work. Shop

55 drawings of each airfield lighting component, indicating FAA approval, shall be submitted for  
56 approval and be approved prior to ordering any materials for this section. This submittal shall include  
57 the proposed method of installation for all airfield lighting components. The data submitted shall be  
58 sufficient, in the opinion of the DIA Project Manager, to determine compliance with the contract  
59 documents. The Contractors submittals shall be submitted to the DIA Project Manager within 30  
60 days of the first Notice To Proceed. Submittals shall include as a minimum the following data:

- 61
- 62 A. Safety precautions used while maintaining the equipment.
- 63
- 64 B. Theory of circuit and system operation.
- 65
- 66 C. Complete schematic and interconnecting wiring diagrams.
- 67
- 68 D. Complete parts list with each circuit component keyed to designations assigned on  
69 schematics and wiring diagrams. Complete information shall be given for each part to  
70 permit ordering for replacement purposes. This information shall include the components  
71 rating, name of manufacturer and the manufacturer's part number.
- 72
- 73 E. Recommended preventative maintenance.
- 74
- 75 F. Troubleshooting procedures.
- 76
- 77 G. Physical characteristics (weight, size, mounting dimensions etc.).
- 78
- 79 H. Installation instructions/Details
- 80
- 81 I. Operating instructions.
- 82
- 83 J. There shall be no "Black Boxes" for which there are no schematic/wiring diagrams.
- 84

85 The submittals shall be bound in a Dennison National 98 series trapezoid, stiff/case made three ring  
86 binder or approved equal, and subdivided by topic, material and/or equipment. The binder(s) shall  
87 be labeled listing the project name and number, and the equipment name, number, and  
88 manufacturer. The topic division shall utilize Dennison National non-insertable poly-indexes or  
89 approved equal. The method of binding and marking/labeling shall be submitted to the DIA Project  
90 Manager for approval.

91

92 1.04 QUALIFICATIONS. The DIA Project Manager reserves the right to reject any equipment which, in  
93 their opinion, does not meet the system design and the standards and codes specified herein.

94

95

96 **PART 2 MATERIALS**

97

98 2.01 GENERAL.

99

- 100 A. Airport lighting equipment and materials covered by FAA specifications shall have prior  
101 approval of the Federal Aviation Administration, Airports Service, Washington, DC 20591,  
102 and shall be listed in Advisory Circular 150/5345-53, Latest Edition, Airport Lighting  
103 Equipment Certification Program, Appendix 3. All items that are FAA Testing Laboratory or  
104 DIA Project Manager approved at the time of bidding, which otherwise meet the project  
105 specifications, are acceptable. All Light cans to be located in P-501 paving shall be shipped  
106 with plywood and target covers.
- 107
- 108 B. All other equipment and materials covered by other referenced specifications shall be  
109 subject to acceptance through the manufacturer's certification of compliance with the

110 applicable specifications. The Contractor shall submit the manufacturer's certificates of  
111 compliance with the applicable equipment submittals.

112  
113 C. Lists of the equipment and materials required for a particular system are contained in the  
114 applicable Advisory Circulars.

115  
116 2.02 GUARANTEES.

117  
118 A. Except as modified below, all equipment and materials furnished and installed under this  
119 specification shall be guaranteed against defects in materials and workmanship for a period  
120 of twenty four (24) months from final acceptance by the DIA Project Manager. The defective  
121 materials and/or equipment shall be repaired or replaced, at the DIA Project Mangers  
122 discretion, with no additional cost to the Owner.

123  
124 B. The quartz lamp life, as rated by the FAA, shall be warranted for the specified number of  
125 hours. Should ten percent (10%) of the lamps fail prior to 70% of the rated life of the lamp,  
126 then the entire system using the failing lamp type shall be re-lamped, at the contractors  
127 expense, and the warranty time shall start over. At the Owners option, the Contractor may  
128 supply 100% spares.

129  
130 C. LED fixtures shall be provided with a 5 year warranty. Any defective LED fixture shall be  
131 returned to the Contractor for repair or complete replacement for the first two years of the  
132 warranty period. Beyond two years into the warranty period, DIA will coordinate directly with  
133 the manufacturer for fixture replacement or repair.

134  
135 2.03 BASIS OF DESIGN. The airfield lighting systems are designed using the below listed  
136 maximum fixture wattage. Approved airfield lighting fixtures with higher wattage are not  
137 permissible. In no case shall the Contractor be allowed to reduce the size of the constant  
138 current regulators or the power distribution systems. The series lighting circuits shall be 6.6  
139 amps, except sign circuits.

|     |           |                                                          |        |
|-----|-----------|----------------------------------------------------------|--------|
| 140 |           |                                                          |        |
| 141 | L-804(L)  | Elevated Runway Guard Light                              | 110VA  |
| 142 |           |                                                          |        |
| 143 | L-850A(L) | Runway Centerline Light                                  | 59VA   |
| 144 |           |                                                          |        |
| 145 | L-850B(L) | Touchdown Zone Light                                     | 30VA   |
| 146 |           |                                                          |        |
| 147 | L-850C    | In-pavement Runway Edge Light                            | 210W   |
| 148 |           |                                                          |        |
| 149 | L-852C(L) | Taxiway Centerline Light – Narrow Beam (Uni-directional) | 46VA   |
| 150 |           |                                                          |        |
| 151 | L-852D(L) | Taxiway Centerline Light – Wide Beam (Uni-directional)   | 56VA   |
| 152 |           |                                                          |        |
| 153 | L-852K(L) | Taxiway Centerline Light – Toe-In (Uni-directional)      | 56VA   |
| 154 |           |                                                          |        |
| 155 | L-852C(L) | Taxiway Centerline Light – Narrow Beam (Bi-directional)  | 56VA   |
| 156 |           |                                                          |        |
| 157 | L-852D(L) | Taxiway Centerline Light – Wide Beam (Bi-directional)    | 58VA   |
| 158 |           |                                                          |        |
| 159 | L-852K(L) | Taxiway Centerline Light - Toe-In (Bi-directional)       | 58VA   |
| 160 |           |                                                          |        |
| 161 | L-852C(L) | Taxiway Centerline Light – Two-Lamp, Two-Circuit         | 2-34VA |
| 162 |           |                                                          |        |
| 163 | L-852D(L) | Taxiway Centerline Light – Two-Lamp, Two-Circuit         | 2-45VA |
| 164 |           |                                                          |        |

|     |            |                                                  |        |
|-----|------------|--------------------------------------------------|--------|
| 165 | L-852K(L)  | Taxiway Centerline Light – Two-Lamp, Two-Circuit | 2-45VA |
| 166 |            |                                                  |        |
| 167 | L-852GS(L) | In-pavement Stop Bar/Runway Guard Light          | 2-105W |
| 168 |            |                                                  |        |
| 169 | L-852T(L)  | In-pavement Taxiway Edge Light                   | 45VA   |
| 170 |            |                                                  |        |
| 171 | L-858      | Guidance Sign                                    |        |
| 172 |            | 2-Module                                         | 160VA  |
| 173 |            | 3-Module                                         | 288VA  |
| 174 |            | 4-Module                                         | 290VA  |
| 175 |            |                                                  |        |
| 176 | L-861T     | Elevated Taxiway Edge Light                      | 45W    |
| 177 |            |                                                  |        |
| 178 | L-862      | Elevated Runway Edge Light                       | 150W   |
| 179 |            |                                                  |        |
| 180 | L-862E     | Elevated Runway Threshold Light                  | 150W   |
| 181 |            |                                                  |        |
| 182 | L-862S     | Elevated Runway Stop Bar Light                   | 150W   |
| 183 |            |                                                  |        |

184 2.04 RUNWAY CENTERLINE LIGHT. The runway centerline lights shall be L-850A type with LEDs.  
 185 Fixtures shall be Class 2, Mode 1 (6.6A) Style 3 (“Flush”) and shall have a maximum height above  
 186 finished pavement of 0.220”. LED fixtures shall have heater kits.

188 2.05 RUNWAY TOUCHDOWN ZONE LIGHT. The runway touchdown zone lights shall be L-850B type  
 189 with LEDs. Fixtures shall be Class 2, Mode 1 (6.6A) Style 3 (“Flush”) and shall have a maximum  
 190 height above finished pavement of 0.220”. LED fixtures shall have heater kits.

192 2.06 RUNWAY EDGE LIGHT. The runway edge lights shall be L-850C type with quartz lamps. Fixtures  
 193 shall be Class 2, Mode 1 (6.6A) Style 3 (“Flush”) and shall have a maximum height above finished  
 194 pavement of 0.220”. Elevated runway edge light shall be L-862 quartz type and have an overall  
 195 mounting height of 24”. The elevated edge light frangible coupling shall be a 2” – NPT with slotted  
 196 threads for ease in removal of broken couplings mounted on a corten base plate with a neoprene  
 197 gasket.

199 2.07 TAXIWAY CENTERLINE LIGHT. The taxiway centerline lights shall be L-852 type with LEDs.  
 200 Fixtures shall be Class 2, Mode 1 (6.6A) Style 3 (“Flush”) and shall have a maximum height above  
 201 finished pavement of 0.220”. LED fixtures shall have heater kits.

203 2.08 TAXIWAY EDGE LIGHT. The in-pavement taxiway edge lights shall be L-852T type with LEDs.  
 204 Fixtures shall be Class 2, Mode 1 (6.6A) Style 3 (“Flush”) and shall have a maximum height above  
 205 finished pavement of 0.220”. Elevated taxiway edge light shall be L-861T quartz type and have an  
 206 overall mounting height of 24”. The elevated edge light frangible coupling shall be a 1.5” – 12 NF  
 207 with slotted threads for ease in removal of broken couplings. Mount fixtures on corten base plate  
 208 with a neoprene gasket.

210 2.09 INSET STOP BAR / RUNWAY GUARD LIGHT. The in-pavement stop bar / runway guard light shall  
 211 be L-852GS. Fixtures shall be Class 2, Mode 1 (6.6A) Style 3 (“Flush”) two-circuit and shall have a  
 212 maximum height above finished pavement of 0.220”. LED fixtures shall be provided if a certified  
 213 fixture is available. LED fixtures shall have heater kits.

215 2.10 ELEVATED RUNWAY GUARD LIGHT. The runway guard lights shall be L-804 type with LEDs.  
 216 Fixtures shall be Class 2, Mode 1 (6.6A), have an overall mounting height of 30”. The frangible  
 217 coupling shall be a 2” – NPT. Mount fixture on a heavy (≥ 3/8” thick) base plate with a neoprene  
 218 gasket.

- 220 2.11 ELEVATED STOP BAR LIGHT. The runway stop bar lights shall be L-862S type with 150W quartz  
221 lamps. Fixtures shall be Class 2, Mode 1 (6.6A), have an overall mounting height of 24". The  
222 frangible coupling shall be a 2" – NPT. Mount fixture on a heavy ( $\geq 3/8"$  thick) base plate with a  
223 neoprene gasket.  
224
- 225 2.12 GUIDANCE SIGN. The guidance signs shall be L-858Y, R, or L internally lighted as indicated. The  
226 units shall be Size 3. The signs shall be Style 5 (1-step); Class 2 (-40 °F to 131 °F); and Mode 2  
227 (withstand wind loads of 200 mph). They shall meet the requirements of FAA AC 150/5345-44  
228 (latest edition).  
229
- 230 2.13 LIGHT BASES. The light bases shall be L-867 type for the non-load bearing units and L-868 for the  
231 load bearing units. The sizes of the units shall be as shown on the drawings and in this specification.  
232 All light bases shall be Class IA (Galvanized Steel). All base cans shall include an identification  
233 marker installed on the opposite side of pavement marking. Each can shall have an internal and  
234 external grounding lug. The ground lug and the counterpoise connection must maintain electrical  
235 continuity. The flanges shall include an O-ring so that it is not excessively elevated above the  
236 channel. The spacer rings, adapter rings, and flange rings with pavement dams shall be galvanized  
237 steel.  
238
- 239 2.14 CABLES. Cables shall comply with specification L-108.  
240
- 241 2.15 CONNECTORS. Connectors shall comply with specification L-108.  
242
- 243 2.16 ISOLATION TRANSFORMER. The isolation transformers shall be L-830, sized per the fixture  
244 manufacturer's recommendations.  
245
- 246 Existing Crouse-Hinds sign L-830 transformers are 5.5 amps primary/ 6.2 amps secondary and  
247 wattage is sized per module length of sign.  
248
- 249 2.17 LAMP. Where listed with the fixture types above, lamps shall be quartz of the size and type to  
250 provide distribution and minimum output requirements of isocandela curves shown for each size in  
251 AC 150/5345-46.  
252
- 253 2.18 COLORED FILTERS. Colored filters, or colored lenses, to be used for Airfield Lighting Fixtures shall  
254 conform to the requirements of Military Specification MIL-C-25050 type I and FAA Advisory Circulars.  
255
- 256 2.19 TAPE. Electrical tapes shall be Scotch Electrical Vinyl Tape number 88 and Scotch Electrical  
257 Rubber Type number 130C, as manufactured by the Minnesota Mining and Manufacturing  
258 Company, or an approved equal.  
259
- 260 2.20 CONCRETE and FLOWABLE BACKFILL. Concrete for backfill and flowable backfill shall be in  
261 accordance with Item P-610 and P-162 respectively.  
262
- 263 2.21 CONDUIT. Conduit shall comply with specification L-110.  
264
- 265 2.22 HEAT SHRINK. Heat shrink shall comply with specification L-108.  
266
- 267 2.23 IDENTIFICATION/NUMBER MARKERS. The engraved identification/number markers shall be as  
268 shown on the drawings. Engraved samples shall be submitted and approved prior to placement  
269 showing character depth and height being provided as well as physical properties of the marker.  
270 Payment for the markers shall be incidental to the item identified, except as indicated otherwise on  
271 the drawings.  
272
- 273 2.24 REINFORCING STEEL. All reinforcing steel shall be ASTM A615 grade 60.  
274
- 275 2.25 BOLTING HARDWARE. Airfield bolting hardware, other than for mounting light fixtures to light

276 bases, shall be stainless steel and meet FAA requirements. All bolts 1/4" and larger shall be hex  
277 head type. All bolts smaller than 1/4" trade size shall be recessed allen type. All bolted connections  
278 shall utilize an approved anti-rotational locking type device.

279  
280 All bolts attaching equipment to a base can shall extend 1/2" minimum, 1-1/2" maximum beyond the  
281 base can flange ring and continuously threaded. Bolts attaching equipment to base cans shall  
282 conform to Engineering Brief 83 or latest approved edition, such as approved dual coated bolts, with  
283 ceramic-metallic base coat/fluoropolymer top coat by MCB industries or approved equal. Existing  
284 airfield lighting bolting hardware consists of steel and stainless steel bolts.

285  
286 2.26 ANTI-SEIZE COMPOUND. Anti-seize compound shall have an oxidation inhibitor and electrical  
287 conductive properties. Do not use in conjunction with the ceramic-metallic/flouropolymer coated  
288 bolts used for light fixture mounting.

289  
290 2.27 FILLERS AND ADHESIVES. Joint sealing filler shall be FAA type P-605 and adhesive compounds  
291 shall be FAA type P-606.

292  
293 2.28 DELIVERY, STORAGE AND HANDLING. Ship materials and equipment disassembled only to the  
294 extent necessary for reasons of shipping limitations, handling facilities, and to avoid damage during  
295 shipment. Maintain materials in new condition. This shall include the use of heat lamps, suitable  
296 coverings, indoor storage, etc. to properly protect the equipment and materials. Any equipment or  
297 materials, in the opinion of the DIA Project Manager, damaged during construction, handling, or  
298 storage periods shall be replaced by and at the cost of the Contractor.

299  
300 2.29 CEMENTITIOUS GROUT. For use in the installation of ID markers. Use SikaGrout 212 or equal as  
301 approved by the DIA Project Manager.

302  
303 2.30 MANHOLE CABLE RACKING. Manhole cable raking shall be heavy duty nonmetallic cable rack  
304 mounting and component parts. Rack mounting and components shall be manufactured by  
305 Underground Devices, Inc (UD) or approved equal. Stanchions shall be 36" long, UD # CR36-B or  
306 24"long UD #CR24-B. Anchor bolts shall be 303 stainless steel, 1/2"-13 drop in anchors with 316  
307 stainless steel flat washers UD # FFW316-18-40, 1/2"-13 x 3/8" long hex head cap screw UD #  
308 FHC316-16-044, Anchors shall be installed with a racking manufacturer approved setting tool.  
309 Rack arms shall be 6.5"long UD # RA06, 11.25"long UD # RA11 or 20"long UD # RA20.

310

311

312 **PART 3 CONSTRUCTION METHODS**

313

314 3.01 INSTALLATION.

315

316 A. All fixtures, signs, base cans, etc. shall be installed as shown on the drawings or approved  
317 shop drawings and in accordance with the applicable FAA Advisory Circular. Tolerances  
318 given in the FAA Advisory Circulars, these specifications, and the drawings shall not be  
319 exceeded. Where no tolerance is given, no deviation is permitted. Items not installed in  
320 accordance with the FAA Advisory Circulars, these specifications and drawings shall be  
321 replaced by and at the expense of the contractor. In case of conflict between documents the  
322 most stringent shall apply. Plywood and target covers are required on all light cans located  
323 in P-501 during shipping and paving. The tops of the light cans shall be surveyed to be  
324 located a minimum of 2-3/8" below the finished surface of the P-501. All concrete used for  
325 these items shall be completely consolidated and contain no voids. All exposed concrete  
326 shall be finished smooth with a steel trowel and broom finished. The finished pavement  
327 surface shall be protected from foreign substances which could cause staining, i.e. oil, etc.  
328 The Contractor shall immediately clean all spills and correct/clean any stained surfaces at  
329 the Contractor's expense.

330

331 B. Assemble units and connect to the system in accordance with the manufacturer's

- 332 recommendations and instructions.  
333  
334 C. An identification marker shall be installed with each fixture, sign, blank base can, etc. as  
335 shown in the drawings. Plastic circuit identification tags identifying each circuit shall be  
336 attached to each cable as shown in the drawings.  
337  
338 D. Provide three (3) feet minimum, four (4) feet maximum of slack in each cable in each base  
339 can from conduit entrance.  
340  
341 E. Galvanized surfaces that are damaged shall be repaired according to the manufacturer's  
342 recommendations, to the satisfaction of the DIA Project Manager. When the damage to a  
343 surface is ten percent or more of the total surface, the item shall be replaced at the  
344 contractor's expense. Base cans that have been deformed will cause damage to the  
345 galvanizing and will be cause for removal and replacement at the contractor's expense.  
346  
347 F. Except where ceramic-metallic/flouropolymer coated bolts are being inserted, airfield lighting  
348 steel threaded connections, i.e. frangible couplings shall be coated with an approved anti-  
349 seize compound before being screwed together. No anti-seize compound shall be applied  
350 to the ceramic-metallic/flouropolymer coated bolts.  
351  
352 Surebond Everflex SB-1800 compound or approved equal shall be applied between the top  
353 of the base can and spacer rings and/or spacer rings and bottom of flange ring with  
354 pavement dam. Dow 111 compound or approved equal shall be applied to the gasket O-  
355 ring or inside the flange ring with pavement dam. Application between the fixture and flange  
356 ring with pavement dam shall be dependent on the type of flange ring with pavement dam  
357 that is installed, verify application with DIA Project Manager prior to proceeding. Surebond  
358 Everflex SB-1800 compound or approved equal shall not be applied between the fixture and  
359 the flange ring with pavement dam.  
360  
361 G. All damaged or incorrect ID markers shall be removed and replaced.  
362  
363 H. Where existing cable and new cable will be connected, install a new connector on the  
364 existing and new cable. Once the connection is made, all joints shall be wrapped as  
365 discussed in Specification L-108.  
366  
367 I. Reinforcing steel cages shall be assembled with tie wire. Reinforcing steel shall be installed  
368 true and plumb according to the dimensions and tolerances given on the Drawings. Welding  
369 is not acceptable.  
370  
371 J. If a PCCP panel must be removed and replaced for any reason and the panel contains a  
372 light base(s), a new light base(s) shall be installed as part of the panel replacement at the  
373 Contractor's expense.  
374  
375 K. Maintenance of Existing Airport Lighting Systems during Construction. Protect existing  
376 airport lighting systems. Any portion of the existing airport lighting systems damaged or  
377 disconnected during installation of the new systems, or other construction activities shall  
378 be repaired and reconnected. Each circuit must be fully functional prior to dusk each day  
379 or during adverse weather conditions, to the satisfaction of the Engineer. This work shall  
380 be at no additional cost to the Owner. All lighting systems serving active taxiways or  
381 runways shall be completely operational to the satisfaction of the Engineer. Any closure  
382 to taxiways or runways shall be approved by the Airport.  
383  
384 L. Dewatering necessary to construct L-125 Items and related erosion and turbidity control  
385 in accordance with Federal, State and local requirement is incidental to its respective pay  
386 item as part of L-125. The cost of all excavation regardless of type of material  
387 encountered shall be included in the unit price bid for the L-125 Item.  
388

- 389 M. Installation of Base Can in turf. Depth of the hole shall be sufficient for the base can as  
390 well as any material to be placed below for drainage. Fasten a cover to the can, which  
391 shall include gasket at final installation. Base cans shall be surveyed to proper elevation,  
392 location and set level. P-610 anchor shall be placed around the base can with a  
393 minimum of 6" anchor on all sides of the base can. ID markers shall be incidental to base  
394 can installation. Dispose of any unused material as direct by the Engineer.  
395  
396 The can hub shall be fitted with grommet fittings as shown on the Drawings. Unused  
397 openings shall be securely sealed by an approved manufactured means.  
398  
399 For paved areas, base installation shall be as shown on the Drawings. Before paving  
400 may proceed, the Contractor shall demonstrate to the Engineer that the base cans are at  
401 the correct elevation, azimuth and rotation and that the proper clearance exists between  
402 the base can the paving train.  
403  
404 In Asphalt paved areas two piece L-867 base cans shall have the bottom section  
405 surveyed and conduit installed prior to asphalt pavement, to assure the base can  
406 installation is at the correct azimuth and elevation.  
407  
408 N. Semi-flush Fixture Installation. Semi-flush lights shall be assembled in accordance with  
409 manufacturer's instructions. The transformer secondary leads shall be connected to the  
410 lamp leads by means of a disconnecting plug and receptacle.  
411  
412 Install the fixtures in accordance with the general requirements and details shown on the  
413 Drawings. The fixture base and leveling jig shall not be removed until the concrete has  
414 sufficiently set.  
415  
416 Proper base can installation is critical to the elevation and alignment of in-pavement  
417 lights.  
418  
419 After installation of the light fixture, the azimuth of the light beam shall not vary more than  
420 plus or minus ½-degree from the required orientation.  
421  
422 O. Existing airfield lighting bolting hardware consists of either ceramic-metallic/flouropolymer  
423 coated bolts, stainless steel bolts, or carbon steel bolts. All bolts and lock washers  
424 removed by the Contractor shall be replaced with new SAE Grade 2 bolts with ceramic-  
425 metallic/fluoropolymer coated bolts and new stainless steel lock washers. Any existing  
426 damage to existing equipment shall be documented and brought to the Project Manager's  
427 attention prior to commencing work. Light fixture mounting bolts which are broken by the  
428 Contractor shall be repaired by the Contractor at no additional cost to the Airport. Broken  
429 bolts shall be repaired using a method approved by the Project Manager. The method  
430 shall include using an approved repair kit that fits within the fixture dam ring. Existing  
431 bolts shall be drilled out and tapped using the template to assure proper alignment of drill.  
432 Inserts shall only be used when approved by CCD Project Manager, two part epoxy, and  
433 spacer rings are to be removed to assure the insert is installed properly. The insert used  
434 shall be approved, and manufactured for the intent of base can repairs.  
435  
436 P. In new pavement, all conduits, ducts banks, counterpoise, base cans, etc. shall be  
437 installed prior to the placement of the final lift of pavement.  
438  
439 Q. If a light can is installed incorrectly or the duct / conduit is plugged / broken or the  
440 concrete joints are installed incorrectly or the light base can is sawed by the concrete  
441 saw, the concrete or asphalt pavement around the light base can and the light shall be  
442 removed and replaced at the Contractor's expense. When in concrete, the full panel shall  
443 be removed. No partial panel removals will be accepted.  
444  
445 R. Manufacturer approved means as accepted by the Project Manager shall be used to seal  
446 between sections of base cans, spacer rings, and adapter rings. Manufacturer approved



447 means for lubrication fixture flange ring or o-ring shall be used.

- 448
- 449 S. All new fixtures shall be provided with properly sized FAA approved transformers.
- 450
- 451 T. Each time a fixture is removed, the Contractor shall clean the top of the flange of all
- 452 sediment preferably with the use of a vacuum. Apply Dow 111 or approved equal to the
- 453 top of the flange or the O-ring. Provide a new O-ring for existing fixture flanges where
- 454 new fixtures are being installed. All bolts shall be torqued to manufacturer
- 455 recommendations.

456 3.02 TESTING

- 457
- 458 A. Fully test the installation under the observation of the DIA Project Manager by continuous
- 459 operation for a period of not less than four (4) hours as a completed unit, prior to acceptance
- 460 by the DIA Project Manager.
- 461
- 462 B. Up to two (2) walk-throughs may be initiated by the DIA Project Manager during which the
- 463 airfield lighting units will be required to be in operation. Additional walk-throughs may be
- 464 necessary depending upon the number of discrepancies found on the previous walk-
- 465 throughs.
- 466
- 467 C. The Contractor is responsible for lamp replacements and necessary maintenance of airfield
- 468 items during the testing, construction and walk-through periods.
- 469
- 470 D. Test cabling per specification L-108.
- 471
- 472 E. The Contractor shall perform the necessary inspection and tests for some items concurrently
- 473 with the installation because of subsequent inaccessibility of some components. The DIA
- 474 Project Manager shall be notified by the Contractor forty-eight (48) hours in advance of any
- 475 testing.
- 476
- 477 F. Prior to beginning work, provide written certification that existing light fixtures in area of work
- 478 are operational.
- 479

480

481 **PART 4 METHOD OF MEASUREMENT**

482

483 4.01 Refer to Appendix A for Method of Measurement.

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485

486 **PART 5 BASIS OF PAYMENT**

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488 5.01 Refer to Appendix A for Basis of Payment.

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492 **END OF ITEM L- 125**

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ITEM L-127

AIRPORT 8-FOOT WIND CONES

PART 1 DESCRIPTION

1.01 GENERAL. This item shall consist of furnishing and installing an airport supplemental wind cone on an existing concrete foundation or new concrete foundation in accordance with these specifications and in accordance with the dimensions, design, and details shown in the plans. The work shall include mounting and wiring of the wind cone. The item shall also include all cable connections, power adapter (if required) the furnishing and installation of an LED lighted assembly, the testing of the installation, and all incidentals necessary to place the wind cone in operation to the satisfaction of the DIA Project Manager.

Any power adapters or wind cone assemblies removed as part of this project shall be turned over to the Airport. The Contractor shall coordinate and transport the equipment to a site on Airport property as directed by the DIA Project Manager.

1.02 SUBMITTALS. Shall comply with specification L-100, Lighting and Electrical Work. Data sheets for each airfield lighting component called for in this section, indicating FAA approval, shall be submitted for approval and be approved prior to ordering any materials for this section. This submittal shall include the proposed method of installation and detail sufficient, in the opinion of the DIA Project Manager, to determine compliance with the contract documents. Cold temperature methods, procedures and limitations shall be included in the submittal.

1.03 SUBMITTALS REFERENCED Additional information pertaining to the items covered in this section are contained in the Federal Aviation Administration (FAA) Advisory Circulars (AC's), latest edition, listed below:

|             |                                                  |
|-------------|--------------------------------------------------|
| 150/5345-27 | Specification for Wind Cone Assemblies           |
| 150/5345-43 | Specification for Obstruction Lighting Equipment |
| 150/5345-53 | Airport Lighting Equipment Certification Program |

The Contractor is responsible for obtaining and using the latest edition of the referenced FAA Advisory Circulars. This list is not all inclusive but is offered as a convenience to the Contractor.

PART 2 EQUIPMENT AND MATERIALS

2.01 GENERAL

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified and listed under Advisory Circular (AC) 150/5345-53, Latest Edition, Airport Lighting Equipment Certification Program, Appendix 3. All items that are FAA Testing Laboratory or DIA Project Manager approved at the time of bidding, which otherwise meet the project specifications, are acceptable.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specifications. The Contractor shall submit the manufacturer's certificates of compliance with the applicable equipment submittals.

c. Manufacturer's certifications shall not relieve the Contractor of the Contractor's responsibility to provide materials in accordance with these specifications and acceptable to the DIA

56 Project Manager. Materials supplied and/or installed that do not materially comply with these  
57 specifications shall be removed, when directed by the DIA Project Manager and replaced with  
58 materials, which do comply with these specifications, at the sole cost of the Contractor.  
59

60 d. All equipment and materials furnished and installed under this section shall be guaranteed  
61 against defects in materials and workmanship for a period of at least twenty-four (24) months  
62 from final acceptance by the Owner. The defective materials and/or equipment shall be  
63 repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.  
64

65 2.02 WIND CONES. The 8-foot (Size 1) wind cones shall conform to the requirements of AC  
66 150/5345-27, Specification for Wind Cone Assemblies. The wind cones shall be L-806 type with  
67 LEDs. The LED light assemblies shall be Style IA.  
68

69 2.03 WIRE. Wire and cable shall be in accordance with Item L-108.  
70

71 2.04 CONNECTORS. Connectors shall be in accordance with Item L-108.  
72

73 2.05 ISOLATION TRANSFORMER. The isolation transformers shall be L-830, sized per the fixture  
74 manufacturer's recommendations.  
75

76 2.06 CONCRETE. The concrete and steel reinforcement for foundations shall be proportioned, placed,  
77 and cured in accordance with Item P-610, Structural Portland Cement Concrete.  
78

79 2.07 OBSTRUCTION LIGHT. The obstruction lights shall conform to the requirements of AC  
80 150/5345-43, Specification for Obstruction Lighting Equipment. The obstruction light shall be  
81 type L-810, steady burning, LED, operating from a 6.6A series circuit.  
82

83  
84 **PART 3 CONSTRUCTION METHODS**  
85

86 3.01 GENERAL. The frangible mast shall be installed on an existing or new concrete foundation as  
87 shown in the plans. Apply "Nerverseize" to the anchor bolts . Supply new nuts and washers for  
88 installation of the wind cone. If the existing anchor bolt circle does not match the new wind cone  
89 mounting flange, the Contractor shall provide a viable option to install the wind cone on the  
90 existing foundation. The pole shall be installed plumb and secure.  
91

92 3.02 ELECTRICAL CONNECTION. The Contractor shall furnish all labor and materials and shall make  
93 complete electrical connections in accordance with the wiring diagram furnished with the  
94 Manufacturer's installation manual.  
95

96  
97 **PART 4 METHOD OF MEASUREMENT**  
98

99 4.01 Refer to Appendix A for Method of Measurement.  
100

101  
102 **PART 5 BASIS OF PAYMENT**  
103

104 5.01 Refer to Appendix A for Basis of Payment.  
105

106 **END OF ITEM L-127**

ITEM L-139

TEMPORARY CONSTRUCTION MARKER LIGHTS

PART 1 GENERAL

1.01 DESCRIPTION This item shall consist of installation, relocation, maintenance and removal of temporary Construction Marker Lights and/or barricades, furnished and installed in accordance with this specification. This item shall include furnishing all required equipment, materials, services, and incidentals necessary to place the systems in operation and to maintain them as completed units to the continuing satisfaction of the Engineer during the course of the entire construction project. These lights shall be required whenever the Contractor is working adjacent to the existing operational runways, taxiways and aprons, or whenever removing and relocating existing taxiway lights or signs.

PART 2 EQUIPMENT AND MATERIALS

2.01 CONSTRUCTION EDGE MARKER LIGHTS. Lights for runway, taxiway, apron or roadway closures and for delineating construction area marking shall be airport marker lights with an overall height of 24".

Batteries: Two each, six volt, industrial rated, spring top lantern batteries.

Switch: Photocell for dusk to dawn operation and Manual switch for Off - Flashing.

Light Output: Omni-directional Red Dome

Flashing: 55 to 75 flashes per minute, flash duration ten percent.

Base: The base shall hold the Construction Marker Light securely without tipping or sliding when placed on a concrete or asphalt surface and subjected to aircraft propeller/jet blasts of 150 mph (approximately 60 pounds per square foot).

PART 3 CONSTRUCTION METHODS

3.01 GENERAL. The installation, relocation, and/or removal of the Construction Marker Lights are critical to airport operations (aircraft, vehicular, and personnel movements); therefore, the Contractor shall follow the schedules as established in the plans and specifications or as directed by the Engineer. Construction Marker Lights shall be in place along the runway, taxiway or apron edge throughout the period of construction. The Contractor shall furnish and use as many lights as are needed to satisfy the spacing requirements.

3.02 AIRPORT INSTALLED CONSTRUCTION MARKER LIGHTS. If for any reason, the Contractor does not provide and/or maintain the required temporary Construction Marker Lights, barricades or such equipment on the project to meet the operational needs of the airport, the Owner will have the necessary equipment installed and the Contractor will be back charged for rental of the equipment, all labor and any other expenses incurred.

3.03 CONSTRUCTION MARKER LIGHTS. The Construction Marker Lights shall be spaced 25 feet apart (maximum) and located as directed by the Engineer. The lights shall be designed to remain in place without further anchoring, but the Contractor shall furnish and install sand bags or other approved materials if required to prevent displacement.

57 3.04 MAINTENANCE. The Contractor shall maintain all of the temporary Construction Marker Lights,  
58 barricades and equipment in proper alignment and in good working order. Lamps, batteries, and  
59 other items which fail or are damaged shall be immediately repaired or replaced. At the completion of  
60 the project, all Construction Marker Lights shall be removed from the project site.  
61

62

63 **PART 4 METHOD OF MEASUREMENT**

64

65 4.01 Refer to Appendix A for Method of Measurement.  
66

67

68

69 **PART 5 BASIS OF PAYMENT**

70

71 5.01 Refer to Appendix A for Basis of Payment.  
72

73

**END OF ITEM L-139**

ITEM L-140

FIELD PHOTOMETRIC TESTING

PART 1 DESCRIPTION

1.01 GENERAL. Photometric testing of airfield lighting systems shall be performed by a firm with demonstrated capability for the field measurement of the photometric performance of airfield lighting fixtures. The firm shall have experience in evaluating the test results against FAA standards and manufacturers' performance criteria. The firm shall demonstrate its capability by having performed similar work successfully at no less than ten (10) international air carrier airports in the past five (5) years. Suggested contacts for this service shall be as follows or approved equal:

Lean Photometrics  
10316 N. 49<sup>th</sup> Place  
Scottsdale, AZ 85253  
Phone: (480) 948-9662  
Fax: (480) 948-9556  
Email: [dlean@leanphotometrics.com](mailto:dlean@leanphotometrics.com)

Navaid Lighting Associates, Inc.  
141 Autumn Glenn Road  
Saltillo, MS 38866  
Phone: (662) 869-8655  
Fax: (662) 869-0065  
Cell: (662) 322-6418  
Email: [david@navaidlighting.com](mailto:david@navaidlighting.com)

Photometric testing shall be performed at night, with minimum interference with airport operations. The night before starting the test, the Contractor shall clean all the light fixtures to assure that the system is ready for testing.

A list of equipment to be used for the photometric testing shall be submitted. In addition, record of experience on similar projects with references for future contact shall be submitted.

1.02 TESTING REQUIREMENTS. The testing shall be performed on all new semi-flush light fixtures and elevated runway edge light fixtures installed as part of this project.

The photometric test equipment shall have an array of sensors capable of taking simultaneous readings along the horizontal axis of the light output. (Ref. FAA AC 150/5345-46, Table 1) Photometric testing shall include the measurement at each light fixture of the light distribution along the horizontal axis. The software shall be capable of recording the data and analyzing that data to calculate:

- A. The average photometric output of the main beam of the fixture,
- B. The location of the maximum reading,
- C. The location of the minimum reading,
- D. The ratio of the maximum reading to the average output,

E. The ratio of the minimum reading to the average output, and

F. Comparisons of these values with FAA specified values.

Ten percent (10%) of the fixtures shall be evaluated at three (3) different vertical angles, on the centerline of the light beam, and at two (2) degrees above and below the centerline of the beam.

All sensor readings shall be displayed simultaneously for operator and Airport representative review and evaluation. All sensor readings shall be recorded automatically through the computer and shall be printed out via computer-controlled printer. (Hand written data recording will not be accepted.)

The measurements shall be compared to FAA standards as presented in FAA AC 150/5345-46. The calculated averages shall be not less than the minimum average intensities specified in the Advisory Circular in order for the fixture to be considered acceptable. In addition, all other readings within the specified pattern shall be at least fifty percent (50%) of the specified minimum average intensity in order for the fixture to be considered acceptable.

If any of the calculated average readings is below the specified minimum average intensity, or if any individual reading is below fifty percent (50%) of the specified minimum average intensity, additional sets of readings shall be taken to identify the problem(s) with the fixture in question.

1.03 Test Reports. Initial Reports will be submitted periodically during the progress of the work so that corrective measures may be taken as may be required. If the corrective measures are promptly made, the fixtures involved will be reevaluated during the scheduled period of field testing to assure that proper performance has been achieved.

The final test results shall be documented in a Final Report, with six (6) copies submitted to the Airport. The Final Report shall present an evaluation of each fixture tested, including proposed corrective measures, such as cleaning or replacement of lenses, re-aiming of fixture, repair or replacement of fixture, for those fixtures that do not meet the performance requirements. The Final Report shall include the following:

A. The photometric condition of each light fixture tested, as follows:

(1) Passes/Meets FAA Requirements. This classification includes those new light fixtures which exceed the FAA requirement based on the field test results, or in the case of existing lighting systems, those fixtures which exceed seventy percent (70%) of FAA requirements. (FAA specifies that airfield lights must be replaced when the outputs are less than 70% of the required output.) In such cases, there is no need for any further action other than periodic monitoring. In the photometric data, when there is nothing indicated in the "Remarks" column, this indicates that the light fixture passed the test.

B. Investigate. These light fixtures have not met the FAA required photometric output for the particular type of light fixture based on the field test results. These fixtures should be investigated to determine why the performance is insufficient. Appropriate corrective measures need to be taken to bring the performance of these fixtures up to FAA standards and, then, the fixtures need to be retested to assure that the repairs/replacements are satisfactory. In the photometric data, these light fixtures are indicated by an "I" in the "Remarks" column.

C. Photometric test data tabulated with the following information:

| Fixture Number | As shown on the Plans |
|----------------|-----------------------|
|----------------|-----------------------|



|     |                    |                                                       |
|-----|--------------------|-------------------------------------------------------|
| 111 | Light Direction    | Direction of light beam                               |
| 112 | Max CD             | Maximum candela output in a point along the main beam |
| 113 | Avg. CD            | Average candela on fixture being tested               |
| 114 | Lens Color         | Color of lens on fixture being tested                 |
| 115 | Max Sensor Reading | Sensor number (on the sensor bar) that provides the   |
| 116 |                    | maximum reading                                       |

117  
118 Spares. Spare lights provided as part of Item L-125, Appendix A, shall be on-site and  
119 available for use by the Contractor prior to the scheduled photometric testing. Any  
120 fixtures replaced as part of the photometric testing shall be shipped back to the  
121 manufacturer for repair or replacement and delivered back to DIA.

122  
123 There shall be a minimum of one (1) unit of each element provided.

124  
125 Any of these spares not used for correcting deficiencies shall be delivered to the DIA  
126 Project Manager. These spares shall be included in the Contractor's proposal.

127  
128 1.04 Corrective Action. The Contractor shall be responsible for correcting any deficient condition  
129 identified as a result of the photometric testing. If retesting of corrected conditions can be  
130 completed within the originally scheduled field test period, then retesting shall be performed to  
131 verify that any deficient condition has been successfully corrected.

132  
133  
134 **PART 2 METHOD OF MEASUREMENT**

135  
136 2.01 Refer to Appendix A for Method of Measurement.

137  
138 **PART 3 BASIS OF PAYMENT**

139  
140 3.01 Refer to Appendix A for Basis of Payment

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142  
143 **END OF ITEM L-140**

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ITEM T-901

SEEDING

PART 1 GENERAL

1.01 DESCRIPTION. This item shall consist of soil preparation and seeding the areas shown on the plans or as directed by the Project Manager in accordance with these specifications.

PART 2 MATERIALS

2.01 SEED. The species and application rates of grass, legume, and cover-crop seed furnished shall be those stipulated herein.

Seed shall be furnished separately or in mixtures in standard containers with the seed name, lot number, net weight, percentages of purity and of germination and hard seed, and percentage of maximum weed seed content clearly marked for each kind of seed. Purity and germination are defined as they are under Colorado Seed Law. The Contractor shall furnish the Project Manager duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within 6 months of date of delivery. This statement shall include: name and address of laboratory, date of test, lot number for each kind of seed, and the results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnished, and, in case of a mixture, the proportions of each kind of seed.

Seed mixture used will be as follows: For this project, use Mix Design 2.

**Mix Design 1 - Non-saline Upland Seed Mix, Denver International Airport**

| Scientific Name                      | Common Name             | Variety                  | lbs PLS /acre* | % of mix** |
|--------------------------------------|-------------------------|--------------------------|----------------|------------|
| <b>GRASSES</b>                       |                         |                          |                |            |
| <i>Bouteloua curtipendula</i>        | Sideoats Grama          | Vaughn                   | 0.8            | 10         |
| <i>Bouteloua gracilis</i>            | Blue Grama              | Bad River                | 0.05           | 2.5        |
| <i>Bouteloua gracilis</i>            | Blue Grama              | Hachita                  | 0.05           | 2.5        |
| <i>Buchloe dactyloides</i>           | Buffalograss            | Cody                     | 0.7            | 2.5        |
| <i>Buchloe dactyloides</i>           | Buffalograss            | Native -VNS <sup>†</sup> | 0.7            | 2.5        |
| <i>Distichlis spicata v. stricta</i> | Inland Saltgrass        | Native -VNS <sup>†</sup> | 0.3            | 5          |
| <i>Elymus lanceolatus</i>            | Thickspike Wheatgrass   | Critana                  | 0.5            | 5          |
| <i>Elymus trachycaulus</i>           | Slender Wheatgrass      | Primar                   | 0.5            | 5          |
| <i>Nasella viridula</i>              | Green Needlegrass       | LoDorm                   | 0.8            | 5          |
| <i>Panicum virgatum</i>              | Switchgrass             | Nebraska 28              | 0.6            | 15         |
| <i>Pascopyrum smithii</i>            | Western Wheatgrass      | Arriba                   | 3.6            | 25         |
| <i>Poa secunda</i>                   | Sandberg Bluegrass      | Native -VNS <sup>†</sup> | 0.5            | 5          |
| <i>Sporobolus cryptandrus</i>        | Sand Dropseed           | Native -VNS <sup>†</sup> | 0.01           | 4          |
| <i>Stipa comata</i>                  | Needleandthread Grass   | Native -VNS <sup>†</sup> | 0.7            | 5          |
| <b>Grass species subtotal</b>        |                         |                          | 9.41           | 95         |
| <b>FORBS (Wildflowers)</b>           |                         |                          |                |            |
| <i>Cleome serrulata</i>              | Rocky Mountain Beeplant | Native -VNS <sup>†</sup> | 0.1            | <1         |
| <i>Coreopsis tinctoria</i>           | Plains coreopsis        | Native -VNS <sup>†</sup> | 0.01           | <1         |
| <i>Erysimum asperum</i>              | Western Wallflower      | Native -VNS <sup>†</sup> | 0.01           | <1         |
| <i>Gaillardia aristata</i>           | Blanketflower           | Native -VNS <sup>†</sup> | 0.1            | <1         |
| <i>Helianthus annuus</i>             | Common sunflower        | Native -VNS <sup>†</sup> | 0.01           | <1         |
| <i>Liatris punctata</i>              | Blazing-star            | Native -VNS <sup>†</sup> | 0.1            | <1         |

|                              |                       |                          |             |    |
|------------------------------|-----------------------|--------------------------|-------------|----|
| Linum lewisii                | Blue Flax             | Native -VNS <sup>†</sup> | 0.03        | <1 |
| Oenothera villosa            | Tall Eveningprimrose  | Native -VNS <sup>†</sup> | 0.01        | <1 |
| Penstemon angustifolia       | Narrow-leaf Penstemon | Native -VNS <sup>†</sup> | 0.02        | <1 |
| Ratibida columnaris          | Prairie Coneflower    | Native -VNS <sup>†</sup> | 0.3         | <1 |
| <b>Forb species subtotal</b> |                       |                          | 0.69        | 5  |
|                              |                       |                          |             |    |
|                              | <b>TOTAL PLS Rate</b> |                          | <b>10.1</b> |    |

32  
33

**Mix Design 2 - Non-saline Upland Seed Mix For Shoulder Areas**

| Scientific Name                    | Common Name           | Variety                  | Ibs PLS /acre* | % of mix** |
|------------------------------------|-----------------------|--------------------------|----------------|------------|
| <i>GRASSES</i>                     |                       |                          |                |            |
| Bouteloua curtipendula             | Sideoats Grama        | Vaughn                   | 0.8            | 10         |
| Bouteloua gracilis                 | Blue Grama            | Bad River                | 0.05           | 2.5        |
| Bouteloua gracilis                 | Blue Grama            | Hachita                  | 0.05           | 2.5        |
| Buchloe dactyloides                | Buffalograss          | Cody                     | 0.7            | 2.5        |
| Buchloe dactyloides                | Buffalograss          | Native -VNS <sup>†</sup> | 0.7            | 2.5        |
| Distichlis spicata v. stricta      | Inland Saltgrass      | Native -VNS <sup>†</sup> | 0.3            | 5          |
| Elymus lanceolatus v. lanceolatus  | Thickspike Wheatgrass | Critana                  | 1.1            | 11         |
| Elymus lanceolatus v. psammophilus | Streambank Wheatgrass | Sodar                    | 1.0            | 10         |
| Elymus trachycaulus                | Slender Wheatgrass    | Primar0.5                | 0.5            | 5          |
| Nasella viridula                   | Green Needlegrass     | LoDorm                   | 0.8            | 5          |
| Pascopyrum smithii                 | Western Wheatgrass    | Arriba                   | 3.6            | 25         |
| Poa secunda                        | Sandberg Bluegrass    | Native -VNS <sup>†</sup> | 0.5            | 5          |
| Sporobolus cryptandrus             | Sand Dropseed         | Native -VNS <sup>†</sup> | 0.01           | 4          |
| Stipa comata                       | Needleandthread Grass | Native -VNS <sup>†</sup> | 0.7            | 5          |
| <b>Grass species subtotal</b>      |                       |                          | 10.8           | 100        |
|                                    |                       |                          |                |            |
|                                    | <b>TOTAL</b>          |                          | <b>10.8</b>    | <b>100</b> |

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**Mix Design 3 - Saline Upland Area Mix, Denver International Airport**

| Scientific Name               | Common Name           | Variety | Ibs PLS /acre* | % of mix** |
|-------------------------------|-----------------------|---------|----------------|------------|
| <i>GRASSES</i>                |                       |         |                |            |
| Buchloe dactyloides           | Buffalograss          | Cody    | 1.4            | 5          |
| Buchloe dactyloides           | Buffalograss          | Native  | 1.4            | 5          |
| Distichlis spicata v. stricta | Inland Saltgrass      | Native  | 0.8            | 25         |
| Sporobolus airoides           | Alkali Sacaton        | Salado  | 0.2            | 20         |
| Pascopyrum smithii            | Western Wheatgrass    | Arriba  | 2.1            | 15         |
| Puccinellia distans           | Alkaligrass           | Fults   | 0.2            | 15         |
| Puccinellia airoides          | Nuttall Alkaligrass   | Native  | 0.1            | 12         |
| <b>Grass species subtotal</b> |                       |         | 6.1            | 97         |
|                               |                       |         |                |            |
| <i>SHRUBS</i>                 |                       |         |                |            |
| Atriplex gardneri             | Gardner Saltbush      | Native  | 0.4            | 3          |
| <b>Shrub species subtotal</b> |                       |         | 0.4            | 3          |
|                               |                       |         |                |            |
|                               | <b>TOTAL PLS RATE</b> |         | <b>6.5</b>     |            |

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**Mix Design 4 - Non-saline Wetland Mix, Denver International Airport**

| Scientific Name                 | Common Name          | Variety | lbs PLS /acre* | % of mix** |
|---------------------------------|----------------------|---------|----------------|------------|
| <i>GRASSES &amp; GRASSLIKES</i> |                      |         |                |            |
| <i>Beckmannia syzigachne</i>    | American Sloughgrass | Native  | 0.2            | 10         |
| <i>Glyceria grandis</i>         | Giant Mannagrass     | Native  | 0.1            | 10         |
| <i>Juncus torreyii</i>          | Torrey Bulrush       | Native  | 0.01           | 5          |
| <i>Carex nebrascensis</i>       | Nebraska sedge       | Native  | 0.3            | 10         |
| <i>Carex utriculata</i>         | Beaked Sedge         | Native  | 0.4            | 10         |
| <i>Elymus canadensis</i>        | Canada Wildrye       | Native  | 2.0            | 15         |
| <i>Leymus triticoides</i>       | Creeping Wildrye     | Native  | 4.6            | 15         |
| <i>Juncus balticus</i>          | Baltic Rush          | Native  | 0.01           | 10         |
| <i>Schoenoplectus validus</i>   | Softstem Bulrush     | Native  | 0.4            | 15         |
| <b>TOTAL PLS RATE</b>           |                      |         | <b>8.0</b>     |            |

43

**Mix Design 5 - Saline Wetland Seed Mix, Denver International Airport**

44

| Scientific Name                                     | Common Name         | Variety | lbs PLS /acre* | % of mix** |
|-----------------------------------------------------|---------------------|---------|----------------|------------|
| <i>GRASSES &amp; GRASSLIKES</i>                     |                     |         |                |            |
| <i>Scirpus paludosus</i><br>( <i>S. maritimus</i> ) | Alkali Bulrush      | Native  | 3.9            | 50         |
| <i>Puccinellia airoides</i>                         | Nuttall Alkaligrass | Native  | 0.33           | 25         |
| <i>Distichlis spicata v. stricta</i>                | Inland Saltgrass    | Native  | 0.65           | 25         |
| <b>TOTAL PLS RATE</b>                               |                     |         | <b>4.9</b>     | 100        |

45

**Mix Design 6 - Pond Bottom Seed Mix**

46

| Scientific Name                                     | Common Name         | Variety                  | lbs PLS /acre* | % of mix** |
|-----------------------------------------------------|---------------------|--------------------------|----------------|------------|
| <i>GRASSES &amp; GRASSLIKES</i>                     |                     |                          |                |            |
| <i>Distichlis spicata v. stricta</i>                | Inland Saltgrass    | Native -VNS <sup>†</sup> | 0.3            | 10         |
| <i>Juncus balticus</i>                              | Baltic Rush         | Native -VNS <sup>†</sup> | 0.02           | 10         |
| <i>Panicum virgatum</i>                             | Switchgrass         | Nebraska 28              | 0.4            | 10         |
| <i>Pascopyrum smithii</i>                           | Western Wheatgrass  | Arriba                   | 7.9            | 50         |
| <i>Puccinellia airoides</i>                         | Nuttall Alkaligrass | Native -VNS <sup>†</sup> | 0.06           | 10         |
| <i>Scirpus paludosus</i><br>( <i>S. maritimus</i> ) | Alkali Bulrush      | Native -VNS <sup>†</sup> | 1.1            | 10         |
| <b>TOTAL</b>                                        |                     |                          | <b>9.8</b>     | <b>100</b> |

47

\* PLS means Pure Live Seed; rates shown are for drill seeding, if broadcast, rates should be doubled.

48

\*\* Percent by seed number

49

\*\*\* Wetland mixes to be used only where wetland hydrology exists. Check with DIA Environmental Services.

50

<sup>†</sup> VNS = Variety Not Stated

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Seeding shall be performed during the period between spring thaw and July 1 or between October 15 and the freezing of the ground.

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57

Seeding shall be accomplished by drill seeding or by broadcast seeding.

58

59

If drill seeding is used, the seed drill will be equipped with three seed boxes including one for large smooth seed, one for fluffy seed (with picker wheels to prevent bridging), and one for small smooth seed. Furrow spacing may vary between 7 and 9 inches. Drill will have double disc furrow openers and functioning depth bands set to plant at ½ inch depth. Drill will have either

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64 packer wheels or drag chains. Grain drills are NOT acceptable. Seeder-cultipackers are also not  
65 acceptable.  
66

67 If broadcast seeding is used, soil surface will be roughened IMMEDIATELY prior to seeding using  
68 a toothed-type harrow. Seed will be spread by hand or by cyclonic spreader at a rate TWICE that  
69 specified for drill seeding in Tables 901-1 and 901-2. Immediately following seeding, the treated  
70 area will be harrowed with a tooth-type harrow to cover the seed. Sufficient passes will be made  
71 to assure that seed is covered to a depth of at least ¼ inch. Brush or chain-link drags are not  
72 acceptable for this purpose.  
73

74 2.02 FERTILIZER. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures  
75 containing the percentages of total nitrogen, available phosphoric acid, and water-soluble  
76 potash. They shall be furnished in standard containers with name, weight, and guaranteed  
77 analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be  
78 permitted in mixed fertilizers.  
79

80 The fertilizers may be supplied in one of the following forms:

- 81 A. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;
- 82 B. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or
- 83 C. A granular or pellet form suitable for application by blower equipment.

84 Fertilizers shall be submitted and approved commercial fertilizer and shall be spread at a rate  
85 which is determined by the seeding contractor to allow proper vegetative growth.  
86

87 2.03 SOIL FOR REPAIRS. The soil for fill and topsoiling of areas to be repaired shall be at least of  
88 equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be  
89 relatively free from large stones, roots, stumps, or other materials that will interfere with  
90 subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the  
91 Project Manager before being placed.  
92

### 93 PART 3 CONSTRUCTION METHODS

94 3.01 ADVANCE PREPARATION AND CLEANUP. After grading of areas has been completed and  
95 before applying fertilizer, areas to be seeded shall be raked or otherwise cleared of stones larger  
96 than 2 inches (50 mm) in any diameter, sticks, stumps, and other debris that might interfere with  
97 sowing of seed, growth of grasses, or subsequent maintenance of grass-covered areas. If any  
98 damage by erosion or other causes has occurred after the completion of grading and before  
99 beginning the application of fertilizer, the Contractor shall repair such damage. This may include  
100 filling gullies, smoothing irregularities, and repairing other incidental damage.  
101

102 An area to be seeded shall be considered a satisfactory seedbed without additional treatment if it  
103 has recently been thoroughly loosened and worked to a depth of not less than 5 inches (125 mm)  
104 as a result of grading operations and, if immediately prior to seeding, the top 3 inches (75 mm) of  
105 soil is loose, friable, reasonably free from large clods, rocks, large roots, or other undesirable  
106 matter, and if shaped to the required grade.  
107

108 However, when the area to be seeded is sparsely sodded, weedy, barren and unworked, or  
109 packed and hard, any grass and weeds shall first be cut or otherwise satisfactorily disposed of,  
110 and the soil then scarified or otherwise loosened to a depth not less than 5 inches (125 mm).  
111 Clods shall be broken and the top 3 inches (75 mm) of soil shall be worked into a satisfactory  
112 seedbed by disking, or by use of cultipackers, rollers, drags, harrows, or other appropriate  
113 means. In consideration of severe weediness as well as project time tables, Project Manager  
114 may direct Contractor to deplete the weed seed bank by application of pre-emergent herbicides  
115 or by successive cultivation prior to permanent seeding.  
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122  
123 3.02 MAINTENANCE OF SEEDED AREAS. The Contractor shall protect seeded areas against traffic  
124 or other use by warning signs or barricades, as approved by the Project Manager. Surfaces  
125 gullied or otherwise damaged following seeding shall be repaired by re-grading and reseeding as  
126 directed. The Contractor shall mow, water as directed, and otherwise maintain seeded areas in a  
127 satisfactory condition until final inspection and acceptance of the work.

128  
129 It will be required that the Contractor establish a good stand of grass with uniform cover to the  
130 satisfaction of the Project Manager. A grass stand shall be considered adequate when after the  
131 first growing season there are an average of at least three (3) seedlings of desirable (planted)  
132 species per square foot.

133  
134 Alternatively, a two-year warranty period may be established after which re-vegetation  
135 requirements associated with construction projects as regulated by the National Pollutant  
136 Discharge Elimination System (NPDES) stormwater program and managed by the Colorado  
137 Department of Public Health and Environment (CDPHE) would be implemented. Permanent  
138 stabilization is defined by CDPHE and in this specification as return of ground cover (cover of live  
139 plants including weeds plus that of litter (detached dead plant parts) and standing dead plant  
140 material) equal to or greater than 70% of that present previous to disturbance. Inasmuch as total  
141 ground cover in this area prior to disturbance is often in the range of 70 to 80%, meaning that  
142 70% of these levels is about 50 to 55%, a single standard of 50% total ground cover will be used.  
143 That is, to be regarded as stabilized, project areas must demonstrate 50% ground cover (by  
144 visual estimate). In other words no more than 50% of the surface may be exposed soil. Areas  
145 with bare soil in excess of 50% may be no larger than 1000 sq.ft. as determined by Project  
146 Manager.

147  
148 If, at the time when the contract has been otherwise completed it is not possible to make a  
149 determination of the adequacy of the re-vegetation, payment for the unaccepted portions of the  
150 areas will be withheld until such time as these requirements have been met.

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153 **PART 4 METHOD OF MEASUREMENT**

154  
155 4.01 Refer to Appendix A for Method of Measurement.

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157  
158 **PART 5 BASIS OF PAYMENT**

159  
160 5.01 Refer to Appendix A for Basis of Payment.

161  
162  
163 **PART 6 MATERIAL REQUIREMENTS**

164  
165 **Attachment 901-A Noxious Weed Species as Per Colorado Weed Act**

166  
167 **List A Noxious Weed Species**

- 168  
169 African rue (*Peganum harmala*)  
170 Camelthorn (*Alhagi pseudalhagi*)  
171 Common crupina (*Crupina vulgaris*)  
172 Cypress spurge (*Euphorbia cyparissias*)  
173 Dyer's woad (*Isatis tinctoria*)  
174 Giant salvinia (*Salvinia molesta*)  
175 Hydrilla (*Hydrilla verticillata*)  
176 Meadow knapweed (*Centaurea pratensis*)  
177 Mediterranean sage (*Salvia aethiopsis*)  
178 Medusahead (*Taeniatherum caput-medusae*)  
179 Myrtle spurge (*Euphorbia myrsinites*)

- 180 Purple loosestrife (*Lythrum salicaria*)
- 181 Rush skeletonweed (*Chondrilla juncea*)
- 182 *Sericea lespedeza* (*Lespedeza cuneata*)
- 183 Squarrose knapweed (*Centaurea virgata*)
- 184 Tansy ragwort (*Senecio jacobaea*)
- 185 Yellow starthistle (*Centaurea solstitialis*)

186

187 **List B Noxious Weed species**

188

- 189 Absinth wormwood (*Artemisia absinthium*)
- 190 Black henbane (*Hyoscyamus niger*)
- 191 Bouncingbet (*Saponaria officinalis*)
- 192 Bull thistle (*Cirsium vulgare*)
- 193 Canada thistle (*Cirsium arvense*)
- 194 Chinese clematis (*Clematis orientalis*)
- 195 Common tansy (*Tanacetum vulgare*)
- 196 Common teasel (*Dipsacus fullonum*)
- 197 Corn chamomile (*Anthemis arvensis*)
- 198 Cutleaf teasel (*Dipsacus laciniatus*)
- 199 Dalmatian toadflax, broad-leaved (*Linaria dalmatica*)
- 200 Dalmatian toadflax, narrow-leaved (*Linaria genistifolia*)
- 201 Dame's rocket (*Hesperis matronalis*)
- 202 Diffuse knapweed (*Centaurea diffusa*)
- 203 Eurasian watermilfoil (*Myriophyllum spicatum*)
- 204 Hoary cress (*Cardaria draba*)
- 205 Houndstongue (*Cynoglossum officinale*)
- 206 Leafy spurge (*Euphorbia esula*)
- 207 Mayweed chamomile (*Anthemis cotula*)
- 208 Moth mullein (*Verbascum blattaria*)
- 209 Musk thistle (*Carduus nutans*)
- 210 Orange hawkweed (*Hieracium aurantiacum*)
- 211 Oxeye daisy (*Chrysanthemum leucanthemum*)
- 212 Perennial pepperweed (*Lepidium latifolium*)
- 213 Plumeless thistle (*Carduus acanthoides*)
- 214 Quackgrass (*Elytrigia repens*)
- 215 Redstem filaree (*Erodium cicutarium*)
- 216 Russian knapweed (*Acroptilon repens*)
- 217 Russian-olive (*Elaeagnus angustifolia*)
- 218 Salt cedar (*Tamarix chinensis*, *T. parviflora*, and *T. ramosissima*)
- 219
- 220 Scentless chamomile (*Matricaria perforata*)
- 221 Scotch thistle (*Onopordum acanthium*)
- 222 Scotch thistle (*Onopordum tauricum*)
- 223 Spotted knapweed (*Centaurea maculosa*)
- 224 Spurred anoda (*Anoda cristata*)
- 225 Sulfur cinquefoil (*Potentilla recta*)
- 226 Venice mallow (*Hibiscus trionum*)
- 227 Wild caraway (*Carum carvi*)
- 228 Yellow nutsedge (*Cyperus esculentus*)
- 229 Yellow toadflax (*Linaria vulgaris*)

230

231 **List C Noxious Weed Species**

232

- 233 Chicory (*Cichorium intybus*)
- 234 Common burdock (*Arctium minus*)
- 235 Common mullein (*Verbascum thapsus*)
- 236 Common St. Johnswort (*Hypericum perforatum*)
- 237 Downy brome (*Bromus tectorum*)



- 238 Field bindweed (*Convolvulus arvensis*)
- 239 Halogeton (*Halogeton glomeratus*)
- 240 Johnsongrass (*Sorghum halepense*)
- 241 Jointed goatgrass (*Aegilops cylindrica*)
- 242 Perennial sowthistle (*Sonchus arvensis*)
- 243 Poison hemlock (*Conium maculatum*)
- 244 Puncturevine (*Tribulus terrestris*)
- 245 Velvetleaf (*Abutilon theophrasti*)
- 246 Wild proso millet (*Panicum miliaceum*)

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**END OF ITEM T-901**

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**ITEM T-905**  
**TOPSOILING**

**PART 1 GENERAL**

1.01 DESCRIPTION. This item shall consist of preparing the ground surface for topsoil application, removing topsoil from designated stockpiles or areas to be stripped on the site or from approved sources off the site, and placing and spreading the topsoil on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the Project Manager.

**PART 2 MATERIALS**

2.01 TOPSOIL. Topsoil shall be the surface layer of soil with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones (2 inches or more in diameter), and clay lumps or similar objects. Brush and other vegetation that will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary sods and herbaceous growth such as grass and weeds are not to be removed but shall be thoroughly broken up and intermixed with the soil during handling operations. The topsoil or soil mixture, unless otherwise specified or approved, shall have a pH range of approximately 5.5 pH to 8.0pH, when tested in accordance with the methods of testing of the association of official agricultural chemists in effect on the date of invitation of bids. The organic content shall be not less than 1% nor more than 10% as determined by the wet-combustion method (chromic acid reduction). Soil textures (USDA) suitable for re-vegetation include Sandy Loam, Loam, Silt Loam, Clay Loam, Sandy Clay Loam, Silty Clay Loam, and Loamy Sand.

When topsoil is imported to the site, it shall meet the following criteria:

| Parameter                    | Acceptable                                                                           | Unacceptable                             |
|------------------------------|--------------------------------------------------------------------------------------|------------------------------------------|
| Texture                      | Sandy Loam, Loam, Silt Loam, Clay Loam, Sandy Clay Loam, Silty Clay Loam, Loamy Sand | Silty Clay, Clay, Sandy Clay, Sand, Silt |
| Soil Reaction                | pH 5.0 to 8.0                                                                        | < 5.0 or > 8.0                           |
| Salinity (mmhos/cm)          | < or = 4.0                                                                           | > 4.0                                    |
| Organic Matter (%)           | > or = 1.0                                                                           | < 1.0                                    |
| Coarse Fragment Content (%)* | < or = 20                                                                            | > 20                                     |

\* Percent by weight of particles > 2 mm diameter (ie. gravels; cobbles and boulders excluded by provisions of 901-3.2)

Natural topsoil may be amended by the Contractor with approved materials and methods to meet the above specifications.

2.02 INSPECTION AND TESTS. Within 10 days following acceptance of the bid, the Project Manager shall be notified of the source of topsoil to be furnished by the Contractor. The topsoil shall be inspected to determine if the selected soil meets the requirements specified and to determine the depth to which stripping will be permitted. At this time, the Contractor may be required to take representative soil samples from several locations within the area under consideration and to the proposed stripping depths, for testing purposes as specified in 905-2.01.

**PART 3 CONSTRUCTION METHODS**

1 3.01 GENERAL. Areas to be topsoiled shall be shown on the plans. If topsoil is available on the site,  
2 the location of the stockpiles or areas to be stripped of topsoil and the stripping depths shall be  
3 shown on the plans.  
4

5 Suitable equipment necessary for proper preparation and treatment of the ground surface,  
6 stripping of topsoil, and for the handling and placing of all required materials shall be on hand, in  
7 good condition, and approved by the Project Manager before the various operations are started.  
8

9 3.02 PREPARING THE GROUND SURFACE. Immediately prior to dumping and spreading of topsoil  
10 on any area, the surface shall be loosened by chisels or rippers to a minimum depth of 18 inches  
11 (45 cm) minus the specified depth of the topsoil. *If, for example, the topsoil depth is six inches*  
12 *(as would be typical) the ripping need only go to 12 inches (30 cm).* In FAA determined safety  
13 areas on the shoulders of taxiways, runways or ramps where only 6 inches of ripping is allowed,  
14 the total depth of loosened material including topsoil will be 6 inches.  
15

16 The surface of the area to be topsoiled shall be cleared of all stones larger than 2 inches (50 mm)  
17 in any diameter and all litter or other material which may be detrimental to proper bonding, the  
18 rise of capillary moisture, or the proper growth of the desired planting. Limited areas, as shown  
19 on the plans, which are too compact to respond to these operations shall receive special  
20 scarification.  
21

22 Grades on the area to be topsoiled, which have been established by others as shown on the  
23 plans, shall be maintained in a true and even condition. Where grades have not been  
24 established, the areas shall be graded to positively drain. Compaction as a result of grading will  
25 be relieved as described above.  
26

27 3.03 OBTAINING TOPSOIL. Prior to the stripping of topsoil from designated areas, any vegetation,  
28 briars, stumps and large roots, rubbish or stones found on such areas, which may interfere with  
29 subsequent operations, shall be removed using methods approved by the Project Manager.  
30 Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other  
31 means shall be removed.  
32

33 When suitable topsoil is available on the site, the Contractor shall remove this material from the  
34 designated areas and to the depth as directed by the Project Manager. The topsoil shall be  
35 spread on areas already tilled and smooth-graded, or stockpiled in areas approved by the Project  
36 Manager. Any topsoil stockpiled by the Contractor shall be rehandled and placed without  
37 additional compensation. Any topsoil that has been stockpiled on the site by others, and is  
38 required for topsoiling purposes, shall be removed and placed by the Contractor. The sites of all  
39 stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be  
40 graded if required and put into a condition acceptable for seeding.  
41

42 When suitable topsoil is secured off the airport site, the Contractor shall locate and obtain the  
43 supply, subject to the approval of the Project Manager who will require documentation that the  
44 source material does not include seed of plants on the State of Colorado Department of  
45 Agriculture Noxious Lists A, B, or C. The Contractor shall notify the Project Manager sufficiently  
46 in advance of operations in order that necessary measurements and tests can be made. The  
47 Contractor shall remove the topsoil from approved areas and to the depth as directed. The  
48 topsoil shall be hauled to the site of the work and placed for spreading, or spread as required.  
49 Any topsoil hauled to the site of the work and stockpiled shall be rehandled and placed without  
50 additional compensation.  
51

52 If topsoil is unavailable or of such poor quality that available materials need supplementary  
53 organic matter, then soil amendments shall be used. The soil amendment shall consist of  
54 composted biosolids or composted manure, or other organic soil amendment product approved  
55 by the Project Manager.  
56

57 Organic amendment comprised of composted biosolids shall comply with all requirements of U.S.  
58 EPA's biosolids regulations.  
59

Organic amendment comprised of composted manure shall be produced as follows:

- A. Compost organic amendment (cow or sheep manure) for 90 to 120 days. Certification must be provided to prove the product has gone through this process.
- B. Eradicate harmful pathogens including coliform bacteria.
- C. Create a carbon to nitrogen ratio of 15:1 to 25:1.
- D. Contain no solid particle greater than ½ inch diameter.
- E. Have a non-offensive smell similar to fresh turned soil.
- F. Contain no significant level of dirt, soil, or chemical preservatives and contain a maximum of 30 percent composted plant residue.
- G. Have a Ph after composting between 6 and 8 with an organic matter content of at least 20 percent.
- H. Contain soluble salts not greater than 5mmhos/cm.
- I. Produced by aerobic decomposition.
- J. Processed at a consistent temperature of 140 degrees F or greater.

A Certificate of Compliance shall be provided to the Project Manager to verify the organic matter content, Ph, and carbon matter to nitrogen ratio, and salt levels (by electrical conductivity mmhos/cm).

If organic amendment is not available, a natural trace mineral, carbon, and humic acid based granular soil conditioner may be used (such as Menefee Humate, or approved equal).

The proposed soil amendment shall be submitted to the Project Manager for his work approval as a part of the Common Excavation Plan. The soil amendment plan shall be based on soil samples obtained from the topsoil removed and stockpiled and shall be formulated to develop a suitable seed bed at least as suitable as those areas where topsoil is placed.

The Contractor shall prepare a Topsoil Plan which shall include but not be limited to the following items:

- A. Location and quantity of topsoil stockpiles available for the project.
- B. Location and quantity of topsoil available from borrow areas.
- C. Location and quantity of topsoil required for all areas to be topsoiled within project limits.
- D. Identification of and plan for removal of all undesirable materials such as weeds, trash, debris, etc., before actual stripping commences.
- E. Haul routes, schedules, utility conflicts, and other Topsoil Plan features by the Project Manager.

3.04 STOCKPILING. Stockpiled side slopes shall not exceed 3:1. All stockpiles and adjacent areas that have been disturbed by the Contractor shall be graded, topsoiled if necessary, ripped and seeded in accordance with Sections T-901 and T-908. Whenever it is practical, topsoil shall be hauled directly from the salvage site to the placement site to avoid double handling.

A sufficient amount of topsoil for the entire project including shrinkage and waste shall be set aside before any quality topsoil material is used for purposes other than topsoiling.

3.05 PLACING TOPSOIL. The topsoil shall be evenly spread on the prepared areas that have been left roughened to prevent topsoil layer slippage. Topsoil shall be placed to an average depth of six (6) inches, where the subsoil is suitable according to the following.

Subsoil Suitability criteria are as follows:

| Parameter           | Acceptable    | Unacceptable  |
|---------------------|---------------|---------------|
| Soil Reaction       | pH 5.0 to 8.7 | < 5.0 or >8.7 |
| Salinity (mmhos/cm) | < or = 7.0    | > 7.0         |

1 Where the subsoil does not meet the above suitability criteria, then the topsoil depth shall be 15  
2 inches, or the Contractor shall apply soil amendments in order to bring brine soils within  
3 acceptance criteria.  
4

5 Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in  
6 a condition detrimental to the work. Spreading shall be carried on so that turfing operations can  
7 proceed with a minimum of soil preparation or tilling.  
8

9 After spreading, any large, stiff clods and hard lumps shall be broken with a pulverizer or by other  
10 effective means, and all stones or rocks (2 inches (50 mm) or more in diameter), roots, litter, or  
11 any foreign matter shall be raked up and disposed of by the Contractor. After spreading is  
12 completed, the topsoil shall if necessary be satisfactorily firmed by rolling with a cultipacker or by  
13 other means approved by the Project Manager. The firmed topsoil surface shall conform to the  
14 required lines, grades, and cross sections. Any topsoil or other dirt falling upon pavements as a  
15 result of hauling or handling of topsoil shall be promptly removed.  
16

17 3.06 VERIFICATION OF TOPSOIL THICKNESS. The contractor shall be required to provide depth  
18 measurements for every 5,000 square yards of topsoil placed to minimum of 6 inch depth of  
19 topsoil. To test the depth of topsoil, the redressed areas will be divided into 10 acre plots. Within  
20 each plot, at least ten randomly selected locations will be sampled for topsoil depth before  
21 seedbed preparation. More than 90% of the samples must have a depth equal to or greater than  
22 the specified design depth. If this criterion is not met, the contractor will redress the plot. Topsoil  
23 shall be added as necessary to provide and maintain the minimum 6 inches of topsoil through the  
24 contract and maintenance period.  
25

26 3.07 TOLERANCES. The surface of the finished topsoil surface shall be of such smoothness that it  
27 will not vary more than plus 0.10' to minus 0.10' from true grade as shown on the Contract  
28 Drawings. Any deviation in excess of this amount shall be corrected by loosening, adding and  
29 removing materials, and reshaping.  
30  
31

32 **PART 4 METHOD OF MEASUREMENT**

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34 4.01 Refer to Appendix A for Method of Measurement.  
35

36 **PART 5 BASIS OF PAYMENT**

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38 5.01 Refer to Appendix A for Basis of Payment  
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42 **END OF ITEM T-905**

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**ITEM T-908**  
**MULCHING**

**PART 1 GENERAL**

1.01 DESCRIPTION. This item shall consist of furnishing, hauling, placing, and securing mulch on surfaces indicated on the plans or designated by the Project Manager.

**PART 2 MATERIALS**

2.01 MULCH MATERIAL. Acceptable mulch shall be the materials listed below or any approved locally available material that is similar to those specified. Mulch materials, which contain matured seed of species that would volunteer and be detrimental to the proposed overseeding, or to surrounding farm land, will not be acceptable. Straw or other mulch material which is fresh and/or excessively brittle, or which is in such an advanced stage of decomposition as to smother or retard the planted grass, will not be acceptable.

A. Wood-fiber Mulch. Wood fiber mulch must be virgin long-fiber material. Wood fiber shall be absent of materials toxic to plant growth. Wood chips are not acceptable.

B. Matting.

(1) *Covering*. Covering shall consist of blankets with close weave mesh and nettings with open weave mesh made of various materials as specified herein.

Blankets and nettings shall be biodegradable, non-toxic to vegetation or germination of seed, and shall not be toxic or injurious to humans.

(a) *Excelsior*. Excelsior soil retention covering shall be biodegradable as follows.

The blanket shall consist of a machine produced mat of curled wood excelsior of 80 percent, 6 inch or longer fiber length with a consistent thickness of fibers evenly distributed over the entire area of the blanket. The top side of the blanket shall be covered with a biodegradable netting, manufactured from a jute or other biodegradable material and stitched on 2 inch centers the entire width of the blanket.

Dimensions: 48" by 180' or 96" by 90'  
Roll Weight: 0.9 to 1.1 pounds per sq. yd.

(b). *Soil Retention Blanket (Coconut)*. Soil Retention Blanket (Coconut) shall be a machine produced mat consisting of 100 percent coconut fiber. The blanket shall be of consistent thickness with the coconut fiber evenly distributed over the entire area of the mat. The blanket shall be sewn together with biodegradable thread.

Material requirements:

Coconut Fiber Content: 100%, 0.50 to 0.60 lb. per sq. yd.  
Netting: Both sides, biodegradable  
9.3 lbs. per 1000 sq. ft.  
Thread: Biodegradable  
Roll Width: 6.5 to 7.5 feet

58 Roll Length: 83.5 to 110 feet  
59 Area Covered by  
60 One Roll: 60 to 80 sq. yds.  
61

62 A sample of the soil retention blanket (coconut) shall be submitted at  
63 advance of its use on the project for approval by the Project Manager.  
64

65 (c) *Soil Retention Blanket (Straw)*. Soil Retention Blanket (Straw) shall be a  
66 machine produced mat consisting of 100 percent agricultural straw. The  
67 blanket shall be of consistent thickness with the straw evenly distributed  
68 over the entire area of the mat. The blanket shall be covered on the top  
69 side with biodegradable netting having an approximate 5/8 inch x 5/8  
70 inch to 1/2 inch x 1/2 inch mesh and on the bottom with biodegradable  
71 netting with an approximate 1/4 inch x 1/4 inch to 1/2 inch x 1/2 inch mesh.  
72 The blanket shall be sewn together with biodegradable thread.  
73

74 Material requirements:

75 Straw Content: 100%, 0.50 lb. per sq. yd.  
76 Netting: Bottom side biodegradable, 9. lbs. per 1000 sq. ft.; Top  
77 side biodegradable, 9.3 lbs. per 1000 sq. ft.  
78 Thread: Biodegradable  
79 Roll Width: 6.5 to 7.5 feet  
80 Roll Length: 83.5 to 110 feet  
81 Area Covered by  
82 One Roll: 60 to 80 sq. yds.  
83

84 A sample of the soil retention blanket (straw) shall be submitted at  
85 least 2 weeks in advance of its use on the project for approval by the  
86 Project Manager.  
87

88 (d) *Soil Retention Blanket (Straw and Coconut)*. Soil Retention Blanket  
89 (Straw/Coconut) shall be a machine produced mat consisting of 70  
90 percent agricultural straw and 30 percent coconut fiber. The blanket shall  
91 be of consistent thickness with the straw and coconut fiber evenly  
92 distributed over the entire area of the mat. The blanket shall be covered  
93 on the top side with polypropylene netting having an approximate 5/8  
94 inch x 5/8 inch mesh and on the bottom with polypropylene netting with  
95 an approximate 1/4 inch x 1/4 inch to 1/2 inch x 1/2 inch mesh. The blanket  
96 shall be sewn together with cotton, biodegradable or photodegradable  
97 thread.  
98

99 Material requirements:

100 Straw Content: 70% 0.35 lb. per sq. yd.  
101 Coconut Fiber Content 30% 0.15 lb. per sq. yd.  
102 Netting: Bottom side biodegradable, 9.3 lbs. per 1000 sq.  
103 ft.; Top side biodegradable, 9.3 lbs. per 1000 sq.  
104 ft.  
105 Thread: Cotton, biodegradable  
106 Roll Width: 6.5 to 7.5 feet  
107 Roll Length: 83.5 to 110 feet  
108 Area Covered by  
109 One Roll: 60 to 80 sq. yds.  
110

111 A sample of the soil retention blanket (straw and coconut) shall be  
112 submitted at least 2 weeks in advance of its use on the project for  
113 approval by the Project Manager.  
114



- 115  
 116 (2) *Pins and Staples.* Pins and staples shall be made of wire 0.162 inch or larger in  
 117 diameter. "U" shaped staples shall have legs 8 inches long and a 1 inch crown.  
 118 "T" shaped pins shall not be used.  
 119  
 120 F. Tackifier. Material for mulch tackifier shall consist of a free-flowing, organic, 100% all  
 121 natural starch polymer, applied in a slurry with water and wood fiber.  
 122  
 123 G. Stubble Mulch. Stubble mulch is the holdover debris of stems and leaves left from a small  
 124 grain crop; these can function as mulch for a permanent seeding. One of the crop  
 125 species below is used to establish a cover and mulch that functions as a standing mulch  
 126 for subsequent seeding.

**Cover Crops for Use in Revegetation**

| Crop                                 | Date of crop planting  | Date of permanent cover seeding | Rate (lb PLS /ac) |
|--------------------------------------|------------------------|---------------------------------|-------------------|
| Wheat/Wheatgrass                     | April 1 to May 15      | Next fall*                      | 35                |
| Hybrid ("ReGreen"™)                  | August 15 to October 1 |                                 | 35                |
| Oats                                 | April 1 to May 15      | Next fall                       | 30                |
| Winter Wheat/Triticale               | August 1 to October 1  | Next fall                       | 25                |
| Spring Barley                        | April 1 to May 15      | Next fall                       | 30                |
| Long-season (southern) Grain Sorghum | May 15 to July 15      | Next fall                       | 30                |

\*Next fall after cover crop seeding

- 127  
 128  
 129 2.02 INSPECTION. Within 5 days after acceptance of the bid, the Project Manager shall be notified of  
 130 sources and quantities of mulch materials available and the Contractor shall furnish him with  
 131 representative samples of the materials to be used. These samples may be used as standards  
 132 with the approval of the Project Manager and any materials brought on the site that do not meet  
 133 these standards shall be rejected.  
 134  
 135 2.03 STORAGE. The Contractor shall store mulch with protection from weather or other conditions  
 136 that would damage or impact the effectiveness of the product.  
 137  
 138

**PART 3 CONSTRUCTION METHODS**

- 139  
 140  
 141 3.01 PREPARATION FOR AND TIMING OF MULCHING. Before spreading mulch, all large clods,  
 142 stumps, stones, brush, roots, and other foreign material shall be removed from the area to be  
 143 mulched. Mulch shall be applied immediately after seeding.  
 144  
 145 3.02 HAY OR STRAW MULCH. (not used)  
 146  
 147 3.03 HYDRAULIC MULCHING. Wood-fiber mulch and tackifier shall be added to water to form  
 148 homogeneous slurry. The operator shall apply the slurry mixture uniformly over the designated  
 149 seeded area via spraying.  
 150  
 151 Hydraulic mulching shall not be done in the presence of free surface water.  
 152  
 153 Mixing procedure for the hydraulic mulch and tackifier mixture shall be as follows:  
 154  
 155 (1) Fill tank with water approximately ¼ full.  
 156 (2) Continue filling while agitating with engine at full rpm.  
 157 (3) Pour tackifier, at a moderate rate, directly into area of greatest turbulence.

158 (4) With the recommended amount of tackifier in solution, add wood-fiber mulch. Do not add  
159 fertilizer.  
160

161 Apply the mulch and tackifier mixture at the following rate:

| <u>Wood-Fiber Mulch</u> | <u>Tackifier</u> | <u>Water</u>   |
|-------------------------|------------------|----------------|
| 2000 lbs./Acre          | 90 lbs./Acre     | 3000 gal./Acre |

162  
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165  
166 After the hydraulic mulch is applied, foot traffic on the mulch surface should be minimized. Mulch  
167 once mixed with water and tackifier shall be used within 4 hours. Unused mulch mixture shall be  
168 promptly removed from the site.  
169

170 3.04 MATTING. All erosion control matting installed will be keyed into the ground surface along all  
171 exposed (non-overlapping) edges. Keying will consist placing the edge across a six-inch deep  
172 trench and backfilling over the mat to the original ground surface level.  
173

174 A. *Excelsior*. The area to be covered shall be prepared, fertilized, and seeded in accordance  
175 with Section 212, before the blanket is placed. When the blanket is unrolled, the netting  
176 shall be on top and the fibers shall be in contact with the soil. In ditches, blankets shall be  
177 unrolled in the direction of the flow of water. The end of the upstream blanket shall  
178 overlap the buried end of the downstream blanket a maximum of 8 inches and a  
179 minimum of 4 inches, forming a junction slot. This junction slot shall be stapled across at  
180 8 inch intervals. Adjoining blankets (side by side) shall be offset 8 inches from center of  
181 ditch and overlapped a minimum of 4 inches. Six staples shall be used across the start of  
182 each roll, at 4 foot intervals, alternating the center row so that the staples form an "X"  
183 pattern. A common row of staples shall be used on adjoining blankets.  
184

185 B. *Soil Retention Blanket (Coconut), (Straw), and (Straw and Coconut)*. The area to be  
186 covered with Soil Retention Blanket (Coconut), (Straw), and (Straw and Coconut) shall be  
187 properly prepared, fertilized, and seeded before the blanket is placed. When the blanket  
188 is unrolled, the heavyweight polypropylene netting shall be on top and the lightweight  
189 polypropylene netting shall be in contact with the soil. In ditches and on slopes, blankets  
190 shall be unrolled in the direction of the flow of water. Installation shall be in accordance  
191 with manufacturer's recommendations. A representative of the manufacturer shall be  
192 present to give instruction during the installation of the soil retention blanket.  
193

194 The blanket shall be placed smoothly but loosely on the soil surface without stretching. The  
195 upslope end shall be buried in a trench 6 inches wide by 6 inches deep beyond the crest of  
196 the slope to avoid undercutting. For slope applications, there shall be a 6 inch overlap  
197 wherever one roll of blanket ends and another begins with the uphill blanket placed on top on  
198 the blanket on the downhill side. There shall be a 4 inch overlap wherever two widths of  
199 blanket are applied side by side. Insert staples in a pattern according to the manufacturer's  
200 recommendation at approximately two staples per square yard.  
201

202 At terminal ends, and every 35 feet, Soil Retention Blanket (Coconut), (Straw), and  
203 (Straw/Coconut) placed in ditches shall be buried in a trench approximately 6 inches deep by  
204 6 inches wide. Before backfilling, staples shall be placed across the width of the trench  
205 spaced at 6 inches on center in a zigzag pattern. The trench shall then be backfilled to grade  
206 and compacted by foot tamping.  
207

208 3.05 CARE AND REPAIR.

209 A. The Contractor shall care for the mulched areas until final acceptance of the project.  
210 Such care shall consist of providing protection against traffic or other use by placing  
211 warning signs, as approved by the Project Manager, and erecting any barricades that  
212 may be shown on the plans before or immediately after mulching has been completed on  
213 the designated areas.  
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- B. The Contractor shall be required to repair or replace any mulching that is defective or becomes damaged until the project is finally accepted. When, in the judgment of the Project Manager, such defects or damages are the result of poor workmanship or failure to meet the requirements of the specifications, the cost of the necessary repairs or replacement shall be borne by the Contractor. However, once the Contractor has completed the mulching of any area in accordance with the provisions of the specifications and to the satisfaction of the Project Manager, no additional work at his/her expense will be required, but subsequent repairs and replacements deemed necessary by the Project Manager shall be made by the Contractor and will be paid for as additional or extra work.
  
- C. The Contractor shall maintain the blanket, fabric, or netting areas until all work on the Contract has been completed and accepted. Maintenance shall consist of the repair of areas where damage is due to the Contractor's operations. Maintenance shall be performed at the Contractor's expense. Repair of those areas damaged by wind, fire, or other causes not attributable to the Contractor's operations shall be repaired by the Contractor and will be paid for at the contract unit price. Areas shall be repaired to reestablish the condition and grade of the soil prior to application of the covering and shall be refertilized, reseeded, and re-mulched as directed.

**PART 4 METHOD OF MEASUREMENT**

4.01 Refer to Appendix A for Method of Measurement.

**PART 5 BASIS OF PAYMENT**

5.01 Refer to Appendix A for Basis of Payment.

**END OF ITEM T-908**

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**SECTION 13410A**

**AIRFIELD LIGHTING CONTROL AND MONITORING SYSTEM MODIFICATIONS**

**PART 1 – PROJECT REQUIREMENTS**

**1.01 PROJECT SCOPE**

- A. Verify the operation of ACE units located in the airfield lighting vault.  
Replacement of communications loops being completed by others.
- B. Provide new Brite III remote units used for operation of in-pavement runway guard lights/ stop bar lights and elevated stop bar lights at airfield stop bar locations for the Runway 8-26 Complex.
- C. The work shall include all supervision, labor, software, programming, materials, tools, equipment, testing of the installation, manual updates, and all incidentals necessary to provide a fully functional and complete system to the satisfaction of the DIA Project Manager.
- D. Maintain a fully functional and operational airport lighting control system throughout the modification and testing of the affected system components. Coordinate construction with the DIA Project Manager to avoid conflicts with airport operational requirements and to schedule required system outages.
- E. Provide a 1 year maintenance warranty agreement which shall include the furnishing of key spare parts along with technical support on a 24 hour/ 7 day week/ 365 day year both remote and on site.
- F. Provide sensors to monitor the remote/off/local switches in the three remote input/output Circuit Selector Switch racks associated with the Runway 8-26 Complex. The first rack includes two ADB CSSs with four-series circuit relays each. The remaining two racks each consist of one Crouse-Hinds CSS with four-series circuit relays. Any one switch at a CSS rack left in either the off or local position shall provide an alarm back to all monitors.

**1.02 SUBMITTAL**

- A. Equipment and software submittals shall meet the requirements listed in Item L-100.
- B. Software submittals shall provide a complete description of the system on a functional level.
- C. Submittals of graphic displays shall include color pictorial representations of all runway and taxiway operations above 1200' RVR, between 1200' and 600' RVR, and below 600' RVR, including SMGCS operations affected by this project.

**1.03 OPERATION AND MAINTENANCE MANUALS**

1           A.           The supplier shall provide revision pages for eight existing operation and  
2                           maintenance manuals. The manual revisions shall be easy-to-understand and contain  
3                           detailed instructions and well-diagrammed procedures for operations and systems  
4                           maintenance.

5    **1.04           TESTING**

6           A.           General:

7                   1.           All elements of the ALCMS system affected by work associated with this  
8                           project shall be tested to demonstrate that the total system satisfies all of the  
9                           functional requirements of this Specification.

10                  2.           As a minimum, the testing shall include the following:

11                   a.           Software Implementation Tests (SIT).

12                   b.           Operational Acceptance Tests (OAT).

13                   c.           Functional Acceptance Tests (FAT).

14                  3.           Each test shall be in the cause and effect format. The person conducting  
15                           the test shall initiate an input (cause) and, upon the systems or subsystems  
16                           producing the correct result (effect), the specific test requirement will have been  
17                           satisfied.

18                  4.           All tests shall be conducted in accordance with, and documented on,  
19                           prior Owner-approved procedures, forms, and checklists. Each specific test to be  
20                           performed shall be described and a space provided after it for signoff by the  
21                           appropriate party after its satisfactory completion.

22                  5.           Copies of these signoff test procedures, forms, and checklists will  
23                           constitute the required test documentation.

24                  6.           Provide all special testing materials and equipment. Perform tests using  
25                           actual system variables, equipment, and data.

26                  7.           Coordinate all testing with the Owner.

27                  8.           The Owner will actively participate in many of the tests. The Owner  
28                           reserves the right to test or retest any and all specified functions whether or not  
29                           explicitly stated in the prior-approved Test Procedures.

30                  9.           The Owner's decision shall be final regarding the acceptability and  
31                           completeness of all testing.

32           B.           Software Implementation Tests (SIT):

33                   1.           The new software shall be installed on one of the existing ALCMS for  
34                           testing and to demonstrate that the proposed system components will function  
35                           through the reconfigured software.

- 1                    2.                    Tests shall demonstrate all newly installed or reinstalled hardware and  
2                    software components function to the satisfaction of the Owner. As a minimum  
3                    the tests shall include the following from AC 150/5345-56:
- 4                    a.                    10.9.3 Initiating a Low Visibility Test
- 5                    b.                    10.9.4 Stopbar Cycling and Resetting Test
- 6                    c.                    10.9.8 Stopbar lamps Out Warning and Alarm Test
- 7                    d.                    Operational state of the remote Circuit Selector Switch test,
- 8                    C.                    Operational Acceptance Tests (OAT):
- 9                    1.                    At the completion of the SIT, the system shall be made available to the  
10                    Owner's personnel for hands-on operational testing. The system shall be  
11                    completely usable and available for the OAT.
- 12                    2.                    The OAT will run for a period of 2 days. Coordinate all tests and provide  
13                    assistance for any simulations needed with the Owner. The supplier shall be on  
14                    site for the duration of the tests. The OAT shall be performed for both the  
15                    primary and secondary ALCMS.
- 16                    3.                    At the end of the OAT, the Owner, and Contractor shall coordinate and  
17                    address any discrepancies found during the OAT.
- 18                    4.                    All discrepancies shall be taken care of prior to the start of the FAT.
- 19                    D.                    Functional Acceptance Tests (FAT):
- 20                    1.                    Once the system has completed the OAT, a witnessed Functional  
21                    Acceptance Test shall be performed on the complete ALCMS to demonstrate  
22                    that it is operating and in compliance with these Specifications. Each specified  
23                    function shall be demonstrated on a paragraph-by-paragraph and site-by-site  
24                    basis.
- 25                    2.                    Updated versions of the documentation shall be made available to the  
26                    Owner at the jobsite both before and during the tests. In addition, one copy of an  
27                    O&M Manual shall be made available to the Owner at the jobsite both before and  
28                    during testing.
- 29                    3.                    The daily schedule called for under paragraph SIT shall also be followed  
30                    during the FAT.
- 31                    **1.05                    ONSITE SERVICES**
- 32                    A.                    General:
- 33                    1.                    Provide experienced personnel and management onsite to coordinate  
34                    and effect, for modifications to the Airfield Lighting Control and Monitoring  
35                    System:
- 36                    a.                    Installation, termination, and adjustment.

- 1                                            b.                                            All onsite testing.
- 2                                            c.                                            Startup assistance.
- 3                                            B.                                            Onsite Supervision:
- 4                                            1.                                            Provide onsite, an experienced resident engineering manager to
- 5                                                                                            supervise and coordinate all of the onsite Airfield Lighting Control and Monitoring
- 6                                                                                            System activities. This resident engineering manager shall be onsite during the
- 7                                                                                            total period required to effect all of the required onsite activities relating to the
- 8                                                                                            Airfield Lighting Control and Monitoring System modification.
- 9                                            C.                                            Testing Team:
- 10                                            1.                                            Provide, onsite, a team of experienced engineering and technician
- 11                                                                                            personnel during the total period required to:
- 12                                                                                            a.                                            Thoroughly check the installation, termination, and adjustment of
- 13                                                                                                                                            all of the Subsystems and their components affected by this project.
- 14                                                                                            b.                                            Perform and complete all onsite tests.
- 15                                                                                            c.                                            Provide assistance to the Owner for a period of one calendar
- 16                                                                                                                                            week after interim and final acceptance inspections.

17    **1.06                                            PROJECT CONDITIONS**

- 18                                            A.                                            This project is located on an active airport and work is subject to security and
- 19                                                                                            other restrictions.
- 20                                            B.                                            The airport will be operational during construction and requires coordination and
- 21                                                                                            prior approval from the resident engineer for any planned power and systems outages.
- 22                                                                                            All work inside the airport security fence shall be coordinated with the DIA Project
- 23                                                                                            Manager.
- 24                                            C.                                            The existing airport lighting control system shall remain operational during
- 25                                                                                            construction and testing of the system modifications. The existing control system
- 26                                                                                            configuration shall remain operational until the DIA Project Manager accepts the new
- 27                                                                                            system modifications.

28    **1.07                                            HARDWARE FOR PROCUREMENT**

- 29                                            A.                                            Supply Brite III remote units, one channel, quantity as indicated in Appendix A for
- 30                                                                                            installation on L-862S Elevated Stop Bar Lights. Installation by others.
- 31                                            B.                                            Supply Brite III remote units, dual channel, quantity as indicated in Appendix A
- 32                                                                                            for installation on L-852GS Inset Runway Guard/Stop Bar Lights. Installation by others.

33    **PART 2 – CONSTRUCTION REQUIREMENTS**

- 34    2.01                                            In the event that a communication or software adjustment or defective equipment
- 35                                                                                            requires repair or replacement, testing may be suspended or continued at the sole discretion of



1 the DIA Project Manager. Prior tests shall be verified to still meet the project requirements before  
2 continuing if testing is suspended.

3 2.02 If the need for further adjustments of any kind becomes evident during inspection or  
4 demonstration, the supplier shall continue work until the installation operates properly.

5 **PART 3 – METHOD OF MEASUREMENT**

6 3.01 Refer to Appendix A for Method of Measurement.  
7  
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9 **PART 4 BASIS OF PAYMENT**

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11 4.01 Refer to Appendix A for Basis of Payment.  
12

13 **END OF SECTION**  
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**SECTION 13410C**

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**AIRFIELD LIGHTING CONTROL AND MONITORING SYSTEM CONSTRUCTION MODIFICATIONS**

3

**PART 1 – PROJECT REQUIREMENTS**

4

**1.01 PROJECT SCOPE**

5

A. The Contractor shall remove the existing Brite III remote units in the airfield associated with the Runway 8-26 complex and deliver them to a site on Airport property as directed by the DIA Project Manager. Install new Brite III remote units for the inset runway guard/stop bar lights and elevated stop bar lights.

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B. Install sensors to monitor the remote/off/local switches in the three remote Circuit Selector Switch racks associated with the Runway 8-26 Complex.

10

11

C. Rewire the ALCMS communications loops into the new ACE and IRMS equipment included with the CCRs.

12

13

D. Install power wiring from the UPS to the new ACE units included with the CCRs.

14

E. The work shall include all supervision, labor, materials, tools, equipment, testing assistance of the installation, and all incidentals necessary to provide a fully functional and complete system to the satisfaction of the DIA Project Manager.

15

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F. Maintain a fully functional and operational airport lighting control system throughout the modification and testing of the affected system components. Coordinate construction with the DIA Project Manager to avoid conflicts with airport operational requirements and to schedule required system outages.

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**1.02 SUBMITTAL**

22

A. Manufacturer's certifications shall not relieve the Contractor of their responsibility to provide materials acceptable to these specifications and to the DIA Project Manager. Materials supplied and/or installed that do not materially comply with these specifications shall be removed, when directed by the DIA Project Manager, at the sole cost of the Contractor.

23

24

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27

Comply with specification L-100, Lighting and Electrical Work. Data sheets for each component called for in this section, shall be submitted for approval and be approved prior to ordering any materials for this section. This submittal shall include the proposed method of installation and detail sufficient, in the opinion of the DIA Project Manager, to determine compliance with the contract documents.

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**1.03 TESTING**

33

A. General:

34

1. All elements of the ALCMS affected by this project shall be tested to demonstrate that the total system satisfies all of the functional requirements of this Specification.

35

36

- 1                   2.       As a minimum, the testing shall include the following:
- 2                   a.       Software Implementation Tests (SIT).
- 3                   b.       Operational Acceptance Tests (OAT).
- 4                   c.       Functional Acceptance Tests (FAT).
- 5                   3.       All tests shall be conducted by ADB personnel. The Contractor shall provide any
- 6                   assistance needed by ADB to complete these tests.

7       **PART 2 – MATERIALS**

- 8                   1.       Provide twisted pair shielded No. 24 AWG cables with a common (drain wire)
- 9                   meeting EIA RS-485.

10       **PART 3 – CONSTRUCTION REQUIREMENTS**

- 11   3.01   Remove and reinstall Brite III remote units as part of the runway stop bar/runway guard light
- 12       work. Coordinate with the ADB technician the locations and individual unit numbers of each
- 13       remote.
- 14   3.02   Install network control cable within the East Airfield lighting Vault to connect the new CCRs to the
- 15       existing ALCMS. Tag each cable with phenolic with black on white lettering, with lettering being
- 16       no less than ¼-inch high. Neatly rack the cables on the existing communications cable tray.
- 17   3.03   Relocate current transformers within the Circuit Selector Switch (CSS) cabinets as shown on the
- 18       Drawings. Install a sensor as directed by ADB to sense the position of an existing hand/off auto
- 19       switch in the CSS cabinets. Connect the sensors into the ALCMS.
- 20   3.04   The Contractor shall have an electrician on site during the testing of the remote circuit selector
- 21       switch sensors, wiring of the L-829 CCRs into the ALCMS, software update, during all on-site
- 22       testing, and the reopening of the Runway 8-26 complex.

23       **PART 4 – METHOD OF MEASUREMENT**

- 24   4.01   Refer to Appendix A for Method of Measurement.
- 25
- 26

27       **PART 5 BASIS OF PAYMENT**

28

- 29   5.01   Refer to Appendix A for Basis of Payment.
- 30
- 31

**END OF SECTION**

# APPENDIX A MEASUREMENT AND PAYMENT



**APPENDIX A**

**MEASUREMENT AND PAYMENT**

**01050 – LAYOUT OF WORK AND SURVEYS**

**METHOD OF MEASUREMENT AND PAYMENT**

There shall be no direct measurement or payment for work within this specification. The work shall be considered subsidiary to other items of work.

**APPENDIX A****MEASUREMENT AND PAYMENT****01505 – MOBILIZATION****METHOD OF MEASUREMENT AND PAYMENT**01505a      MobilizationMethod of Measurement

- A. The Contractor shall submit for the Project Manager's approval 15 days prior to the first mobilization billing a detailed breakdown of all items, including subcontractor mobilization items that are proposed to be invoiced under Mobilization as part of the Schedule of Values (reference Technical Specifications Section 01370). This breakdown shall be labeled MOBILIZATION SCHEDULE. This schedule will be reviewed by the Project Manager to inform the Contractor what exact types of costs will be approved and paid under Mobilization.
- B. All requests for payment for mobilization shall include a detailed Mobilization Schedule which shall identify the nature of each expense item, its delivery date, setup and startup date and the actual invoice amounts inclusive of acquisition, taxes, transportation assembly, and installation less all discounts.
- C. The Contractor shall identify a line item in the Mobilization Schedule as "Demobilization" and shall establish the value for this line item, at a minimum, of fifteen percent (15%) of the pay item for mobilization.
- D. The initial approved Mobilization Schedule shall determine the basis for all future mobilization payments.

Basis of Payment

- A. Payment will be made only for substantiated Mobilization costs in accordance with the approved Mobilization Schedule, and only to the limit of the contract lump sum amount for the pay item Mobilization. In no case will the City pay Mobilization in excess of five percent (5%) of the total Contract amount.
- B. Payment for the Contractor's bonds may be included in the Mobilization Schedule to the limits of the actual amount.
- C. Payment amounts for personnel involved in mobilization and listed on the approved Mobilization Schedule shall be limited to the Contractor's certified payroll amounts.
- D. Payment amounts for materials, supplies and transportation involved in mobilization and listed on the approved Mobilization Schedule shall be for the actual amounts paid as shown on invoices marked paid. No payment will be made under mobilization for the cost of permanent materials to be installed for this contract. See Section 01370 for Stored Materials.



**APPENDIX A – MEASUREMENT AND PAYMENT**

- E. No payment under mobilization will be made for rented or leased equipment other than actual transportation cost.
- F. No separate payment will be made as part of the Mobilization Schedule for the maintenance and/or use of personnel, equipment, supplies and incidentals after project setup except for demobilization. These costs are to be incorporated in the remaining items of work in the Schedule of Values by multiplier or work request.
- G. For any mobilization payment amounts requested by the Contractor that are unsubstantiated or exceed the allowable limit of five percent of the total Contract amount, the Project Manager, may in its sole discretion reallocate any, all, or none of those amounts to other work items in the Schedule of Values for lump sum contracts or to be disbursed on a prorated basis as determined by the Project Manager for unit price contracts. Any unsubstantiated mobilization payment amounts not reallocated by the Project Manager will not be paid.

**APPENDIX A**

**MEASUREMENT AND PAYMENT**

**01566 – ENVIRONMENTAL CONTROLS**

**METHOD OF MEASUREMENT AND PAYMENT**

Item 01566a Erosion Control Sediment Log

Erosion Control Sediment Log shall be measured per linear foot to include furnishing, installation, maintenance and removal.

Payment for Erosion Control Sediment Log shall be made at the contract unit price per linear foot. This price shall be full compensation for furnishing all materials and for all preparation, installation, maintenance and removal as required to complete the item; and for all labor, equipment, tools and incidentals necessary to complete the item.

## APPENDIX A

## MEASUREMENT AND PAYMENT

**01575 – ELECTRICAL PHASING****METHOD OF MEASUREMENT AND PAYMENT**Item 01575a Cover Elevated Edge LightsItem 01575b Cover Panel on Guidance Signs

Cover Elevated Edge Lights and Cover Panel on Guidance Signs shall be measured per each item covered.

Payment will be made at the contract unit price per each sign panels covered on guidance signs, elevated edge light covers, and tie backs installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item 01575c Install Shorting Plug on Secondary of Isolation Transformer

Install Shorting Plugs on Secondary of Isolation Transformer shall be measured per each item installed. It shall also include the removal and reinstallation of the existing fixture, cleaning of the fixture flange ring and installation of SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating, and two piece lock washers. The shorting plug shall be manufactured and recommended by an FAA certified airfield lighting supplier.

Payment will be made at the contract unit price per each shorting plugs on secondary of isolation transformer installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item 01575d Install Tie Back

Install Tie Back shall be measured per each item installed. It shall also include the removal and reinstallation of the existing fixture, cleaning of the fixture flange ring and installation of SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating, and two piece lock washers, new L-823 primary connector kits, cable necessary to reconnect circuit (measured per linear foot), and 65W 6.6A/6.6A isolation transformer. The fixture shall be salvaged to a location on DIA property as directed by the DIA Project Manager.

Payment will be made at the contract unit price per each for tie backs installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item 01575e Install Temporary Jumper

## APPENDIX A – MEASUREMENT AND PAYMENT

Install Temporary Jumper shall be measured by the number of linear feet of cable installed in orange HDPE conduit, including L-823 connector kits, vinyl electrical tape, and rubber electrical tape in place, completed, ready for operation, and accepted as satisfactory. It shall also include the removal and reinstallation of the existing fixture, cleaning of the fixture flange ring and installation of SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating, and two piece lock washers, new L-823 primary connector kits, cable necessary to reconnect circuit (measured per linear foot), and 65W 6.6A/6.6A isolation transformer. The fixtures shall be salvaged to a location on DIA property as directed by the DIA Project Manager.

Payment will be made at the contract unit price per linear foot of temporary cable and HDPE conduit installed measured from center-to-center of lights along the conduit path including cable slack as measured and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item 01575f Install Isolation Transformer, 65W, 6.6A/6.6A

The quantity of airfield equipment to be paid for under this item shall be the number of each type installed, complete and in place, ready for operation, and accepted by the DIA Project Manager. It shall also include the removal and proper disposal of existing isolation transformer.

This bid item shall only be for replacement of isolation transformers associated with electrical phasing tie backs or temporary jumper installation.

Incidental to Install Isolation Transformer, 6.6A/6.6A shall include installation of rubber and vinyl tape.

Payment will be made at the contract unit price per each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item 01575g Maintain Lighted X's

Maintain Lighted X's shall be measured per lump sum.

Payment for Maintenance of the Lighted X's shall be made at the contract unit price per lump sum. Payment will be made in increments equal to the construction completion progress. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

**APPENDIX A**  
**MEASUREMENT AND PAYMENT**

**01576 - TRAFFIC CONTROL**

**METHOD OF MEASUREMENT AND PAYMENT**

Item 01576a Traffic Control

Traffic Control shall be measured per lump sum.

Payment for Traffic Control shall be made at the contract unit price per lump sum. This price shall include all costs for obtaining low profile barricades and delineators from DIA, placing, maintaining throughout the project, and returning to DIA at the end of the project.

**APPENDIX A****MEASUREMENT AND PAYMENT****P-150 – DEMOLITION****METHOD OF MEASUREMENT AND PAYMENT**

## Item P-150a Remove Taxiway Centerline Light and Foundation

Measurement for payment of Removal of taxiway centerline light and foundation shall be made per each. The removal of lights includes removal of fixture, base can, concrete anchor, rebar, and conduit. The fixture shall be salvaged to a location on DIA property as directed by the DIA Project Manager. The isolation transformer, base can, spacer rings, and concrete shall be disposed of off-site.

Payment shall be made at the contract unit price per each light and foundation removed. The price includes the removal of fixture, base can, concrete anchor, rebar, and conduit and delivery of removed existing fixture to DIA. This price shall be full compensation for furnishing all materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

## Item P-150b Remove Taxiway Edge Light and Install Blank Cover Plate

Measurement for payment of removal of Taxiway Edge Lights shall be made per each. The removal of edge lights includes removal of fixture, cable, isolation transformer and installation of a new cover plate to include ceramic coated bolts.

Payment shall be made at the contract unit price per each light fixture removed and replaced with a cover plate. The price includes the removal of fixture, all conduit and cable, installation of a new cover plate, and delivery of removed existing fixture to DIA. This price shall be full compensation for furnishing all materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

## Item P-150c Remove Asphalt Shoulder

Measurement for payment of Removal of asphalt shoulder shall be made per square yard based on the area approved for removal by DIA and actually removed during construction. Any pavement removed outside the preapproved limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment. The thickness of the existing material to be removed is approximate only and the Contractor will not be reimbursed for areas that may be thicker than shown on the plans. Removal of pavement shall include all sawcutting, excavation, hauling and disposal (including disposal fees) of pavement necessary to facilitate removal.

Payment shall be made at the contract unit price per square yard for pavement material removed and disposal of removed material off-site. This price shall be full compensation for furnishing all materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

**Item P-150d Remove 17-inch Non-Reinforced Concrete Pavement**

Measurement for payment of Removal of 17-inch non-reinforced concrete pavement shall be made per square yard based on the area shown on the plans. Any pavement removed outside the designed limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment. The thickness of the existing material to be removed is approximate only and the Contractor will not be reimbursed for areas that may be thicker than shown on the plans. Removal of pavement shall include all sawcutting, excavation, hauling, and disposal (including disposal fees) of pavement necessary to facilitate removal.

Payment shall be made at the contract unit price per square yard of pavement material removed and disposal of removed material off-site. This price shall be full compensation for furnishing all materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

**Item P-150e Remove 17-inch Reinforced Concrete Pavement**

Measurement for payment of Removal of 17-inch reinforced concrete pavement shall be made per square yard based on the area shown on the plans. Any pavement removed outside the designed limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment. The thickness of the existing material to be removed is approximate only and the Contractor will not be reimbursed for areas that may be thicker than shown on the plans. Removal of pavement shall include all sawcutting, excavation, hauling, and disposal (including disposal fees) of pavement necessary to facilitate removal.

Payment shall be made at the contract unit price per square yard of pavement material removed and disposal of removed material off-site. This price shall be full compensation for furnishing all materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

**APPENDIX A****MEASUREMENT AND PAYMENT****P-152 – EXCAVATION AND EMBANKMENT****METHOD OF MEASUREMENT AND PAYMENT**Item P-152a Topsoil Embankment from Stockpile

Measurement for payment of topsoil embankment from stockpile shall be made per cubic yards. The quantity of embankment will be measured in its final place by field survey, per cubic yard. No measurement shall be made due to foundation or embankment settlement. Measurement for select embankment shall be to a vertical plane at the horizontal distances shown on the plans. Quantities for all embankments shall be computed by the average end area method in cross-sections taken at maximum 20 foot intervals. Measurement shall be based on the elevations of ground surface after stripping, between neat lines shown on the Contract Drawings. No payment will be made due to over excavation.

Payment for topsoil embankment from stockpile site shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item. It includes excavating material from nearby stockpiles, hauling, haul roads, preparation of the embankment area, placing, spreading, conditioning, and compacting. Measurement for payment of topsoil removal, stockpile, and replacement shall be made per square yard. The quantity of topsoil removal, stockpile, and replacement will be measured in its final place by field survey, per square yard. Measurements shall be taken after QC survey has verified the topsoil layer has been placed as designed.

Item P-152b Unclassified Excavation, Embank On Site

Measurement for payment of unclassified excavation, embank on site shall be made per cubic yard. The quantity of unclassified excavation embanked on site will be measured in its initial place by field survey, per cubic yard. Measurement for excavation shall be to a vertical plane at the horizontal distances shown on the plans. Quantities for all excavations shall be computed by the average end area method in cross-sections taken at maximum 100 foot intervals. Measurement shall be based on the elevations of ground surface between neat lines shown on the Contract Drawings.

Payment for unclassified excavation, embank on site shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item. It includes clearing and grubbing, excavating, hauling, haul roads, stockpiling, preparation of the embankment area, placing, spreading, shaping, maintaining ditches, disposing of unsuitable material, moisture conditioning, and compaction of embankment materials. This item also includes sub-excavation, stockpiling or windrowing, moisture conditioning, placement, and compaction of existing on-site soils required to achieve proper moisture and compaction to the depths indicated on the drawings.



**APPENDIX A**  
**MEASUREMENT AND PAYMENT**

**P-153 – WATERING**

**METHOD OF MEASUREMENT AND PAYMENT**

There shall be no direct measurement or payment for work within this specification. The work shall be considered subsidiary to other items of work.

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**MEASUREMENT AND PAYMENT**

**P-161 – GEOTEXTILE**

**METHOD OF MEASUREMENT AND PAYMENT**

Item P-161a Bondbreaker Fabric

Bondbreaker fabric used in conjunction with pavement construction shall be measured by the number of square yards in-place based on the areas approved by DIA and measured in the field. No allowance will be made for materials in laps, seams, or for waste trimmed.

Payment will be made at the contract unit price per square yard for bondbreaker fabric. The price shall be full compensation for furnishing and placing all material and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

Item P-161b Geotextile Fabric

Where the geotextile fabric is used in conjunction with pavement construction, the quantity of geotextile shall be measured by the number of square yards in-place based on areas approved by DIA and measured in the field. No allowance will be made for materials in laps, seams, or for waste trimmed.

Where geotextile fabric is used for underdrains, drainage structures, rip rap, and other drainage applications, it shall be considered incidental to the construction work item and no separate measurement will be made for geotextile.

Payment will be made at the contract unit price per square yard for geotextile fabric. The price shall be full compensation for furnishing and placing all material and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

**APPENDIX A**

**MEASUREMENT AND PAYMENT**

**P-162 – CONTROLLED LOW-STRENGTH MATERIAL (CLSM)**

**METHOD OF MEASUREMENT AND PAYMENT**

There shall be no direct measurement or payment for CLSM. The work under this item shall be considered subsidiary to other items of work.

CLSM shall be considered incidental to the project. No payment shall be made for CLSM.

**APPENDIX A**

**MEASUREMENT AND PAYMENT**

**P-304C – CDOT AGGREGATE BASE COURSE**

**METHOD OF MEASUREMENT AND PAYMENT**

Item P-304Ca Crushed Aggregate Base Course, CDOT Class 6 (10-Inch)

CDOT Aggregate Base Course shall be measured by the number of square yards as specified, compacted in-place, complete and accepted by the DIA Project Manager.

Payment shall be made at the contract unit price per square yard of aggregate base course. This price shall be full compensation for furnishing all materials, for all preparation, delivery, and application of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item. Water will not be measured and paid for separately but shall be included in the work.

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## MEASUREMENT AND PAYMENT

**P-401C – CDOT PLANT MIX PAVEMENTS****METHOD OF MEASUREMENT AND PAYMENT**

Item P-401Ca CDOT Bituminous Surface Course (3-Inch)

Item P-401Cb CDOT Bituminous Surface Course (6-Inch)

Item P-401Cc CDOT Bituminous Base Course (7-Inch)

Plant mix bituminous pavement shall be measured per ton per the specified depth of bituminous mixture to be used in the accepted work. Recorded batch weights or truck scale weight will be used to determine the bases for the tonnage. Any waste leaving the project site in trucks will be deducted from the total measured tonnage. The Contractor and DIA Project Manager will agree on the amount of waste to be deducted.

Payment for accepted plant mix bituminous pavement shall be made at the contract unit price per ton adjusted in accordance with paragraph 401C-5.01.A. Aggregate, asphalt cement, asphalt recycling agent, additives, hydrated lime, and all other work necessary to construct the pavement section will not be paid for separately and shall be included in the work. Water used in the mixing plant to bring the lime-aggregate mixture to approved moisture content will not be measured and paid for separately but shall be included in the work. The amount of asphalt cement contained in recycled asphalt pavement (RAP) material will not be measured or paid for separately, but shall be included in the work. Coring for longitudinal joint density testing, core hole repair and associated expenses will not be paid for separately, but shall be included in the work.

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**MEASUREMENT AND PAYMENT**

**P-403 – ASPHALT-TREATED PERMEABLE BASE**

**METHOD OF MEASUREMENT AND PAYMENT**

Item P-403a Asphalt Treated Permeable Base Course (5-Inch)

Asphalt Treated Permeable Base (ATPB) shall be measured by the number of square yards as specified in-place, complete and accepted by the DIA Project Manager.

Payment for an accepted Asphalt Treated Permeable Base (ATPB) shall be made at the full or adjusted contract unit price per square yard. This price shall be full compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

**APPENDIX A**

**MEASUREMENT AND PAYMENT**

**P-501 – PORTLAND CEMENT CONCRETE PAVEMENT**

**METHOD OF MEASUREMENT AND PAYMENT**

Item P-501a 17-inch Portland Cement Concrete Pavement, Plain

A Portland cement concrete pavement shall be measured by the number of square yards of plain (unreinforced) pavement as specified in-place, complete and accepted by the DIA Project Manager. Portland cement concrete pavement transition areas from 17” to 21” shall be measured as 17” Portland cement concrete pavement.

Payment for accepted concrete pavement shall be made at the contract unit price per square yard adjusted in accordance with paragraph 501-8.01.A.

Item P-501b 17-inch Portland Cement Concrete Pavement, Reinforced

A Portland cement concrete pavement shall be measured by the number of square yards of reinforced pavement as specified in-place, complete and accepted by the DIA Project Manager. Portland cement concrete pavement transition areas from 17” to 21” shall be measured as 17” Portland cement concrete pavement.

Payment for accepted concrete pavement shall be made at the contract unit price per square yard adjusted in accordance with paragraph 501-8.01.A.

**APPENDIX A**

**MEASUREMENT AND PAYMENT**

**P-603 – BITUMINOUS TACK COAT**

**METHOD OF MEASUREMENT AND PAYMENT**

There shall be no direct measurement or payment for tack coat. The work under this item shall be considered subsidiary to other items of work.

Bituminous tack coat shall be considered incidental to the project. No payment shall be made for bituminous tack coat.



**APPENDIX A****MEASUREMENT AND PAYMENT****P-604A – PREFORMED EXPANSION JOINT COMPRESSION SEALS****METHOD OF MEASUREMENT AND PAYMENT**

There shall be no direct measurement or payment for preformed expansion joint compression seals associated with new pavement construction. The work under this item shall be considered subsidiary to other items of work.

Preformed expansion joint compression seals associated with new pavement construction shall be considered incidental to the project. No payment shall be made for preformed expansion joint compression seals.

**APPENDIX A****MEASUREMENT AND PAYMENT****P-604B – POLYCHLOROPRENE COMPRESSION JOINT SEALS****METHOD OF MEASUREMENT AND PAYMENT**

There shall be no direct measurement or payment for polychloroprene compression joint seals associated with new pavement construction. The work under this item shall be considered subsidiary to other items of work.

Polychloroprene compression joint seals associated with new pavement construction shall be considered incidental to the project. No payment shall be made for polychloroprene compression joint seals.

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**MEASUREMENT AND PAYMENT**

**P-605 – JOINT SEALING FILLER**

**METHOD OF MEASUREMENT AND PAYMENT**

There shall be no direct measurement or payment for joint sealing filler. The work under this item shall be considered subsidiary to other items of work.

Joint sealing filler shall be considered incidental to the project. No payment shall be made for joint sealing filler.

**APPENDIX A**

**MEASUREMENT AND PAYMENT**

**P-606 – ADHESIVE COMPOUNDS, TWO-COMPONENT FOR SEALING WIRE AND LIGHTS IN PAVEMENT**

**METHOD OF MEASUREMENT AND PAYMENT**

There shall be no direct measurement or payment for adhesive. The work under this item shall be considered subsidiary to other items of work.

Adhesive shall be considered incidental to the project. No payment shall be made for adhesive.

**APPENDIX A**

**MEASUREMENT AND PAYMENT**

**P-610 – STRUCTURAL PORTLAND CEMENT CONCRETE**

**METHOD OF MEASUREMENT AND PAYMENT**

In general, and unless listed in the proposal as a separate payment item, structural concrete will not be measured for payment, but shall be incidental to those proposed items constructed of concrete.

Structural concrete shall be considered incidental to the project. No payment shall be made for structural concrete, unless listed in the proposal as a separate payment item.

**APPENDIX A**

**MEASUREMENT AND PAYMENT**

**D-705 – PIPE UNDERDRAINS FOR AIRPORT**

**METHOD OF MEASUREMENT AND PAYMENT**

Item P-705a 6-Inch Non-Perforated Corrugated Polyethylene Underdrain Pipe

Non-Perforated Underdrain pipe shall be measured by the linear feet of pipe installed, including trenching, excavation, removal of excavated material, controlled low strength material and installation, backfill, compaction, connection to manhole, rip rap, concrete end walls with varmint screen, and pipe fittings, all measured in place, completed, and accepted as satisfactory.

Payment will be made at the contract unit price per linear foot for non-perforated underdrain pipe. The price shall be full compensation for furnishing and placing all material and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

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**D-751 – MANHOLES, CATCH BASINS, INLETS AND INSPECTION HOLES**

**METHOD OF MEASUREMENT AND PAYMENT**

Item D-751a Adjust Existing Electrical Manhole

Adjustment of existing structures shall be measured per each, in-place, complete and accepted by the DIA Project Manager.

Payment shall be made at the contract unit price per each, complete and in-place. This price shall include but not be limited to full compensation for furnishing all materials and for all preparation, dewatering, excavation, sawcutting and removal of existing manhole structure, concrete, forms, rebar, frames/lids, covers, backfilling and placing of the materials; furnishing and installation of other materials or connections as may be required to complete the item shown on the plans; and for all labor, equipment, tools and incidentals necessary to complete the item.

**APPENDIX A****MEASUREMENT AND PAYMENT****L-100 – LIGHTING AND ELECTRICAL WORK****METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

There shall be no separate measurement made for items in L-100.

All work required by Item L-100 shall be included in the prices for installation of the respective electrical items. Each pay item listed in other sections of these specifications lists the major components of work and material to be installed. In no way shall the omission of any reference to work or material implied by the drawings or specifications release the Contractor from performing or providing a complete and functional installation for the contract price as agreed upon at the time of contract award.

If the Contractor can identify work not included as part of other pay items, payment in L-100 shall be made under the following conditions. The work identified must not be described or shown on the plans, not listed as part of other pay items as identified in these specifications, and must be required to complete the work and provide a complete and functional installation. If this pay item is submitted upon, the contractor shall submit a list clearly identifying and describing each item claimed not to be part of the other pay items. This list shall be reviewing by the DIA Project Manager for approval.



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## MEASUREMENT AND PAYMENT

L-108 – UNDERGROUND POWER CABLE FOR AIRPORTS

## METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Counterpoise wire and all exothermic welds shall be incidental to either each base can installed or the linear feet of conduit installed.

Item L-108a Install Cable, 1/C #8, 19 Strand, 5000V, L-824, Type C

Cable installed in conduit shall be measured by the number of linear feet of cable installed in conduit, including L-823 connector kits, vinyl electrical tape, rubber electrical tape, Amerace T connectors, and cable tags in place, completed, ready for operation, and accepted as satisfactory.

Payment will be made at the contract unit price per linear foot of cable installed in conduit measured from center-to-center of lights or splice cans along the conduit path including cable slack and loops as measured and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-108b Install Cable, 1/C #8, 600V, Green Insulated Ground

Cable installed in conduit shall be measured by the number of linear feet of cable installed in conduit, including L-823 connector kits, vinyl electrical tape, rubber electrical tape, and cable tags in place, completed, ready for operation, and accepted as satisfactory.

Payment will be made at the contract unit price per linear foot of cable installed in conduit measured from center-to-center of lights or splice cans along the conduit path including cable slack and loops as measured and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

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**L-110 – AIRPORT UNDERGROUND ELECTRICAL DUCT BANKS AND CONDUITS****METHOD OF MEASUREMENT AND BASIS OF PAYMENT**Item L-110a Install 1-Way, 2-Inch PVC Duct in CLSM

Underground duct shall be measured by the linear feet of duct installed, including trenching, excavation, removal of excavated material, conduit, conduit chairs, conduit couplings, adhesives, counterpoise, CLSM encasement, backfill, compaction, all measured in place, completed, and accepted as satisfactory.

Payment for duct will be made at the contract unit price per linear foot for each type and size of duct completed and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-110b Install 1-Way, 2-Inch PVC Duct (CE), in Existing Pavement

Underground duct shall be measured by the linear feet of duct installed, including sawcutting existing asphalt pavement, demolition of existing asphalt pavement, disposal of existing asphalt pavement, disposal of asphalt treated permeable base course, disposal of cement treated base, trenching, excavation, removal and disposal of excavated material, conduit, conduit chairs, conduit couplings, adhesives, counterpoise, concrete encasement, backfill with and compaction of crushed aggregate, all measured in place, completed, and accepted as satisfactory.

Payment for duct will be made at the contract unit price per linear foot for each type and size of duct completed and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-110c Install 2-Way, 4-Inch PVC Duct (CE)

Underground duct shall be measured by the linear feet of duct installed, including trenching, excavation, removal of excavated material, conduit chairs, conduit couplings, adhesives, concrete encasement, counterpoise, red-dyed CLSM to within 10" of finished grade, backfill, compaction, all measured in place, completed, and accepted as satisfactory.

Payment for duct will be made at the contract unit price per linear foot for each type and size of duct completed and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to

complete this item.

**APPENDIX A**

**MEASUREMENT AND PAYMENT**

**L-122A – PROCURE CONSTANT CURRENT REGULATORS**

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

- Item L-122Aa Procure L-829 Constant Current Regulator with Integral Control, 10kW, 3-Step, 480V Input
- Item L-122Ab Procure L-829 Constant Current Regulator with Integral Control, 20kW, 3-Step, 480V Input
- Item L-122Ac Procure L-829 Constant Current Regulator with Integral Control, 30kW, 3-Step, 480V Input
- Item L-122Ad Procure L-829 Constant Current Regulator with Integral Control, 20kW, 5-Step, 480V Input
- Item L-122Ae Procure L-829 Constant Current Regulator with Integral Control, 30kW, 5-Step, 480V Input

The quantity of vault equipment to be paid for under this item shall be the number of each type delivered on-site to the contractor's equipment storage area and accepted by the DIA Project Manager.

Payment will be made at the contract unit price for each item procured in accordance with the plans and specifications. Procurement line item unit costs includes shipping costs to DIA and 3.62% city tax. State and RTD taxes are exempted based on the Contractor obtaining tax exempt status for this contract by filing State Form DR-0172. Questions regarding this form can be directed to (303)238-7378. This price shall be full compensation for furnishing each constant current regulator."

**APPENDIX A****MEASUREMENT AND PAYMENT****L-122C – INSTALL CONSTANT CURRENT REGULATORS****METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Item L-122Ca Install L-829 Constant Current Regulator with Integral Control, 10kW, 3-Step, 480V Input

Item L-122Cb Install L-829 Constant Current Regulator with Integral Control, 20kW, 5-Step, 480V Input

Item L-122Cc Install L-829 Constant Current Regulator with Integral Control, 30kW, 5-Step, 480V Input

The quantity of vault equipment to be paid for under this item shall be the number of each type CCR installed, complete and in place, ready for operation, and accepted by the DIA Project Manager. It shall also include the removal of existing CCR, ACE units, framing channel, S-1 cutouts and stands, conduit, and cable. The CCRs shall be salvaged to a location on DIA property as directed by the DIA Project Manager.

Incidental to Install L-829 Constant Current Regulator with Integral Control shall include reconnecting the existing airfield lighting control and monitoring system (ALCMS) manufactured by ADB, and the installation of an S-1 cutout(s) and cutout stand, framing channel, channel connections, rigid conduit, conduit couplings, liquid tight flexible metal conduit, cable (power and communication), and T-condulettes. The front of the equipment shall be aligned in a neat and orderly fashion as approved by the DIA Project Manager.

Payment will be made at the contract unit price per each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-122Cd Install L-829 Constant Current Regulator with Integral Control, 20kW, 3-Step, 480V Input

The quantity of vault equipment to be paid for under this item shall be the number of each CCR installed, complete and in place, ready for operation, and accepted by the DIA Project Manager. It shall also include the removal of existing CCR, ACE units, framing channel, S-1 cutouts and stands, conduit, and cable. The CCRs shall be salvaged to a location on DIA property as directed by the DIA Project Manager.

Incidental to Install L-829 Constant Current Regulator with Integral Control, 20kW, 3-Step, 480V Input shall include reconnecting the existing airfield lighting control and monitoring system (ALCMS) manufactured by ADB, and the installation of an S-1 cutout(s) and cutout stand, framing channel, channel connections, rigid conduit, conduit couplings, liquid tight flexible metal conduit, cable (power and communication), and T-condulettes. The front of the equipment shall be aligned in a neat and orderly fashion as approved by the DIA Project Manager.

Payment will be made at the contract unit price per each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-122Ce Install L-829 Constant Current Regulator with Integral Control, 30kW, 3-Step, 480V Input

The quantity of vault equipment to be paid for under this item shall be the number of each CCR installed, complete and in place, ready for operation, and accepted by the DIA Project Manager. It shall also include the removal of existing CCR, ACE units, framing channel, S-1 cutout and stand, conduit, and cable. The CCRs shall be salvaged to a location on DIA property as directed by the DIA Project Manager.

Incidental to Install L-829 Constant Current Regulator with Integral Control, 30kW, 3-Step, 480V Input shall include reconnecting the existing airfield lighting control and monitoring system (ALCMS) manufactured by ADB, and the installation of S-1 cutout and stand, framing channel, channel connections, rigid conduit, conduit couplings, liquid tight flexible metal conduit, cable (power and communication), and T-condulettes. Reinstall the Brite Master for the stop bar circuit. The front of the equipment shall be aligned in a neat and orderly fashion as approved by the DIA Project Manager.

Payment will be made at the contract unit price per each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-122Cf Install 30A, 3-Phase Bus Plug Circuit Breaker

Item L-122Cg Install 60A, 3-Phase Bus Plug Circuit Breaker

Item L-122Ch Install 90A, 3-Phase Bus Plug Circuit Breaker

The quantity of vault equipment to be paid for under this item shall be the number of each circuit breaker installed, complete and in place, ready for operation, and accepted by the DIA Project Manager. It shall also include the removal of the existing bus plug circuit breaker, conduit, and cable to the associated CCR. The circuit breaker shall be salvaged to a location on DIA property as directed by the DIA Project Manager.

Incidental to Install 3-Phase Bus Plug Circuit Breaker shall include a properly sized bus plug disconnect, conduit, conduit couplings, and cable to each new CCR. The bus plug disconnect shall be compatible with the existing bus duct, GE Spectra Series.

Payment will be made at the contract unit price per each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-122Ci Vault Modifications

Measurement for payment of Vault modifications shall be made per each. Incidental to removal of each existing pad-mounted 15kVA transformer shall include the removal of each bus plug disconnect, conduit, and cable. The circuit breaker shall be salvaged to a location on DIA property as directed by the DIA Project Manager. The transformer, conduit, and cable shall be disposed of off-site properly.

Payment will be made at the contract unit price per each piece of electrical equipment removed. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete this item.

## APPENDIX A

## MEASUREMENT AND PAYMENT

L-125 – AIRPORT LIGHTING SYSTEMS

## METHOD OF MEASUREMENT AND BASIS OF PAYMENT

|             |                                                                            |
|-------------|----------------------------------------------------------------------------|
| Item L-125a | <u>Procure L-850A(L) Runway Centerline Light</u>                           |
| Item L-125b | <u>Procure L-850B(L) Runway Touchdown Zone Light</u>                       |
| Item L-125c | <u>Procure L-850C Runway Edge Light</u>                                    |
| Item L-125d | <u>Procure L-852C(L) Unidirectional Taxiway Centerline Light</u>           |
| Item L-125e | <u>Procure L-852C(L) Bidirectional Taxiway Centerline Light</u>            |
| Item L-125f | <u>Procure L-852C(L) 2-Circuit, Bidirectional Taxiway Centerline Light</u> |
| Item L-125g | <u>Procure L-852D(L) Unidirectional Taxiway Centerline Light</u>           |
| Item L-125h | <u>Procure L-852D(L) Bidirectional Taxiway Centerline Light</u>            |
| Item L-125i | <u>Procure L-852K(L) Unidirectional Taxiway Centerline Light</u>           |
| Item L-125j | <u>Procure L-852K(L) Bidirectional Taxiway Centerline Light</u>            |
| Item L-125k | <u>Procure L-852K(L) 2-Circuit, Bidirectional Taxiway Centerline Light</u> |
| Item L-125l | <u>Procure L-852GS(L) 2-Circuit, Runway Stop Bar/Guard Light</u>           |
| Item L-125m | <u>Procure L-804(L) Elevated Runway Guard Light</u>                        |
| Item L-125n | <u>Procure L-861T Taxiway Edge Light</u>                                   |
| Item L-125o | <u>Procure L-862 Runway Edge Light</u>                                     |
| Item L-125p | <u>Procure L-862E Runway Threshold Light</u>                               |
| Item L-125q | <u>Procure L-862S Runway Stop Light</u>                                    |
| Item L-125r | <u>Procure Isolation Transformer, 100W, 5.5A/6.2A</u>                      |
| Item L-125s | <u>Procure Isolation Transformer, 150W, 5.5A/6.2A</u>                      |
| Item L-125t | <u>Procure Isolation Transformer, 200W, 5.5A/6.2A</u>                      |
| Item L-125u | <u>Procure Manhole 36" Stanchion</u>                                       |



## APPENDIX A – MEASUREMENT AND PAYMENT

Item L-125v Procure 8" Cable Rack Arm

Item L-125w Procure 11" Cable Rack Arm

The quantity of airfield lighting units and equipment to be paid for under this item shall be the number of each type delivered on-site and accepted by the DIA Project Manager.

LED fixtures shall be supplied with a heater kit.

If a certified L-852GS(L) fixture is unavailable at the time of bid this quantity shall be zero and no payment shall be made to the contractor under this bid item.

Elevated and inset light fixture procurement shall include the fixture only. Frangible couplings, cover plates, and isolation transformers sized as recommended by the manufacturer will be included as part of the various installation bid items.

Payment will be made at the contract unit price for each item procured in accordance with the plans and specifications. This price shall be full compensation for furnishing the airfield lighting equipment.

Item L-125x Procure 2" L-868B Base Can Extension

The quantity of airfield lighting units and equipment to be paid for under this item shall be the number of each type delivered on-site and accepted by the DIA Project Manager.

Payment will be made at the contract unit price for each item procured in accordance with the plans and specifications. This price shall be full compensation for furnishing the airfield lighting equipment.

Item L-125y Install L-850A(L) Runway Centerline Light

Item L-125z Install L-850B(L) Runway Touchdown Zone Light

Item L-125aa Install L-850C Runway Edge Light

Item L-125bb Install L-852C(L) Unidirectional Taxiway Centerline Light

Item L-125cc Install L-852C(L) Bidirectional Taxiway Centerline Light

Item L-125dd Install L-852C(L) 2-Circuit, Bidirectional Taxiway Centerline Light

Item L-125ee Install L-852D(L) Unidirectional Taxiway Centerline Light

Item L-125ff Install L-852D(L) Bidirectional Taxiway Centerline Light

Item L-125gg Install L-852K(L) Unidirectional Taxiway Centerline Light

Item L-125hh Install L-852K(L) Bidirectional Taxiway Centerline Light

Item L-125ii Install L-852K(L) 2-Circuit, Bidirectional Taxiway Centerline Light

The quantity of airfield lighting units to be paid for under this item shall be the number of each type installed, complete and in place, ready for operation, and accepted by the DIA

## APPENDIX A – MEASUREMENT AND PAYMENT

Project Manager. It shall also include the removal of the existing fixture and isolation transformer(s). The fixture shall be salvaged to a location on DIA property as directed by the DIA Project Manager. The isolation transformer(s) shall be disposed of off-site.

Incidental to Install Semi-Flush Light shall include properly sized isolation transformer(s), vinyl and rubber tape, fixture ground conductor, and retrofit ground lug. Each fixture includes the installation of SAE grade 2 bolts with ceramic-metallic/ fluorocarbon polymer coating, and two piece lock washers. Fixtures supplied for these items will be paid for under the various associated procurement bid items.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125jj Install L-852GS(L) 2-Circuit, Runway Stop Bar/Guard Light

The quantity of airfield lighting units to be paid for under this item shall be the number of each type installed, complete and in place, ready for operation, and accepted by the DIA Project Manager.

If a certified L-852GS(L) fixture is unavailable, this bid item shall have a quantity of zero and no payment shall be made to the contractor under this bid item.

Incidental to Install L-852GS(L) 2-Circuit, Runway Stop Bar/Guard Light shall include properly sized isolation transformer(s), installation of ADB Brite Remote, vinyl and rubber tape, fixture ground conductor, and retrofit ground lug. Each fixture includes the installation of SAE grade 2 bolts with ceramicmetallic/fluorocarbon polymer coating, and two piece lock washers. Fixtures and Brite remotes supplied for this item will be paid for under the procurement bid items L-125I and 13410Ae respectively.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125kk Install L-850A(L) Runway Centerline Light and Spacer Rings

Item L-125ll Install L-850B(L) Runway Touchdown Zone Light and Spacer Rings

Item L-125mm Install L-850C Runway Edge Light and Spacer Rings

Item L-125nn Install L-852C(L) Unidirectional Taxiway Centerline Light and Spacer Rings

Item L-125oo Install L-852C(L) Bidirectional Taxiway Centerline Light and Spacer Rings

Item L-125pp Install L-852C(L) 2-Circuit, Bidirectional Taxiway Centerline Light and Spacer Rings

Item L-125qq Install L-852D(L) Unidirectional Taxiway Centerline Light and Spacer Rings

Item L-125rr Install L-852D(L) Bidirectional Taxiway Centerline Light and Spacer Rings

## APPENDIX A – MEASUREMENT AND PAYMENT

Item L-125ss Install L-852K(L) Unidirectional Taxiway Centerline Light and Spacer Rings

Item L-125tt Install L-852K(L) Bidirectional Taxiway Centerline Light and Spacer Rings

Item L-125uu Install L-852K(L) 2-Circuit, Bidirectional Taxiway Centerline Light and Spacer Rings

The quantity of airfield lighting units to be paid for under this item shall be the number of each type installed, complete and in place, ready for operation, and accepted by the DIA Project Manager. It shall also include the removal of the existing fixture, spacer ring(s), spacer ring with concrete dam, and isolation transformer(s). The fixture shall be salvaged to a location on DIA property as directed by the DIA Project Manager. The spacer rings and isolation transformer(s) shall be disposed of off-site.

Incidental to Install Semi-Flush Light shall include new galvanized steel spacer ring(s), new galvanized steel spacer ring with concrete dam, o-ring, adhesive, sealant, epoxy, properly sized isolation transformer(s), vinyl and rubber tape, fixture ground conductor, and retrofit ground lug. Each fixture includes the installation of SAE grade 2 bolts with ceramicmetallic/fluorocarbon polymer coating, and two piece lock washers. Fixtures supplied for these items will be paid for under the various associated procurement bid items.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125vv Install L-852GS(L) 2-Circuit, Runway Stop Bar/Guard Light and Spacer Rings

The quantity of airfield lighting units to be paid for under this item shall be the number of each type installed, complete and in place, ready for operation, and accepted by the DIA Project Manager.

If a certified L-852GS(L) fixture is unavailable, this bid item shall have a quantity of zero and no payment shall be made to the contractor under this bid item.

Incidental to Install L-852GS(L) 2-Circuit, Runway Stop Bar/Guard Light shall include new galvanized steel spacer ring(s), new galvanized steel spacer ring with concrete dam, o-ring, adhesive, sealant, epoxy, properly sized isolation transformer(s), installation of ADB Brite Remote, vinyl and rubber tape, fixture ground conductor, and retrofit ground lug. Each fixture includes the installation of SAE grade 2 bolts with ceramicmetallic/fluorocarbon polymer coating, and two piece lock washers. Fixtures and Brite remotes supplied for this item will be paid for under the procurement bid items L-125l and 13410Ae respectively.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125ww Install L-850C Runway Edge Light and Adapter Plate

The quantity of airfield lighting units to be paid for under this item shall be the number of

each type installed, complete and in place, ready for operation, and accepted by the DIA Project Manager. It shall also include the removal of the existing fixture, spacer ring(s), spacer ring with concrete dam or snow plow ring, and isolation transformer. The fixture shall be salvaged to a location on DIA property as directed by the DIA Project Manager. The spacer rings and isolation transformer(s) shall be disposed of off-site.

Incidental to Install L-850C Runway Edge Light and Adapter Ring shall include, new galvanized steel spacer ring(s), new galvanized adapter plate with o-ring, adhesive, sealant, epoxy, properly sized isolation transformer, vinyl and rubber tape, fixture ground conductor, and retrofit ground lug. Each fixture includes the installation of SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating, and two piece lock washers. Fixtures supplied for this item will be paid for under the procurement bid item L-125c.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125xx Install L-852C(L) Bidirectional Taxiway Centerline Light on a New Foundation

Item L-125yy Install L-852D(L) Unidirectional Taxiway Centerline Light on a New Foundation

The quantity of airfield lighting units to be paid for under this item shall be the number of each type installed, complete and in place, ready for operation, and accepted by the DIA Project Manager. It shall also include reconnection to existing conduits and counterpoise wire.

Incidental to Install Semi-Flush Light on a New Foundation shall include a, new Size B 24" deep L-868 galvanized steel base can, internal and external ground lug, new galvanized steel spacer ring(s), new galvanized steel spacer ring with concrete dam, rubber grommets, end bells, rebar, concrete, oring, adhesive, sealant, epoxy, properly sized isolation transformer, vinyl and rubber tape, ground rod, and fixture ground conductor. Each fixture includes the installation of SAE grade 2 bolts with ceramicmetallic/fluorocarbon polymer coating, two piece lock washers, and fixture ID marker. Fixtures supplied for these items will be paid for under the various associated procurement bid items. Installation of conduit and counterpoise to reconnect to existing shall be incidental to this line item and shall not be measured or paid for separately.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125zz Install L-804(L) Elevated Runway Guard Light

The quantity of airfield lighting units to be paid for under this item shall be the number of each type installed, complete and in place, ready for operation, and accepted by the DIA Project Manager. It shall also include the removal of the existing fixture and isolation transformer. The fixture shall be salvaged to a location on DIA property as directed by the DIA Project Manager. The isolation transformer shall be disposed of off-site.

Incidental to Install L-804(L) Elevated Runway Guard Light shall include properly sized isolation transformer, tether, heavy duty baseplate, rubber gasket, vinyl and rubber tape, fixture ground conductor, and retrofit ground lug. Each fixture includes the installation of SAE grade 2 bolts with ceramicmetallic/fluorocarbon polymer coating. Aim per the drawings. Fixtures supplied for this item will be paid for under the procurement bid item L-125m.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125aaa Install L-861T Taxiway Edge Light

Item L-125bbb Install L-862 Runway Edge Light

Item L-125ccc Install L-862E Runway Threshold Light

The quantity of airfield lighting units to be paid for under this item shall be the number of each type installed, complete and in place, ready for operation, and accepted by the DIA Project Manager. It shall also include the removal of the existing fixture and isolation transformer. The fixture shall be salvaged to a location on DIA property as directed by the DIA Project Manager. The isolation transformer shall be disposed of off-site.

Incidental to Install Elevated Edge Light shall include properly sized isolation transformer, corten baseplate, rubber gasket, vinyl and rubber tape, fixture ground conductor, and retrofit ground lug. Each fixture includes the installation of SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating. Fixtures supplied for these items will be paid for under the various associated procurement bid items.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125ddd Install L-862S Runway Stop Light

The quantity of airfield lighting units to be paid for under this item shall be the number of each type installed, complete and in place, ready for operation, and accepted by the DIA Project Manager. It shall also include the removal of the existing fixture, isolation transformer, and ADB Brite Remote. The fixture and ADB Brite Remote shall be salvaged to a location on DIA property as directed by the DIA Project Manager. The isolation transformer shall be disposed of off-site.

Incidental to Install L-862 Runway Stop Light shall include properly sized isolation transformer, installation of ADB Brite Remote, corten baseplate, rubber gasket, vinyl and rubber tape, fixture ground conductor, and retrofit ground lug. Each fixture includes the installation of SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating. Aim per the drawings. Fixtures and Brite remotes supplied for this item will be paid for under the procurement bid items L-125q and 13410Ad respectively.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125eee Install Isolation Transformer, 100W, 5.5A/6.2A

Item L-125fff Install Isolation Transformer, 150W, 5.5A/6.2A

Item L-125ggg Install Isolation Transformer, 200W, 5.5A/6.2A

The quantity of airfield equipment to be paid for under this item shall be the number of each type installed, complete and in place, ready for operation, and accepted by the DIA Project Manager. It shall also include the removal and proper disposal of existing sign isolation transformer.

Incidental to Install Isolation Transformer, 5.5A/6.2A shall include installation of rubber and vinyl tape, rubber gasket, including SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating to affix the cover plate to the base can. Isolation transformers supplied for these items will be paid for under the various associated procurement bid items.

Payment will be made at the contract unit price per each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125hhh Install Manhole 36" Stanchion

The quantity of units to be paid for under this item shall be the number complete and in place and accepted by the DIA Project Manager.

Incidental to Install Manhole 36" Stanchion shall include removal and disposal of existing stanchions and arms, as well as installation of new stanchion using stainless steel expansion anchors. Stanchions supplied for this item will be paid for under the procurement bid item L-125u

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125iii Install 8" Cable Rack Arm

Item L-125jjj Install 11" Cable Rack Arm

The quantity of units to be paid for under this item shall be the number complete and in place and accepted by the DIA Project Manager.

Payment will be made at the contract unit price for each item completed in accordance with

the plans and specifications by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item. Cable rack arms supplied for these items will be paid for under the procurement bid items L-125v and L-125w.

Item L-125kkk Install 2" L-868B Base Can Extension

The quantity of units to be paid for under this item shall be the number complete and in place and accepted by the DIA Project Manager.

Incidental to Install 2" L-868B Base Can Extension shall include adhesive, sealant, and SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating. Base can extensions supplied for this item will be paid for under the procurement bid item L-125x.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125lll Install Fixture ID Marker

The quantity of markers to be paid for under this item shall be the number of each installed, complete and in place, ready for operation, and accepted by the DIA Project Manager

Incidental to Install Fixture ID Marker shall include a new brass ID marker stamped as indicated on the drawings, core pavement, and cementitious grout.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125mmm Remove Fixture, Epoxy, and Spacer Rings and Install Spacer Rings, Coverplate, and Epoxy

The quantity of units to be paid for under this item shall be the number of each type removed and installed, complete and in place, ready for operation, and accepted by the DIA Project Manager. It shall also include the removal of the existing epoxy, spacer ring(s), spacer ring with concrete dam, and cover plate or fixture. The cover plate or fixture shall be salvaged to a location on DIA property as directed by the DIA Project Manager. The spacer rings shall be disposed of off-site.

Incidental to Remove Fixture, Epoxy, and Spacer Rings and Install Spacer Rings, Coverplate, and Epoxy shall include a new 12" diameter galvanized steel cover plate with recessed bolt holes, new galvanized steel spacer ring(s), new galvanized steel spacer ring with concrete dam, o-ring, adhesive, sealant, and epoxy. Each cover plate includes the installation of SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating, and

two piece lock washers.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125nnn Remove Fixture and Install Coverplate

The quantity of units to be paid for under this item shall be the number of each type removed and installed, complete and in place, ready for operation, and accepted by the DIA Project Manager. It shall also include the removal of the existing fixture. The fixture shall be salvaged to a location on DIA property as directed by the DIA Project Manager.

Incidental to Remove Fixture and Install Coverplate shall include a new 12" diameter galvanized steel cover plate with recessed bolt holes, o-ring, adhesive, and sealant. Each cover plate includes the installation of SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating, and two piece lock washers.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125ooo Remove and Install Fixture ID Marker

The quantity of markers to be paid for under this item shall be the number of each installed, complete and in place, ready for operation, and accepted by the DIA Project Manager. It shall also include the removal and disposal of the existing brass marker.

Incidental to Remove and Install Fixture ID Marker shall include a new brass ID marker stamped as indicated on the drawings and cementitious grout.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125ppp Remove L-852GS 2-Circuit, Runway Stop Bar/Guard Light

The quantity of units to be paid for under this item shall be the number of each type remove, and accepted by the DIA Project Manager. It shall also include the removal of the existing L-852GS fixture, ADB Brite Remote, and isolation transformers. The fixture and ADB Brite Remote shall be salvaged to a location on DIA property as directed by the DIA Project Manager. The isolation transformer shall be disposed of properly.

It shall also include the removal of the spacer ring(s) and spacer ring with concrete dam, per the drawings. The spacer rings shall be disposed of off-site.

Payment will be made at the contract unit price for each item removed in accordance with



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the plans and specifications that is completed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125qqq Reinstall L-852GS 2-Circuit, Runway Stop Bar/Guard Light

The quantity of airfield lighting units to be paid for under this item shall be the number of each type reinstalled, complete and in place, ready for operation, and accepted by the DIA Project Manager.

If a certified L-852GS(L) fixture is available, this bid item shall have a quantity of zero and no payment shall be made to the contractor under this bid item.

Incidental to Reinstall L-852GS 2-Circuit, Runway Stop Bar/Guard Light shall include new properly sized isolation transformers, new lamps, installation of ADB Brite Remote, vinyl and rubber tape, fixture ground conductor, and retrofit ground lug. Each fixture includes the installation of SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating, and two piece lock washers. Brite remotes supplied for this item will be paid for under the procurement bid item 13410Ae.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125rrr Reinstall L-852GS 2-Circuit, Runway Stop Bar/Guard Light and Spacer Rings

The quantity of airfield lighting units to be paid for under this item shall be the number of each type installed, complete and in place, ready for operation, and accepted by the DIA Project Manager.

If a certified L-852GS(L) fixture is available, this bid item shall have a quantity of zero and no payment shall be made to the contractor under this bid item.

Incidental to Reinstall L-852GS 2-Circuit, Runway Stop Bar/Guard Light and Spacer Rings shall include new galvanized steel spacer ring(s), new galvanized steel spacer ring with concrete dam, o-ring, adhesive, sealant, epoxy, properly sized isolation transformers, new lamps, installation of ADB Brite Remote, vinyl and rubber tape, fixture ground conductor, and retrofit ground lug. Each fixture includes the installation of SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating, and two piece lock washers. Brite remotes supplied for this item will be paid for under the procurement bid item 13410Ae.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125sss Drill Out Existing Bolt and Rethread Existing Bolt Hole

The quantity of units to be paid for under this item shall be the number complete and in place and accepted by the DIA Project Manager.

Incidental to Drill Out Existing Bolt and Rethread Existing Bolt Hole shall include a manufacturer recommended template to drill and tap the existing bolt holes in the base can top flange, so that the new tapped bolt holes are at the correct location and aligned properly.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125ttt CSS Rack Modifications

The quantity of airfield equipment to be paid for under this item shall be the number of each type modified, complete and in place, ready for operation, and accepted by the DIA Project Manager. It shall also include the removal of conduit, old CTs, and a section of reinforced concrete foundation. Contractor shall properly dispose of the CTs and reinforced concrete off-site.

Incidental to CSS Rack Modifications shall include installation of Size B 24" deep galvanized steel base can, rubber grommets, rubber gasket, end bells, base plate, concrete, welded wire fabric, adhesive, and sealant, including SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating to affix the base plate to the base can.

Installation of fiberglass strut to the backboard and mounting of existing CTs to the strut, per the drawings.

Payment will be made at the contract unit price per each item completed in accordance with the plans and specifications that is modified by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item L-125uuu Modify Unidirectional Light Fixture Base Cans with Toe-in

The quantity of modified base cans to be paid for under this item shall be per each base can modified and accepted by the DIA Project Manager. It shall include the installation of six hex head plugs and Loctite in bolt holes aligned for fixtures set tangent to the taxiway centerline marking.

Payment will be made at the contract unit price per each item completed in accordance with the plans and specifications that is modified by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

L-125vvv Install L-858(L) Guidance Sign, Size 3, 2 Module, 1 Face, Style 5

The quantity of airfield guidance signs to be paid for under this item shall be the number of each type installed, complete and in place, ready for operation, and accepted by the DIA Project Manager.

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Incidental to Install L-858(L) Guidance Sign, Size 3, 2 Module, 1 Face, Style 5 shall include procurement and installation of a new sign as noted, properly sized isolation transformer, vinyl and rubber tape, L-867 Size B base can, galvanized steel cover plate, SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating, two piece lock washers, concrete, wire mesh, ground rod with inspection pit, secondary cable extension, and sign ID marker,

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

L-125www Procure L-868 Base Cans, Size B, 24" Deep

The quantity of light base cans to be paid for under this item shall be the number of each type supplied and shipped to the project site. Incidental to the base cans are four-2" grommet openings at 90° increments, load ring, 3 anti-rotation fins, internal and external ground lugs, and Class 1A.

Payment will be made at the contract unit price for each item procured and shipped to the Airport and accepted by the DIA Project Manager.

Contractor shall provide spare fixtures per the tables below:

| SCHEDULE A SPARE FIXTURE LIST                               |                  |          |
|-------------------------------------------------------------|------------------|----------|
| FIXTURE TYPE                                                | LENS COLOR       | QUANTITY |
| L-850A(L) Runway Centerline Light                           | C/C              | 12       |
| L-850A(L) Runway Centerline Light                           | R/C              | 6        |
| L-850B(L) Runway Touchdown Zone Light                       | C                | 13       |
| L-850C Runway Edge Light                                    | C/C              | 1        |
| L-850C Runway Edge Light                                    | C/Y LEFT TOE-IN  | 1        |
| L-850C Runway Edge Light                                    | C/Y RIGHT TOE-IN | 1        |
| L-852C(L) Unidirectional Taxiway Centerline Light           | G                | 2        |
| L-852C(L) Unidirectional Taxiway Centerline Light           | Y                | 1        |
| L-852C(L) Bidirectional Taxiway Centerline Light            | G/G              | 20       |
| L-852C(L) 2-Circuit, Bidirectional Taxiway Centerline Light | G/G              | 1        |
| L-852C(L) 2-Circuit, Bidirectional Taxiway Centerline Light | Y/Y              | 1        |
| L-852D(L) Unidirectional Taxiway Centerline Light           | G                | 5        |
| L-852D(L) Unidirectional Taxiway Centerline Light           | Y                | 5        |
| L-852K(L) Unidirectional Taxiway Centerline Light           | G LEFT TOE-IN    | 1        |
| L-852K(L) Unidirectional Taxiway Centerline Light           | G RIGHT TOE-IN   | 1        |
| L-852K(L) Unidirectional Taxiway Centerline Light           | Y LEFT TOE-IN    | 1        |
| L-852K(L) Unidirectional Taxiway Centerline Light           | Y RIGHT TOE-IN   | 1        |
| L-852K(L) Bidirectional Taxiway Centerline Light            | G/G              | 8        |
| L-852K(L) 2-Circuit, Bidirectional Taxiway Centerline Light | G/G              | 1        |
| L-852K(L) 2-Circuit, Bidirectional Taxiway Centerline Light | Y/Y              | 1        |

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|                                      |                  |   |
|--------------------------------------|------------------|---|
| L-804(L) Elevated Runway Guard Light | Y                | 2 |
| L-862 Runway Edge Light              | C/C              | 4 |
| L-862 Runway Edge Light              | C/Y LEFT TOE-IN  | 2 |
| L-862 Runway Edge Light              | C/Y RIGHT TOE-IN | 2 |
| L-862E Runway Threshold Light        | R/G LEFT TOE-IN  | 1 |
| L-862E Runway Threshold Light        | R/G RIGHT TOE-IN | 1 |
| L-862S Runway Stop Light             | R                | 2 |

| SCHEDULE B SPARE FIXTURE LIST |            |          |
|-------------------------------|------------|----------|
| FIXTURE TYPE                  | LENS COLOR | QUANTITY |
| L-861T Taxiway Edge Light     | B          | 34       |

| SCHEDULE C SPARE FIXTURE LIST                     |            |          |
|---------------------------------------------------|------------|----------|
| FIXTURE TYPE                                      | LENS COLOR | QUANTITY |
| L-852C(L) Unidirectional Taxiway Centerline Light | G          | 6        |
| L-852C(L) Bidirectional Taxiway Centerline Light  | G/G        | 2        |
| L-852D(L) Bidirectional Taxiway Centerline Light  | G          | 1        |
| L-852K(L) Bidirectional Taxiway Centerline Light  | G/G        | 11       |
| L-861T Taxiway Edge Light                         | B          | 11       |

| SCHEDULE D SPARE FIXTURE LIST                    |            |          |
|--------------------------------------------------|------------|----------|
| FIXTURE TYPE                                     | LENS COLOR | QUANTITY |
| L-852C(L) Bidirectional Taxiway Centerline Light | G/G        | 19       |
| L-852K(L) Bidirectional Taxiway Centerline Light | G/G        | 6        |
| L-861T Taxiway Edge Light                        | B          | 22       |

| SCHEDULE I SPARE FIXTURE LIST                     |            |          |
|---------------------------------------------------|------------|----------|
| FIXTURE TYPE                                      | LENS COLOR | QUANTITY |
| L-852C(L) Bidirectional Taxiway Centerline Light  | G/G        | 1        |
| L-852D(L) Unidirectional Taxiway Centerline Light | Y          | 1        |

| SCHEDULE J SPARE FIXTURE LIST                     |            |          |
|---------------------------------------------------|------------|----------|
| FIXTURE TYPE                                      | LENS COLOR | QUANTITY |
| L-852GS(L) 2-Circuit, Runway Stop Bar/Guard Light | R/Y        | 8        |

The fixtures shall be incidental to the respective procure bid item for each Schedule.

**APPENDIX A****MEASUREMENT AND PAYMENT****L-127 – AIRPORT 8-FOOT WINDCONES****METHOD OF MEASUREMENT AND BASIS OF PAYMENT****Item L-127a     Remove and Install Externally Lighted L-806(L) Supplemental Wind Cone**

The quantity of airfield lighting units to be paid for under this item shall be the number of each type removed and installed, complete and in place, ready for operation, and accepted by the DIA Project Manager. It shall also include the removal of the existing wind cone and power adapter. The existing windcone and power adapter shall be salvaged to a location on DIA property as directed by the DIA Project Manager.

Incidental to Remove and Install Externally Lighted L-806(L) Supplemental Wind Cone shall include a new wind cone as noted, LED light kit, isolation transformer, anchor bolts as required, including the installation of SAE grade 2 bolts with ceramic-metallic/fluorocarbon polymer coating, neoprene gasket, and two piece lock washers.

Payment will be made at the contract unit price for each item completed in accordance with the plans and specifications that is installed by the Contractor and accepted by the DIA Project Manager. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

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**L-139 – TEMPORARY CONSTRUCTION MARKER LIGHTS**

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

There shall be no direct measurement for temporary construction items under L-139. All measurement for these items is covered under specification 01576a, Traffic Control.

There shall be no direct payment for temporary construction items under L-139. All payment for these items is covered under specification 01576a, Traffic Control.

**APPENDIX A****MEASUREMENT AND PAYMENT****L-140 – FIELD PHOTOMETRIC TESTING****METHOD OF MEASUREMENT AND BASIS OF PAYMENT**Item L-140a Photometric Testing for Runway 8-26 Complex Light Fixtures

Runway and taxiway light photometric testing shall be measured as lump sum for all runway and taxiway semi-flush light fixtures as well as runway elevated and threshold light fixtures verified as correct and ready for operation, with documentation submitted to and accepted by the DIA Project Manager.

Payment will be made at the contract unit price per lump sum for completed and approved testing of new lights. This price shall include all labor, equipment, and materials necessary to completely perform all of the work specified, including retesting of the fixtures found to be deficient in the initial testing and corrected by the Contractor. Any photometric retesting shall be paid by the Contractor and is incidental to the installation of the lighting systems.

Item L-140b Photometric Testing for Taxiway “EE”, “M” and “L” Light FixturesItem L-140c Photometric Testing for Taxiway “Z” Light FixturesItem L-140d Photometric Testing for Clearance Bar Light Fixtures

Taxiway light photometric testing shall be measured as lump sum for taxiway semi-flush light fixtures verified as correct and ready for operation, with documentation submitted to and accepted by the DIA Project Manager.

Payment will be made at the contract unit price per lump sum for completed and approved testing of new lights. This price shall include all labor, equipment, and materials necessary to completely perform all of the work specified, including retesting of the fixtures found to be deficient in the initial testing and corrected by the Contractor. Any photometric retesting shall be paid by the Contractor and is incidental to the installation of the lighting systems.

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**T-901 SEEDING**

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Item T-901a    Seeding

All seeding work shall be measured in square yards on the basis of actual surface area acceptably seeded.

Payment shall be made at the contract unit price per square yard or fraction thereof. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.



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**MEASUREMENT AND PAYMENT**

**T-905 - TOPSOILING**

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

There shall be no direct measurement of topsoiling under T-905. All measurement for this item is covered under Specification P-152 "Item P-152a Topsoil Embankment from Stockpile"

There shall be no direct payment of topsoiling under T-905. All payment for this item is covered under Specification P-152 "Item P-152a Topsoil Embankment from Stockpile"

**TOPSOIL EMBANKMENT FROM STOCKPILE**

**APPENDIX A**

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**T-908 - MULCHING**

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Item T-908a    Hydraulic Mulching

All mulching work shall be measured in square yards on the basis of actual surface area acceptably mulched.

Payment for mulching shall be made at the contract unit price per square yard or fraction thereof. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

**APPENDIX A****MEASUREMENT AND PAYMENT****13410A – AIRFIELD LIGHTING CONTROL AND MONITORING SYSTEM MODIFICATIONS****METHOD OF MEASUREMENT AND BASIS OF PAYMENT**Item 13410Aa ALCMS Modifications, Testing, and Calibration Services for Runway 8-26 Complex

The software testing and calibration shall be measured as lump sum for ALCMS modified, complete and in place, ready for operation, and accepted by the DIA Project Manager. It shall include the readdressing of existing Brite Remotes to their reinstalled locations by the Contractor to the satisfaction of the DIA Project Manager.

Incidental to ADB Airfield Solutions Testing and Calibration Services shall include readdressing of Brite units and addressing of the ACE units to communicate with the ALCMS, provide for monitoring of contractor installed Circuit Selector Switch local/remote switches, modification of control screens to represent changes to the circuiting as part of Schedule A, and modification of the east vault network.

Payment will be made at the contract unit price per lump sum for completed and approved testing and calibration services of the control system, network, as well as operational test. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item 13410Ab ALCMS Modifications, Testing, and Calibration Services for Taxiways EE, M, and L

The software testing and calibration shall be measured as lump sum for ALCMS modified, complete and in place, ready for operation, and accepted by the DIA Project Manager.

Testing and Calibration Services for Taxiways EE, M, and L shall include modification of control screens to represent changes to the circuiting as part of Schedule C.

Payment will be made at the contract unit price per lump sum for completed and approved testing and calibration services of the control system, network, as well as operational test. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item 13410Ac ALCMS Modifications, Testing, and Calibration Services for East Vault

The software testing and calibration shall be measured as lump sum for ALCMS modified, complete and in place, ready for operation, and accepted by the DIA Project Manager.

Testing and Calibration Services for East Vault shall include modification of the east vault

network.

Payment will be made at the contract unit price per lump sum for completed and approved testing and calibration services of the control system, network, as well as operational test. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item 13410Ad Procure Brite III Remote Unit, One Channel

Item 13410Ae Procure Brite III Remote Unit, Dual Channel

The quantity of Brite remotes to be paid for under this item shall be the number of each type delivered on-site and accepted by the DIA Project Manager.

Payment will be made at the contract unit price for each item procured in accordance with the plans and specifications. Procurement line item unit costs includes shipping costs to DIA and 3.62% city tax. State and RTD taxes are exempted based on the Contractor obtaining tax exempt status for this contract by filing State Form DR-0172. Questions regarding this form can be directed to (303)238-7378. This price shall be full compensation for furnishing each Brite remote equipment.

Item 13410Af Procure Sensors and ALCMS Modifications for Monitoring the Remote/Off/Local Switches for Three Remote I/O Racks Along Runway 8-26

The quantity of remote/off/local position sensors shall be measured per lump sum for ALCMS modifications, complete and in place, ready for operation, and accepted by the DIA Project Manager.

Payment will be made at the contract unit price per lump sum for the total number of items procured. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation instructions of these materials, and for all incidentals necessary to complete this item. Payment for software modifications associated with the installation of the Circuit Selector Switch local/off/remote switches will be paid for as part of Item 13410Aa.

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**13410C – CONSTRUCTION FOR THE AIRFIELD LIGHTING CONTROL AND MONITORING SYSTEM MODIFICATIONS**

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Item 13410Ca Construction for Runway 8-26 ALCMS Modifications

The construction quantity for the Brite remote installation, software testing and calibration to be paid for under this item shall be by the lump sum for a complete and in place, ready for operation, and accepted ALCMS modification by the DIA Project Manager.

Runway 8-26 ALCMS modification shall include installation of new Brite units to communicate with the ALCMS, proper connection of Brite units to fixture and isolation transformer with the use of rubber and vinyl tape, and assisting ADB personnel as required for completion of the ALCMS modifications.

Payment will be made at the contract unit price per lump sum for completed and approved testing and calibration services of the control system, network, as well as operational test. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item 13410Cb Construction for the Vault ALCMS Modifications

The East Lighting Vault modifications, software testing and calibration to be paid for under this item shall be by the lump sum for a complete and in place, ready for operation, and accepted ALCMS modification by the DIA Project Manager.

Vault ALCMS modification shall include installation of communications loops within the East Lighting Vault between the ACE units, and assisting ADB personnel as required for completion of the ALCMS modifications.

Payment will be made at the contract unit price per lump sum for completed and approved testing and calibration services of the control system, network, as well as operational test. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

**END OF APPENDIX A**



**APPENDIX A**  
**MEASUREMENT AND PAYMENT ITEMS**

|         |                                                                  |                 |
|---------|------------------------------------------------------------------|-----------------|
| 01505a  | Mobilization.....                                                | per lump sum    |
| 01566a  | Erosion Control Sediment Log .....                               | per linear foot |
| 01575a  | Cover Elevated Edge Lights.....                                  | per each        |
| 01575b  | Cover Panel on Guidance Signs .....                              | per each        |
| 01575c  | Install Shorting Plug on Secondary of Isolation Transformer..... | per each        |
| 01575d  | Install Tie Back .....                                           | per each        |
| 01575e  | Install Temporary Jumper.....                                    | per linear foot |
| 01575f  | Install Isolation Transformer, 65W, 6.6A/6.6A.....               | per each        |
| 01575g  | Maintain Lighted X's .....                                       | per lump sum    |
| 01576a  | Traffic Control.....                                             | per lump sum    |
| P-150a  | Remove Taxiway Centerline Light and Foundation .....             | per each        |
| P-150b  | Remove Taxiway Edge Light and Install Blank Cover Plate .....    | per each        |
| P-150c  | Remove Asphalt Shoulder.....                                     | per square yard |
| P-150d  | Remove 17-inch Non-Reinforced Concrete Pavement.....             | per square yard |
| P-150e  | Remove 17-inch Reinforced Concrete Pavement.....                 | per square yard |
| P-152a  | Topsoil Embankment from Stockpile.....                           | per cubic yard  |
| P-152b  | Unclassified Excavation, Embankment On Site .....                | per cubic yard  |
| P-161a  | Bondbreaker Fabric.....                                          | per square yard |
| P-161b  | Geotextile Fabric .....                                          | per square yard |
| P-304Ca | Crushed Aggregate Base Course, CDOT Class 6 (10-Inch) .....      | per square yard |
| P-401Ca | CDOT Bituminous Surface Course (3-Inch).....                     | per ton         |
| P-401Cb | CDOT Bituminous Surface Course (6-Inch).....                     | per ton         |

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|         |                                                                                                               |                 |
|---------|---------------------------------------------------------------------------------------------------------------|-----------------|
| P-401Cc | CDOT Bituminous Base Course (7-Inch).....                                                                     | per ton         |
| P-403a  | Asphalt Treated Permeable Base Course (5-Inch).....                                                           | per square yard |
| P-501a  | 17-inch Portland Cement Concrete Pavement, Plain.....                                                         | per square yard |
| P-501b  | 17-inch Portland Cement Concrete Pavement, Reinforced.....                                                    | per square yard |
| D-705a  | 6-Inch Non-Perforated Corrugated Polyethylene Underdrain Pipe.....                                            | per linear foot |
| D-751a  | Adjust Existing Electrical Manhole .....                                                                      | per each        |
| L-108a  | Install Cable, 1/C #8, 7 Strand, 5000V, L-824, Type C.....                                                    | per linear foot |
| L-108b  | Install Cable, 1/C #8, 600V, Green Insulated Ground.....                                                      | per linear foot |
| L-110a  | Install 1-Way, 2-Inch PVC Duct in CLSM.....                                                                   | per linear foot |
| L-110b  | Install 1-Way, 2-Inch PVC Duct (CE), in Existing Pavement.....                                                | per linear foot |
| L-110c  | Install 2-Way, 4-Inch PVC Duct (CE) .....                                                                     | per linear foot |
| L-122Aa | Procure L-829 Constant Current Regulator with Integral Control, 10kW, 3-Step, 480V Input....<br>.....         | per each        |
| L-122Ab | Procure L-829 Constant Current Regulator with Integral Control, 20kW, 3-Step, 480V Input....<br>.....         | per each        |
| L-122Ac | Procure L-829 Constant Current Regulator with Integral Control, 30kW, 3-Step, 480V Input....<br>.....         | per each        |
| L-122Ad | Procure L-829 Constant Current Regulator with Integral Control, 20kW, 5-Step, 480V Input....<br>.....         | per each        |
| L-122Ae | Procure L-829 Constant Current Regulator with Integral Control, 30kW, 5-Step, 480V Input....<br>.....         | per each        |
| L-122Ca | Install L-829 Constant Current Regulator with Integral Control, 10kW, 3-Step, 480V Input<br>.....<br>per each |                 |
| L-122Cb | Install L-829 Constant Current Regulator with Integral Control, 20kW, 5-Step, 480V Input<br>.....<br>per each |                 |
| L-122Cc | Install L-829 Constant Current Regulator with Integral Control, 30kW, 5-Step, 480V Input<br>.....<br>per each |                 |
| L-122Cd | Install L-829 Constant Current Regulator with Integral Control, 20kW, 3-Step, 480V Input<br>.....<br>per each |                 |



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|         |                                                                                                               |          |
|---------|---------------------------------------------------------------------------------------------------------------|----------|
| L-122Ce | Install L-829 Constant Current Regulator with Integral Control, 30kW, 3-Step, 480V Input<br>.....<br>per each |          |
| L-122Cf | Install 30A, 3-Phase Bus Plug Circuit Breaker.....                                                            | per each |
| L-122Cg | Install 60A, 3-Phase Bus Plug Circuit Breaker.....                                                            | per each |
| L-122Ch | Install 90A, 3-Phase Bus Plug Circuit Breaker.....                                                            | per each |
| L-122Ci | Vault Modifications .....                                                                                     | per each |
| L-125a  | Procure L-850A(L) Runway Centerline Light .....                                                               | per each |
| L-125b  | Procure L-850B(L) Runway Touchdown Zone Light.....                                                            | per each |
| L-125c  | Procure L-850C Runway Edge Light.....                                                                         | per each |
| L-125d  | Procure L-852C(L) Unidirectional Taxiway Centerline Light.....                                                | per each |
| L-125e  | Procure L-852C(L) Bidirectional Taxiway Centerline Light .....                                                | per each |
| L-125f  | Procure L-852C(L) 2-Circuit, Bidirectional Taxiway Centerline Light.....                                      | per each |
| L-125g  | Procure L-852D(L) Unidirectional Taxiway Centerline Light.....                                                | per each |
| L-125h  | Procure L-852D(L) Bidirectional Taxiway Centerline Light .....                                                | per each |
| L-125i  | Procure L-852K(L) Unidirectional Taxiway Centerline Light .....                                               | per each |
| L-125j  | Procure L-852K(L) Bidirectional Taxiway Centerline Light .....                                                | per each |
| L-125k  | Procure L-852K(L) 2-Circuit, Bidirectional Taxiway Centerline Light.....                                      | per each |
| L-125l  | Procure L-852GS(L) 2-Circuit, Runway Stop Bar/Guard Light .....                                               | per each |
| L-125m  | Procure L-804(L) Elevated Runway Guard Light .....                                                            | per each |
| L-125n  | Procure L-861T Taxiway Edge Light.....                                                                        | per each |
| L-125o  | Procure L-862 Runway Edge Light .....                                                                         | per each |
| L-125p  | Procure L-862E Runway Threshold Light .....                                                                   | per each |
| L-125q  | Procure L-862S Runway Stop Light.....                                                                         | per each |
| L-125r  | Procure Isolation Transformer, 100W, 5.5A/6.2A .....                                                          | per each |
| L-125s  | Procure Isolation Transformer, 150W, 5.5A/6.2A .....                                                          | per each |
| L-125t  | Procure Isolation Transformer, 200W, 5.5A/6.2A .....                                                          | per each |
| L-125u  | Procure Manhole 36" Stanchion.....                                                                            | per each |

**APPENDIX A – MEASUREMENT AND PAYMENT**

|         |                                                                                        |          |
|---------|----------------------------------------------------------------------------------------|----------|
| L-125v  | Procure 8" Cable Rack Arm .....                                                        | per each |
| L-125w  | Procure 11" Cable Rack Arm .....                                                       | per each |
| L-125x  | Procure 2" L-868B Base Can Extension .....                                             | per each |
| L-125y  | Install L-850A(L) Runway Centerline Light.....                                         | per each |
| L-125z  | Install L-850B(L) Runway Touchdown Zone Light .....                                    | per each |
| L-125aa | Install L-850C Runway Edge Light .....                                                 | per each |
| L-125bb | Install L-852C(L) Unidirectional Taxiway Centerline Light .....                        | per each |
| L-125cc | Install L-852C(L) Bidirectional Taxiway Centerline Light .....                         | per each |
| L-125dd | Install L-852C(L) 2-Circuit, Bidirectional Taxiway Centerline Light.....               | per each |
| L-125ee | Install L-852D(L) Unidirectional Taxiway Centerline Light .....                        | per each |
| L-125ff | Install L-852D(L) Bidirectional Taxiway Centerline Light .....                         | per each |
| L-125gg | Install L-852K(L) Unidirectional Taxiway Centerline Light .....                        | per each |
| L-125hh | Install L-852K(L) Bidirectional Taxiway Centerline Light.....                          | per each |
| L-125ii | Install L-852K(L) 2-Circuit, Bidirectional Taxiway Centerline Light .....              | per each |
| L-125jj | Install L-852GS(L) 2-Circuit, Runway Stop Bar/Guard Light.....                         | per each |
| L-125kk | Install L-850A(L) Runway Centerline Light and Spacer Rings.....                        | per each |
| L-125ll | Install L-850B(L) Runway Touchdown Zone Light and Spacer Rings .....                   | per each |
| L-125mm | Install L-850C Runway Edge Light and Spacer Rings .....                                | per each |
| L-125nn | Install L-852C(L) Unidirectional Taxiway Centerline Light and Spacer Rings .....       | per each |
| L-125oo | Install L-852C(L) Bidirectional Taxiway Centerline Light and Spacer Rings.....         | per each |
| L-125pp | Install L-852C(L) 2-Circuit, Bidirectional Taxiway Centerline Light and Spacer Rings . | per each |
| L-125qq | Install L-852D(L) Unidirectional Taxiway Centerline Light and Spacer Rings .....       | per each |
| L-125rr | Install L-852D(L) Bidirectional Taxiway Centerline Light and Spacer Rings.....         | per each |
| L-125ss | Install L-852K(L) Unidirectional Taxiway Centerline Light and Spacer Rings.....        | per each |
| L-125tt | Install L-852K(L) Bidirectional Taxiway Centerline Light and Spacer Rings.....         | per each |
| L-125uu | Install L-852K(L) 2-Circuit, Bidirectional Taxiway Centerline Light and Spacer Rings . | per each |
| L-125vv | Install L-852GS(L) 2-Circuit, Runway Stop Bar/Guard Light and Spacer Rings.....        | per each |

**APPENDIX A – MEASUREMENT AND PAYMENT**

|          |                                                                                                    |          |
|----------|----------------------------------------------------------------------------------------------------|----------|
| L-125ww  | Install L-850C Runway Edge Light and Adapter Plate .....                                           | per each |
| L-125xx  | Install L-852C(L) Bidirectional Taxiway Centerline Light on a New Foundation .....                 | per each |
| L-125yy  | Install L-852D(L) Unidirectional Taxiway Centerline Light on a New Foundation .....                | per each |
| L-125zz  | Install L-804(L) Elevated Runway Guard Light .....                                                 | per each |
| L-125aaa | Install L-861T Taxiway Edge Light .....                                                            | per each |
| L-125bbb | Install L-862 Runway Edge Light.....                                                               | per each |
| L-125ccc | Install L-862E Runway Threshold Light .....                                                        | per each |
| L-125ddd | Install L-862S Runway Stop Light .....                                                             | per each |
| L-125eee | Install Isolation Transformer, 100W, 5.5A/6.2A.....                                                | per each |
| L-125fff | Install Isolation Transformer, 150W, 5.5A/6.2A.....                                                | per each |
| L-125ggg | Install Isolation Transformer, 200W, 5.5A/6.2A.....                                                | per each |
| L-125hhh | Install Manhole 36" Stanchion .....                                                                | per each |
| L-125iii | Install 8" Cable Rack Arm.....                                                                     | per each |
| L-125jjj | Install 11" Cable Rack Arm.....                                                                    | per each |
| L-125kkk | Install 2" L-868B Base Can Extension.....                                                          | per each |
| L-125lll | Install Fixture ID Marker .....                                                                    | per each |
| L-125mmm | Remove Fixture, Epoxy, and Spacer Rings and Install Spacer Rings, Coverplate, and Epoxy .<br>..... | per each |
| L-125nnn | Remove Fixture and Install Coverplate .....                                                        | per each |
| L-125ooo | Remove and Install Fixture ID Marker.....                                                          | per each |
| L-125ppp | Remove L-852GS 2-Circuit, Runway Stop Bar/Guard Light .....                                        | per each |
| L-125qqq | Reinstall L-862GS 2-Circuit, Runway Stop Bar/Guard Light.....                                      | per each |
| L-125rrr | Reinstall L-862GS 2-Circuit, Runway Stop Bar/Guard Light and Spacer Rings.....                     | per each |
| L-125sss | Drill out Existing Bolt and Rethread Existing Bolt Hole .....                                      | per each |
| L-125ttt | CSS Rack Modifications .....                                                                       | per each |
| L-125uuu | Modify Unidirectional Light Fixture Base Cans with Toe-in.....                                     | per each |
| L-127a   | Remove and Install Externally Lighted L-806(L) Supplemental Wind Cone .....                        | per each |

**APPENDIX A – MEASUREMENT AND PAYMENT**

|         |                                                                                                |                 |
|---------|------------------------------------------------------------------------------------------------|-----------------|
| L-140a  | Photometric Testing for Runway 8-26 Complex Lights.....                                        | per lump sum    |
| T-901a  | Seeding.....                                                                                   | per square yard |
| T-908a  | Hydraulic Mulching .....                                                                       | per square yard |
| 13410Aa | ALCMS Modifications, Testing, and Calibration Services for Runway 8-26 Complex.....<br>.....   | per lump sum    |
| 13410Ab | ALCMS Modifications, Testing, and Calibration Services for Taxiways EE, M, and L.....<br>..... | per lump sum    |
| 13410Ac | ALCMS Modifications, Testing, and Calibration Services for East Vault.....                     | per lump sum    |
| 13410Ad | Procure Brite III Remote Unit, One Channel .....                                               | per each        |
| 13410Ae | Procure Brite III Remote Unit, Dual Channel .....                                              | per each        |
| 13410Ca | Construction for the Field ALCMS Modifications.....                                            | per lump sum    |
| 13410Cb | Construction for the Vault ALCMS Modifications .....                                           | per lump sum    |

# Denver International Airport

DIA Project No. 201313528

## RUNWAY 8-26 COMPLEX LIGHTING REHABILITATION

- SCHEDULE A : REPLACE RUNWAY 8-26 LIGHTING, REPLACE PARALLEL TAXIWAY "R" AND CONNECTOR TAXIWAY CENTERLINE LIGHTING (FEDERAL)
- SCHEDULE B : REPLACE PARALLEL TAXIWAY "R" AND CONNECTOR TAXIWAY EDGE LIGHTING (FEDERAL)
- SCHEDULE C : REPLACE TAXIWAYS "EE", "M", AND "L" CENTERLINE AND EDGE LIGHTING (FEDERAL)
- SCHEDULE D : REPLACE TAXIWAY "Z" CENTERLINE AND EDGE LIGHTING (FEDERAL)
- SCHEDULE E : REPLACE HOMERUN CABLE (FEDERAL)
- SCHEDULE F : EAST AIRFIELD LIGHTING VAULT MODIFICATIONS (FEDERAL)
- SCHEDULE G : PROCURE CONSTANT CURRENT REGULATORS (NON-FEDERAL)
- SCHEDULE H : PAVEMENT REPAIRS (NON-FEDERAL)
- SCHEDULE I : CLEARANCE BAR INSTALLATION (FEDERAL)
- SCHEDULE J : REPLACE COMBINATION RUNWAY STOP BAR/GUARD LIGHTS (FEDERAL)

ISSUED FOR CONSTRUCTION  
Issue Date: JANUARY 7, 2014



### CH2MHILL

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AIRPORT



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8500 Pena Blvd.  
Denver, CO 80249-6340



RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

### CH2MHILL

| NO. | BY | PURPOSE | DATE   | CHKD |
|-----|----|---------|--------|------|
| 1   | BK | CONST   | 07JA14 | CG   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. WAZIRI

CHECKED BY: B. KEAS

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

COVER SHEET

SHEET NO. G1001

1 OF 115

CADD FILE NO. \_201313528-1IGI-001-A

INDEX TO DRAWINGS

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|-----------|-------------|------------------------------------------|
| 1         | GI001       | COVER SHEET                              |
| 2         | GI002       | INDEX TO DRAWINGS AND ABBREVIATIONS      |
| 3         | GI003       | SUMMARY OF APPROXIMATE QUANTITIES        |
| 4         | GI101       | ELECTRICAL KEY PLAN                      |
| 5         | GI102       | OVERALL CONSTRUCTION ACCESS PLAN         |
| 6         | GI103       | RUNWAY 8-26 SITE ACCESS AND SAFETY PLAN  |
| 7         | GI104       | GENERAL AND SAFETY NOTES                 |
| 8         | GI105       | GENERAL CONSTRUCTION SAFETY DETAILS      |
| 9         | GC101       | OVERALL PHASING PLAN                     |
| 10        | GC102       | CONSTRUCTION PHASING PLAN - PHASE 1      |
| 11        | GC103       | CONSTRUCTION PHASING PLAN - PHASE 2      |
| 12        | GC104       | CONSTRUCTION PHASING PLAN - PHASE 3      |
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| 15        | GC201       | ELECTRICAL PHASING PLAN - PHASE 1        |
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| 17        | GC701       | SCHEDULE BREAKDOWN AND MILESTONES        |
| 18        | GC702       | PHASING DESCRIPTION TABLE (NOT INCLUDED) |
| 19        | GC801       | SURVEY CONTROL PLAN                      |
| 20        | CU101       | UTILITY PLAN                             |
| 21        | CU102       | UTILITY PLAN                             |
| 22        | CU103       | UTILITY PLAN                             |
| 23        | CU501       | UTILITY DETAILS                          |
| 24        | CU502       | UTILITY DETAILS                          |
| 25        | CD001       | DEMOLITION NOTES AND DETAILS             |
| 26        | C-301       | TYPICAL SECTIONS                         |
| 27        | CS101       | CSS ACCESS ROAD GEOMETRY PLAN            |
| 28        | CP501       | PAVING DETAILS                           |
| 29        | CP502       | PAVING DETAILS                           |
| 30        | CP503       | PAVING DETAILS                           |
| 31        | CP504       | PAVING DETAILS                           |
| 32        | CP505       | PAVING DETAILS                           |
| 33        | EL001       | ELECTRICAL NOTES                         |
| 34        | EL002       | ELECTRICAL LEGEND                        |
| 35        | EL101       | AIRFIELD ELECTRICAL PLAN                 |
| 36        | EL102       | AIRFIELD ELECTRICAL PLAN                 |
| 37        | EL103       | AIRFIELD ELECTRICAL PLAN                 |
| 38        | EL104       | AIRFIELD ELECTRICAL PLAN                 |
| 39        | EL105       | AIRFIELD ELECTRICAL PLAN                 |
| 40        | EL106       | AIRFIELD ELECTRICAL PLAN                 |
| 41        | EL107       | AIRFIELD ELECTRICAL PLAN                 |
| 42        | EL108       | AIRFIELD ELECTRICAL PLAN                 |
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| 45        | EL111       | AIRFIELD ELECTRICAL PLAN                 |
| 46        | EL112       | AIRFIELD ELECTRICAL PLAN                 |
| 47        | EL113       | AIRFIELD ELECTRICAL PLAN                 |
| 48        | EL114       | AIRFIELD ELECTRICAL PLAN                 |
| 49        | EL115       | AIRFIELD ELECTRICAL PLAN                 |
| 50        | EL116       | AIRFIELD ELECTRICAL PLAN                 |
| 51        | EL117       | AIRFIELD ELECTRICAL PLAN                 |
| 52        | EL118       | AIRFIELD ELECTRICAL PLAN                 |
| 53        | EL119       | AIRFIELD ELECTRICAL PLAN                 |
| 54        | EL120       | AIRFIELD ELECTRICAL PLAN                 |
| 55        | EL121       | AIRFIELD ELECTRICAL PLAN                 |
| 56        | EL122       | AIRFIELD ELECTRICAL PLAN                 |
| 57        | EL123       | AIRFIELD ELECTRICAL PLAN                 |

|     |       |                                        |
|-----|-------|----------------------------------------|
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| 59  | EL125 | AIRFIELD ELECTRICAL PLAN               |
| 60  | EL126 | AIRFIELD ELECTRICAL PLAN               |
| 61  | EL127 | AIRFIELD ELECTRICAL PLAN               |
| 62  | EL128 | AIRFIELD ELECTRICAL PLAN               |
| 63  | EL129 | AIRFIELD ELECTRICAL PLAN               |
| 64  | EL130 | AIRFIELD ELECTRICAL PLAN               |
| 65  | EL131 | AIRFIELD ELECTRICAL PLAN               |
| 66  | EL132 | AIRFIELD ELECTRICAL PLAN               |
| 67  | EL133 | AIRFIELD ELECTRICAL PLAN               |
| 68  | EL134 | AIRFIELD ELECTRICAL PLAN               |
| 69  | EL135 | AIRFIELD ELECTRICAL PLAN               |
| 70  | EL136 | AIRFIELD ELECTRICAL PLAN               |
| 71  | EL137 | AIRFIELD ELECTRICAL PLAN               |
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| 74  | EL140 | AIRFIELD ELECTRICAL PLAN               |
| 75  | EL141 | AIRFIELD ELECTRICAL PLAN               |
| 76  | EL142 | AIRFIELD ELECTRICAL PLAN               |
| 77  | EL201 | AIRFIELD ELECTRICAL PLAN               |
| 78  | EL202 | AIRFIELD ELECTRICAL PLAN               |
| 79  | EL203 | AIRFIELD ELECTRICAL PLAN               |
| 80  | EL204 | AIRFIELD ELECTRICAL PLAN               |
| 81  | EL205 | AIRFIELD ELECTRICAL PLAN               |
| 82  | EL206 | AIRFIELD ELECTRICAL PLAN               |
| 83  | EL207 | AIRFIELD ELECTRICAL PLAN               |
| 84  | EL208 | AIRFIELD ELECTRICAL PLAN               |
| 85  | EL209 | AIRFIELD ELECTRICAL PLAN               |
| 86  | EL210 | AIRFIELD ELECTRICAL PLAN               |
| 87  | EL501 | ELECTRICAL DETAILS                     |
| 88  | EL502 | ELECTRICAL DETAILS                     |
| 89  | EL503 | ELECTRICAL DETAILS                     |
| 90  | EL504 | ELECTRICAL DETAILS                     |
| 91  | EL505 | ELECTRICAL DETAILS                     |
| 92  | EL506 | ELECTRICAL DETAILS                     |
| 93  | EL507 | ELECTRICAL DETAILS                     |
| 94  | EL508 | ELECTRICAL DETAILS                     |
| 95  | EL509 | ELECTRICAL DETAILS                     |
| 96  | EL510 | ELECTRICAL DETAILS                     |
| 97  | EL511 | ELECTRICAL DETAILS                     |
| 98  | EL512 | ELECTRICAL DETAILS                     |
| 99  | EL513 | ELECTRICAL DETAILS                     |
| 100 | EL514 | ELECTRICAL DETAILS                     |
| 101 | EL701 | MANHOLE BUTTERFLIES                    |
| 102 | EL702 | MANHOLE BUTTERFLIES                    |
| 103 | EL703 | MANHOLE BUTTERFLIES                    |
| 104 | EL704 | MANHOLE BUTTERFLIES                    |
| 105 | EL705 | MANHOLE BUTTERFLIES                    |
| 106 | EL706 | MANHOLE BUTTERFLIES                    |
| 107 | EL707 | MANHOLE BUTTERFLIES                    |
| 108 | EL708 | MANHOLE BUTTERFLIES                    |
| 109 | EL801 | EAST VAULT DEMOLITION                  |
| 110 | EL802 | EAST VAULT AND ALCMS MODIFICATION PLAN |
| 111 | EL803 | EAST VAULT AND ALCMS MODIFICATION PLAN |
| 112 | EL804 | EAST VAULT SECTIONS AND DETAILS        |
| 113 | EL805 | EAST VAULT SECTIONS AND DETAILS        |
| 114 | EL806 | EAST VAULT DETAILS                     |
| 115 | EL807 | ALCMS CONTROL SCREEN MODIFICATION PLAN |

ABBREVIATIONS:

|          |                                              |
|----------|----------------------------------------------|
| AC       | ASPHALT CONCRETE, ADVISORY CIRCULAR          |
| ADG      | AIRPLANE DESIGN GROUP                        |
| ALD      | AIRFIELD LIGHTING DUCT                       |
| AOA      | AIRPORT OPERATIONS AREA                      |
| ASTM     | AMERICAN STANDARDS FOR TESTING AND MATERIALS |
| ATPB     | ASPHALT TREATED PERMEABLE BASE               |
| AVE      | AVENUE                                       |
| AWG      | AMERICAN WIRE GAGE                           |
| BC       | BARE COPPER                                  |
| B.S.D.   | BARE SOFT DRAWN                              |
| CE       | CONCRETE ENCASED                             |
| C/L OR ☉ | CENTERLINE                                   |
| CLSM     | CONTROLLED LOW-STRENGTH MATERIAL             |
| COMM     | COMMUNICATIONS                               |
| CONT     | CONTINUOUS                                   |
| CSS      | CIRCUIT SELECTOR SWITCH                      |
| CT       | CURRENT TRANSFORMER                          |
| CTB      | CEMENT TREATED BASE                          |
| CU       | COPPER                                       |
| DES      | DEVELOPMENT ENGINEERING SERVICES             |
| DIA      | DENVER INTERNATIONAL AIRPORT                 |
| ⌀        | DIAMETER                                     |
| DIW      | DE-ICING WASTE                               |
| E        | EAST, EASTING                                |
| EL       | ELEVATION                                    |
| EMH      | ELECTRICAL MANHOLE                           |
| EOP      | EDGE OF PAVEMENT                             |
| E.W.     | EACH WAY                                     |
| FAA      | FEDERAL AVIATION ADMINISTRATION              |
| F.E.S.   | FLARED END SECTION                           |
| FOD      | FOREIGN OBJECT DEBRIS                        |
| FOMO     | FIXED OR MOVABLE OBJECT                      |
| FT       | FEET                                         |
| H        | HEIGHT                                       |
| ID       | IDENTIFICATION                               |
| I.D.     | INSIDE DIAMETER                              |
| IE       | INVERT ELEVATION                             |
| I/O      | INPUT/OUTPUT                                 |
| KV       | KILOVOLT                                     |
| L        | LENGTH                                       |
| LF       | LINEAR FEET                                  |
| MAX      | MAXIMUM                                      |
| MH       | MANHOLE                                      |
| MIN      | MINIMUM                                      |
| MPH      | MILES PER HOUR                               |
| N        | NORTH, NORTHING                              |
| NO       | NUMBER                                       |
| NTP      | NOTICE TO PROCEED                            |
| NTS      | NOT TO SCALE                                 |
| O.C.     | ON CENTER                                    |
| O.D.     | OUTSIDE DIAMETER                             |
| OFA      | OBJECT FREE AREA                             |
| PAPI     | PRECISION APPROACH PATH INDICATOR            |
| PC       | POINT OF CURVATURE                           |
| PCC      | POINT OF COMPOUND CURVATURE                  |
| PCCP     | PORTLAND CEMENT CONCRETE                     |
| POC      | PORTLAND CEMENT CONCRETE PAVEMENT            |
| POC      | POINT ON CURVE                               |
| PSI      | POUNDS PER SQUARE INCH                       |
| PT       | POINT OF TANGENCY                            |
| PVC      | POLYVINYL CHLORIDE, POINT OF VERTICAL CURVE  |
| PW       | PUBLIC WORKS                                 |
| R        | RADIUS                                       |
| RCP      | REINFORCED CONCRETE PIPE                     |
| RD       | ROAD                                         |
| RIO      | REMOTE I/O                                   |
| RON      | REMAIN OVERNIGHT                             |
| RP       | RADIAL POINT                                 |
| R/W      | RUNWAY                                       |
| S        | SLOPE, SOUTH                                 |
| SCH      | SCHEDULE                                     |
| SDG      | STORM DRAIN GRAVITY                          |
| ST       | STREET                                       |
| STA      | STATION                                      |
| THRU     | THROUGH                                      |
| TA       | TAXIWAY SAFETY AREA                          |
| T/W      | TAXIWAY                                      |
| TYP      | TYPICAL                                      |
| UCO      | UNDERDRAIN CLEANOUT                          |
| UDG      | UNDERDRAINS                                  |
| UG       | UNDERGROUND                                  |
| VSR      | VEHICLE SERVICE ROAD                         |
| W        | WATT, WEST                                   |

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RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

CH2MHILL

| NO. | BY | PURPOSE | DATE   | CHKD |
|-----|----|---------|--------|------|
| 1   | BK | CONST   | 07JA14 | CG   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. WAZIRI

CHECKED BY: B. KEAS

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE  
INDEX TO  
DRAWINGS AND  
ABBREVIATIONS

SHEET NO.  
GI002

2 OF 115  
CADD FILE NO.  
\_201313528-1GI-002-A



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RUNWAY 8-26  
 COMPLEX LIGHTING  
 REHABILITATION

**CH2MHILL**

ISSUE RECORD  
NO. BY PURPOSE DATE CKD  
1 BK CONST 07JA14 CG

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. WAZIRI

CHECKED BY: B. KEAS

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

SUMMARY OF APPROXIMATE QUANTITIES

SHEET NO.

G1003  
3 OF 115

CADD FILE NO. 201313528-1G1003-A

ISSUED FOR CONSTRUCTION

SCHEDULE A - REPLACE RUNWAY 8-26 LIGHTING, REPLACE PARALLEL T/W "R" AND CONNECTOR T/W CENTERLINE LIGHTING (FEDERAL)

| BID ITEM | DESCRIPTION                                                                                                                       | UNIT | QUANTITY  |              |         |
|----------|-----------------------------------------------------------------------------------------------------------------------------------|------|-----------|--------------|---------|
|          |                                                                                                                                   |      | ESTIMATED | CHANGE ORDER | ASBUILT |
| 01505a   | Mobilization                                                                                                                      | LS   | 1         |              |         |
| 01575a   | Cover Elevated Edge Lights                                                                                                        | EA   | 85        |              |         |
| 01575b   | Cover Panel on Guidance Sign                                                                                                      | EA   | 3         |              |         |
| 01575c   | Install Shorting Plug on Secondary of Isolation Transformer                                                                       | EA   | 27        |              |         |
| 01575d   | Install Tie Back                                                                                                                  | EA   | 3         |              |         |
| 01575e   | Install Temporary Jumper                                                                                                          | LF   | 138       |              |         |
| 01575f   | Install Isolation Transformer, 65W, 6.6A/6.6A                                                                                     | EA   | 5         |              |         |
| 01575g   | Maintain Lighted Xs                                                                                                               | LS   | 1         |              |         |
| 01576a   | Traffic Control                                                                                                                   | LS   | 1         |              |         |
| P-150a   | Remove Taxiway Centerline Light and Foundation                                                                                    | EA   | 2         |              |         |
| P-150d   | Remove 17-inch Non-Reinforced Concrete Pavement                                                                                   | SY   | 131       |              |         |
| P-161a   | Bondbreaker Fabric                                                                                                                | SY   | 131       |              |         |
| P-401Ca  | CDOT Bituminous Surface Course (3-Inch)                                                                                           | TN   | 2         |              |         |
| P-401Cc  | CDOT Bituminous Base Course (7-Inch)                                                                                              | TN   | 5         |              |         |
| P-501a   | 17-Inch Portland Cement Concrete Pavement, Plain                                                                                  | SY   | 131       |              |         |
| L-108a   | Install Cable, 1/C #8, 19 Strand, 5000V, L-824, Type C                                                                            | LF   | 465,750   |              |         |
| L-108b   | Install Cable, 1/C #8, 600V, Green Insulated Ground                                                                               | LF   | 13,476    |              |         |
| L-110a   | Install 1-Way, 2-Inch PVC in CLSM                                                                                                 | LF   | 499       |              |         |
| L-110b   | Install 1-Way, 2-Inch PVC (CE), in Existing Pavement                                                                              | LF   | 26        |              |         |
| L-110c   | Install 2-Way, 4-Inch PVC (CE)                                                                                                    | LF   | 840       |              |         |
| L-125a   | Procure L-850A(L) Runway Centerline Light                                                                                         | EA   | 238       |              |         |
| L-125b   | Procure L-850B(L) Runway Touchdown Zone Light                                                                                     | EA   | 180       |              |         |
| L-125c   | Procure L-850C Runway Edge Light                                                                                                  | EA   | 19        |              |         |
| L-125d   | Procure L-852C(L) Unidirectional Taxiway Centerline Light                                                                         | EA   | 34        |              |         |
| L-125e   | Procure L-852C(L) Bidirectional Taxiway Centerline Light                                                                          | EA   | 281       |              |         |
| L-125f   | Procure L-852C(L) 2-Circuit, Bidirectional Taxiway Centerline Light                                                               | EA   | 8         |              |         |
| L-125g   | Procure L-852D(L) Unidirectional Taxiway Centerline Light                                                                         | EA   | 136       |              |         |
| L-125i   | Procure L-852K(L) Unidirectional Taxiway Centerline Light                                                                         | EA   | 54        |              |         |
| L-125j   | Procure L-852K(L) Bidirectional Taxiway Centerline Light                                                                          | EA   | 108       |              |         |
| L-125k   | Procure L-852K(L) 2-Circuit, Bidirectional Taxiway Centerline Light                                                               | EA   | 20        |              |         |
| L-125m   | Procure L-804(L) Elevated Runway Guard Light                                                                                      | EA   | 18        |              |         |
| L-125o   | Procure L-862 Runway Edge Light                                                                                                   | EA   | 101       |              |         |
| L-125p   | Procure L-862E Runway Threshold Light                                                                                             | EA   | 16        |              |         |
| L-125q   | Procure L-862S Runway Stop Light                                                                                                  | EA   | 18        |              |         |
| L-125s   | Procure Isolation Transformer, 150W, 5.5A/6.2A                                                                                    | EA   | 11        |              |         |
| L-125t   | Procure Isolation Transformer, 200W, 5.5A/6.2A                                                                                    | EA   | 12        |              |         |
| L-125u   | Procure Manhole 36" Stanchion                                                                                                     | EA   | 50        |              |         |
| L-125v   | Procure 8" Cable Rack Arm                                                                                                         | EA   | 75        |              |         |
| L-125w   | Procure 11" Cable Rack Arm                                                                                                        | EA   | 75        |              |         |
| L-125x   | Procure 2" L-868B Base Can Extension                                                                                              | EA   | 10        |              |         |
| L-125y   | Install L-850A(L) Runway Centerline Light                                                                                         | EA   | 10        |              |         |
| L-125z   | Install L-850B(L) Runway Touchdown Zone Light                                                                                     | EA   | 31        |              |         |
| L-125aa  | Install L-850C Runway Edge Light                                                                                                  | EA   | 4         |              |         |
| L-125bb  | Install L-852C(L) Unidirectional Taxiway Centerline Light                                                                         | EA   | 14        |              |         |
| L-125cc  | Install L-852C(L) Bidirectional Taxiway Centerline Light                                                                          | EA   | 40        |              |         |
| L-125dd  | Install L-852C(L) 2-Circuit, Bidirectional Taxiway Centerline Light                                                               | EA   | 4         |              |         |
| L-125ee  | Install L-852D(L) Unidirectional Taxiway Centerline Light                                                                         | EA   | 13        |              |         |
| L-125gg  | Install L-852K(L) Unidirectional Taxiway Centerline Light                                                                         | EA   | 28        |              |         |
| L-125hh  | Install L-852K(L) Bidirectional Taxiway Centerline Light                                                                          | EA   | 42        |              |         |
| L-125ii  | Install L-852K(L) 2-Circuit, Bidirectional Taxiway Centerline Light                                                               | EA   | 3         |              |         |
| L-125kk  | Install L-850A(L) Runway Centerline Light and Spacer Rings                                                                        | EA   | 228       |              |         |
| L-125ll  | Install L-850B(L) Runway Touchdown Zone Light and Spacer Rings                                                                    | EA   | 149       |              |         |
| L-125mm  | Install L-850C Runway Edge Light and Spacer Rings                                                                                 | EA   | 2         |              |         |
| L-125nn  | Install L-852C(L) Unidirectional Taxiway Centerline Light and Spacer Rings                                                        | EA   | 20        |              |         |
| L-125oo  | Install L-852C(L) Bidirectional Taxiway Centerline Light and Spacer Rings                                                         | EA   | 235       |              |         |
| L-125pp  | Install L-852C(L) 2-Circuit, Bidirectional Taxiway Centerline Light and Spacer Rings                                              | EA   | 4         |              |         |
| L-125qq  | Install L-852D(L) Unidirectional Taxiway Centerline Light and Spacer Rings                                                        | EA   | 123       |              |         |
| L-125rs  | Install L-852K(L) Unidirectional Taxiway Centerline Light and Spacer Rings                                                        | EA   | 26        |              |         |
| L-125st  | Install L-852K(L) Bidirectional Taxiway Centerline Light and Spacer Rings                                                         | EA   | 66        |              |         |
| L-125uu  | Install L-852K(L) 2-Circuit, Bidirectional Taxiway Centerline Light and Spacer Rings                                              | EA   | 17        |              |         |
| L-125vw  | Install L-850C Runway Edge Light and Adapter Plate                                                                                | EA   | 13        |              |         |
| L-125xx  | Install L-852C(L) Bidirectional Taxiway Centerline Light on a New Foundation                                                      | EA   | 5         |              |         |
| L-125zz  | Install L-804(L) Elevated Runway Guard Light                                                                                      | EA   | 18        |              |         |
| L-125bbb | Install L-862 Runway Edge Light                                                                                                   | EA   | 101       |              |         |
| L-125ccc | Install L-862E Runway Threshold Light                                                                                             | EA   | 16        |              |         |
| L-125ddd | Install L-862S Runway Stop Light                                                                                                  | EA   | 18        |              |         |
| L-125fff | Install Isolation Transformer, 150W, 5.5A/6.2A                                                                                    | EA   | 11        |              |         |
| L-125ggg | Install Isolation Transformer, 200W, 5.5A/6.2A                                                                                    | EA   | 12        |              |         |
| L-125hhh | Install Manhole 36" Stanchion                                                                                                     | EA   | 50        |              |         |
| L-125iii | Install 8" Cable Rack Arm                                                                                                         | EA   | 75        |              |         |
| L-125jjj | Install 11" Cable Rack Arm                                                                                                        | EA   | 75        |              |         |
| L-125kkk | Install 2" L-868B Base Can Extension                                                                                              | EA   | 10        |              |         |
| L-125lll | Install Fixture ID Marker                                                                                                         | EA   | 132       |              |         |
| L-125mmm | Remove Fixture, Epoxy, and Spacer Rings and Install Spacer Rings, Coverplate, and Epoxy                                           | EA   | 132       |              |         |
| L-125nnn | Remove Fixture and Install Coverplate                                                                                             | EA   | 89        |              |         |
| L-125ooo | Remove and Install Fixture ID Marker                                                                                              | EA   | 86        |              |         |
| L-125ppp | Remove L-852GS 2-Circuit, Runway Stop Bar/Guard Light                                                                             | EA   | 114       |              |         |
| L-125qqq | Reinstall L-852GS 2-Circuit, Runway Stop Bar/Guard Light                                                                          | EA   | 32        |              |         |
| L-125rrr | Reinstall L-852GS 2-Circuit, Runway Stop Bar/Guard Light and Spacer Rings                                                         | EA   | 82        |              |         |
| L-125sss | Drill Out Existing Bolt and Rethread Existing Bolt Hole                                                                           | EA   | 260       |              |         |
| L-125ttt | CSS Rack Modifications                                                                                                            | EA   | 2         |              |         |
| L-125uuu | Modify Unidirectional Light Fixture Base Cans with Toe-in                                                                         | EA   | 225       |              |         |
| L-127a   | Remove and Install Externally Lighted L-806(L) Supplemental Wind Cone                                                             | EA   | 2         |              |         |
| L-140a   | Photometric Testing for Runway 8-26 Complex Light Fixtures                                                                        | LS   | 1         |              |         |
| 13410Aa  | ALCMS Modifications, Testing, and Calibration Services for Runway 8-26 Complex                                                    | LS   | 1         |              |         |
| 13410Ad  | Procure Bite III Remote Unit, One Channel                                                                                         | EA   | 18        |              |         |
| 13410Ae  | Procure Bite III Remote Unit, Dual Channel                                                                                        | EA   | 114       |              |         |
| 13410Af  | Procure Sensors and ALCMS Modifications for Monitoring the Remote/Off/Local Switches for Three Remote I/O Racks Along Runway 8-26 | LS   | 1         |              |         |
| 13410Ca  | Construction for Runway 8-26 ALCMS Modifications                                                                                  | LS   | 1         |              |         |

SCHEDULE B - REPLACE PARALLEL TAXIWAY "R" AND CONNECTOR TAXIWAY EDGE LIGHTING (FEDERAL)

| BID ITEM | DESCRIPTION                                            | UNIT | QUANTITY  |              |         |
|----------|--------------------------------------------------------|------|-----------|--------------|---------|
|          |                                                        |      | ESTIMATED | CHANGE ORDER | ASBUILT |
| 01505a   | Mobilization                                           | LS   | 1         |              |         |
| P-150b   | Remove Taxiway Edge Light and Install Blank Coverplate | EA   | 10        |              |         |
| P-401Ca  | CDOT Bituminous Surface Course (3-Inch)                | TN   | 2         |              |         |
| P-401Cc  | CDOT Bituminous Base Course (7-Inch)                   | TN   | 5         |              |         |
| L-108a   | Install Cable, 1/C #8, 19 Strand, 5000V, L-824, Type C | LF   | 161,000   |              |         |
| L-110a   | Install 1-Way, 2-Inch PVC in CLSM                      | LF   | 763       |              |         |
| L-110b   | Install 1-Way, 2-Inch PVC (CE), in Existing Pavement   | LF   | 65        |              |         |
| L-125n   | Procure L-861T Taxiway Edge Light                      | EA   | 465       |              |         |
| L-125r   | Procure Isolation Transformer, 100W, 5.5A/6.2A         | EA   | 4         |              |         |
| L-125s   | Procure Isolation Transformer, 150W, 5.5A/6.2A         | EA   | 20        |              |         |
| L-125t   | Procure Isolation Transformer, 200W, 5.5A/6.2A         | EA   | 8         |              |         |
| L-125aaa | Install L-861T Taxiway Edge Light                      | EA   | 465       |              |         |
| L-125eee | Install Isolation Transformer, 100W, 5.5A/6.2A         | EA   | 4         |              |         |
| L-125fff | Install Isolation Transformer, 150W, 5.5A/6.2A         | EA   | 20        |              |         |
| L-125ggg | Install Isolation Transformer, 200W, 5.5A/6.2A         | EA   | 8         |              |         |

SCHEDULE C - REPLACE TAXIWAYS "EE", "M", AND "L" CENTERLINE AND EDGE LIGHTING (FEDERAL)

| BID ITEM | DESCRIPTION                                                                             | UNIT | QUANTITY  |              |         |
|----------|-----------------------------------------------------------------------------------------|------|-----------|--------------|---------|
|          |                                                                                         |      | ESTIMATED | CHANGE ORDER | ASBUILT |
| 01505a   | Mobilization                                                                            | LS   | 1         |              |         |
| L-108a   | Install Cable, 1/C #8, 19 Strand, 5000V, L-824, Type C                                  | LF   | 86,250    |              |         |
| L-110a   | Install 1-Way, 2-Inch PVC in CLSM                                                       | LF   | 48        |              |         |
| L-125d   | Procure L-852C(L) Unidirectional Taxiway Centerline Light                               | EA   | 79        |              |         |
| L-125e   | Procure L-852C(L) Bidirectional Taxiway Centerline Light                                | EA   | 15        |              |         |
| L-125h   | Procure L-852D(L) Bidirectional Taxiway Centerline Light                                | EA   | 5         |              |         |
| L-125j   | Procure L-852K(L) Bidirectional Taxiway Centerline Light                                | EA   | 150       |              |         |
| L-125n   | Procure L-861T Taxiway Edge Light                                                       | EA   | 147       |              |         |
| L-125s   | Procure Isolation Transformer, 150W, 5.5A/6.2A                                          | EA   | 2         |              |         |
| L-125t   | Procure Isolation Transformer, 200W, 5.5A/6.2A                                          | EA   | 15        |              |         |
| L-125cc  | Install L-852C(L) Bidirectional Taxiway Centerline Light                                | EA   | 15        |              |         |
| L-125ff  | Install L-852D(L) Bidirectional Taxiway Centerline Light                                | EA   | 2         |              |         |
| L-125hh  | Install L-852K(L) Bidirectional Taxiway Centerline Light                                | EA   | 19        |              |         |
| L-125nn  | Install L-852C(L) Unidirectional Taxiway Centerline Light and Spacer Rings              | EA   | 79        |              |         |
| L-125rr  | Install L-852D(L) Bidirectional Taxiway Centerline Light and Spacer Rings               | EA   | 3         |              |         |
| L-125tt  | Install L-852K(L) Bidirectional Taxiway Centerline Light and Spacer Rings               | EA   | 131       |              |         |
| L-125aaa | Install L-861T Taxiway Edge Light                                                       | EA   | 147       |              |         |
| L-125fff | Install Isolation Transformer, 150W, 5.5A/6.2A                                          | EA   | 2         |              |         |
| L-125ggg | Install Isolation Transformer, 200W, 5.5A/6.2A                                          | EA   | 15        |              |         |
| L-125mmm | Remove Fixture, Epoxy, and Spacer Rings and Install Spacer Rings, Coverplate, and Epoxy | EA   | 120       |              |         |
| L-125nnn | Remove Fixture and Install Coverplate                                                   | EA   | 24        |              |         |
| L-125ooo | Remove and Install Fixture ID Marker                                                    | EA   | 61        |              |         |
| L-125sss | Drill Out Existing Bolt and Rethread Existing Bolt Hole                                 | EA   | 90        |              |         |
| L-140b   | Photometric Testing for Taxiway "EE", "M" and "L" Light Fixtures                        | LS   | 1         |              |         |
| 13410Ab  | ALCMS Modifications, Testing, and Calibration Services for Taxiways EE, M, and L        | LS   | 1         |              |         |

SCHEDULE D - REPLACE TAXIWAY "Z" CENTERLINE AND EDGE LIGHTING (FEDERAL)

| BID ITEM | DESCRIPTION                                                                             | UNIT | QUANTITY  |              |         |
|----------|-----------------------------------------------------------------------------------------|------|-----------|--------------|---------|
|          |                                                                                         |      | ESTIMATED | CHANGE ORDER | ASBUILT |
| 01505a   | Mobilization                                                                            | LS   | 1         |              |         |
| L-108a   | Install Cable, 1/C #8, 19 Strand, 5000V, L-824, Type C                                  | LF   | 109,250   |              |         |
| L-125e   | Procure L-852C(L) Bidirectional Taxiway Centerline Light                                | EA   | 138       |              |         |
| L-125j   | Procure L-852K(L) Bidirectional Taxiway Centerline Light                                | EA   | 80        |              |         |
| L-125n   | Procure L-861T Taxiway Edge Light                                                       | EA   | 155       |              |         |
| L-125s   | Procure Isolation Transformer, 150W, 5.5A/6.2A                                          | EA   | 1         |              |         |
| L-125t   | Procure Isolation Transformer, 200W, 5.5A/6.2A                                          | EA   | 2         |              |         |
| L-125oo  | Install L-852C(L) Bidirectional Taxiway Centerline Light and Spacer Rings               | EA   | 138       |              |         |
| L-125tt  | Install L-852K(L) Bidirectional Taxiway Centerline Light and Spacer Rings               | EA   | 80        |              |         |
| L-125aaa | Install L-861T Taxiway Edge Light                                                       | EA   | 155       |              |         |
| L-125fff | Install Isolation Transformer, 150W, 5.5A/6.2A                                          | EA   | 1         |              |         |
| L-125ggg | Install Isolation Transformer, 200W, 5.5A/6.2A                                          | EA   | 2         |              |         |
| L-125mmm | Remove Fixture, Epoxy, and Spacer Rings and Install Spacer Rings, Coverplate, and Epoxy | EA   | 80        |              |         |
| L-125sss | Drill Out Existing Bolt and Rethread Existing Bolt Hole                                 | EA   | 75        |              |         |
| L-140c   | Photometric Testing for Taxiway "Z" Light Fixtures                                      | LS   | 1         |              |         |

SCHEDULE E - REPLACE HOMERUN CABLE (FEDERAL)

| BID ITEM | DESCRIPTION                                            | UNIT | QUANTITY  |              |         |
|----------|--------------------------------------------------------|------|-----------|--------------|---------|
|          |                                                        |      | ESTIMATED | CHANGE ORDER | ASBUILT |
| L-108a   | Install Cable, 1/C #8, 19 Strand, 5000V, L-824, Type C | LF   | 402,500   |              |         |
| L-108b   | Install Cable, 1/C #8, 600V, Green Insulated Ground    | LF   | 8,989     |              |         |

SCHEDULE F - EAST AIRFIELD LIGHTING VAULT MODIFICATIONS (FEDERAL)

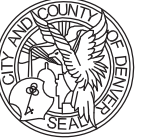
| BID ITEM | DESCRIPTION                                                                              | UNIT | QUANTITY  |              |         |
|----------|------------------------------------------------------------------------------------------|------|-----------|--------------|---------|
|          |                                                                                          |      | ESTIMATED | CHANGE ORDER | ASBUILT |
| 01505a   | Mobilization                                                                             | LS   | 1         |              |         |
| L-122Ca  | Install L-829 Constant Current Regulator with Integral Control, 10kW, 3-Step, 480V Input | EA   | 2         |              |         |
| L-122Cb  | Install L-829 Constant Current Regulator with Integral Control, 20kW, 5-Step, 480V Input | EA   | 3         |              |         |
| L-122Cc  | Install L-829 Constant Current Regulator with Integral Control, 30kW, 5-Step, 480V Input | EA   | 1         |              |         |
| L-122Cd  | Install L-829 Constant Current Regulator with Integral Control, 20kW, 3-Step, 480V Input | EA   | 5         |              |         |
| L-122Ce  | Install L-829 Constant Current Regulator with Integral Control, 30kW, 3-Step, 480V Input | EA   | 6         |              |         |
| L-122Cf  | Install 30A, 3-Phase Bus Plug Circuit Breaker                                            | EA   | 2         |              |         |
| L-122Cg  | Install 60A, 3-Phase Bus Plug Circuit Breaker                                            | EA   | 8         |              |         |
| L-122Ch  | Install 90A, 3-Phase Bus Plug Circuit Breaker                                            | EA   | 7         |              |         |
| L-122Ci  | Vault Modifications                                                                      | EA   | 2         |              |         |
| 13410Ac  | ALCMS Modifications, Testing, and Calibration Services for East Vault                    | LS   | 1         |              |         |
| 13410Cb  | Construction for the Vault ALCMS Modifications                                           | LS   | 1         |              |         |

SCHEDULE G - PROCURE CONSTANT CURRENT REGULATORS (NON-FEDERAL)

| BID ITEM | DESCRIPTION                                                                              | UNIT | QUANTITY  |              |         |
|----------|------------------------------------------------------------------------------------------|------|-----------|--------------|---------|
|          |                                                                                          |      | ESTIMATED | CHANGE ORDER | ASBUILT |
| L-122Aa  | Procure L-829 Constant Current Regulator with Integral Control, 10kW, 3-Step, 480V Input | EA   | 3         |              |         |
| L-122Ab  | Procure L-829 Constant Current Regulator with Integral Control, 20kW, 3-Step, 480V Input | EA   | 6         |              |         |
| L-122Ac  | Procure L-829 Constant Current Regulator with Integral Control, 30kW, 3-Step, 480V Input | EA   | 7         |              |         |
| L-122Ad  | Procure L-829 Constant Current Regulator with Integral Control, 20kW, 5-Step, 480V Input | EA   | 3         |              |         |
| L-122Ae  | Procure L-829 Constant Current Regulator with Integral Control, 30kW, 5-Step, 480V Input | EA   | 1         |              |         |

SCHEDULE H - PAVEMENT REPAIRS (NON-FEDERAL)

| BID ITEM | DESCRIPTION                                     | UNIT | QUANTITY  |              |         |
|----------|-------------------------------------------------|------|-----------|--------------|---------|
|          |                                                 |      | ESTIMATED | CHANGE ORDER | ASBUILT |
| 01505a   | Mobilization                                    | LS   | 1         |              |         |
| 01566a   | Erosion Control Sediment Log                    | LF   | 263       |              |         |
| P-150c   | Remove Asphalt Shoulder                         | SY   | 13        |              |         |
| P-150d   | Remove 17-inch Non-Reinforced Concrete Pavement | SY   | 394       |              |         |
| P-150e   | Remove 17-inch Reinforced Concrete Pavement     | SY   | 44        |              |         |
| P-152a   | Topsoil Embankment from Stockpile               | CY   | 83        |              |         |
| P-152b   | Unclassified Excavation, Embankment On Site     | CY   |           |              |         |



**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE     | CHKD |
|--------------|-----|-------|---------|----------|------|
| 1            | BK  | CONST |         | 07/14/14 | CG   |

SCALE: AS SHOWN

DATE: 01/07/2014

DRAWN BY: S. WAZIRI

CHECKED BY: B. KEAS

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**ELECTRICAL  
KEY PLAN**

SHEET NO.

G101

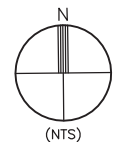
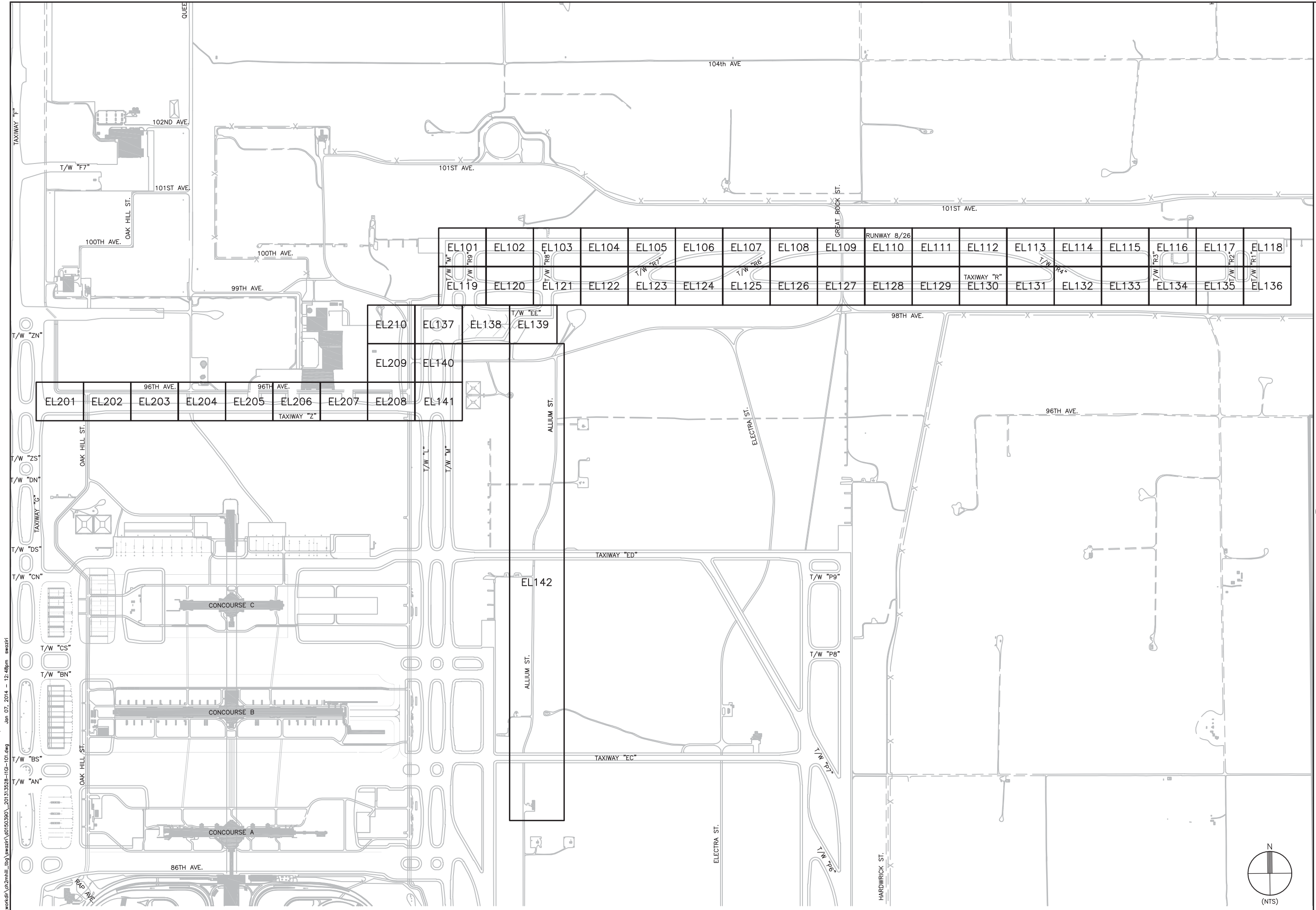
4 OF 115

CADD FILE NO.

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|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------------|-------|-------|-------|-------|-------|-------|-------|
| EL101 | EL102 | EL103 | EL104 | EL105 | EL106 | EL107 | EL108 | EL109 | EL110 | EL111 | EL112       | EL113 | EL114 | EL115 | EL116 | EL117 | EL118 |       |
| EL119 | EL120 | EL121 | EL122 | EL123 | EL124 | EL125 | EL126 | EL127 | EL128 | EL129 | TAXIWAY "R" | EL130 | EL131 | EL132 | EL133 | EL134 | EL135 | EL136 |

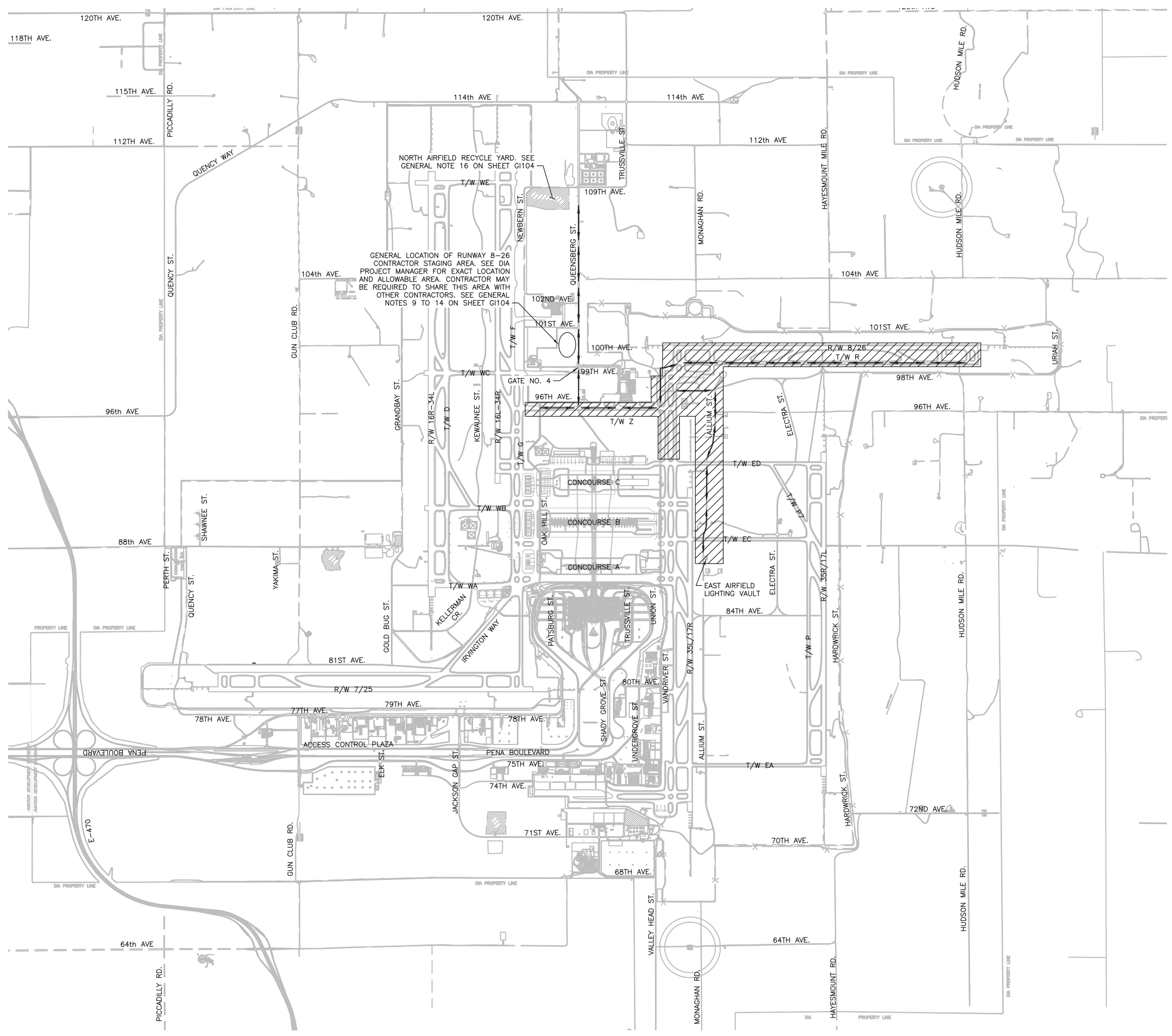
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| EL210 | EL137 | EL138 | EL139 |       |       |       |       |       |
| EL209 | EL140 |       |       |       |       |       |       |       |
| EL201 | EL202 | EL203 | EL204 | EL205 | EL206 | EL207 | EL208 | EL141 |










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ISSUED FOR CONSTRUCTION





- NOTE:**  
1. FOR GENERAL AND SAFETY NOTES, SEE SHEET G1104.
- LEGEND:**
-  RUNWAY 8-26 WORK AREA INCLUDES ALL WORK PHASES
  -  CONTRACTOR ACCESS ROUTE
  -  CLOSED PAVEMENT BARRIER, SEE DETAIL 
  -  TEMPORARILY CLOSED PAVEMENT DELINEATORS, SEE DETAIL 
  -  LIGHTED CLOSED RUNWAY CROSS, SEE SAFETY NOTE 8 ON SHEET G1104

CITY & COUNTY OF DENVER

DENVER INTERNATIONAL AIRPORT



DENVER INTERNATIONAL AIRPORT  
MAINT. & ENR.  
8500 Pena Blvd.  
Denver, CO 80249-6340

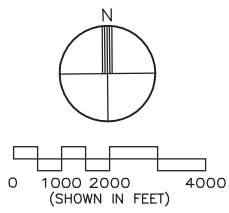


**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| ISSUE RECORD | NO. | BY     | PURPOSE | DATE | CHKD |
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| DATE                | 01/07/2014                       |
| DRAWN BY:           | B. KEAS                          |
| CHECKED BY:         | C. GAMET                         |
| FAA AIP NO:         |                                  |
| WORK BREAKDOWN NO.  |                                  |
| DESIGN CONTRACT NO. | CE84021                          |
| CONST. CONTRACT NO. | 201313528                        |
| VOLUME NO.          | 1                                |
| SHEET TITLE         | OVERALL CONSTRUCTION ACCESS PLAN |
| SHEET NO.           | G1102                            |
|                     | 5 OF 115                         |
| CADD FILE NO.       | _201313528-1G1-102-A             |



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ISSUED FOR CONSTRUCTION

- NOTES:**
1. FOR GENERAL AND SAFETY NOTES, SEE SHEET G1104.
  2. SEE SHEET G1102 FOR CONSTRUCTION ACCESS LEGEND.
  3. ALL CONTRACTOR PERSONNEL MUST BE BADGED OR ESCORTED BY CONTRACTOR PERSONNEL THAT ARE BADGED FOR DIA AIRFIELD DRIVING AND ESCORTING PRIVILEGES.
  4. SEE SHEETS GC101 TO GC106 FOR CONSTRUCTION PHASING AND SITE ACCESS INFORMATION AND TAXIWAY CLOSURE LOCATION DETAILED INFORMATION.

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

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SCALE: AS SHOWN

DATE: 01/07/2014

DRAWN BY: B. KEAS

CHECKED BY: C. GAMET

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

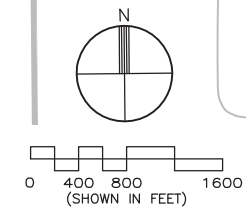
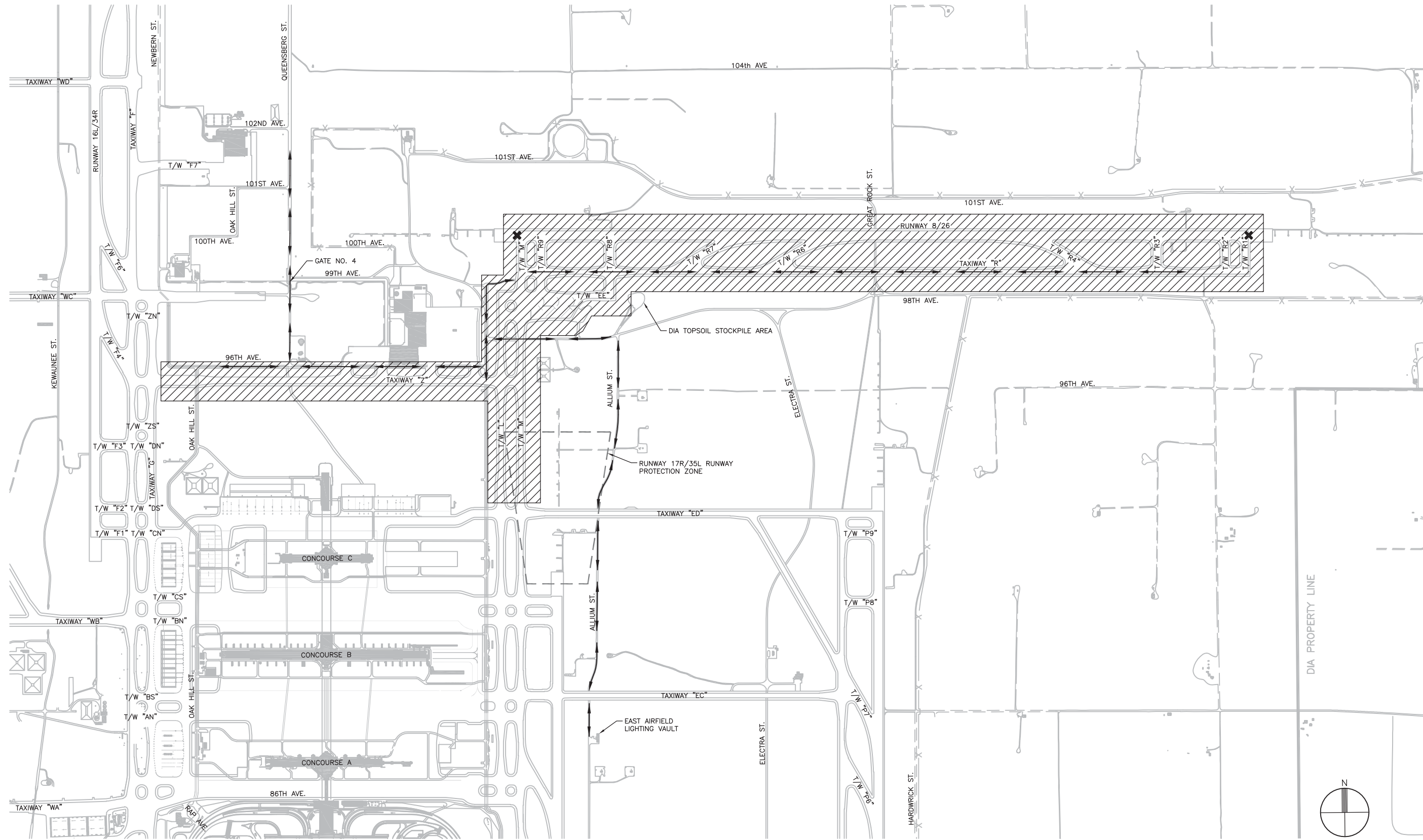
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SHEET TITLE  
**RUNWAY 8-26  
SITE ACCESS AND  
SAFETY PLAN**

SHEET NO. G1103

6 OF 115

CADD FILE NO.  
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**GENERAL NOTES:**

1. CONSTRUCTION ACCESS SHALL BE AS SHOWN ON THIS PLAN UNLESS OTHERWISE APPROVED BY THE DIA PROJECT MANAGER.
2. ALL ACCESS AND DELIVERIES TO THE RUNWAY 8-26 PROJECT SITES SHALL BE THROUGH THE EXISTING AIRPORT GATE NO. 4 AS SHOWN. ALL CONSTRUCTION AND DELIVERY PERSONNEL WILL BE ACCESSING THE SITE THROUGH THE PERMANENT GATES AND WILL NEED TO BE DIA BADGED. ALL ELECTRICAL CONTRACTOR CREWS ACCESSING THE PROJECT SITE WILL NEED TO HAVE THEIR DRIVERS OBTAIN A LIMITED ACCESS ROUTE BADGE TO ALLOW ACCESS TO THE MAJORITY OF THE PROJECT SITE WITHOUT ESCORT. CONSTRUCTION PERSONNEL AND DRIVERS ASSOCIATED WITH DELIVERIES AND SHORT TERM ACCESS FOR DEMOLITION OR PAVING OPERATIONS SHALL BE DIA BADGED AND SHALL BE ESCORTED BY CONTRACTOR PERSONNEL THAT ARE BADGED FOR DIA AIRFIELD DRIVING AND ESCORTING PRIVILEGES.
3. MAXIMUM SPEED LIMIT OF ALL VEHICLES AND EQUIPMENT SHALL BE AS STATED IN THE SPECIFICATIONS.
4. THIS PROJECT IS IN THE DIA AOA. ALL DIA SECURITY AND SAFETY REQUIREMENTS MUST BE FOLLOWED AS OUTLINED IN THE RULES AND REGULATIONS GOVERNING THE DENVER MUNICIPAL AIRPORT SYSTEM. A COPY OF REGULATIONS MAY BE OBTAINED FROM THE DIA TECHNICAL SERVICES OFFICE.
5. ALL AUTHORIZED VEHICLES AND CONSTRUCTION EQUIPMENT MUST DISPLAY A YELLOW FLASHING BEACON OR A 3'X3' INTERNATIONAL ORANGE AND WHITE FLAG (12-INCH SQUARES) DISPLAYED IN FULL VIEW ABOVE THE VEHICLES, IN ACCORDANCE WITH AC 150/5210-5, CURRENT EDITION. A YELLOW FLASHING BEACON SHALL BE USED DURING NIGHT OPERATIONS (FLAG NOT ACCEPTABLE). VEHICLES WHICH ARE NOT MARKED OR LIGHTED SHALL BE ESCORTED BY A VEHICLE THAT IS EQUIPPED WITH THE APPROPRIATE MARKING AND LIGHTING DEVICES. ONLY VEHICLES MARKED WITH THE CONTRACTOR'S NAME WILL BE ALLOWED IN THE AOA.
6. USE OF UNAUTHORIZED HAUL ROUTES WILL NOT BE ACCEPTABLE. HAUL TRUCKS MUST BE COVERED AT ALL TIMES. IN THE EVENT THAT ANY FOREIGN OBJECTS, SPILLAGE, DEBRIS, OR DUST BUILDS UP AS A RESULT OF HAULING OPERATIONS, THE CONTRACTOR SHALL BE REQUIRED TO IMMEDIATELY CLEAN AND REMOVE THE MATERIAL. HAULING ACROSS ACTIVE TAXIWAYS OR RUNWAYS IS STRICTLY PROHIBITED WITHOUT PRIOR APPROVAL OF AIRPORT OPERATIONS. TAXIWAY AND RUNWAY CROSSINGS WILL REQUIRE BADGED ESCORTS.
7. CONTRACTOR SHALL KEEP ALL ACTIVE AIRCRAFT TRAVELWAYS AND VEHICLE ROADWAYS FREE OF DEBRIS AND SEDIMENT DEPOSITED AS RESULT OF HAULING OF OTHER CONSTRUCTION ACTIVITY AT ALL TIMES. STREET SWEEPERS SHALL BE EMPLOYED AS NECESSARY WHEN DEBRIS AND SEDIMENT ACCUMULATE TO AN UNACCEPTABLE LEVEL AS DETERMINED BY THE DIA PROJECT MANAGER DUE TO CONSTRUCTION HAULING AND PROIR TO REOPENING AIRFIELD PAVEMENT TO AIRCRAFT TRAFFIC.
8. NO AMOUNT OF FOREIGN OBJECT DEBRIS (FOD) WILL BE ALLOWED ON THE ACTIVE APRONS OR TAXIWAYS.
9. THE APPROXIMATE LIMITS OF THE CONTRACTOR'S PARKING AND STAGING AREA FOR MATERIAL STOCKPILING, OFFICE TRAILERS, AND PARKING FOR PUBLIC IS SHOWN ON THE DRAWINGS. THE EXACT LIMITS OF THE CONTRACTOR'S PARKING AND STAGING AREA SHALL BE ESTABLISHED BY THE CONTRACTOR WITH THE APPROVAL OF THE DIA PROJECT MANAGER.
10. THE REQUIRED UTILITIES FOR THE CONTRACTOR'S STAGING AREA SHALL BE ARRANGED AND PAID FOR BY THE CONTRACTOR DIRECTLY WITH THE APPROPRIATE UTILITY AGENCY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE AVAILABILITY OF UTILITIES AND TO ENCLOSE, SECURE, AND SET UP THEIR OPERATIONAL AREA. THE CONTRACTOR SHALL ARRANGE FOR THE REMOVAL OF ALL TEMPORARY UTILITIES INSTALLED FOR THIS PROJECT AND RESTORE THE SITE TO PROVIDE A CLEAN AND SMOOTHLY GRADED AREA THAT ALLOWS FOR POSITIVE DRAINAGE TO THE SATISFACTION OF THE DIA PROJECT MANAGER UPON COMPLETION OF THE CONTRACT WORK. ANY DAMAGE TO EXISTING PAVEMENT, AIRFIELD LIGHTING OR OTHER EXISTING UTILITIES CAUSED BY THE CONTRACTOR SHALL BE REPLACED BY THE CONTRACTOR AT THE CONTRACTOR'S SOLE EXPENSE.
11. ALL AREAS DISTURBED AS A RESULT OF THE CONTRACTOR'S STAGING AND CONSTRUCTION OPERATIONS SHALL BE RESTORED EQUAL TO OR BETTER THAN ORIGINAL CONDITION AT THE CONTRACTOR'S SOLE EXPENSE, AND SHALL BE DONE IN A TIMELY MANNER.
12. THE CONTRACTOR IS RESPONSIBLE FOR SECURING THE PROJECT STAGING AREA.
13. WATER MAY BE AVAILABLE ON-SITE. THE CONTRACTOR SHALL CONTACT DENVER WATER TO COORDINATE AVAILABILITY OF WATER AND METERING REQUIREMENTS. THE CONTRACTOR SHALL CONTACT DENVER WATER FOR AVAILABLE CONNECTIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COST OF CONNECTING TO THE WATERLINE AND FOR ALL WATER USED. THE CONTRACTOR SHALL BE REQUIRED TO OBTAIN A HYDRANT WATER PERMIT FROM DENVER WATER LISTING EACH HYDRANT USED AND A WATER TANK WAGON PERMIT FOR EACH TANK WAGON USED. THE PERMIT(S) SHALL BE IN POSSESSION OF THE CONTRACTOR AT THE HYDRANT DURING THE TIME THE HYDRANT IS BEING USED. HYDRANT METER PERMITS WILL BE VALID FOR A PERIOD OF ONE (1) YEAR FROM THE TIME OF ISSUANCE OR UNTIL CONTRACT COMPLETION, WHICHEVER OCCURS FIRST. ANY DAMAGE DONE TO THE HYDRANT BY THE CONTRACTOR WILL BE REPAIRED BY DENVER WATER, WITH THE ACTUAL COST OF SUCH REPAIRS BILLED TO THE CONTRACTOR. IN ACCORDANCE WITH DENVER WATER'S ENGINEERING STANDARDS AND OPERATING RULES, CONTRACTOR SHALL PROVIDE AND USE THE REQUIRED, APPROVED, AND PROPERLY SUPPORTED FIRE HYDRANT METER, BACKFLOW PREVENTION ASSEMBLY, AND GATE VALVE. CONTRACTOR IS SUBJECT TO DENVER WATER'S HYDRANT USE RULES, REGULATIONS, AND FINES FOR VIOLATION. THE CONTRACTOR SHALL ARRANGE BILLING FOR WATER USE THROUGH DENVER WATER.
14. THE CITY WILL NOT ALLOW THE CONTRACTOR'S EMPLOYEES OR SUBCONTRACTOR EMPLOYEES TO DRIVE PERSONAL VEHICLES ONTO THE SITE. ONLY DIRECT CONSTRUCTION SUPPORT VEHICLES AND/OR EQUIPMENT WILL BE ALLOWED IN THE CONTRACTOR'S WORK AREAS OR SITES. THE CONTRACTOR SHALL PROVIDE PARKING AND TRANSPORTATION FOR ALL OF THEIR EMPLOYEES AND THEIR SUBCONTRACTORS EMPLOYEES ONTO THE SITE. IF DESIRED, EMPLOYEE PARKING IS ALLOWED IN THE STAGING AREA.
15. ALL AIRSIDE HAUL ROUTE DRIVERS SHALL BE SUBJECT TO COLORADO BUREAU OF INVESTIGATION (CBI) BACKGROUND CHECK OF 5 YEARS. COST FOR CBI BACKGROUND CHECK IS APPROXIMATELY \$30.00 DOLLARS PER DRIVER, TO BE PAID BY THE CONTRACTOR DIRECTLY TO DIA SECURITY. BACKGROUND CHECK TO BE COMPLETED AND APPROVED AT LEAST 4 DAYS PRIOR TO ACCESS ON SITE.
16. THE CONTRACTOR SHALL CONTACT DIRECTLY EITHER RECYCLE MATERIALS INC, LOCATED ON AIRPORT PROPERTY, OR ANY OTHER OFF SITE COMMERCIAL RECYCLER OR DISPOSAL SITE FOR PURCHASE OF RECYCLED MATERIALS TO BE USED ON SITE AND FOR DISPOSAL OF DEMOLISHED CONCRETE AND ASPHALT GENERATED FROM THE PROJECT. IT IS THE CONTRACTOR'S RESPONSIBILITY TO NEGOTIATE THE COST FOR THESE MATERIALS. ALL COSTS ARE TO BE INCLUDED AS INCIDENTAL TO THE ASSOCIATED CONSTRUCTION OR DEMOLITION BID ITEMS, THERE WILL BE NO SEPARATE PAYMENT MADE FOR PURCHASING MATERIAL OR DISPOSAL COSTS.
17. CONTACT INFORMATION FOR RECYCLE MATERIALS INC IS AS FOLLOWS: OFFICE 303-431-3701, SALES 303-710-7189.
18. THE DIA NORTH RECYCLE YARD ON QUEENSBURG STREET MAY BE UTILIZED UNDER THIS CONTRACT, AT THE CONTRACTOR'S DISCRETION, FOR ONLY CONCRETE AND ASPHALT SPOILS GENERATED FROM THIS PROJECT. A DETAILED RECYCLED MATERIALS MANIFEST MUST BE MAINTAINED AND SUBMITTED TO THE DIA PROJECT MANAGER, FOR ALL MATERIALS DISPOSED OF IN THE DIA RECYCLE YARDS, AS INDICATED IN SECTION 1566 OF THE TECHNICAL SPECIFICATIONS. ALL OTHER WASTE DEBRIS SHALL BE HAULED OFFSITE TO THE DADS LANDFILL. SEE SECTION 1566 FOR ACCEPTABLE HAUL ROUTE TO DADS LANDFILL.
19. CONTRACTOR STAGING AREA AND BATCH PLANT SHALL MAINTAIN MINIMUM 100-FOOT SEPARATION FROM AOA FENCE. CONTRACTOR SHALL CLEAN UP EXISTING DEBRIS AND GRADE STAGING AREA AND HAUL ROAD.
20. CONTRACTOR SHALL HAVE A MAXIMUM EQUIPMENT HEIGHT OF 50-FEET IN ALL AREAS OF THE PROJECT LIMITS.

21. THE CONTRACTOR SHALL COMPLY WITH ALL LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS AND CONSTRUCTION PERMITS THAT ARE PERTINENT TO THIS WORK.
22. THE CONTRACTOR SHALL FIELD VERIFY THE LOCATION AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO THE START OF CONSTRUCTION. THE CONTRACTOR SHALL REPAIR ANY DAMAGE TO UTILITIES CAUSED BY THE CONTRACTOR'S ACTIONS, AS DIRECTED BY THE DIA PROJECT MANAGER, IMMEDIATELY AT THE CONTRACTOR'S EXPENSE. IN THE EVENT OF DAMAGE TO EXISTING UTILITIES AND CABLES THAT ARE TO REMAIN, THE DIA PROJECT MANAGER AND AIRPORT OPERATIONS ARE TO BE NOTIFIED IMMEDIATELY. CONTRACTOR SHALL INSPECT UTILITIES AND NOTIFY DIA PROJECT MANAGER OF ANY PRIOR DAMAGE BEFORE STARTING ANY WORK IN THE PROJECT AREA.
23. THE CONTRACTOR SHALL CONTROL DUST FROM THEIR OPERATION TO A LEVEL ACCEPTABLE TO THE DIA PROJECT MANAGER AND IN ACCORDANCE WITH ALL APPLICABLE PERMITS AT ALL TIMES. THE CONTRACTOR SHALL HAVE AVAILABLE VACUUM BROOMS, WATERING TRUCKS, AND OTHER EQUIPMENT NECESSARY TO CONTROL DUST AND DEBRIS AT ALL TIMES DURING ALL PAVEMENT RECONSTRUCTION WORK. ALL METHODS FOR CONTROLLING DUST AND DEBRIS SHALL BE SUBJECT TO THE DIA PROJECT MANAGER'S APPROVAL. DUST AND DEBRIS CONTROL SHALL BE STRICTLY MONITORED DUE TO ITS IMPACT ON AIRCRAFT SAFETY. FAILURE TO PROPERLY CONTROL DUST AND DEBRIS OR TO RESPOND TO ANY REQUESTS TO DO SO WILL RESULT IN CONSTRUCTION ACTIVITIES BEING STOPPED BY THE DIA PROJECT MANAGER UNTIL DUST AND DEBRIS CAN BE PROPERLY CONTROLLED. ALL LOST TIME WILL COUNT AGAINST THE CONTRACTOR'S CONTRACT DURATION.
24. THE CONTRACTOR SHALL COOPERATE WITH EXISTING AND FUTURE CONTRACTORS WORKING IN THE AREA. THE CONTRACTOR SHALL COORDINATE THEIR EFFORTS TO MAINTAIN THE NECESSARY CONSTRUCTION ACCESS ROUTES AT ALL TIMES TO ASSURE ALL CONTRACTS CONTINUE ON A TIMELY BASIS.
25. WEEKLY MEETINGS SHALL BE HELD BY THE CONTRACTOR WITH THE DIA PROJECT MANAGER AND OTHER INTERESTED PARTIES TO COORDINATE THE CLOSURES, WORK AREAS, AND CONSTRUCTION SCHEDULES. ADDITIONAL MEETINGS SHALL BE HELD AS NECESSARY.
26. CONTRACTOR SHALL COORDINATE ALL AIRFIELD CLOSURE REQUESTS, INCLUDING DAYTIME CLOSURES, A MINIMUM OF 2 WEEKS PRIOR TO THE REQUESTED CLOSURE.

**SAFETY NOTES:**

1. THE CONTRACTOR, SUBCONTRACTORS, AND OTHER PERSONNEL SHALL BE REQUIRED TO STAY WITHIN THE DEFINED WORK AREA LIMITS.
2. THE AIRPORT WILL REMAIN IN OPERATION DURING CONSTRUCTION. AIRCRAFT WILL HAVE THE RIGHT OF WAY AT ALL TIMES. CONTRACTOR SHALL NOT TRAVEL ON ANY ACTIVE SURFACES, UNLESS PREVIOUSLY APPROVED BY THE DIA PROJECT MANAGER AND AIRPORT OPERATIONS.
3. BECAUSE THE CONSTRUCTION IS NEAR ACTIVE TAXIWAYS AND RUNWAYS, ALL CONSTRUCTION ACTIVITIES SHALL BE CONDUCTED IN A MANNER ACCEPTABLE TO THE DIA PROJECT MANAGER AND THE AIRPORT MANAGER TO PROVIDE ACCEPTABLE LEVELS OF SAFETY FOR ALL AIRPORT OPERATIONS AND CONTRACTOR PERSONNEL.
4. THE CONTRACTOR SHALL COMPLY WITH ALL MARKING, LIGHTING, AND PRECAUTIONARY PROVISIONS ESTABLISHED BY FAA ADVISORY CIRCULAR AC 150/5370-2, CURRENT EDITION.
5. PRIOR TO OPENING ANY RUNWAY, TAXIWAY, OR TAXILANE, THE CONTRACTOR SHALL REMOVE ALL MATERIALS AND FOREIGN OBJECT DEBRIS FROM THE PAVEMENT SURFACES. ONCE THE PAVEMENTS ARE CLEARED FOR AIRCRAFT OPERATION BY THE AIRPORT OPERATIONS, THE CONTRACTOR SHALL REMOVE THE BARRICADES.
6. ALL ELEMENTS OF THE CONSTRUCTION SHALL BE DONE IN SUCH A MANNER THAT, AT THE END OF THE CLOSURE PERIOD, THE SAFETY AREA WILL BE IN A CONDITION SUITABLE TO AIRPORT OPERATIONS. THE SAFETY AREA CONDITION SHALL BE SUBJECT TO DIA PROJECT MANAGER AND AIRPORT OPERATIONS APPROVAL. THE CONTRACTOR SHALL SWEEP THE ACTIVE PAVEMENTS AT A FREQUENCY AS DETERMINED BY AIRPORT OPERATIONS.
7. CONTRACTOR SHALL PREPARE A DETAILED CONSTRUCTION SCHEDULE FOR EACH CONSTRUCTION PHASE. THE CONSTRUCTION SCHEDULE SHALL BE COMPLETED AND SUBMITTED TO THE DIA PROJECT MANAGER FOR REVIEW A MINIMUM OF FIVE (5) WORKING DAYS PRIOR TO THE SCHEDULED PRE-CONSTRUCTION CONFERENCE. PROJECT SCHEDULE SHALL BE UPDATED AND SUBMITTED MONTHLY. A TWO WEEK SCHEDULE SHALL BE UPDATED AND SUBMITTED AT EACH WEEKLY CONSTRUCTION MEETING.
8. THE AIRPORT WILL PROVIDE LIGHTED CLOSED RUNWAY CROSSES. DIA MAINTENANCE STAFF WILL PROVIDE AND MAINTAIN THE LIGHTS. THE CONTRACTOR WILL PROVIDE AND MAINTAIN THE FUEL AND OIL. CONTRACTOR TO INSPECT CROSSES PRIOR TO START OF WORK EACH DAY. CONTACT DIA FOR ANY REQUIRED MAINTENANCE.
9. CONTRACTOR SHALL STAGE ALL VEHICLES AND EQUIPMENT ON THE TAXIWAY PAVEMENT, WITHIN THE PHASE CLOSURE AREA, ON THE SOUTH EDGE OF THE RUNWAY COMPLEX BEYOND THE RUNWAY HOLD BARS WHEN NOT IN USE. CONTRACTOR MAY STAGE SLOW MOVING EQUIPMENT SUCH AS TRACKED EQUIPMENT AND STEEL DRUM ROLLERS ON RUNWAY PAVEMENTS ONLY IF NEEDED TO PAVE RUNWAY PAVEMENTS. EQUIPMENT STORED ON RUNWAY PAVEMENTS SHALL BE CONSOLIDATED INTO A MINIMUM NUMBER OF GROUPS, CONED OFF WITH CONSTRUCTION DELINEATORS, AND LIT WITH LIGHT CARTS AT NIGHT.

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

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| CONST. CONTRACT NO. | 201313528  |
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**GENERAL AND  
SAFETY NOTES**

SHEET NO.  
**G1104**  
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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

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**GENERAL  
CONSTRUCTION  
SAFETY DETAILS**

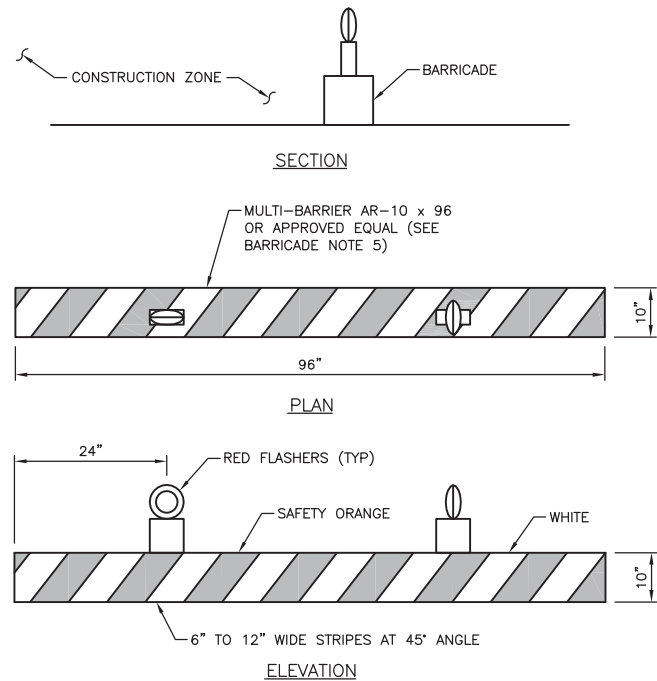
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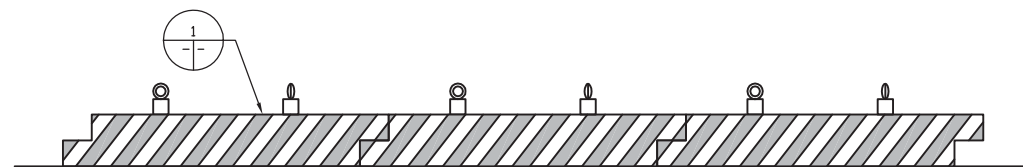
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**BARRICADE NOTES:**

- FLASHERS TO BE BATTERY OPERATED AND/OR SOLAR POWERED. LENSES TO BE RED AND BE ABLE TO ROTATE 90°.
- FACING OF LOW-PROFILE BARRICADE TO BE COVERED WITH REFLECTIVE MATERIAL.
- FLASHERS SHALL BE SECURED TO THE BARRICADES, PER MANUFACTURER'S INSTRUCTIONS. ALTERNATE FLASHER LENSES SO THAT EVERY OTHER LENS IS ROTATED 90°.
- LOW-PROFILE BARRICADES SHALL BE OF LOW MASS, EASILY COLLAPSIBLE UPON CONTACT WITH AN AIRCRAFT OR ANY OF IT'S COMPONENTS, AND WEIGHTED OR STURDILY ATTACHED TO THE SURFACE. IF AFFIXED TO THE SURFACE, THE BARRICADE MUST BE FRANGIBLE AT GRADE LEVEL OR AS LOW AS POSSIBLE, NOT TO EXCEED 3 INCHES ABOVE THE GROUND.
- DIA WILL PROVIDE THE CONTRACTOR WITH ALL BARRICADES AND DELINEATOR CONES WITH RED FLASHING BATTERY OPERATED LIGHTS AS SHOWN FREE OF CHARGE. THE CONTRACTOR SHALL COORDINATE WITH THE DIA PROJECT MANAGER TO CHECK OUT THE BARRICADES, CONES, AND LIGHTS. CONTRACTOR SHALL BE RESPONSIBLE FOR RETURNING ALL ITEMS CHECKED OUT FROM DIA IN A SIMILAR CONDITION AS RECEIVED. ANY LOST OR EXCESSIVELY DAMAGED ITEMS SHALL BE REPLACED BY THE CONTRACTOR AT NO COST TO DIA. CONTRACTOR SHALL MAINTAIN ALL BARRICADES AND ENSURE THEY ARE IN WORKING ORDER TWENTY-FOUR (24) HOURS A DAY, FOR THE DURATION OF THE PROJECT. THE BARRICADE LIGHTING SHALL BE CHECKED NIGHTLY BY THE CONTRACTOR.
- THE LIGHTS SHALL BE OPERATIONAL AT EACH BARRICADE LOCATION AT ALL TIMES. ANY LIGHTS FOUND NON-OPERATIONAL SHALL BE REPAIRED BY THE CONTRACTOR WITHIN 24 HOURS.
- CONTRACTOR SHALL FILL LOW-PROFILE BARRICADES WITH WATER. CONTRACTOR SHALL CHECK WATER LEVELS DAILY AND REFILL BARRICADES AS NECESSARY.

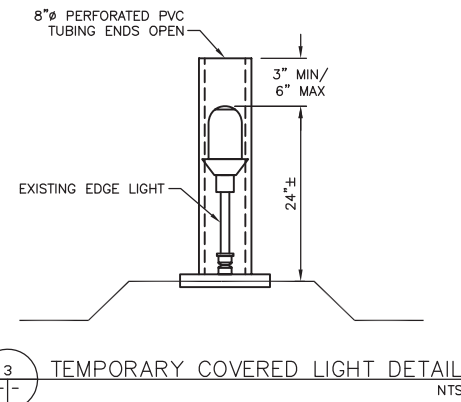
1 LOW-PROFILE BARRICADE DETAIL  
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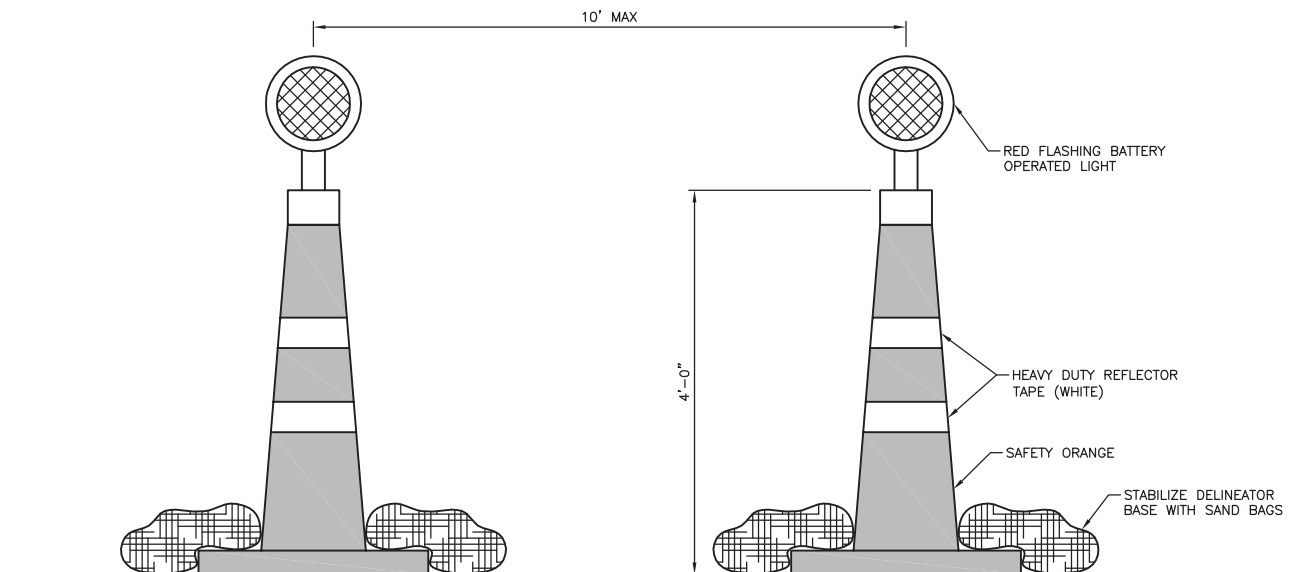
**CLOSED PAVEMENT BARRIER NOTES:**

- PLACE INTERCONNECTED LOW-PROFILE BARRICADES TO COMPLETELY SURROUND OR BLOCK ACCESS TO WORK AREA FROM EDGE OF PAVEMENT TO EDGE OF PAVEMENT AS SHOWN ON THE DRAWINGS AND DIRECTED BY THE PROJECT MANAGER IN THE FIELD.
- BARRIERS CAN BE PLACED IN CURVES OR ANGLES SO LONG AS THEY ARE PLACED IN A NEAT AND ORDERLY PATTERN AND THE BARRICADES REMAIN INTERCONNECTED.
- AT NIGHT, LIGHT PLANTS SHALL BE PLACED AT CLOSURE POINTS AT THE DIA PROJECT MANAGER'S DISCRETION AND SHALL ILLUMINATE THE CLOSED PAVEMENT BARRIER SYSTEM.

2 CLOSED PAVEMENT BARRIER DETAIL  
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3 TEMPORARY COVERED LIGHT DETAIL  
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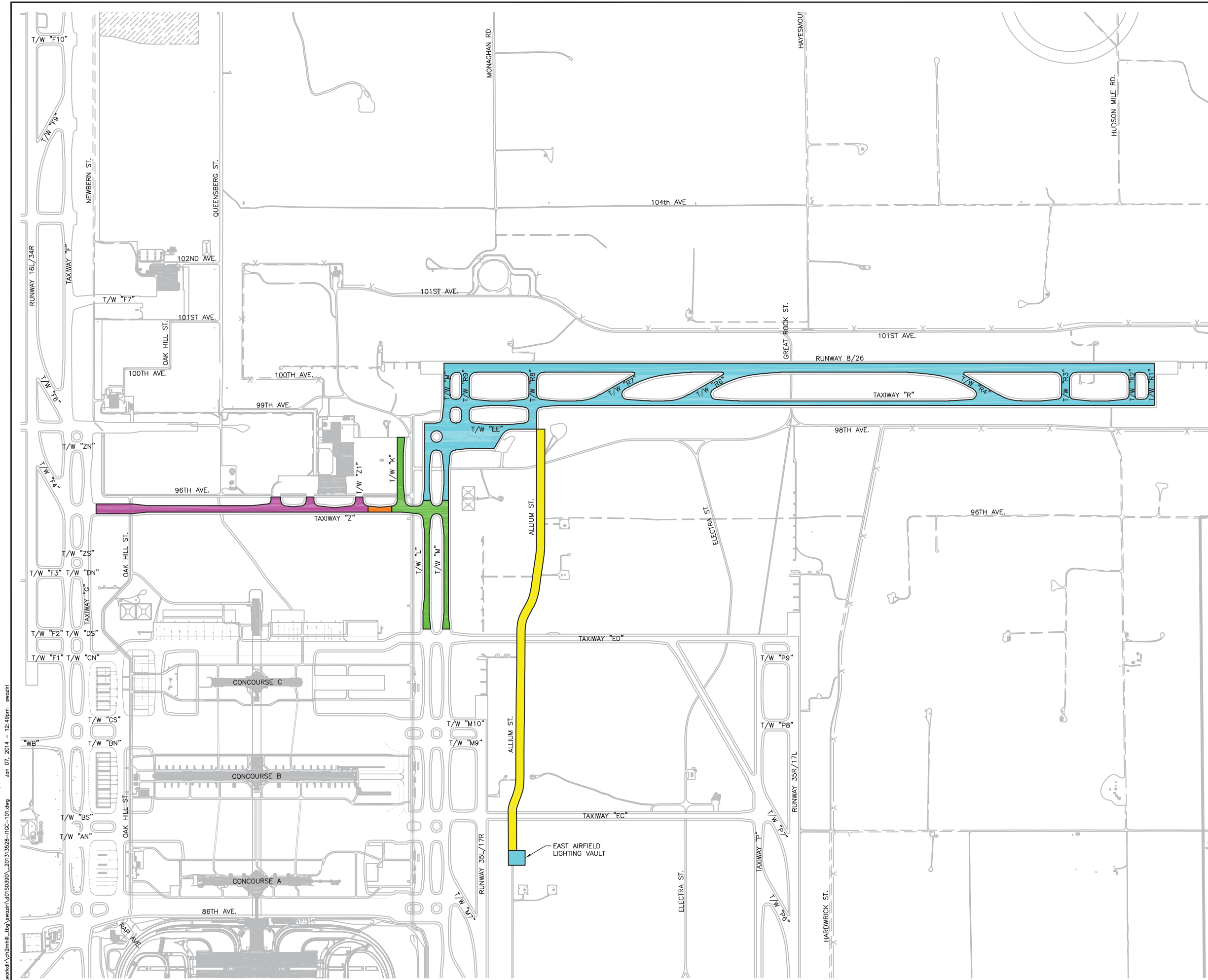


**CONSTRUCTION DELINEATOR NOTE:**

- SEE BARRICADE NOTE 5.

4 CONSTRUCTION DELINEATOR CONE DETAIL  
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- GENERAL NOTES:**
- SEE SHEETS GC102 TO GC106 FOR INDIVIDUAL PHASING REQUIREMENTS.
  - SEE SHEETS GC201 TO GC202 FOR ELECTRICAL PHASING REQUIREMENTS.
  - SEE SHEETS G1102 TO G1103 FOR SITE ACCESS, ESCORT, AND CONTRACTOR BADGING REQUIREMENTS.
  - ALL TAXIWAY CONCRETE PAVEMENT MUST REACH A MINIMUM OF 550 PSI FLEXURAL STRENGTH PRIOR TO REOPENING TO AIRCRAFT TRAFFIC. ALL RUNWAY CONCRETE PAVEMENT MUST REACH A MINIMUM OF 700 PSI FLEXURAL STRENGTH PRIOR TO REOPENING TO AIRCRAFT TRAFFIC. CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT CONCRETE MIX DESIGN AND PLACEMENT SCHEDULE ALLOWS FOR REOPENING PAVEMENT WITHIN THE REQUIRED PHASE DURATION.
  - PHOTOMETRIC TESTING OF THE RUNWAY ELEVATED LIGHTS AND ALL INSET LIGHT FIXTURES REPLACED SHALL TAKE PLACE PRIOR TO THE REOPENING OF RUNWAY 8-26. THE TIME SCHEDULED FOR PHOTOMETRIC TESTING SHALL INCLUDE THE TIME NECESSARY TO CORRECT DEFICIENCIES.

**OVERALL PHASING LEGEND:**

- PHASE 1
- PHASE 2
- PHASE 3
- PHASE 4
- PHASE 5

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**RUNWAY 8-26  
 COMPLEX LIGHTING  
 REHABILITATION**

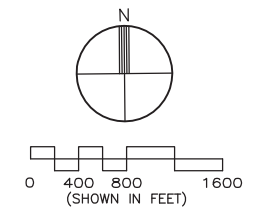


| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
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| VOLUME NO.          | 1          |
| SHEET TITLE         |            |

**OVERALL PHASING PLAN**

SHEET NO. **GC101**  
 9 OF 115  
 CADD FILE NO. **\_201313528-1GC-101-A**



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- PHASE 1 NOTES:**
1. SEE SHEET GC101 FOR OVERALL PHASING NOTES AND LEGEND.
  2. SEE SHEET G102 FOR SITE ACCESS LEGEND.
  3. THE CLOSED PAVEMENT BARRIERS SHALL BE INSTALLED PRIOR TO THE START OF PHASE 1 WORK.
  4. PHASE 1 SHALL BE STARTED IMMEDIATELY AFTER NTP 2 WITH A MAXIMUM ALLOWABLE CONTINUOUS DURATION OF 45 DAYS.
  5. SEE SHEET GC201 FOR PHASE 1 ELECTRICAL PHASING INFORMATION.

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | BK  | CONST | 07JA14  | CG   |      |

SCALE: AS SHOWN

DATE: 01/07/2014

DRAWN BY: B. KEAS

CHECKED BY: C. GAMET

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

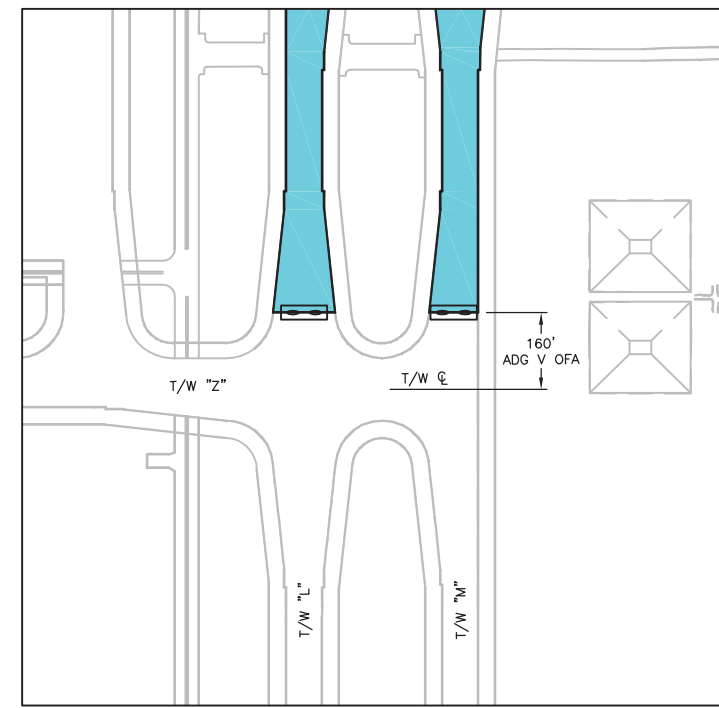
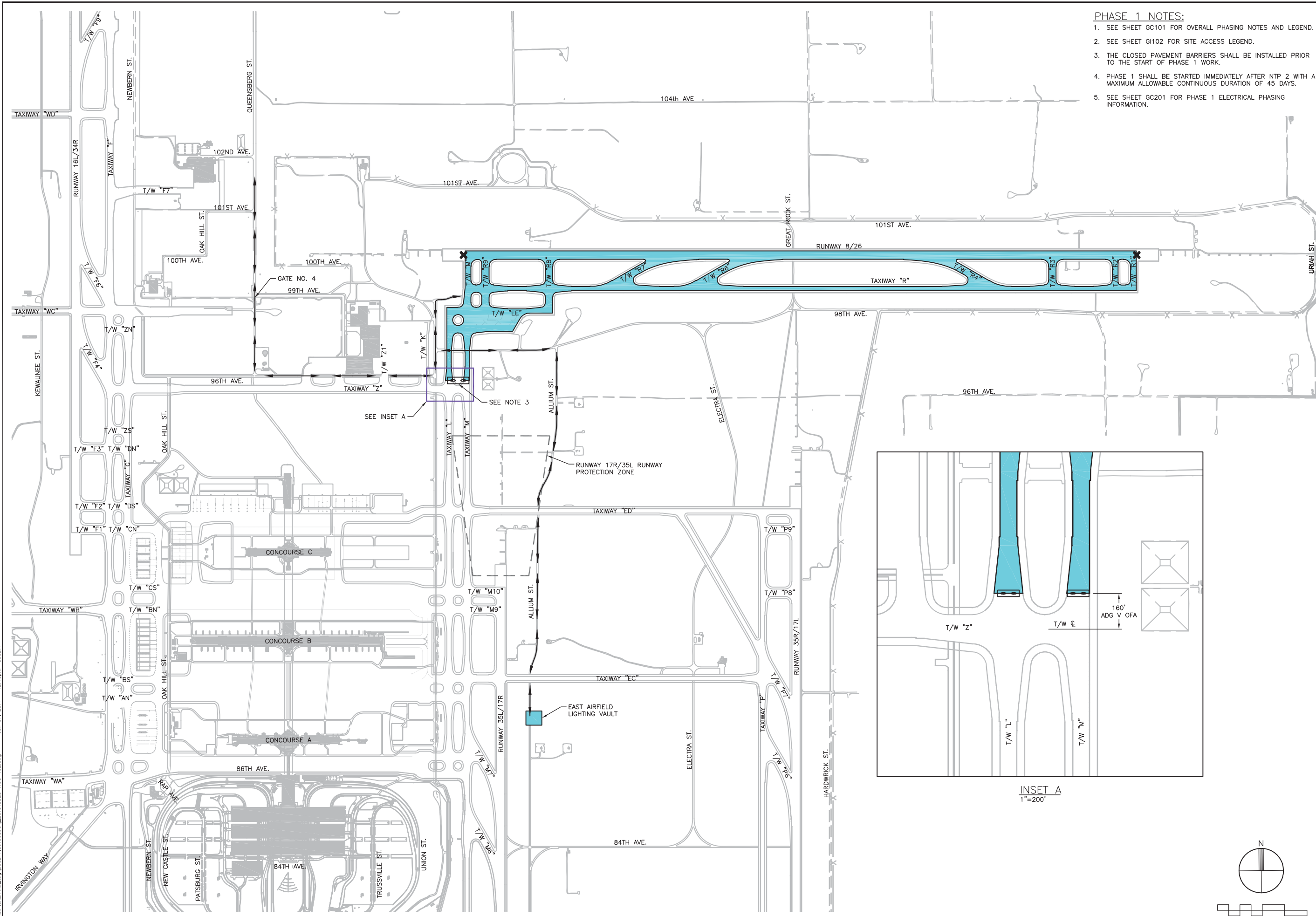
VOLUME NO. 1

SHEET TITLE  
**CONSTRUCTION  
PHASING PLAN -  
PHASE 1**

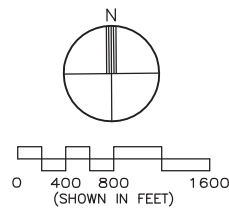
SHEET NO. GC102

10 OF 115

CADD FILE NO. \_201313528-1GC-102-A



INSET A  
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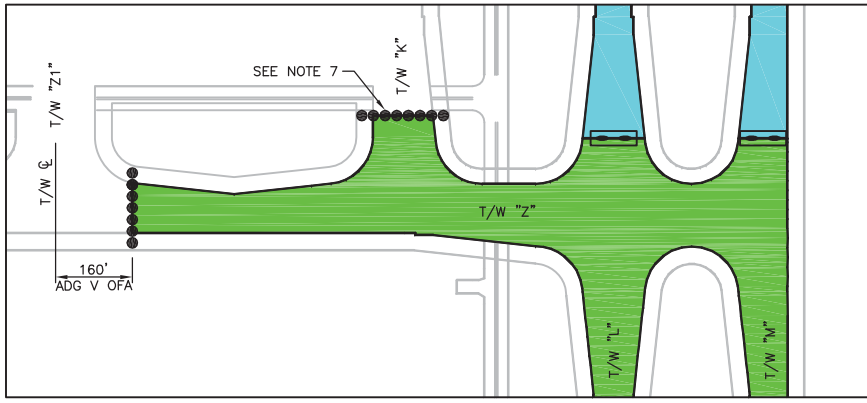
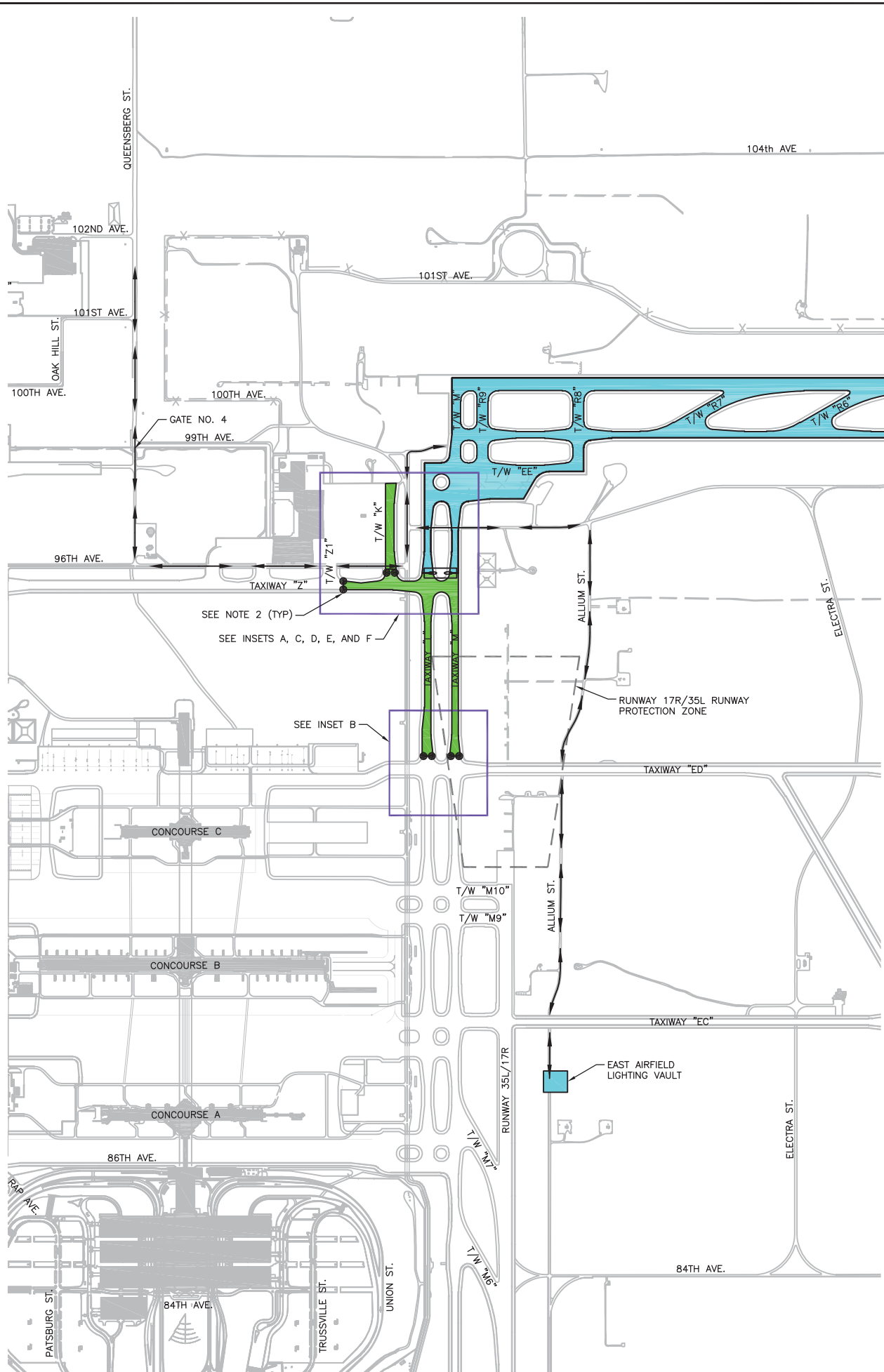
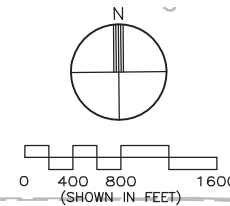
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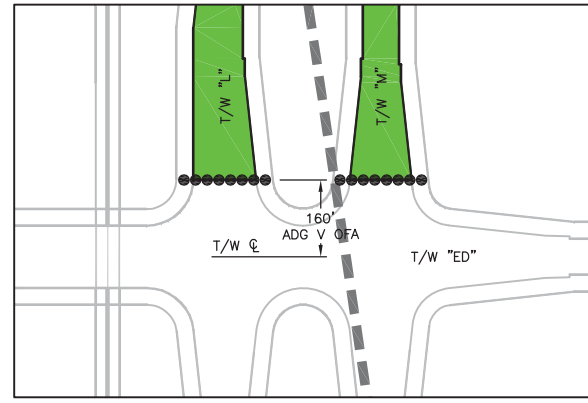


**PHASE 2 NOTES:**

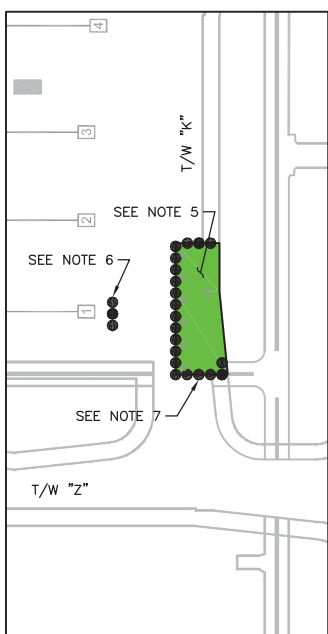
1. SEE SHEET GC101 FOR OVERALL PHASING NOTES AND LEGEND.
2. SEE SHEET G1102 FOR SITE ACCESS LEGEND.
3. WORK IN THE PHASE 2 AREA WILL BE ACCOMPLISHED DURING INDIVIDUAL DAYTIME CLOSURES TO BE COORDINATED WITH DIA.
4. PHASE 2 SHALL BE STARTED IMMEDIATELY AFTER NTP2 AND WILL BE COMPLETED CONCURRENTLY WITH PHASE 1.
5. COMPLETE ALL WORK ON TAXIWAY CENTERLINE LIGHTS AND EDGE LIGHTS IN THE AREA SHOWN DURING THIS SUBPHASE.
6. PLACE 3 CONES AT 10-FOOT INTERVALS ON THE EAST SIDE OF THE PARKING LOCATIONS SHOWN FOR EACH SUBPHASE AS DIRECTED BY DIA OPERATIONS. THE CONES SHALL BE USED TO INDICATE THAT CLOSED PAVEMENT AREAS EXIST TO THE EAST OF THE PARKING LOCATIONS.
7. CONES PLACED ALONG VEHICLE SERVICE ROADS SHALL BE PLACED AT 4-FOOT INTERVALS. ALL OTHER CONES PLACED ON AIRFIELD PAVEMENT AREAS TO BE SPACED AT 10-FOOT INTERVALS.
8. PLACE CONES ALONG VSR AS NEEDED TO ONLY CLOSE THE FURTHEST NORTH (WESTBOUND) LANE OF THE VSR TO GAIN ACCESS TO TAXIWAY CENTERLINE LIGHT LOCATED IN THIS AREA. CONTRACTOR SHALL KEEP THE REMAINING THREE VSR LANES OPEN AND IN SERVICE (TWO EASTBOUND LANES AND ONE WESTBOUND LANE) DURING THIS SUBPHASE.



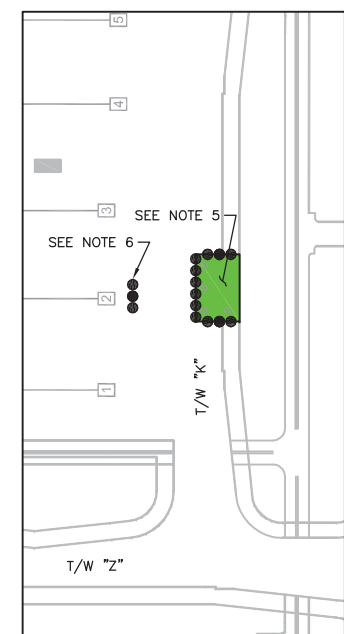
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1"=200'



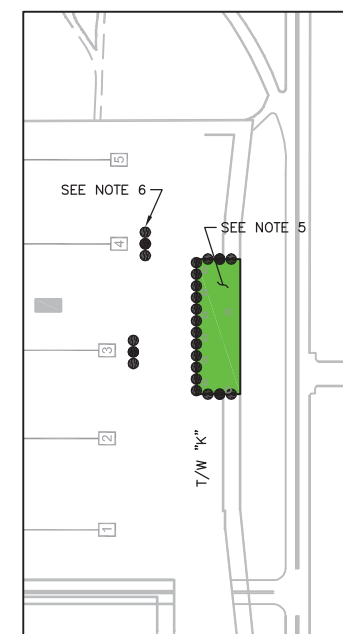
**INSET B**  
1"=200'



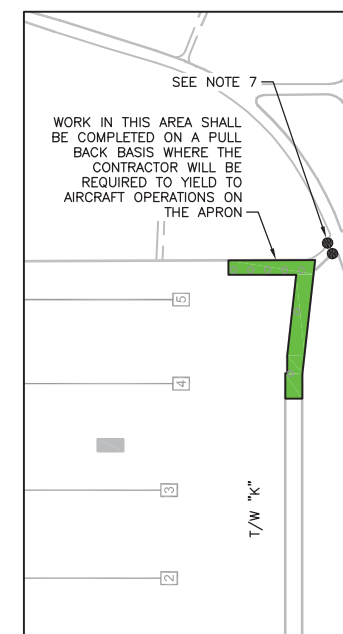
**INSET C**  
1"=200'



**INSET D**  
1"=200'



**INSET E**  
1"=200'



**INSET F**  
1"=200'

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

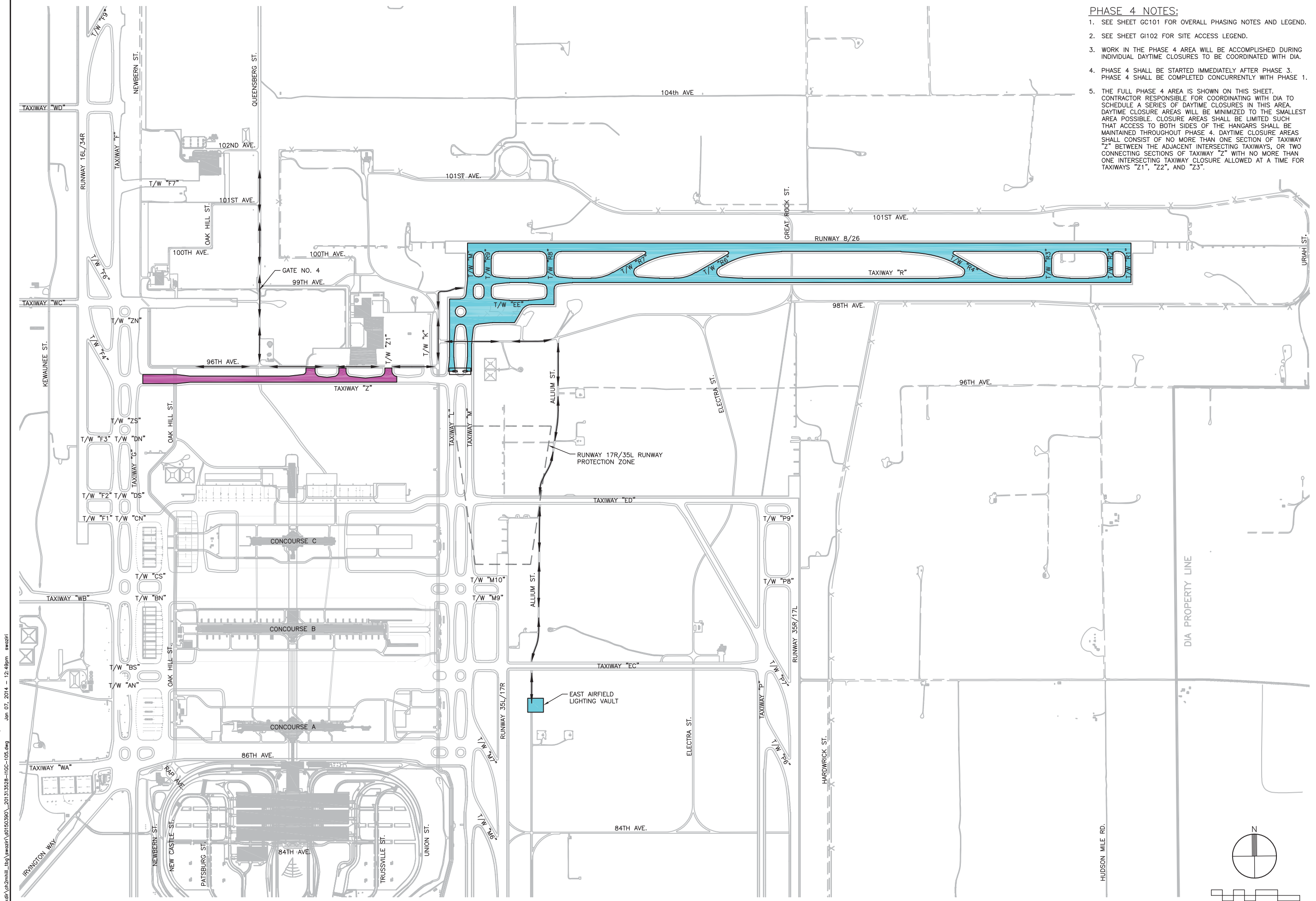
| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | BK  | CONST | 07JA14  | CG   |      |

|                     |                                            |
|---------------------|--------------------------------------------|
| SCALE               | AS SHOWN                                   |
| DATE                | 01/07/2014                                 |
| DRAWN BY:           | B. KEAS                                    |
| CHECKED BY:         | C. GAMET                                   |
| FAA AIP NO:         |                                            |
| WORK BREAKDOWN NO.  |                                            |
| DESIGN CONTRACT NO. | CE84021                                    |
| CONST. CONTRACT NO. | 201313528                                  |
| VOLUME NO.          | 1                                          |
| SHEET TITLE         | <b>CONSTRUCTION PHASING PLAN - PHASE 2</b> |
| SHEET NO.           | GC103                                      |
|                     | 11 OF 115                                  |
| CADD FILE NO.       | _201313528-1GC-103-A                       |

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- PHASE 4 NOTES:**
1. SEE SHEET GC101 FOR OVERALL PHASING NOTES AND LEGEND.
  2. SEE SHEET G102 FOR SITE ACCESS LEGEND.
  3. WORK IN THE PHASE 4 AREA WILL BE ACCOMPLISHED DURING INDIVIDUAL DAYTIME CLOSURES TO BE COORDINATED WITH DIA.
  4. PHASE 4 SHALL BE STARTED IMMEDIATELY AFTER PHASE 3. PHASE 4 SHALL BE COMPLETED CONCURRENTLY WITH PHASE 1.
  5. THE FULL PHASE 4 AREA IS SHOWN ON THIS SHEET. CONTRACTOR RESPONSIBLE FOR COORDINATING WITH DIA TO SCHEDULE A SERIES OF DAYTIME CLOSURES IN THIS AREA. DAYTIME CLOSURE AREAS WILL BE MINIMIZED TO THE SMALLEST AREA POSSIBLE. CLOSURE AREAS SHALL BE LIMITED SUCH THAT ACCESS TO BOTH SIDES OF THE HANGARS SHALL BE MAINTAINED THROUGHOUT PHASE 4. DAYTIME CLOSURE AREAS SHALL CONSIST OF NO MORE THAN ONE SECTION OF TAXIWAY "Z" BETWEEN THE ADJACENT INTERSECTING TAXIWAYS, OR TWO CONNECTING SECTIONS OF TAXIWAY "Z" WITH NO MORE THAN ONE INTERSECTING TAXIWAY CLOSURE ALLOWED AT A TIME FOR TAXIWAYS "Z1", "Z2", AND "Z3".

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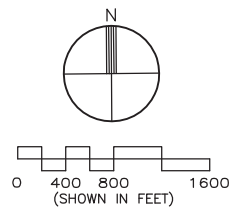
**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**



ISSUE RECORD

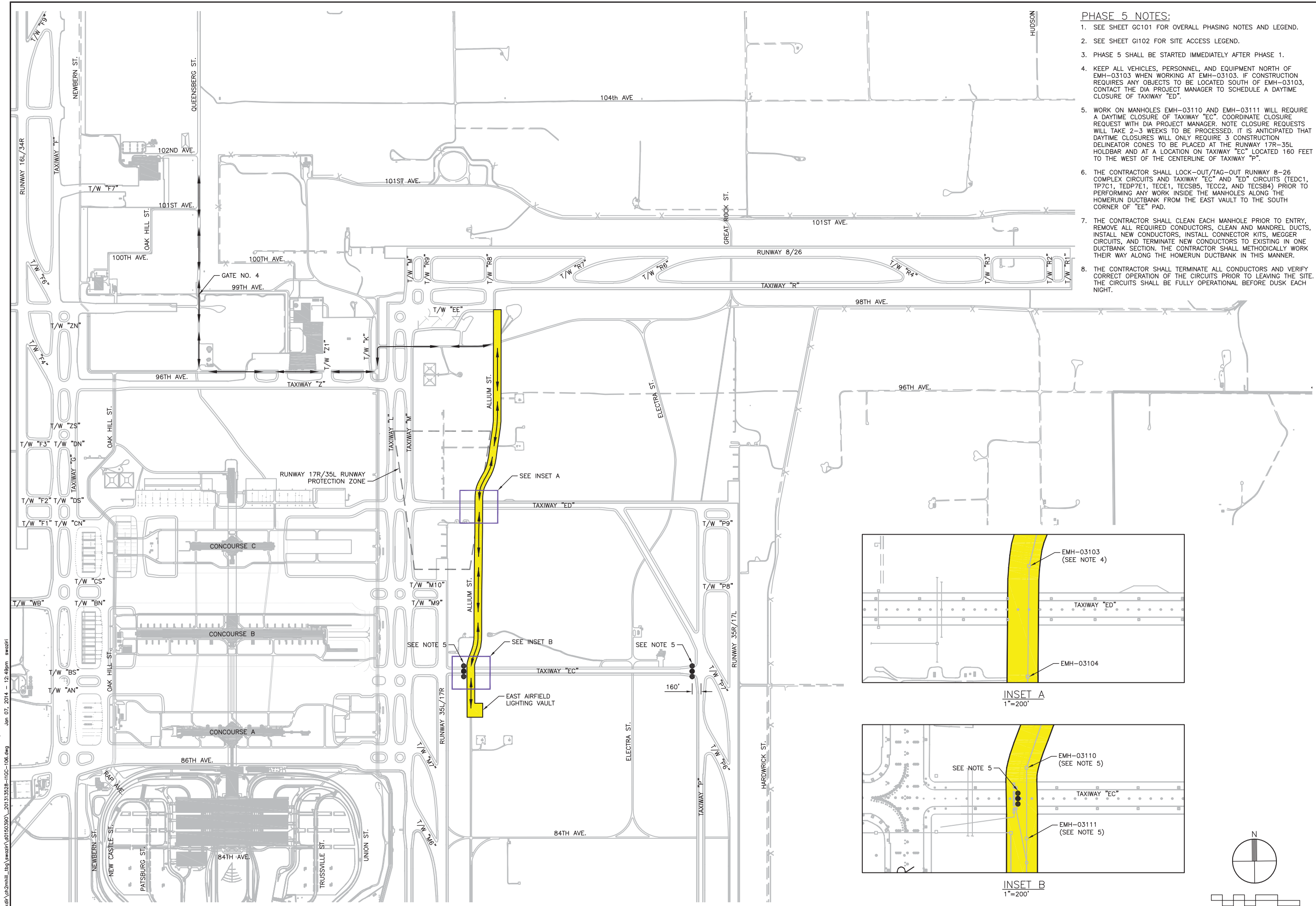
| NO. | BY | PURPOSE | DATE   | CHKD |
|-----|----|---------|--------|------|
| 1   | BK | CONST   | 07JA14 | CG   |

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| SCALE               | AS SHOWN                            |
| DATE                | 01/07/2014                          |
| DRAWN BY:           | B. KEAS                             |
| CHECKED BY:         | C. GAMET                            |
| FAA AIP NO:         |                                     |
| WORK BREAKDOWN NO.  |                                     |
| DESIGN CONTRACT NO. | CE84021                             |
| CONST. CONTRACT NO. | 201313528                           |
| VOLUME NO.          | 1                                   |
| SHEET TITLE         | CONSTRUCTION PHASING PLAN - PHASE 4 |
| SHEET NO.           | GC105                               |
|                     | 13 OF 115                           |
| CADD FILE NO.       | _201313528-1GC-105-A                |

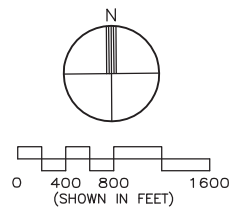
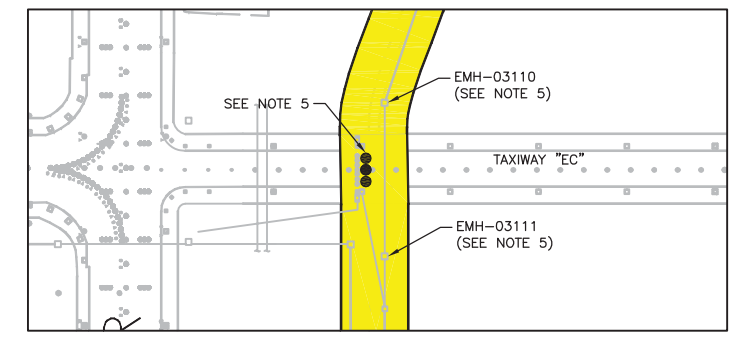
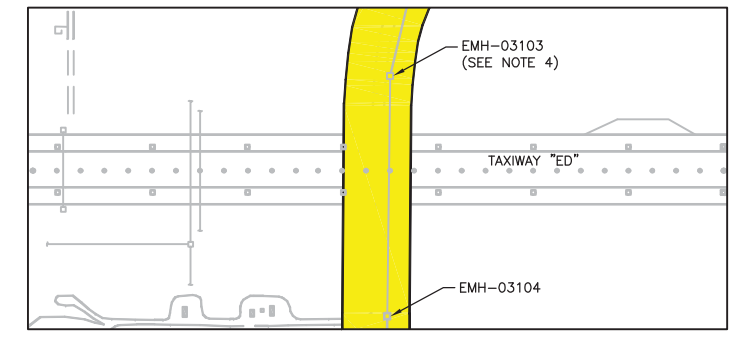


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- PHASE 5 NOTES:**
1. SEE SHEET GC101 FOR OVERALL PHASING NOTES AND LEGEND.
  2. SEE SHEET G1102 FOR SITE ACCESS LEGEND.
  3. PHASE 5 SHALL BE STARTED IMMEDIATELY AFTER PHASE 1.
  4. KEEP ALL VEHICLES, PERSONNEL, AND EQUIPMENT NORTH OF EMH-03103 WHEN WORKING AT EMH-03103. IF CONSTRUCTION REQUIRES ANY OBJECTS TO BE LOCATED SOUTH OF EMH-03103, CONTACT THE DIA PROJECT MANAGER TO SCHEDULE A DAYTIME CLOSURE OF TAXIWAY "ED".
  5. WORK ON MANHOLES EMH-03110 AND EMH-03111 WILL REQUIRE A DAYTIME CLOSURE OF TAXIWAY "EC". COORDINATE CLOSURE REQUEST WITH DIA PROJECT MANAGER. NOTE CLOSURE REQUESTS WILL TAKE 2-3 WEEKS TO BE PROCESSED. IT IS ANTICIPATED THAT DAYTIME CLOSURES WILL ONLY REQUIRE 3 CONSTRUCTION DELINEATOR CONES TO BE PLACED AT THE RUNWAY 17R-35L HOLDBAR AND AT A LOCATION ON TAXIWAY "EC" LOCATED 160 FEET TO THE WEST OF THE CENTERLINE OF TAXIWAY "P".
  6. THE CONTRACTOR SHALL LOCK-OUT/TAG-OUT RUNWAY 8-26 COMPLEX CIRCUITS AND TAXIWAY "EC" AND "ED" CIRCUITS (TEDC1, TP7C1, TEDP7E1, TECE1, TECSB5, TECC2, AND TECSB4) PRIOR TO PERFORMING ANY WORK INSIDE THE MANHOLES ALONG THE HOMERUN DUCTBANK FROM THE EAST VAULT TO THE SOUTH CORNER OF "EE" PAD.
  7. THE CONTRACTOR SHALL CLEAN EACH MANHOLE PRIOR TO ENTRY, REMOVE ALL REQUIRED CONDUCTORS, CLEAN AND MANDREL DUCTS, INSTALL NEW CONDUCTORS, INSTALL CONNECTOR KITS, MEGGER CIRCUITS, AND TERMINATE NEW CONDUCTORS TO EXISTING IN ONE DUCTBANK SECTION. THE CONTRACTOR SHALL METHODOLOGICALLY WORK THEIR WAY ALONG THE HOMERUN DUCTBANK IN THIS MANNER.
  8. THE CONTRACTOR SHALL TERMINATE ALL CONDUCTORS AND VERIFY CORRECT OPERATION OF THE CIRCUITS PRIOR TO LEAVING THE SITE. THE CIRCUITS SHALL BE FULLY OPERATIONAL BEFORE DUSK EACH NIGHT.



**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

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WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE  
**CONSTRUCTION  
PHASING PLAN -  
PHASE 5**

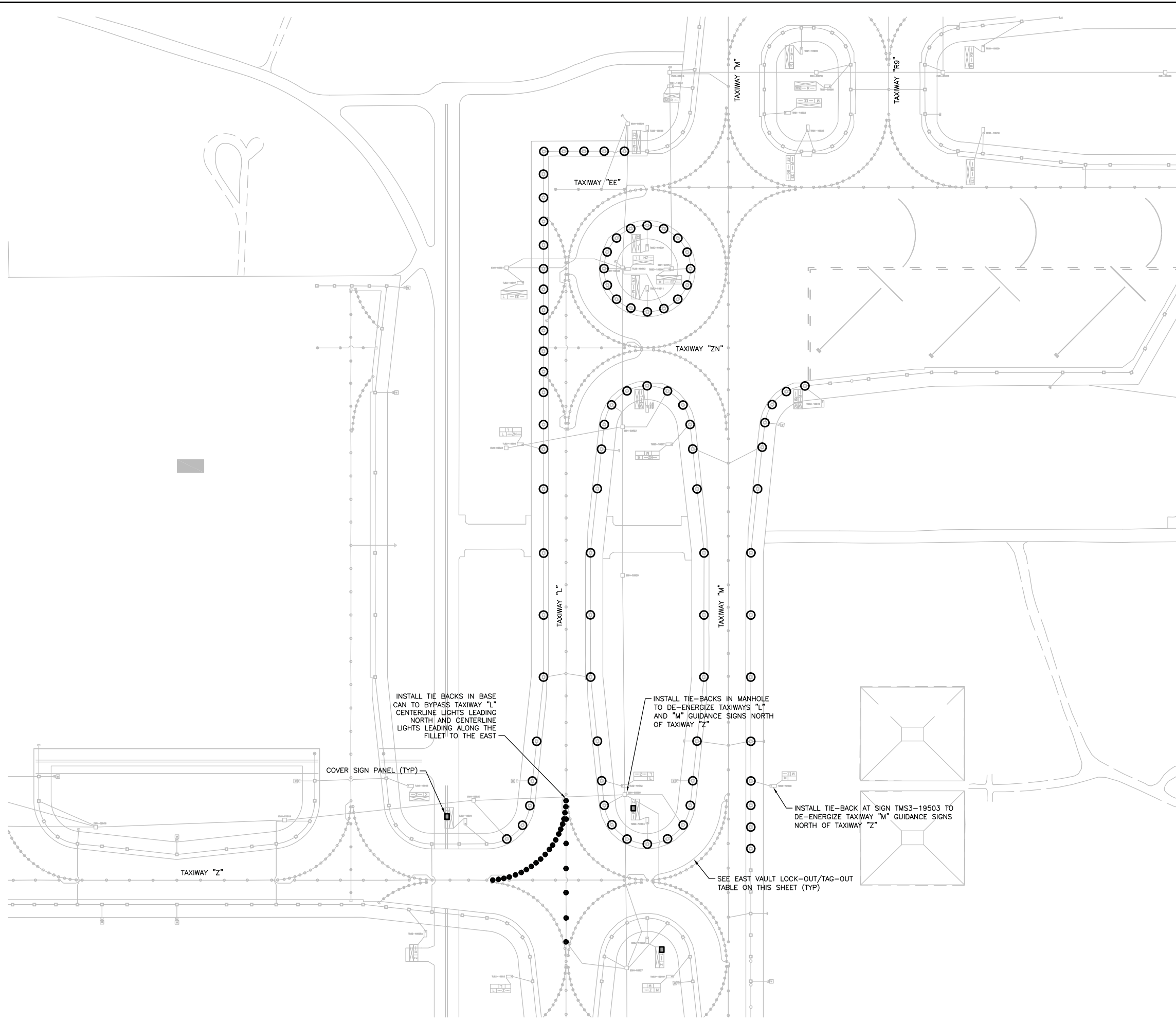
SHEET NO. GC106

14 OF 115

CADD FILE NO. \_201313528-11GC-106-A

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**PHASE 1 NOTES:**

1. THE CONTRACTOR SHALL REMOVE THE SIGN PANEL(S) FROM THE SIGN CASE AND INSERT PROVIDED BLACK BLANK PANEL(S) OR WRAP THE INFORMATION SHOWN TO BE BLANKED OUT WITH GEOTEXTILE FABRIC AND INSERT THE SIGN PANEL(S) BACK INTO THE SIGN CASE. CONTRACTOR SHALL RETURN BLANK PANEL(S) TO DIA AT COMPLETION OF THE PROJECT.
2. CONTRACTOR SHALL FIELD VERIFY CIRCUIT ROUTING PRIOR TO START OF CONSTRUCTION. INFORMATION SHOWN IS BASED ON AS-BUILT INFORMATION AND HAS NOT BEEN VERIFIED.

**LEGEND:**

- COVER SIGN PANEL, SEE NOTE 1
- INSTALL PVC COVER OVER ELEVATED EDGE LIGHT, SEE DETAIL
- OR INSTALL SHORTING PLUG ON SECONDARY OF ISOLATION TRANSFORMER
- TZC1 INSTALL JUMPER CABLE #8 AWG L-824 TYPE C IN ORANGE HDPE CONDUIT. HASH MARKS DENOTE NUMBER OF CONDUCTORS

| EAST AIRFIELD LIGHTING VAULT LOCK-OUT/TAG-OUT TABLE |             |
|-----------------------------------------------------|-------------|
| REGULATOR NO.                                       | CIRCUIT(S)  |
| 31                                                  | R8E         |
| 32                                                  | R8C1        |
| 33                                                  | R8C2        |
| 34                                                  | R8RDRWC     |
| 35                                                  | R8TDZ       |
| 36                                                  | TRE1/TRE2   |
| 37                                                  | TRC1/TRC5   |
| 38                                                  | TRC2        |
| 39                                                  | TRC3        |
| 59                                                  | TRC4        |
| 65                                                  | TEEC1/TR9C1 |
| 42                                                  | TRSB        |
| 43                                                  | TRWW        |
| 44                                                  | GS1/GS2     |
| 55                                                  | TMC6        |

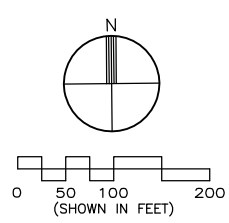
INSTALL TIE BACKS IN BASE CAN TO BYPASS TAXIWAY "L" CENTERLINE LIGHTS LEADING NORTH AND CENTERLINE LIGHTS LEADING ALONG THE FILLET TO THE EAST

INSTALL TIE-BACKS IN MANHOLE TO DE-ENERGIZE TAXIWAYS "L" AND "M" GUIDANCE SIGNS NORTH OF TAXIWAY "Z"

INSTALL TIE-BACK AT SIGN TMS3-19503 TO DE-ENERGIZE TAXIWAY "M" GUIDANCE SIGNS NORTH OF TAXIWAY "Z"

SEE EAST VAULT LOCK-OUT/TAG-OUT TABLE ON THIS SHEET (TYP)

COVER SIGN PANEL (TYP)



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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE     | CHKD |
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| 1   | SJ | CONST   | 07/14/14 | MS   |

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CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE  
**ELECTRICAL  
PHASING PLAN -  
PHASE 1**

SHEET NO. GC201

15 OF 115

CADD FILE NO. \_201313528-1IGC-201-A

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PHASE 3 NOTE:  
1. FOR ELECTRICAL LEGEND, SEE SHEET GC201.

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RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

**CH2MHILL**

| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/JA/14 | MS   |

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DATE 01/07/2014

DRAWN BY: S. JACOBS

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FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

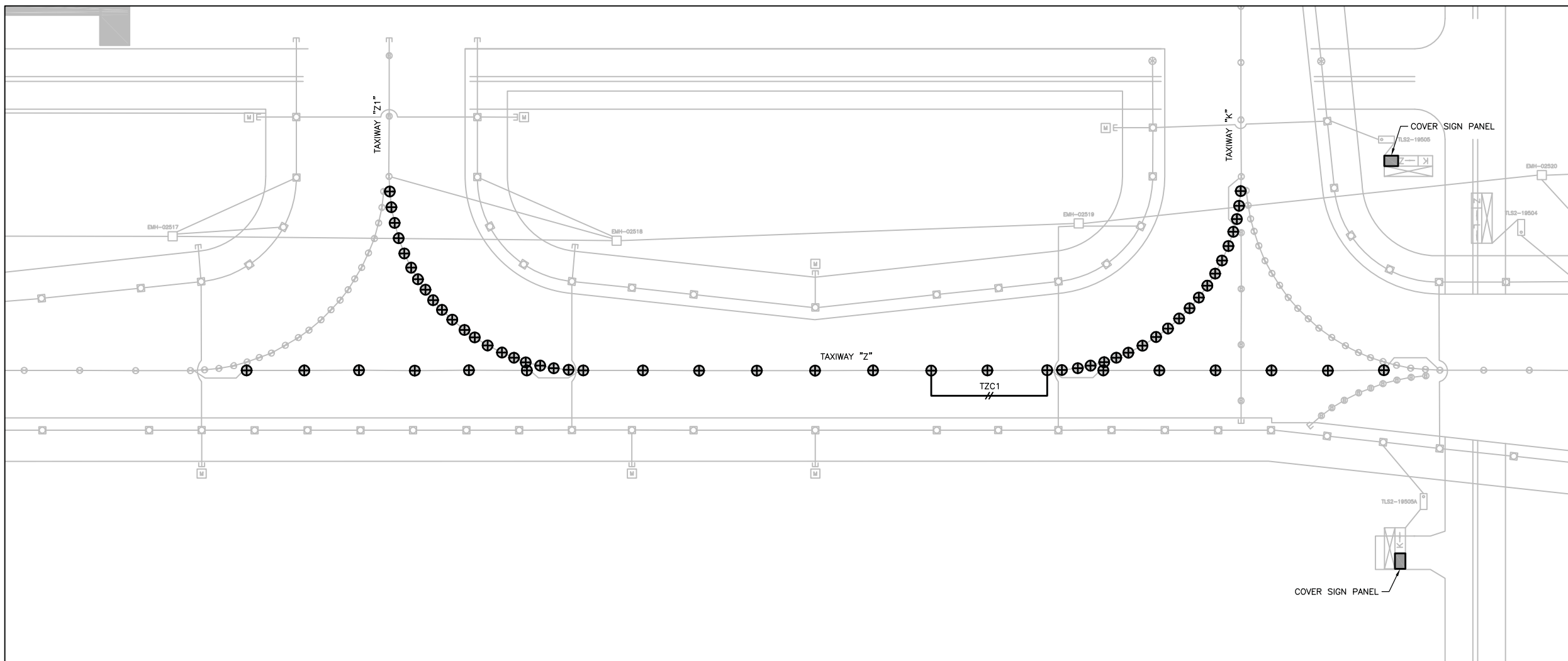
CONST. CONTRACT NO. 201313528

VOLUME NO. 1

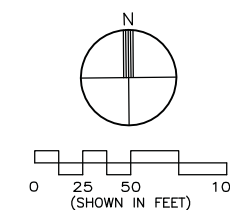
SHEET TITLE  
ELECTRICAL  
PHASING PLAN -  
PHASE 3

SHEET NO. GC202

16 OF 115  
CADD FILE NO.  
\_201313528-1GC-202-A



INTERSECTION OF TAXIWAYS "Z", "Z1", AND "K"



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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**



|              |     |    |         |          |      |
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| ISSUE RECORD | NO. | BY | PURPOSE | DATE     | CHKD |
|              | 1   | BK | CONST   | 07/14/14 | CG   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: B. KEAS

CHECKED BY: C. GAMET

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**SCHEDULE  
BREAKDOWN AND  
MILESTONES**

SHEET NO. GC701

17 OF 115

CADD FILE NO. \_201313528-1GC-701-A

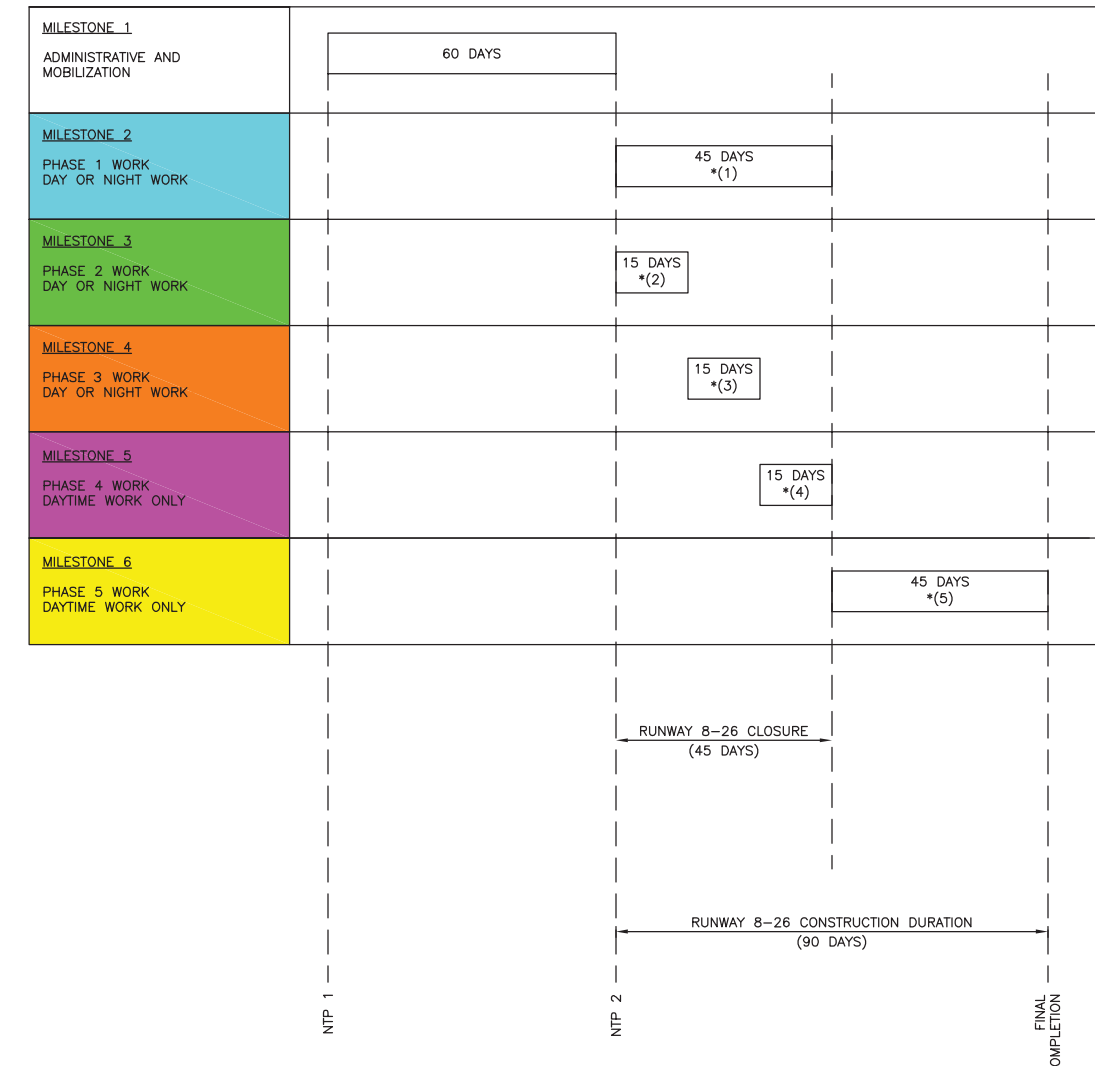
**GENERAL NOTE:**  
1. SEE SHEET GC702 FOR CORRELATIONS BETWEEN FUNDING SCHEDULES AND PROJECT PHASES.

**ELECTRICAL NOTE:**  
1. AIRFIELD CIRCUITS SHALL BE TURNED ON INDIVIDUALLY AND CONFIRMED TO BE OPERATIONAL AT LEAST ONE DAY PRIOR TO PHOTOMETRIC TESTING. PHOTOMETRIC TESTING SHALL OCCUR BEFORE OPENING OF ANY PAVEMENT.

SCHEDULE BREAKDOWN

| SCHEDULE   | WORK ITEMS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SCHEDULE A | <ul style="list-style-type: none"> <li>REMOVAL OF RUNWAY CENTERLINE LIGHTS, TOUCHDOWN ZONE LIGHTS, AND STOPBAR LIGHTS</li> <li>REMOVAL OF RUNWAY EDGE LIGHTS</li> <li>REPLACEMENT OF CABLING</li> <li>REPLACEMENT OF TRANSFORMERS</li> <li>INSTALLATION OF LED RUNWAY CENTERLINE LIGHTS, TOUCHDOWN ZONE LIGHTS, AND STOPBAR LIGHTS</li> <li>INSTALLATION OF RUNWAY QUARTZ EDGE LIGHTS</li> <li>REMOVAL OF TAXIWAY CENTERLINE LIGHTS</li> <li>INSTALLATION OF LED TAXIWAY CENTERLINE LIGHTS</li> <li>REMOVAL OF EXISTING CONCRETE PAVEMENT</li> <li>INSTALLATION OF CONDUITS AND CABLING</li> <li>INSTALL BOND BREAKER FABRIC</li> <li>PORTLAND CEMENT CONCRETE (PCC) PAVING OVER EXISTING CEMENT TREATED BASE</li> <li>REMOVAL OF ASPHALT AND ASPHALT TREATED PERMEABLE BASE</li> <li>REPLACEMENT OF ASPHALT SHOULDER PAVEMENT AND AGGREGATE BASE</li> </ul> |
| SCHEDULE B | <ul style="list-style-type: none"> <li>REMOVAL OF TAXIWAY EDGE LIGHTS</li> <li>REPLACEMENT OF CABLING</li> <li>REPLACEMENT OF TRANSFORMERS</li> <li>INSTALLATION OF QUARTZ TAXIWAY EDGE LIGHTS</li> <li>REMOVAL OF ASPHALT AND ASPHALT TREATED PERMEABLE BASE</li> <li>REPLACEMENT OF ASPHALT SHOULDER PAVEMENT AND AGGREGATE BASE</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| SCHEDULE C | <ul style="list-style-type: none"> <li>REMOVAL OF TAXIWAY CENTERLINE AND EDGE LIGHTS</li> <li>REPLACEMENT OF CABLING</li> <li>REPLACEMENT OF TRANSFORMERS</li> <li>INSTALLATION OF LED TAXIWAY CENTERLINE LIGHTS</li> <li>INSTALLATION OF QUARTZ TAXIWAY EDGE LIGHTS</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| SCHEDULE D | <ul style="list-style-type: none"> <li>REMOVAL OF TAXIWAY CENTERLINE LIGHTS</li> <li>REPLACEMENT OF CABLING</li> <li>REPLACEMENT OF TRANSFORMERS</li> <li>INSTALLATION OF LED TAXIWAY CENTERLINE LIGHTS</li> <li>INSTALLATION OF QUARTZ TAXIWAY EDGE LIGHTS</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| SCHEDULE E | <ul style="list-style-type: none"> <li>REPLACEMENT OF AIRFIELD LIGHTING CABLE BETWEEN THE EAST VAULT AND EMH-03010</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| SCHEDULE F | <ul style="list-style-type: none"> <li>REMOVAL OF EXISTING REGULATORS, BUSWAY, AND CIRCUIT BREAKERS</li> <li>INSTALLATION OF NEW REGULATORS, BUSWAY, AND CIRCUIT BREAKERS</li> <li>VAULT ELECTRICAL/CONTROL MODIFICATIONS</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| SCHEDULE G | <ul style="list-style-type: none"> <li>PROCUREMENT OF CONSTANT CURRENT REGULATORS</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| SCHEDULE H | <ul style="list-style-type: none"> <li>REMOVAL OF EXISTING PAVEMENT (CONCRETE AND ASPHALT)</li> <li>REPAIR CRUSHED CONDUIT</li> <li>INSTALL BOND BREAKER FABRIC</li> <li>PORTLAND CEMENT CONCRETE (PCC) PAVING OVER EXISTING CEMENT TREATED BASE COURSE</li> <li>INSTALL GEOTEXTILE FABRIC</li> <li>ASPHALT PAVING OVER ASPHALT-TREATED PERMEABLE BASE COURSE</li> <li>CONCRETE GROOVING</li> <li>MANHOLE DRAINAGE AND ADJUSTMENTS</li> <li>GRADING</li> <li>TOPSOILING</li> <li>SEEDING</li> </ul>                                                                                                                                                                                                                                                                                                                                                          |
| SCHEDULE I | <ul style="list-style-type: none"> <li>REMOVAL OF EXISTING CONCRETE PAVEMENT</li> <li>REMOVAL OF TAXIWAY CENTERLINE LIGHTS</li> <li>INSTALLATION OF CONDUITS AND CABLING</li> <li>INSTALLATION OF TAXIWAY CENTERLINE LIGHTS AND TRANSFORMERS</li> <li>INSTALLATION OF CLEARANCE BAR LIGHTS AND TRANSFORMERS</li> <li>INSTALL BOND BREAKER FABRIC</li> <li>PORTLAND CEMENT CONCRETE (PCC) PAVING OVER EXISTING CEMENT TREATED BASE COURSE</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                          |
| SCHEDULE J | <ul style="list-style-type: none"> <li>INSTALLATION OF LED COMBINATION RUNWAY STOP BAR/GUARD LIGHTS</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

PHASING SCHEDULE

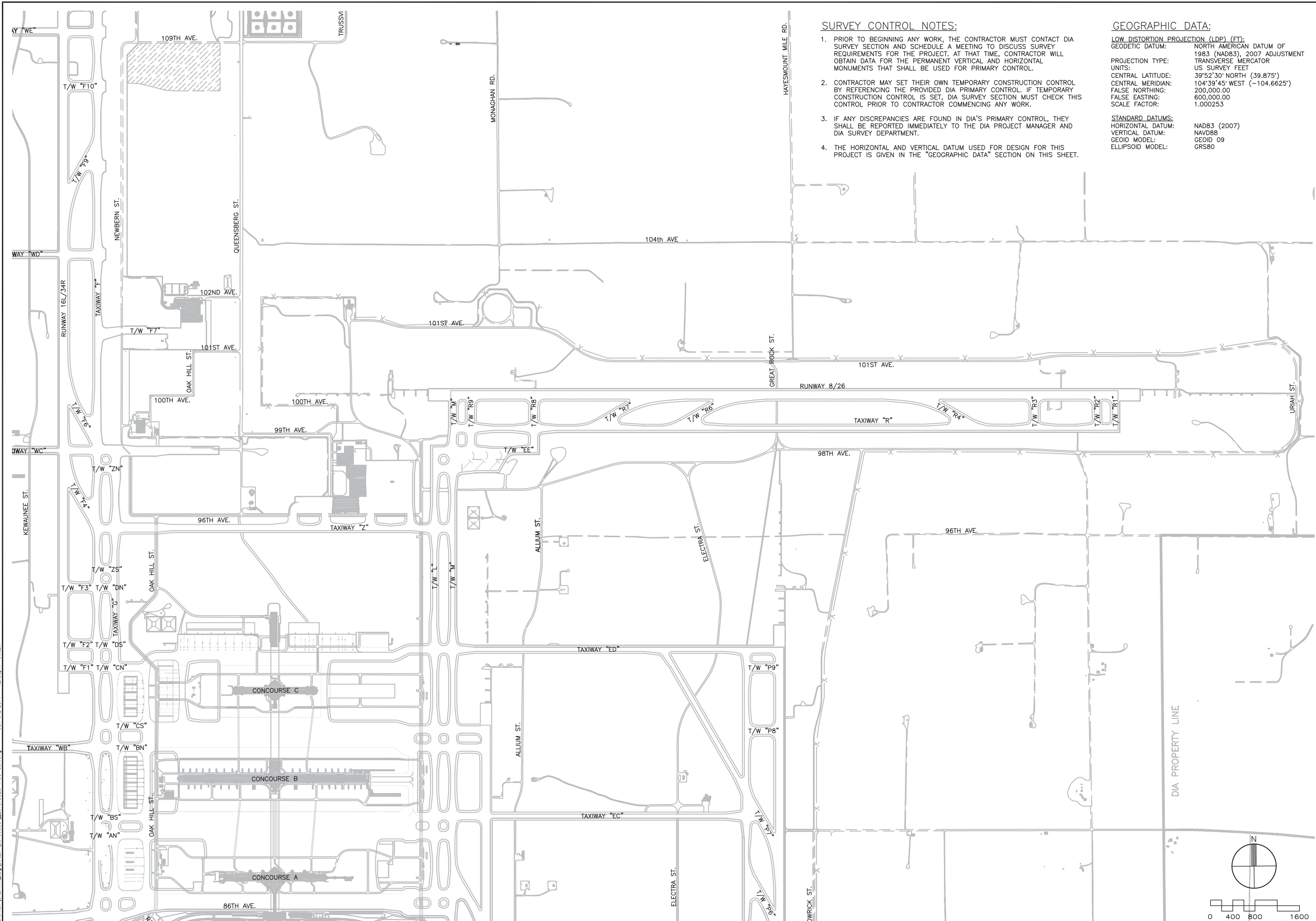


- \*(1) PHASE 1 SHALL START IMMEDIATELY AFTER NTP 2. MILESTONE 2 SHALL BE COMPLETED IN A 45 CONSECUTIVE CALENDAR DAY PERIOD.
- \*(2) PHASE 2 SHALL START IMMEDIATELY AFTER NTP 2 AND WILL BE COMPLETED CONCURRENTLY WITH PHASE 1. MILESTONE 3 SHALL BE COMPLETED IN A TOTAL OF 15 CONSECUTIVE DAYTIME ONLY CLOSURES.
- \*(3) PHASE 3 SHALL START IMMEDIATELY AFTER PHASE 2/MILESTONE 3 IS COMPLETED AND WILL BE COMPLETED CONCURRENTLY WITH PHASE 1. MILESTONE 4 SHALL BE COMPLETED IN A 15 CONSECUTIVE CALENDAR DAY PERIOD.
- \*(4) PHASE 4 SHALL START IMMEDIATELY AFTER PHASE 3/MILESTONE 4 IS COMPLETED AND WILL BE COMPLETED CONCURRENTLY WITH PHASE 1. MILESTONE 5 SHALL BE COMPLETED IN A TOTAL OF 15 CONSECUTIVE DAYTIME ONLY CLOSURES.
- \*(5) PHASE 5 SHALL START IMMEDIATELY AFTER PHASE 1/MILESTONE 2 IS COMPLETED. MILESTONE 6 SHALL BE COMPLETED IN A 45 CONSECUTIVE CALENDAR DAY PERIOD.

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**SURVEY CONTROL NOTES:**

1. PRIOR TO BEGINNING ANY WORK, THE CONTRACTOR MUST CONTACT DIA SURVEY SECTION AND SCHEDULE A MEETING TO DISCUSS SURVEY REQUIREMENTS FOR THE PROJECT. AT THAT TIME, CONTRACTOR WILL OBTAIN DATA FOR THE PERMANENT VERTICAL AND HORIZONTAL MONUMENTS THAT SHALL BE USED FOR PRIMARY CONTROL.
2. CONTRACTOR MAY SET THEIR OWN TEMPORARY CONSTRUCTION CONTROL BY REFERENCING THE PROVIDED DIA PRIMARY CONTROL. IF TEMPORARY CONSTRUCTION CONTROL IS SET, DIA SURVEY SECTION MUST CHECK THIS CONTROL PRIOR TO CONTRACTOR COMMENCING ANY WORK.
3. IF ANY DISCREPANCIES ARE FOUND IN DIA'S PRIMARY CONTROL, THEY SHALL BE REPORTED IMMEDIATELY TO THE DIA PROJECT MANAGER AND DIA SURVEY DEPARTMENT.
4. THE HORIZONTAL AND VERTICAL DATUM USED FOR DESIGN FOR THIS PROJECT IS GIVEN IN THE "GEOGRAPHIC DATA" SECTION ON THIS SHEET.

**GEOGRAPHIC DATA:**

**LOW DISTORTION PROJECTION (LDP) (FT):**  
 GEODETIC DATUM: NORTH AMERICAN DATUM OF 1983 (NAD83), 2007 ADJUSTMENT  
 PROJECTION TYPE: TRANSVERSE MERCATOR  
 UNITS: US SURVEY FEET  
 CENTRAL LATITUDE: 39°52'30" NORTH (39.875°)  
 CENTRAL MERIDIAN: 104°39'45" WEST (-104.6625°)  
 FALSE NORTHING: 200,000.00  
 FALSE EASTING: 600,000.00  
 SCALE FACTOR: 1.000253

**STANDARD DATUMS:**  
 HORIZONTAL DATUM: NAD83 (2007)  
 VERTICAL DATUM: NAVD88  
 GEOID MODEL: GEOID 09  
 ELLIPSOID MODEL: GRS80

CITY & COUNTY OF DENVER

DENVER INTERNATIONAL AIRPORT



DENVER INTERNATIONAL AIRPORT  
 MAINT. & ENGS.  
 8500 Pena Blvd.  
 Denver, CO 80249-6340

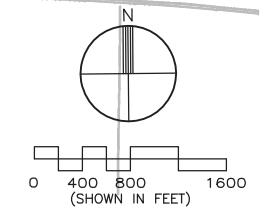


**RUNWAY 8-26  
 COMPLEX LIGHTING  
 REHABILITATION**

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | BK  | CONST | 07JA14  | CG   |      |

|                     |            |
|---------------------|------------|
| SCALE               | AS SHOWN   |
| DATE                | 01/07/2014 |
| DRAWN BY:           | B. KEAS    |
| CHECKED BY:         | C. GAMET   |
| FAA AIP NO:         |            |
| WORK BREAKDOWN NO.  |            |
| DESIGN CONTRACT NO. | CE84021    |
| CONST. CONTRACT NO. | 201313528  |
| VOLUME NO.          | 1          |
| SHEET TITLE         |            |



**SURVEY CONTROL PLAN**

|               |                       |
|---------------|-----------------------|
| SHEET NO.     | GC801                 |
|               | 19 OF 115             |
| CADD FILE NO. | _201313528-11GC-801-A |

C:\work\ch2mhill\log\awaziri\0113528-11GC-801.dwg Jan 07, 2014 - 12:50pm swaziri  
 REUSE OF DOCUMENTS: THIS DOCUMENT AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF CH2M HILL AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CH2M HILL. © CH2MHILL

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

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DATE 01/07/2014

DRAWN BY: S. WAZIRI

CHECKED BY: B. KEAS

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

UTILITY PLAN

SHEET NO.

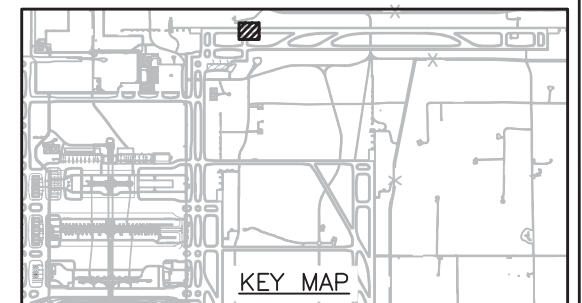
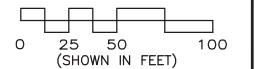
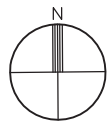
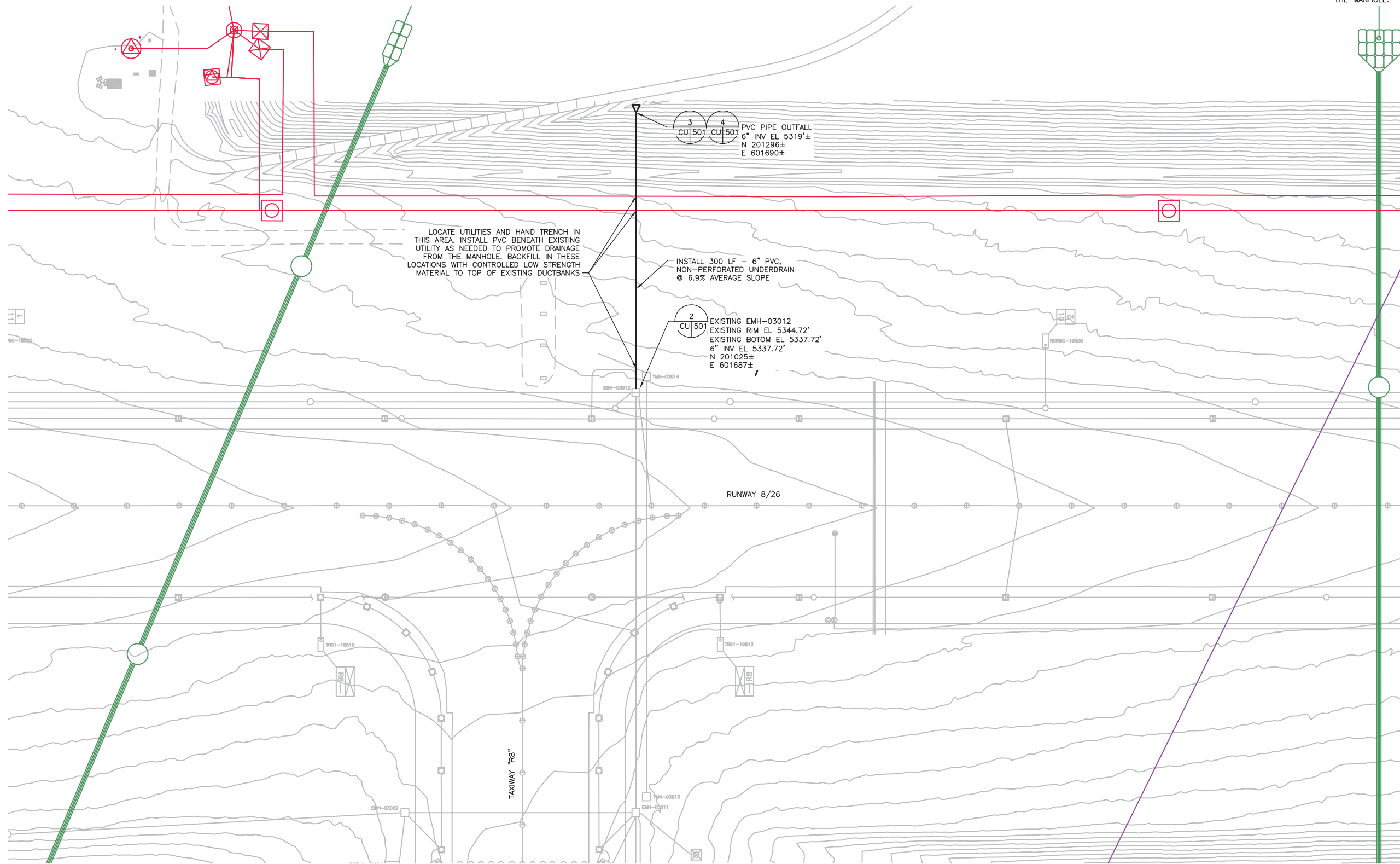
CU101

20 OF 115

CADD FILE NO.

\_201313528-1CU-101-A

NOTE:  
1. PLACE DRAINAGE PIPE AT A MINIMUM DEPTH OF 36" AND FOLLOW EXISTING SLOPE OF THE TERRAIN AS NEEDED TO MAINTAIN POSITIVE DRAINAGE AWAY FROM THE MANHOLE.







**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

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DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**UTILITY PLAN**

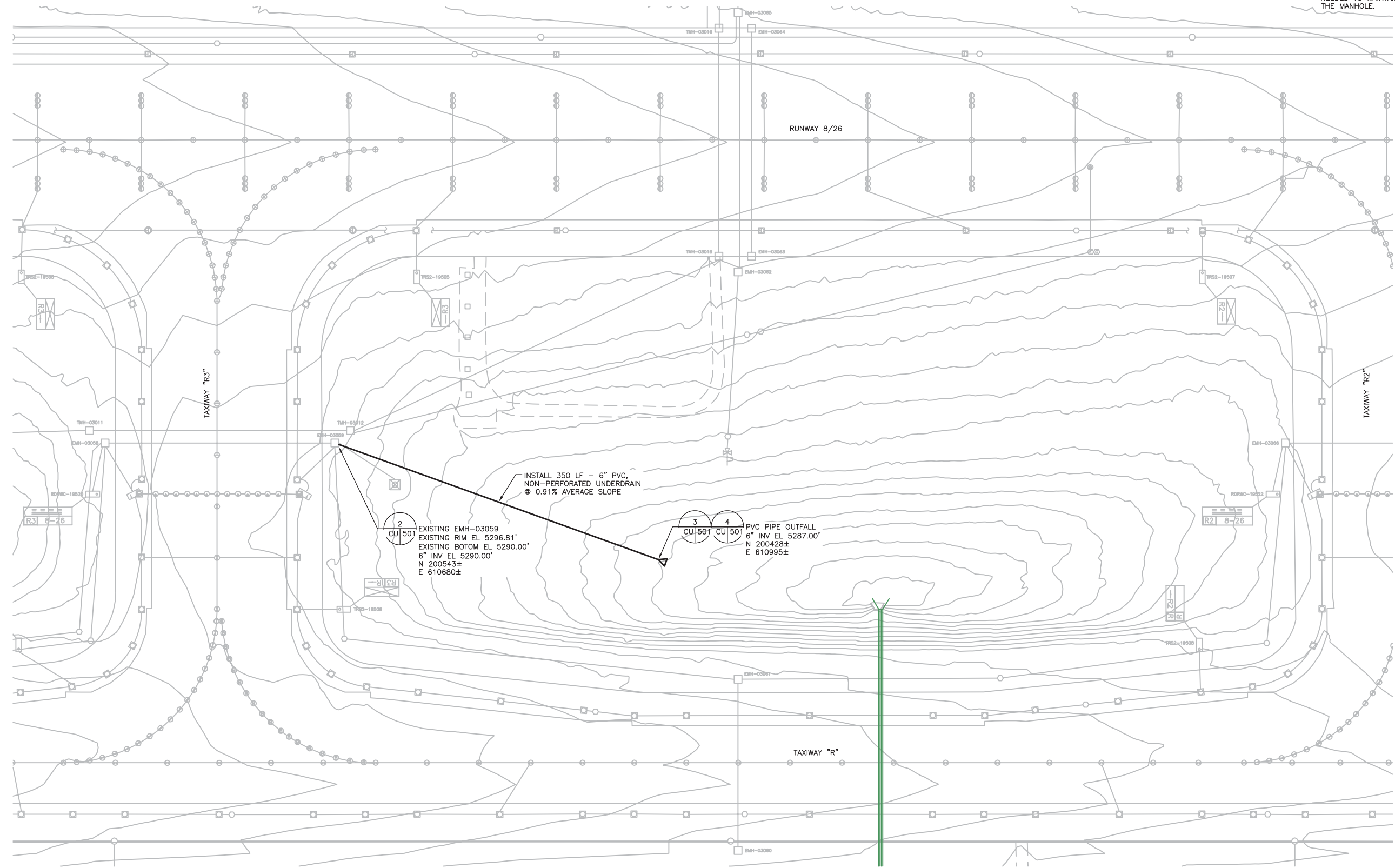
SHEET NO.

**CU102**

21 OF 115

CADD FILE NO. \_201313528-1CU-102-A

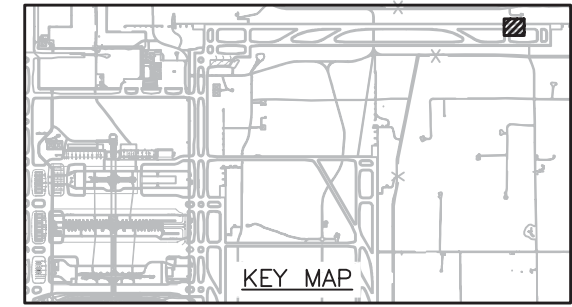
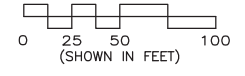
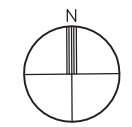
**NOTE:**  
1. PLACE DRAINAGE PIPE AT A MINIMUM DEPTH OF 36" AND FOLLOW EXISTING SLOPE OF THE TERRAIN AS NEEDED TO MAINTAIN POSITIVE DRAINAGE AWAY FROM THE MANHOLE.



2  
CU 50'  
EXISTING EMH-03059  
EXISTING RIM EL 5296.81'  
EXISTING BOTOM EL 5290.00'  
6" INV EL 5290.00'  
N 200543±  
E 610680±

INSTALL 350 LF - 6" PVC,  
NON-PERFORATED UNDERDRAIN  
@ 0.91% AVERAGE SLOPE

3  
CU 50'  
4  
CU 50'  
PVC PIPE OUTFALL  
6" INV EL 5287.00'  
N 200428±  
E 610995±



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RUNWAY 8-26  
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CHECKED BY: B. KEAS

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

UTILITY PLAN

SHEET NO. CU103

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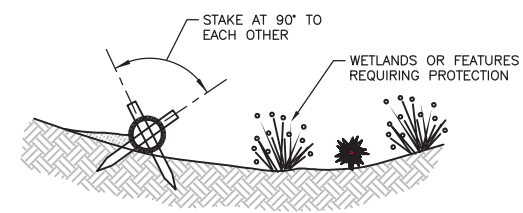
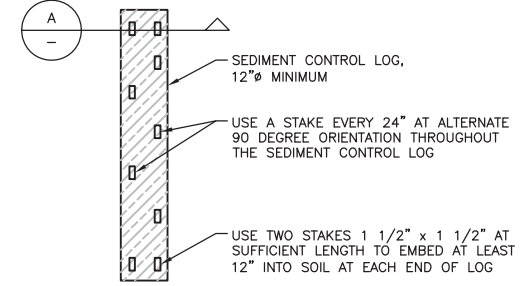
CADD FILE NO. \_201313528-1CU-103-A

NOTES:

1. PROPOSED AND EXISTING CONTOURS ARE SHOWN AT 0.2-FOOT INTERVALS.
2. CONTRACTOR SHALL IMPORT TOPSOIL FILL TO ACCOMPLISH THE GRADING SHOWN ON THIS SHEET. TOPSOIL TO BE IMPORTED FROM NEARBY DIA TOPSOIL STOCKPILE AREA SHOWN ON SHEET G103.
3. GRADED AREA SHALL BE SEEDED AND MULCHED AFTER GRADING HAS BEEN COMPLETED.

LEGEND:

- 5338.0 — PROPOSED CONTOUR
- 5338.0 — EXISTING CONTOUR
- - - GRADING DAYLIGHT/LIMITS
- ▨ SEDIMENT CONTROL LOG, SEE DETAIL



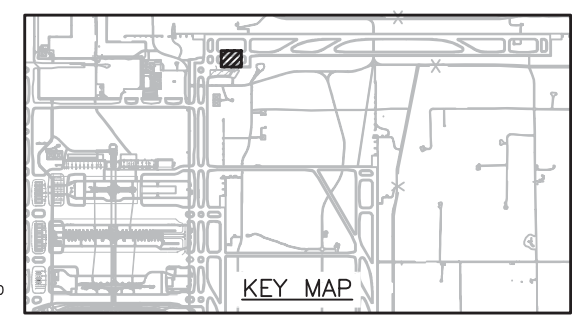
SECTION A

SEDIMENT CONTROL LOG INSTALLATION NOTES:

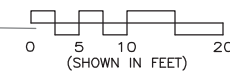
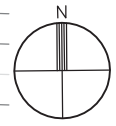
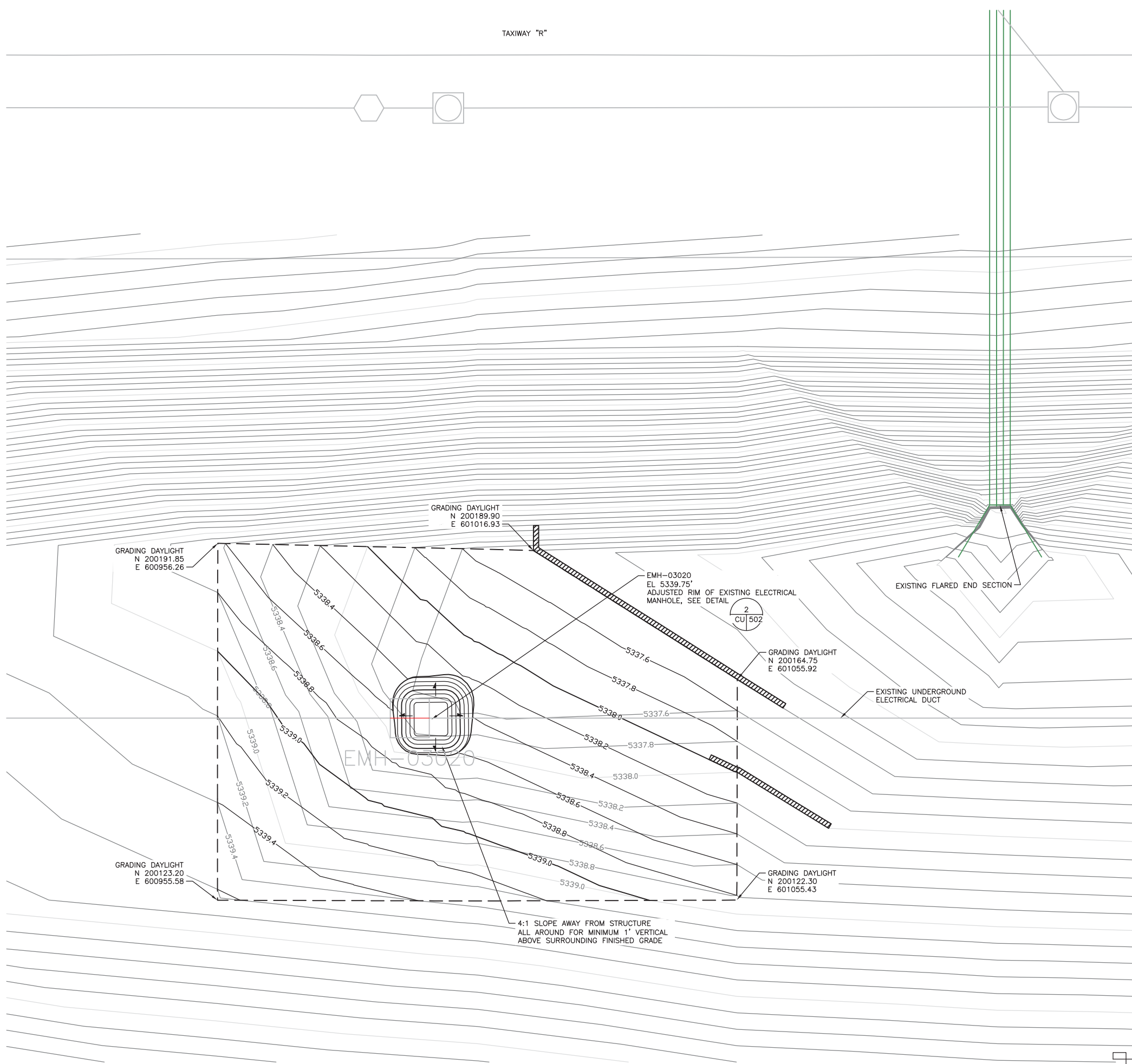
1. SEE PLAN VIEW FOR: -LOCATION AND LENGTH OF SEDIMENT CONTROL LOG.
2. SEDIMENT CONTROL LOGS SHALL BE INSTALLED PRIOR TO ANY LAND-DISTURBING ACTIVITIES.
3. SEDIMENT CONTROL LOGS SHALL CONSIST OF STRAW, COMPOST, EXCELSIOR, OR COCONUT FIBER.
4. NOT FOR USE IN CONCENTRATED FLOW AREAS.
5. THE SEDIMENT CONTROL LOG SHALL BE TRENCHED INTO THE GROUND A MINIMUM OF 2".

SEDIMENT CONTROL LOG MAINTENANCE NOTES:

1. THE SWMP MANAGER SHALL INSPECT SEDIMENT CONTROL LOGS DAILY, DURING AND AFTER ANY STORM EVENT, AND SHALL MAKE REPAIRS OR CLEAN OUT UPSTREAM SEDIMENT AS NECESSARY.
2. SEDIMENT ACCUMULATED UPSTREAM OF SEDIMENT CONTROL LOGS SHALL BE REMOVED WHEN THE SEDIMENT DEPTH IS HALF THE HEIGHT OF THE CREST OF THE LOG.
3. SEDIMENT CONTROL LOGS SHALL BE REMOVED AT THE END OF CONSTRUCTION IF ANY DISTURBED AREA EXISTS AFTER REMOVAL IT SHALL BE COVERED WITH TOPSOIL AND SEEDED AND MULCHED, OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE LOCAL JURISDICTION.



TAXIWAY "R"



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**RUNWAY 8-26  
COMPLEX LIGHTING  
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FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**UTILITY DETAILS**

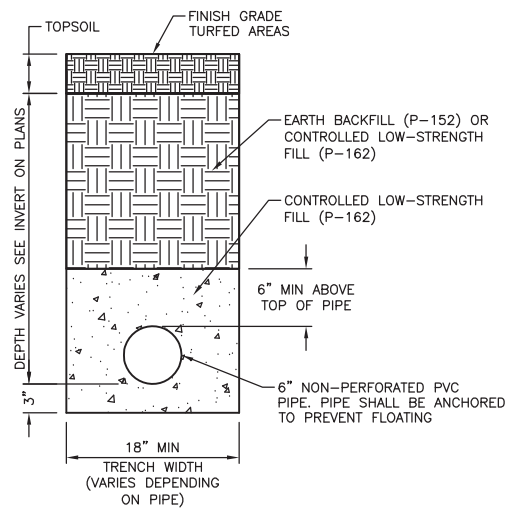
SHEET NO.

CU501

23 OF 115

CADD FILE NO.

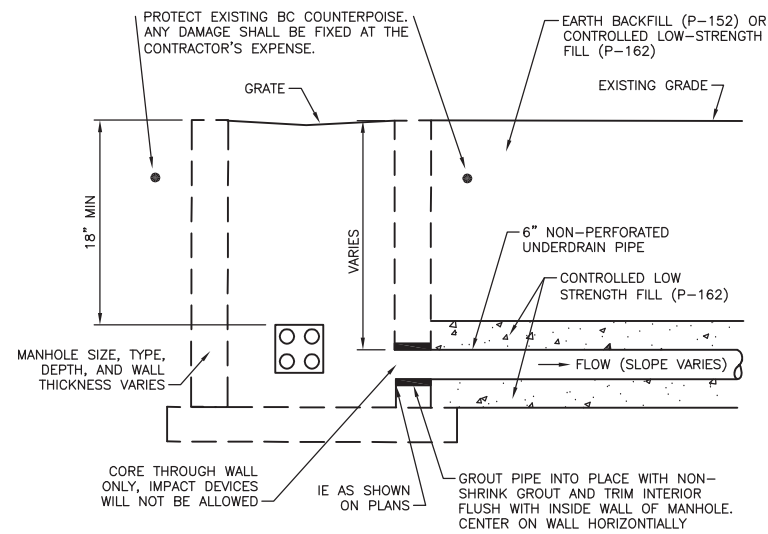
\_201313528-1CU-501-A



**NOTE:**

1. THE CONTROLLED LOW-STRENGTH FILL SHALL BE INSTALLED IN TWO PARTS: BEDDING (UP TO 30% OF PIPE DIAMETER) AND UPON SUFFICIENT HYDRATION, BACKFILL.

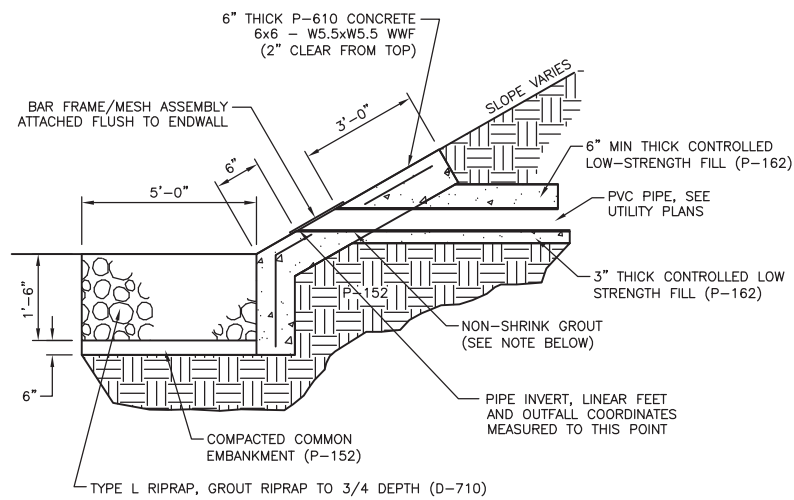
1 PVC PIPE TRENCH UNDER TURFED AREA  
NTS



**NOTE:**

1. WHERE INVERT OF OUTFALL PIPE MATCHES EXISTING MANHOLE BOTTOM, GROUT MANHOLE BOTTOM TO SLOPE TOWARDS OUTFALL PIPE AT 2% MINIMUM.

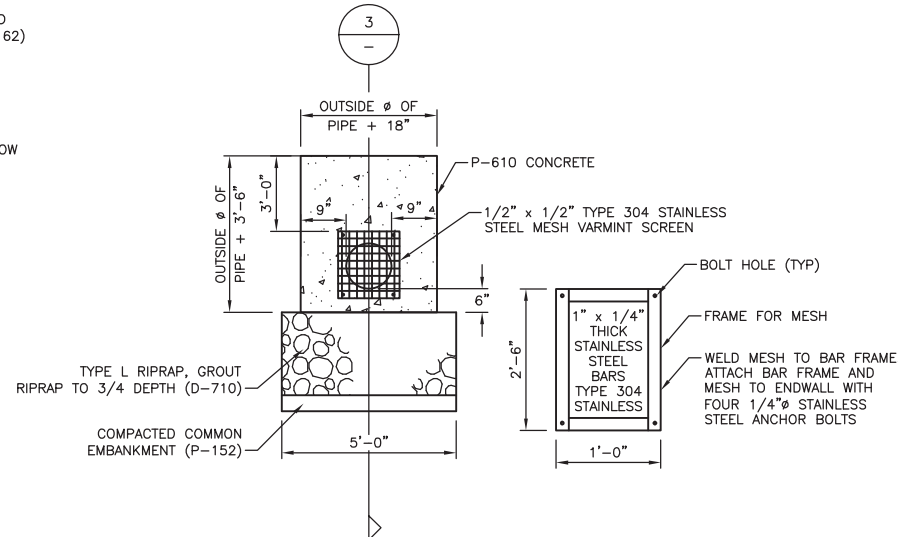
2 UNDERDRAIN PIPE CONNECTION TO ELECTRICAL MANHOLE  
NTS



**NOTE:**

1. IF A PRECAST ENDWALL IS USED, THE PIPE SHALL BE SECURED IN THE OPENING BY GROUTING.

3 OUTFALL ENDWALL SECTION  
NTS



4 OUTFALL ENDWALL DETAIL  
NTS



RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

**CH2MHILL**

| NO. | BY | PURPOSE | DATE   | CHKD |
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CHECKED BY: B. KEAS

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WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

UTILITY DETAILS

SHEET NO.

CU502

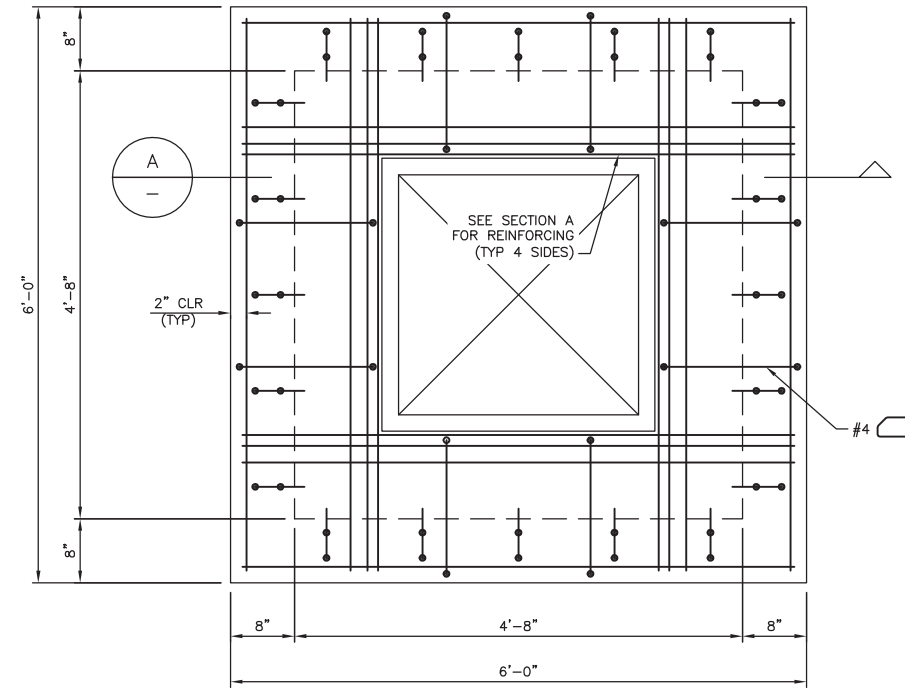
24 OF 115

CADD FILE NO.

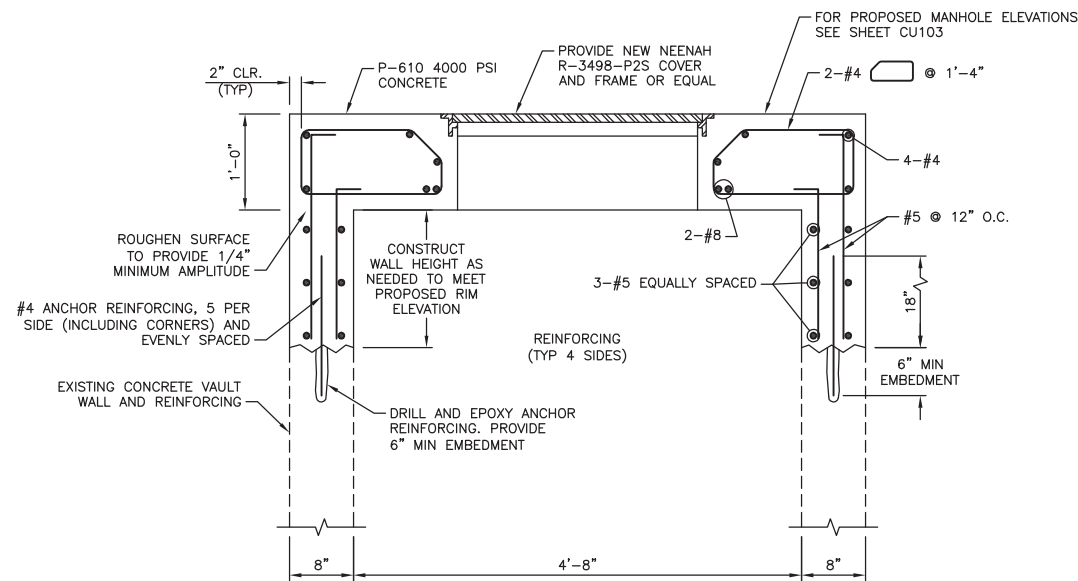
\_201313528-1CU-502-A

NOTES:

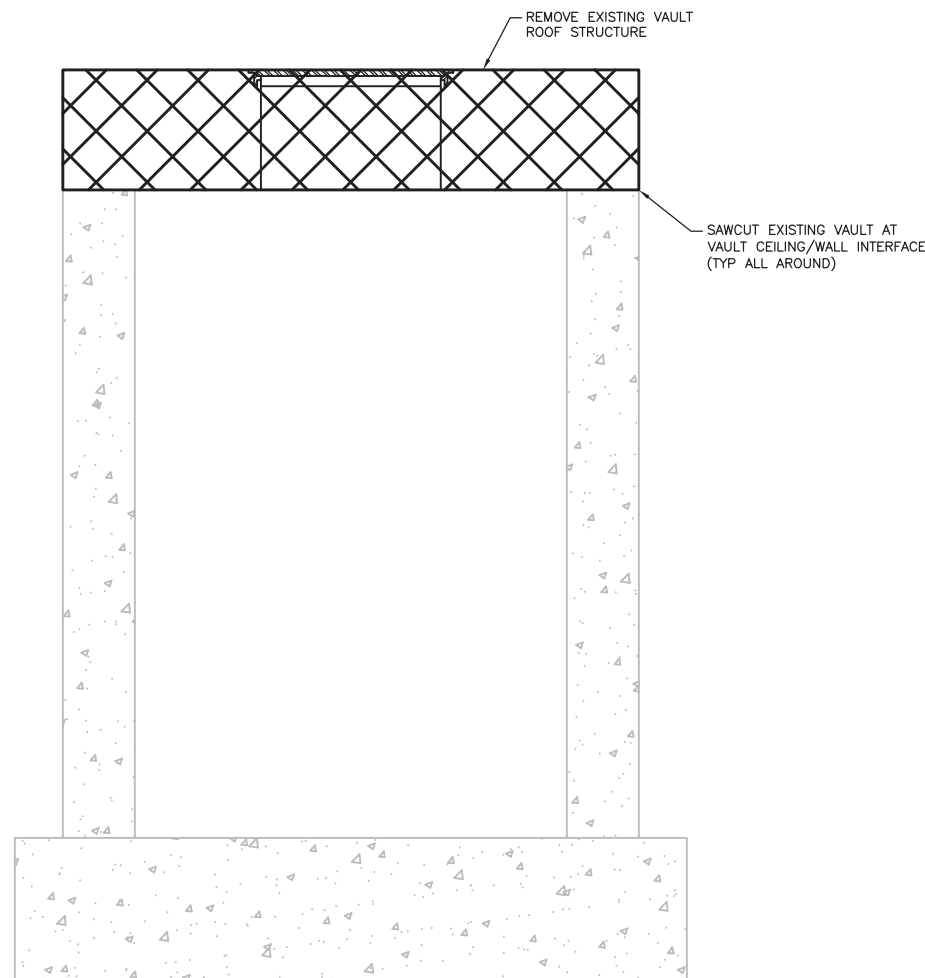
1. ORIGINAL CONSTRUCTION MAY HAVE BEEN CAST IN PLACE OR PRECAST. CAST IN PLACE MODIFICATIONS SHOWN. FIELD VERIFY CONSTRUCTION OF EXISTING MANHOLE. IF EXISTING MANHOLE IS PRECAST WITH A KEYWAY, REMOVE ROOF STRUCTURE AT KEYWAY AND SUBMIT A DETAILED SHOP DRAWING INCLUDING ALL REINFORCING AND MATCHING EXISTING KEYWAY.
2. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS SHOWING ALL REINFORCING STEEL AND OTHER CONSTRUCTION DETAILS (SHIP-LAP JOINT, ETC.) PRIOR TO FABRICATION.
3. THE TOP OF THE MANHOLES SHALL BE 1" MINIMUM (+1" TOL.) ABOVE THE FURNISHED GRADE INCLUDING THE SOD OR TURF.
4. ALL MANHOLES ARE AIRCRAFT RATED AND SHALL BE PROVIDED WITH A NEENAH R-3498-P2S COVER OR EQUAL. THE COVER SHALL BE CAST FLUSH WITH THE TOP OF THE MANHOLE SLAB. THE MANHOLE COVERS SHALL MEET REQUIREMENTS OF FAA A/C 150/5320-6 LATEST EDITION. THE MANUFACTURER SHALL CERTIFY THAT THE MANHOLE COVER IS RATED TO MEET OR EXCEED THE REQUIREMENTS OF A/C 150/5320-6 LATEST EDITION. FOR HEAVY AIRPLANES, THE COVERS SHALL BE FURNISHED WITH HOLD-OPEN SAFETY BARS, STAINLESS STEEL SPRING ASSIST TO LOWER THE LIFTING FORCE AND TO ASSIST IN LOWERING THE COVER, AND WITH BOLTED AND SEALED COVER.
5. ALL MANHOLE COVERS SHALL HAVE SURFACE LETTERING MATCHING THE EXISTING LID IDENTIFYING THE TYPE OF MANHOLE. ALL MANHOLES TO HAVE ENGRAVED MANHOLE IDENTIFICATION MARKER INSTALLED IN CONCRETE COVER.
6. THE USE OF TYPE V SULFATE RESISTANT CEMENT IS REQUIRED FOR THE CONSTRUCTION OF MANHOLES.
7. CONTRACTOR SHALL SURVEY THE EXISTING ELEVATION OF THE MANHOLE PRIOR TO DEMOLITION AND INSTALL NEW LID TO THE PROPOSED ELEVATION. ENGRAVE OR STAMP "ELECTRICAL" INTO LID, AND INSTALL ENGRAVED MANHOLE IDENTIFICATION MARKER INTO NEW CONCRETE COVER.



TOP SLAB PLAN  
(TOP REINFORCING SHOWN)



SECTION A



1 DEMOLITION PLAN - TYPICAL WALL SECTION 6' x 6' VAULT SHOWN  
NTS

2 ELECTRICAL/COMMUNICATIONS MANHOLE  
NTS



**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

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SCALE: AS SHOWN

DATE: 01/07/2014

DRAWN BY: A. TAYLOR

CHECKED BY: B. KEAS

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**DEMOLITION  
NOTES AND DETAILS**

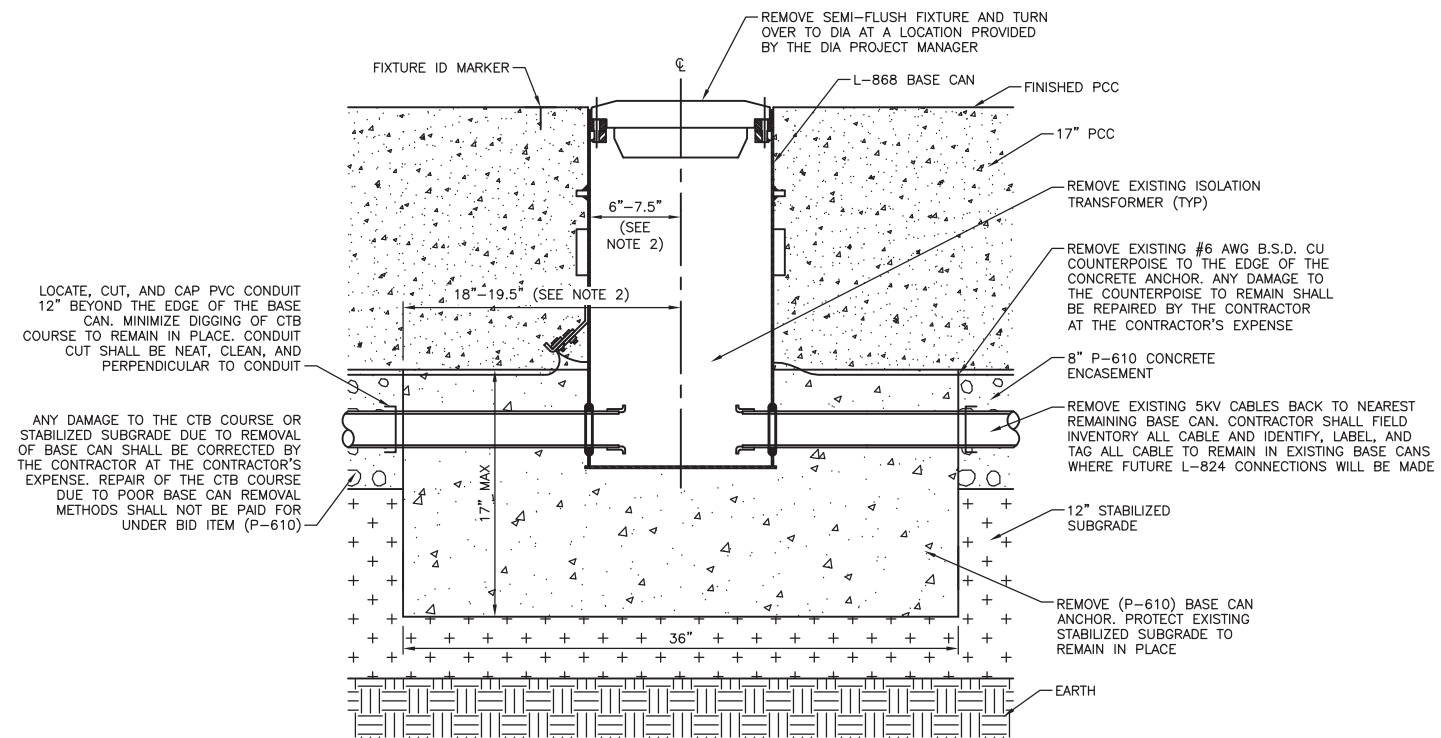
SHEET NO. CD001

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CADD FILE NO. 201313528-1CD-001-A

**DEMOLITION NOTES:**

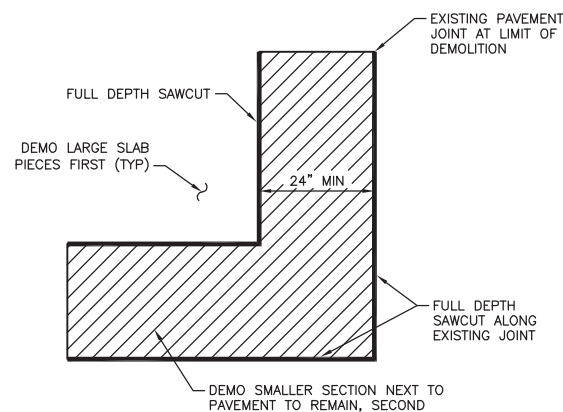
- CONTRACTOR SHALL LOCATE AND PROTECT ALL UTILITIES AND PAVED AREAS TO REMAIN. ALL UTILITIES ARE TO REMAIN, UNLESS OTHERWISE NOTED. DEMOLITION ACTIVITIES SHALL BE CAREFULLY CONTROLLED TO PREVENT DAMAGE TO ADJACENT CONCRETE PAVEMENT, THE UNDERLAYING MATERIAL, OR EXISTING STRUCTURES TO REMAIN IN-PLACE. ANY DAMAGE TO EXISTING STRUCTURES OR PAVEMENT SHALL BE IMMEDIATELY REPORTED TO THE DIA PROJECT MANAGER AND REPAIRED WITH DIA APPROVED MATERIALS AND PROCEDURES AT THE CONTRACTOR'S EXPENSE.
- PAVEMENT SAWCUTTING IS INCIDENTAL TO PAVEMENT REMOVAL.
- AT LOCATIONS WHERE PANELS ARE TO BE REMOVED ALONG PAVEMENT SHOULDERS, CONCRETE MATERIAL (BOTH AC AND ATPB) SHALL BE SAWCUT FULL-DEPTH AND REMOVED AT A DISTANCE OF 5'-0" FROM THE PROPOSED PAVEMENT EDGE TO ALLOW FOR CONCRETE PAVING EQUIPMENT. SEE THE GEOMETRY PLANS FOR THE LAYOUT OF THE PROPOSED PAVEMENT EDGE. ALL LIGHTS, FOUNDATIONS, AND CONDUIT IN THE AREA OF THE 5'-0" SAWCUT SHALL BE PROTECTED FROM DAMAGE. CONTRACTOR SHALL DIVERT SAWCUT TO MAINTAIN A MINIMUM 1'-0" CLEARANCE BETWEEN THE SAWCUT AND THE CLOSEST EDGE OF ANY LIGHT FIXTURE OR AS NECESSARY TO AVOID DAMAGING THE EXISTING LIGHT FIXTURE OR LIGHT FIXTURE FOUNDATION. ANY DAMAGE TO THE LIGHTS, FOUNDATIONS, OR CONDUITS TO REMAIN SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE.
- CLEANUP OF WASTE MATERIAL SHALL BE CONTINUOUS DURING THE SAWCUTTING OPERATION. CLEANUP SHALL USE A VACUUM SWEEPER.
- CONTRACTOR SHALL SURVEY THE LOCATION AND ELEVATION OF ALL 4 CORNERS OF ANY CONCRETE PANEL TO BE REMOVED AND REPLACED IN THE DIA LDP COORDINATE SYSTEM AND IN NAVD 88 PRIOR TO DEMOLISHING THE PANEL. CONTRACTOR SHALL ALSO SURVEY THE ELEVATION AND LOCATION OF ANY OBJECTS SUCH AS LIGHT FIXTURES LOCATED WITHIN THE CONCRETE PANELS PRIOR TO DEMOLITION.
- IT IS ASSUMED THAT THE EXISTING ELECTRICAL DUCTS ARE APPROXIMATELY 22" DEEP. CONTRACTOR TO VERIFY DEPTH OF THE EXISTING CANS AND CONDUIT PRIOR TO DEMOLITION.
- SEVEN CONCRETE PANELS HAVE BEEN IDENTIFIED FOR REMOVAL AND REPLACEMENT FOR DESIGN. ADDITIONAL PANEL REMOVAL IS EXPECTED DURING CONSTRUCTION TO REPAIR DUCTBANK SECTIONS. GENERAL DETAILS AND QUANTITIES HAVE BEEN PROVIDED TO COVER THIS WORK. CONTACT THE DIA PROJECT MANAGER IN THE EVENT THAT THE INFORMATION PROVIDED IN THESE DRAWINGS DIFFERS FROM THE SITE CONDITIONS.



**NOTES:**

- METHOD OF REMOVAL SHALL BE DETERMINED BY THE CONTRACTOR.
- TYPICAL CAN DIAMETER IS 12". SEMI-FLUSH RUNWAY EDGE LIGHTS ARE THE EXCEPTION, AND HAVE A 15" DIAMETER BASE CAN.
- DISPOSE OF ALL DEMOLITION MATERIAL OFFSITE.
- TEST COUNTERPOISE PRIOR TO DEMOLITION, PRIOR TO CONCRETE PAVING, AND AFTER CONCRETE PAVING.

2  
TYPICAL DEMOLITION DETAIL FOR  
INPAVEMENT FIXTURE WITH L-868 BASE CAN  
NTS



**NOTE:**

- UPON COMPLETION OF THE FULL-DEPTH SAWCUTTING, THE MAIN SLAB SHALL BE FURTHER DIVIDED, AT APPROPRIATE LOCATIONS, AND EACH PIECE LIFTED OUT AND REMOVED. THE USE OF IMPACT DEVICES WILL NOT BE ALLOWED.

1  
PCC SLAB DOUBLE SAWCUT DETAIL  
- REMOVAL ALONG EXISTING JOINT  
NTS



RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

CH2MHILL

| NO. | BY | PURPOSE | DATE   | CHKD |
|-----|----|---------|--------|------|
| 1   | BK | CONST   | 07JA14 | CG   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: A. TAYLOR

CHECKED BY: B. KEAS

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

TYPICAL SECTIONS

SHEET NO.

C-301

26 OF 115

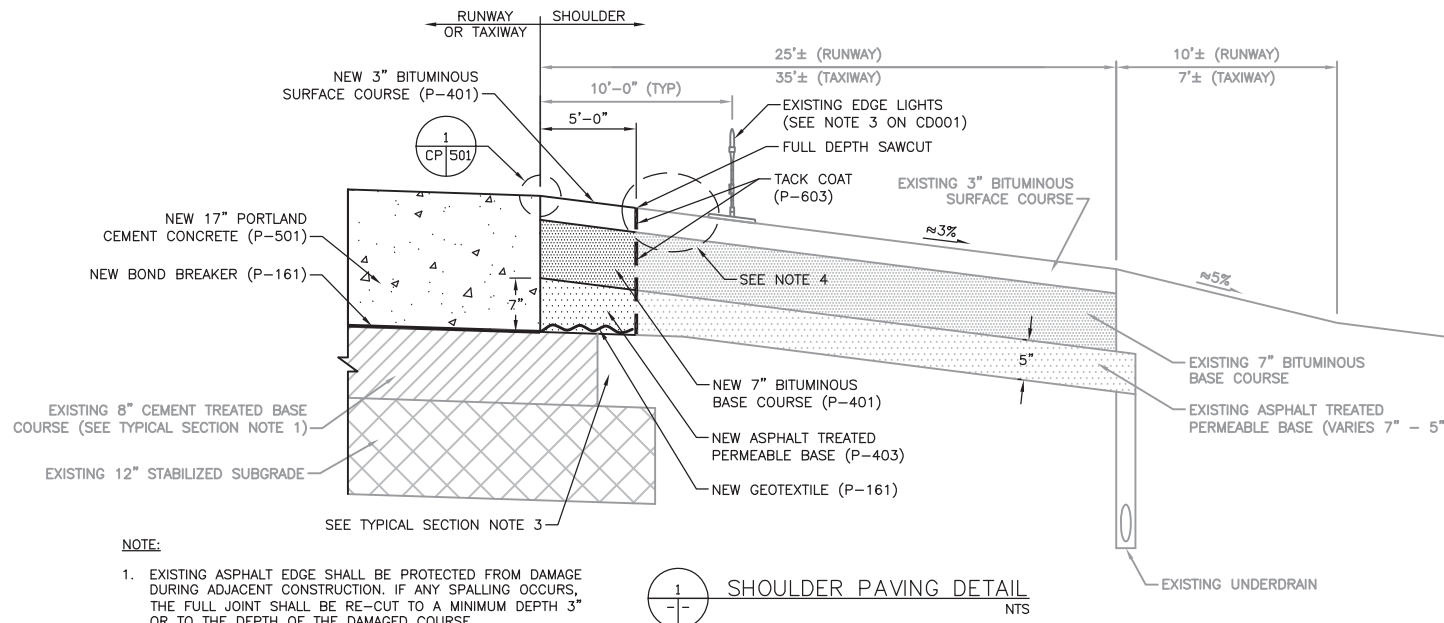
CADD FILE NO.

\_201313528-1C-301-A

ISSUED FOR CONSTRUCTION

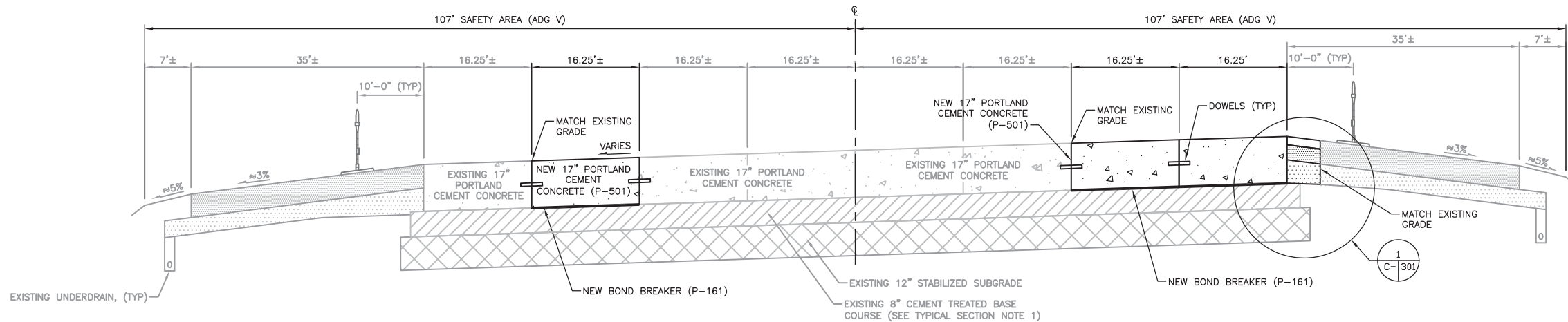
TYPICAL SECTION NOTES:

- IF THERE IS EXISTING DAMAGE TO CEMENT TREATED BASE COURSE AS DETERMINED BY THE DIA PROJECT MANAGER, THE COST OF REPAIRS WILL BE PAID FOR BY THE OWNER. IF THE CEMENT TREATED BASE COURSE IS DAMAGED DURING THE REMOVAL OF THE CONCRETE AND BOND BREAKER, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COST OF THE REPAIRS. THE CONTRACTOR SHALL REPAIR ANY DAMAGE TO THE CEMENT TREATED BASE AS FOLLOWS:
  - IF THE DEPTH OF DAMAGE IS LESS THAN 1/2", NO REPAIR IS REQUIRED.
  - IF THE DEPTH OF DAMAGE IS GREATER THAN 1/2", REPAIR SHALL BE MADE BY MILLING THE EXISTING CEMENT TREATED BASE TO A MINIMUM DEPTH OF 2 TIMES THE 1,200 PSI STRUCTURAL CONCRETE MIX DESIGN MAXIMUM AGGREGATE SIZE AND FILLED WITH 1,200 PSI STRUCTURAL CONCRETE IN ACCORDANCE WITH SPECIFICATION P-610.
- THE ESTIMATED QUANTITY OF CTB REPAIR MAY VARY. UNIT PRICES FOR CTB WILL NOT BE ADJUSTED DUE TO QUANTITY VARIATIONS.
- THE CONTRACTOR SHALL COMPACT APPROXIMATELY A 2-FOOT WIDE WIDTH OF EXISTING SUBGRADE BENEATH THE NEW ASPHALT TREATED PERMEABLE BASE ACCORDING TO SPECIFICATION P-152. PAYMENT FOR THE SUBGRADE COMPACTON IS INCIDENTAL TO THE ASPHALT TREATED PERMEABLE BASE.
- MODIFY LOCATION OF SAWCUT TO MAINTAIN A MINIMUM OF 12" SEPARATION BETWEEN THE SAWCUT AND THE EDGE OF THE LIGHT FIXTURE TO AVOID DAMAGING THE LIGHT FIXTURE FOUNDATION.



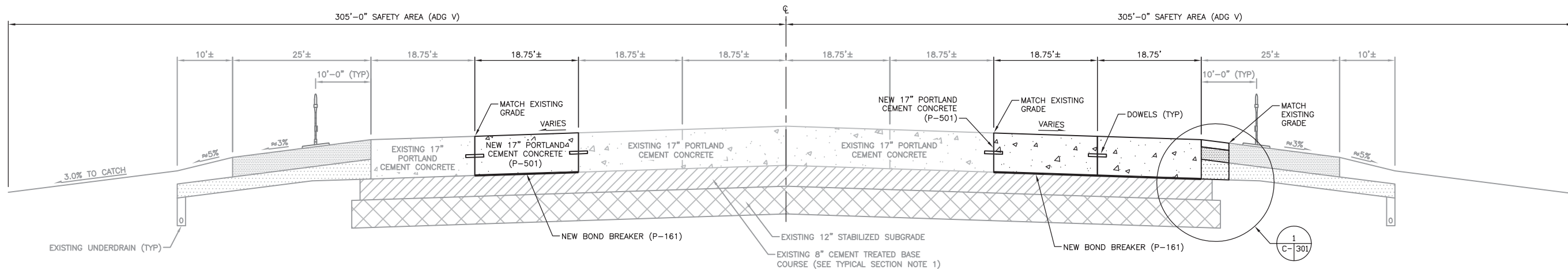
- NOTE:
- EXISTING ASPHALT EDGE SHALL BE PROTECTED FROM DAMAGE DURING ADJACENT CONSTRUCTION. IF ANY SPALLING OCCURS, THE FULL JOINT SHALL BE RE-CUT TO A MINIMUM DEPTH 3" OR TO THE DEPTH OF THE DAMAGED COURSE.

1 SHOULDER PAVING DETAIL  
NTS



- NOTE:
- THIS SECTION SHOWS A TYPICAL PANEL REPLACEMENT. ACTUAL PANELS TO BE REMOVED VARIES.

2 TYPICAL SECTION TAXIWAY  
NTS



- NOTE:
- THIS SECTION SHOWS A TYPICAL PANEL REPLACEMENT. ACTUAL PANELS TO BE REMOVED VARIES.

3 TYPICAL SECTION RUNWAY 8-26  
NTS

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RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | BK  | CONST | 07JA14  | CG   |      |

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DATE 01/07/2014

DRAWN BY: S. WAZIRI

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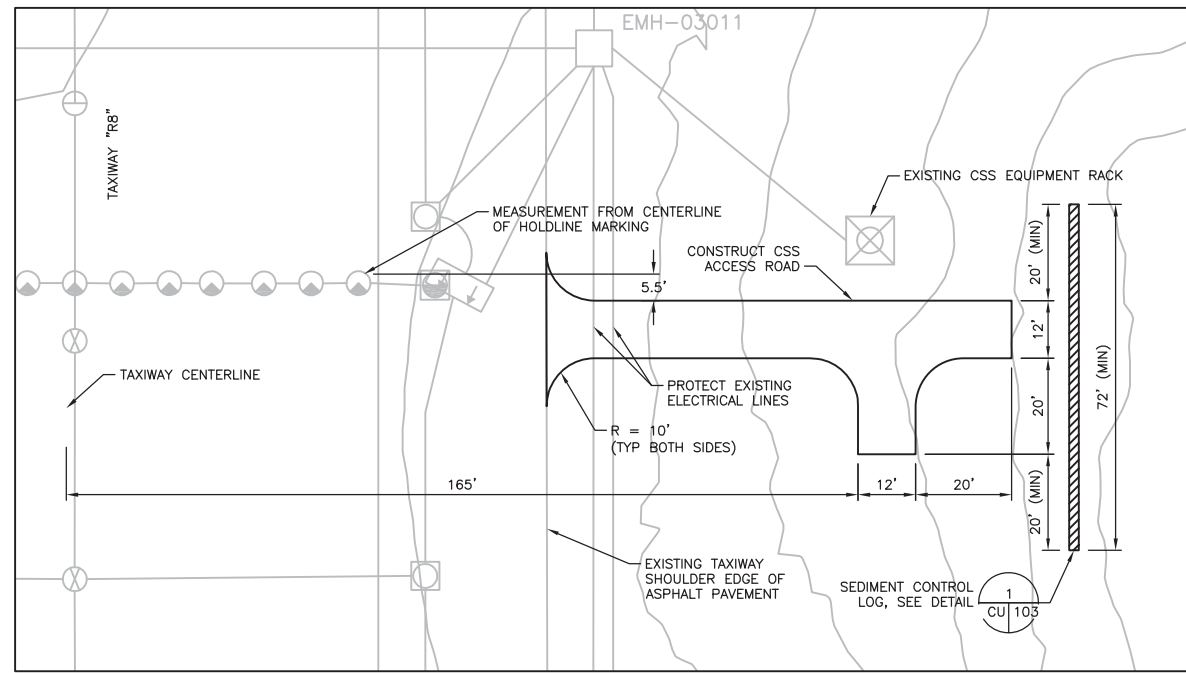
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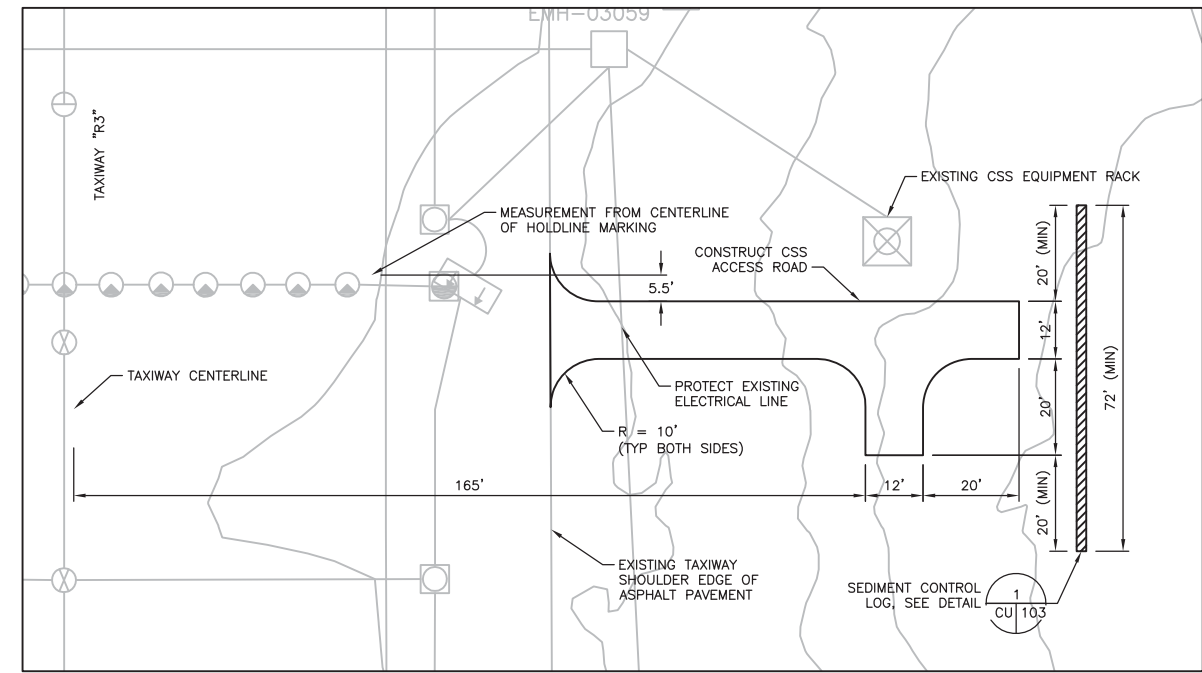
CS101

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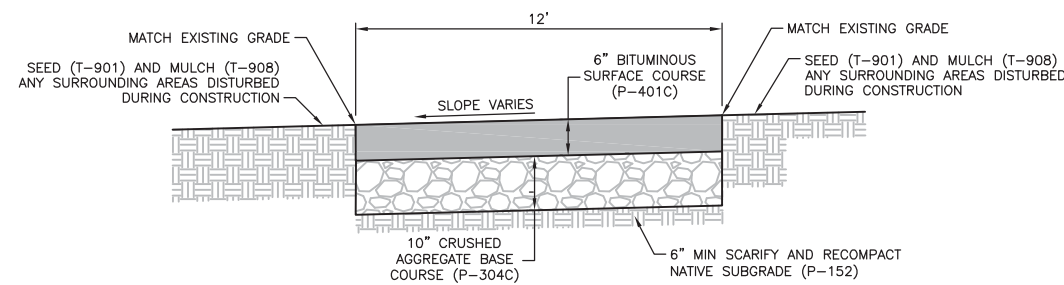
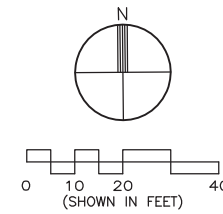
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CSS RACK ACCESS ROAD - TAXIWAY "R8"



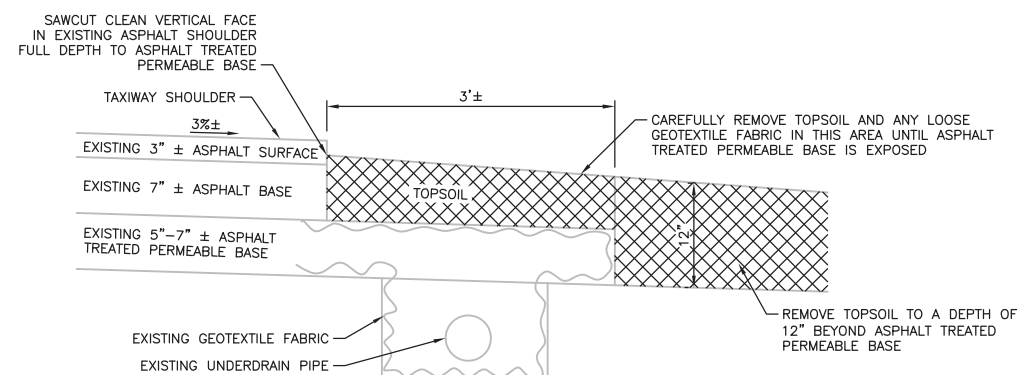
CSS RACK ACCESS ROAD - TAXIWAY "R3"



1 TYPICAL PAVEMENT SECTION- CIRCUIT SELECTOR SWITCH RACK ACCESS ROADS  
NTS

CSS ACCESS ROAD NOTES:

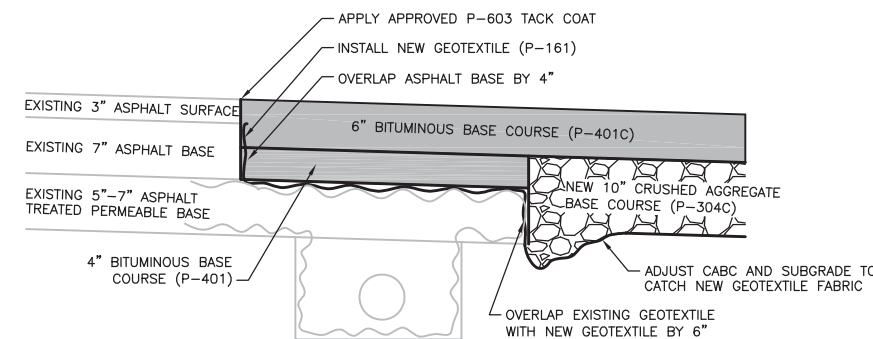
- ROADS ARE LAID OUT BASED ON OFFSETS FROM THE TAXIWAY HOLD LINES AND CENTERLINE MARKINGS.
- STRIP AND DISPOSE OF TOPSOIL TO A DEPTH OF 12" IN THE AREA TO BE PAVED.
- PREPARE AND COMPACT UPPER 6" OF SUBGRADE SOIL PER P-152.
- PLACE AND COMPACT 6" CRUSHED AGGREGATE BASE COURSE PER P-304C.
- PLACE AND COMPACT 6" BITUMINOUS SURFACE COURSE PER P-401C.
- ALL DISTURBED AREAS SHALL BE SEEDED AND MULCHED PER T-901 AND T-908 RESPECTIVELY.



DEMOLITION NOTE:

- REMOVE TOPSOIL NEXT TO TAXIWAY SHOULDER CAREFULLY USING HAND TOOLS TO PROTECT ASPHALT TREATED PERMEABLE BASE AND SHOULDER PAVEMENTS.

2 CSS ACCESS ROAD DEMOLITION DETAIL  
NTS



CSS ROAD TIE-IN NOTES:

- INSTALL NEW GEOTEXTILE FABRIC (P-161) AFTER TOPSOIL HAS BEEN REMOVED.
- PLACE APPROXIMATELY 4" OF NEW BITUMINOUS COURSE (P-401C) OVER NEW GEOTEXTILE AND EXISTING ASPHALT TREATED PERMEABLE BASE.
- PLACE NEW 6" CRUSHED AGGREGATE BASE COURSE (P-304C).
- PLACE 6" BITUMINOUS SURFACE COURSE (P-401C) FOR ACCESS ROAD AREAS.
- APPLY APPROVED P-603 TACK COAT TO VERTICAL ASPHALT SHOULDER FACE AND BETWEEN ASPHALT LIFTS.

3 CSS ACCESS ROAD TIE-IN PAVING DETAIL  
NTS

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE    | CHKD |
|-----|----|---------|---------|------|
| 1   | BK | CONST   | 07/JA14 | CG   |

SCALE: AS SHOWN

DATE: 01/07/2014

DRAWN BY: A. TAYLOR

CHECKED BY: B. KEAS

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**PAVING DETAILS**

SHEET NO. CP501

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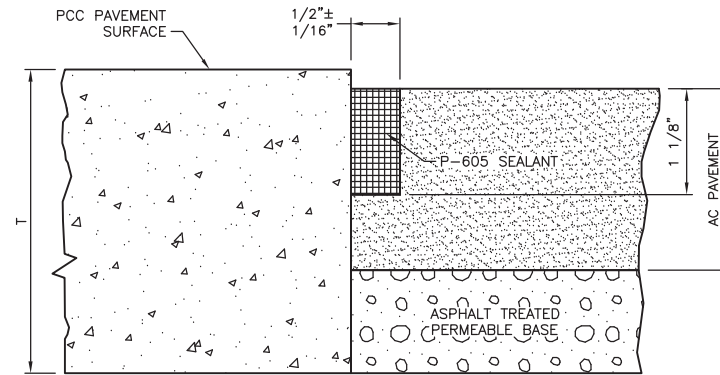
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**GENERAL NOTES:**

1. DRILLING METHOD FOR DOWELS SHALL BE CAPABLE OF MAINTAINING DRILL HOLES PARALLEL TO THE CONCRETE SURFACE AND PERPENDICULAR TO THE JOINT LINE. DRILL HOLES SHALL BE ACCURATELY LAID OUT IN ACCORDANCE WITH SPECIFICATION SECTION P-501. DRILL HOLE DIAMETER TO BE OF SUFFICIENT SIZE TO ACCEPT THE TYPE AND SIZE DOWEL REQUIRED.
2. AFTER THE DRILLING IS COMPLETE AND PRIOR TO THE INSTALLATION OF THE DOWELS, THE HOLES SHALL BE THOROUGHLY CLEANED TO REMOVE DRILLING DUST, CONCRETE CHIPS AND ANY MATERIAL DETRIMENTAL TO DEVELOPING BOND.
3. THE CONCRETE PANELS IDENTIFIED IN THE ELECTRICAL PLAN SHEETS FOR REMOVAL AND REPLACEMENT SHALL BE COMPLETED DURING THE SCHEDULED RUNWAY CLOSURE AND SHALL UTILIZE A STANDARD P-501 CONCRETE MIX DESIGN (NOT HIGH EARLY STRENGTH) AND BE COMPLETED, INCLUDING CURING TIME, DURING THE SCHEDULED RUNWAY CLOSURE PHASE.
4. IF UNEXPECTED CONCRETE PANELS ARE REQUIRED TO BE REMOVED AND REPLACED ON THE TAXIWAYS, THIS WORK SHALL BE COMPLETED IN A MAXIMUM 3 DAY CLOSURE UTILIZING HIGH EARLY STRENGTH CONCRETE IF NECESSARY TO ACHIEVE STRENGTH PRIOR TO OPENING THE TAXIWAY. TAXIWAY CONCRETE PAVEMENT SHALL OBTAIN A MINIMUM FLEXURAL STRENGTH OF 550 PSI PRIOR TO REOPENING.
5. IF UNEXPECTED CONCRETE PANELS ARE REQUIRED TO BE REMOVED AND REPLACED ON THE RUNWAY, THIS WORK SHALL BE COMPLETED IN A MAXIMUM 10 DAY CLOSURE UTILIZING HIGH EARLY STRENGTH CONCRETE IF NECESSARY TO ACHIEVE STRENGTH PRIOR TO OPENING THE RUNWAY. RUNWAY CONCRETE PAVEMENT SHALL OBTAIN A MINIMUM FLEXURAL STRENGTH OF 700 PSI PRIOR TO REOPENING.
6. THE CONCRETE PANELS TO BE REMOVED AND REPLACED TO CONSTRUCT THE CLEARANCE BAR ON TAXIWAY "EE" SHALL BE COMPLETED DURING THE SCHEDULED RUNWAY CLOSURE AND SHALL UTILIZE A STANDARD P-501 CONCRETE MIX DESIGN (NOT HIGH EARLY STRENGTH). ALL WORK SHALL BE COMPLETED, INCLUDING CURE TIME, DURING THE SCHEDULED RUNWAY CLOSURE.
7. THE CONCRETE PANELS TO BE REMOVED AND REPLACED TO CONSTRUCT THE CLEARANCE BAR ON TAXIWAY "Z" SHALL BE COMPLETED DURING THE 15 DAY CLOSURE ON TAXIWAY "Z". THE CONCRETE PANELS IN THIS AREA SHALL UTILIZE NORMAL P-501 CONCRETE CAPABLE OF GAINING 550 PSI FLEXURAL STRENGTH PRIOR TO REOPENING TAXIWAY "Z". CONSTRUCTION OF THESE PANELS SHALL BE COMPLETED, INCLUDING CURE TIME, DURING THE SCHEDULED 15 DAY CLOSURE.

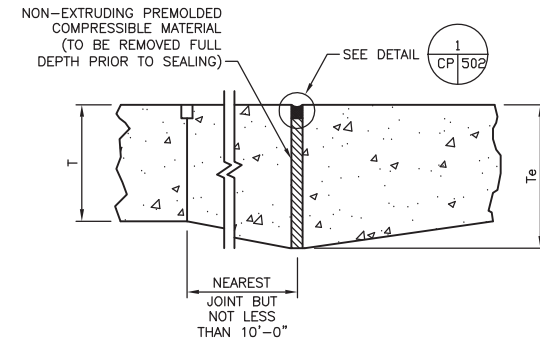
**CONCRETE PAVEMENT THICKNESS TABLE**

| TYPE                       | T   | T/2  | T/3    | T/4   | T/4+1 | T/5  | Te     |
|----------------------------|-----|------|--------|-------|-------|------|--------|
| FULL STRENGTH PCC PAVEMENT | 17" | 8.5" | 5.667" | 4.25" | 5.25" | 3.4" | 21.25" |

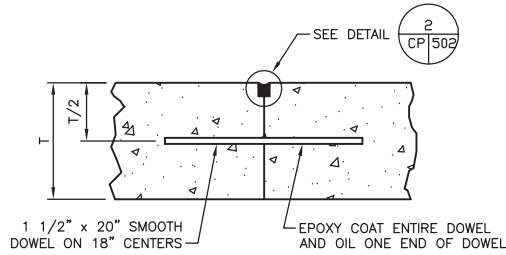


- NOTES:**
1. ASPHALT ELEVATION AT PCC JOINT SHALL BE 0" TO 1/16" BELOW PCC EDGE ELEVATION. HOWEVER, THE P-401 GRADE TOLERANCES SHALL STILL APPLY.
  2. P-605 SEALANT SHALL BE FLUSH WITH TOP OF THE ASPHALT.

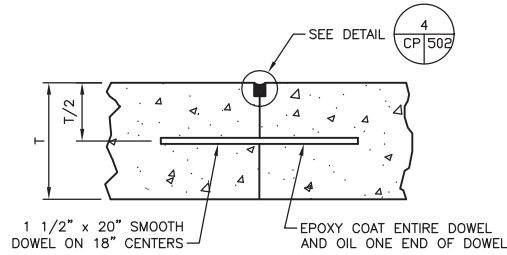
TYPE A - CONSTRUCTION JOINT BETWEEN PCC AND AC  
NTS



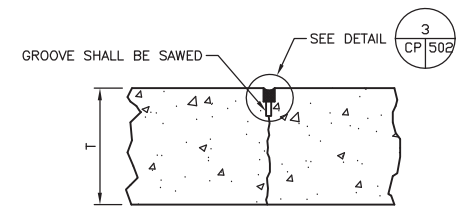
TYPE B1 - THICKENED EDGE EXPANSION JOINT  
NTS



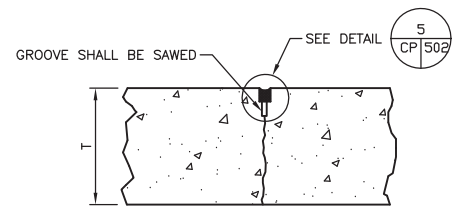
TYPE D1 - DOWELED CONSTRUCTION JOINT  
NTS



TYPE D2 - DOWELED CONSTRUCTION JOINT  
NTS



TYPE H1 - DUMMY CONTRACTION JOINT  
NTS



TYPE H2 - DUMMY CONTRACTION JOINT  
NTS

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RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

**CH2MHILL**




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| 1   | BK | CONST   | 07JA14 | CG   |

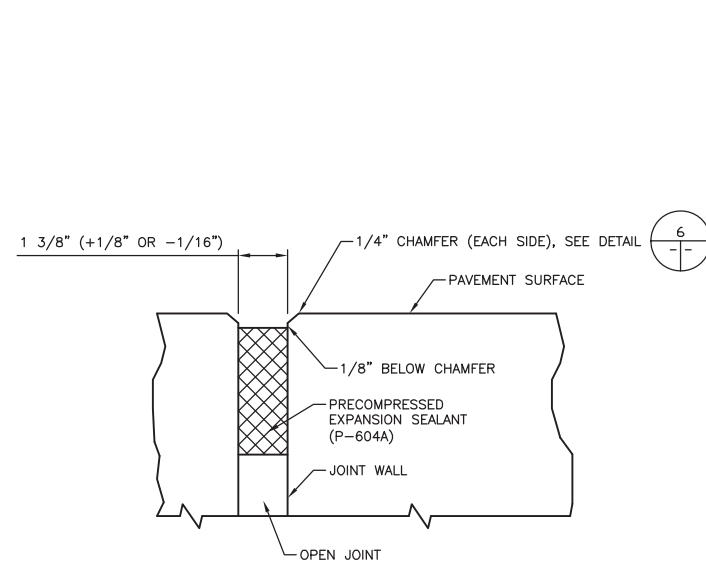
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| SCALE               | AS SHOWN   |
| DATE                | 01/07/2014 |
| DRAWN BY:           | A. TAYLOR  |
| CHECKED BY:         | B. KEAS    |
| FAA AIP NO:         |            |
| WORK BREAKDOWN NO.  |            |
| DESIGN CONTRACT NO. | CE84021    |
| CONST. CONTRACT NO. | 201313528  |
| VOLUME NO.          | 1          |
| SHEET TITLE         |            |

PAVING DETAILS

|               |                      |
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| SHEET NO.     | CP502                |
|               | 29 OF 115            |
| CADD FILE NO. | _201313528-1CP-502-A |

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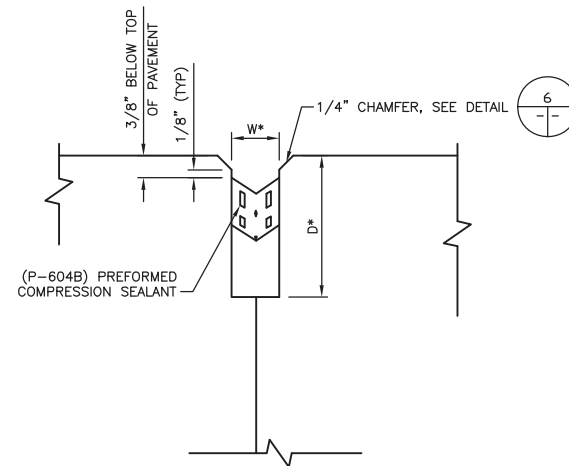
-  SEALANT (P-605)
-  BACKER ROD (CLOSED-CELL RESILIENT FOAM OR SPONGE RUBBER)
-  PRECOMPRESSED EXPANSION SEALANT (P-604A)



NOTE:

- PRE-MOLDED EXPANSION MATERIAL MUST BE REMOVED FULL DEPTH PRIOR TO SEALING THE JOINTS.

1 EXPANSION JOINT  
NTS

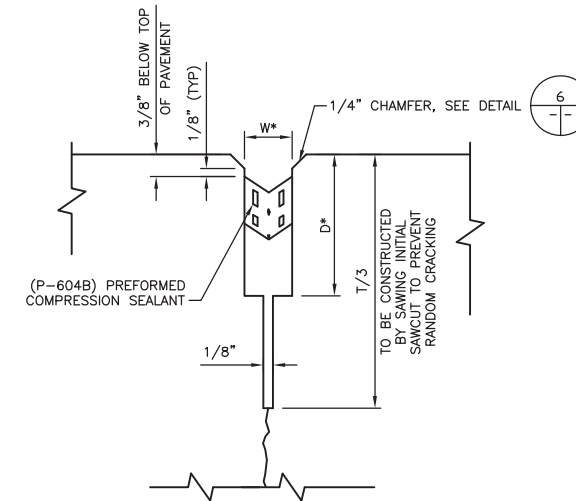


- \* REFER TO SPECIFICATION SECTION P-604 AND MANUFACTURERS RECOMMENDATIONS FOR WIDTH AND DEPTH REQUIREMENTS.

NOTE:

- AT "T" INTERSECTIONS, USE HAND TOOLS AS REQUIRED TO ACHIEVE FULL DEPTH JOINT FOR COMPRESSION SEALANT INSTALLATION.

2 CONSTRUCTION JOINT  
NTS

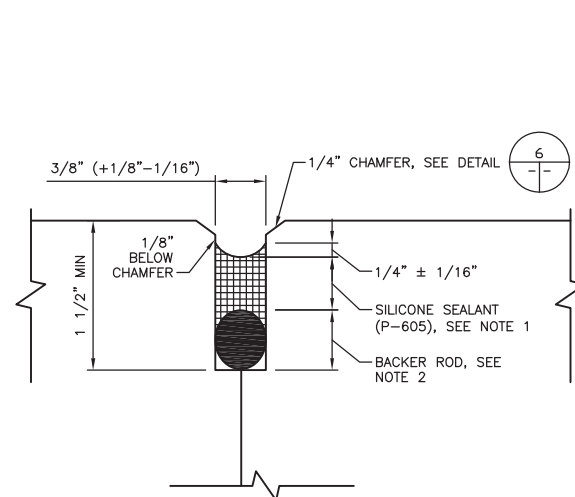


- \* REFER TO SPECIFICATION SECTION P-604 AND MANUFACTURERS RECOMMENDATIONS FOR WIDTH AND DEPTH REQUIREMENTS.

NOTE:

- CLOSED CELL RESILIENT FOAM SIZED TO FIT A 1/8" SAWCUT SHALL BE INSTALLED IMMEDIATELY FOLLOWING INITIAL SAWCUT.

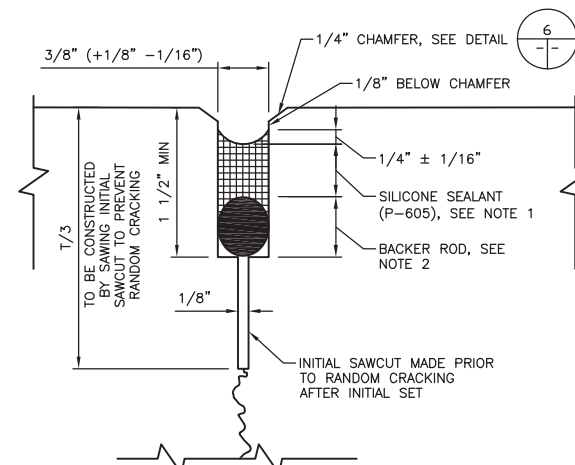
3 CONTRACTION JOINT  
NTS



NOTES:

- DEPTH PER MANUFACTURER'S GUIDELINES. (BASED ON THE WIDTH).
- BACKER ROD MATERIAL MUST BE COMPATIBLE WITH THE TYPE OF SEALANT USED AND SIZED TO PROVIDE THE DESIRED SHAPE FACTOR.

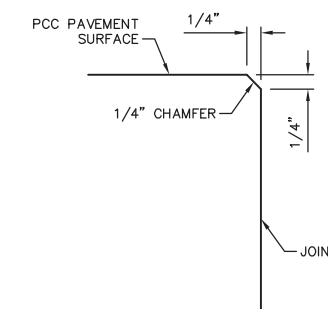
4 CONSTRUCTION JOINT  
NTS



NOTES:

- DEPTH PER MANUFACTURER'S GUIDELINES (BASED ON THE WIDTH).
- BACKER ROD MATERIAL MUST BE COMPATIBLE WITH THE TYPE OF SEALANT USED AND SIZED TO PROVIDE THE DESIRED SHAPE FACTOR.
- CLOSED CELL RESILIENT FOAM SIZED TO FIT A 1/8" SAWCUT SHALL BE INSTALLED IMMEDIATELY FOLLOWING INITIAL SAWCUT.

5 CONTRACTION JOINT  
NTS



6 1/4-INCH CHAMFER  
NTS



RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | BK  | CONST | 07JA14  | CG   |      |

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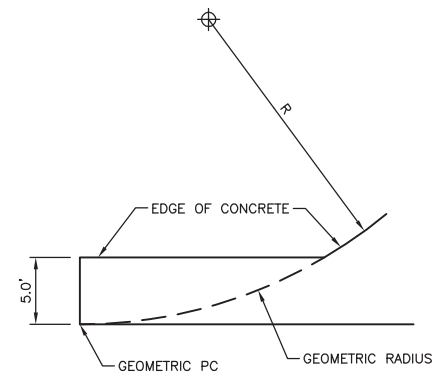
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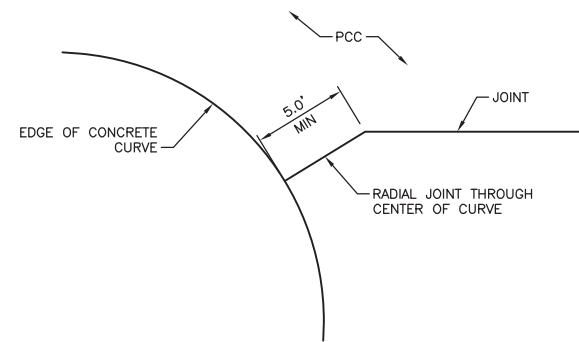
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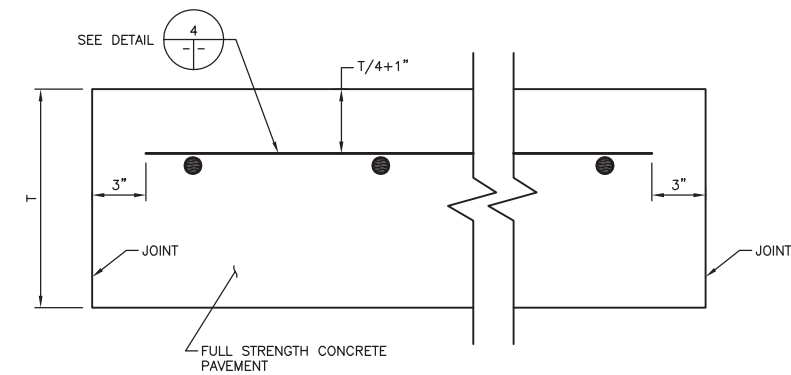
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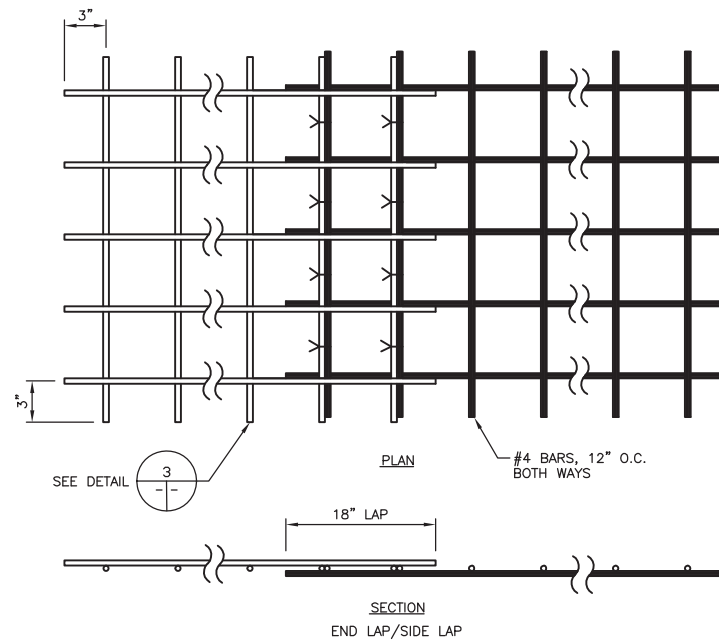
1 CONCRETE WIDENING AT PC'S  
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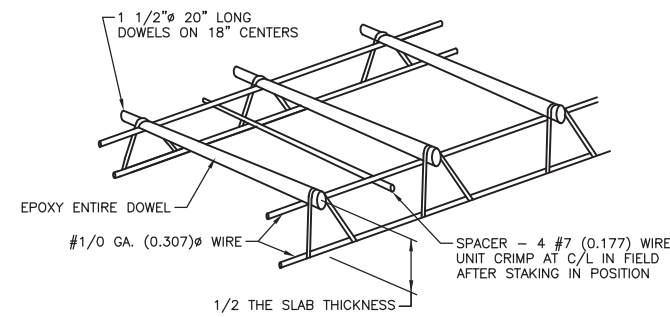
2 TYPICAL JOINT AT CURVE  
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3 REINFORCED PAVEMENT DETAIL  
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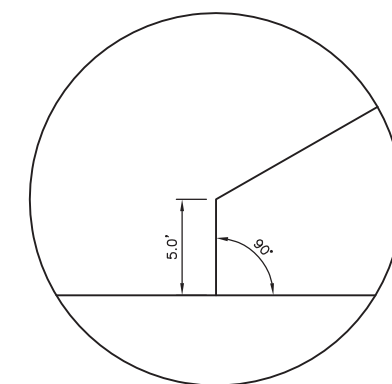


4 WELDED WIRE FABRIC DETAIL  
NTS



NOTE:  
1. ANY PORTION OF THE BASKET IN CONTACT WITH THE SUBGRADE, INCLUDING CTB OR BOND BREAKER, SHALL BE PLASTIC OR EPOXY COATED.

5 CONTRACTION JOINT DOWEL BASKET  
NTS



6 TYPICAL JOINT DOGLEG DETAIL  
NTS



RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

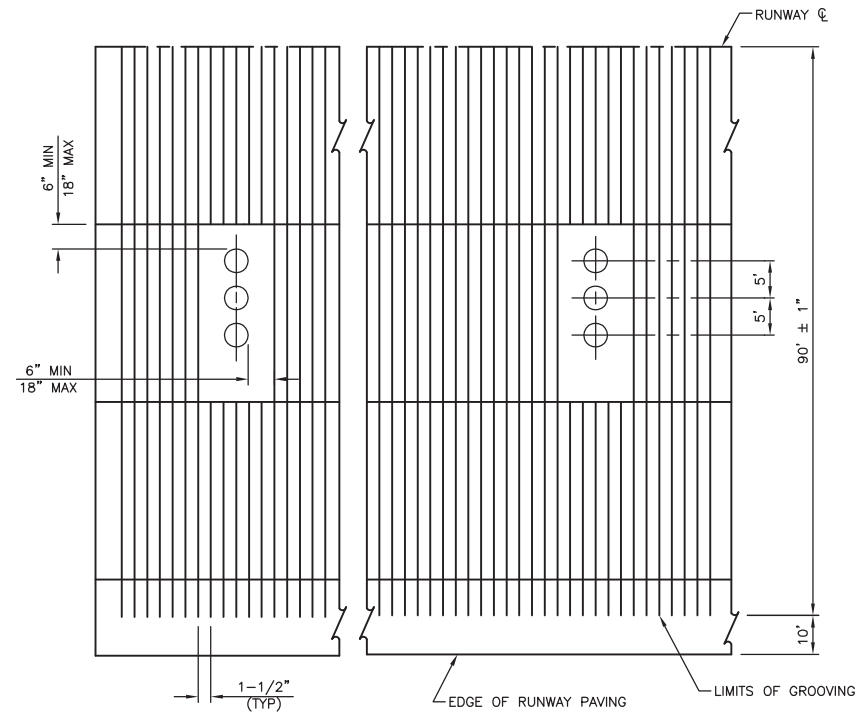
**CH2MHILL**

| NO. | BY | PURPOSE | DATE     | CHKD |
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| 1   | BK | CONST   | 07/14/14 | CG   |

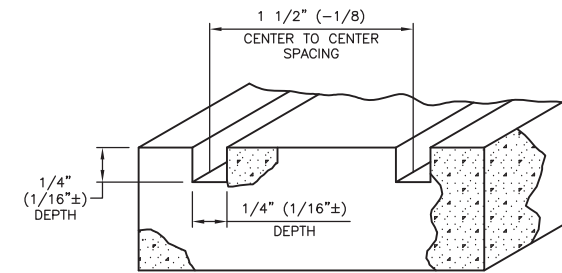
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| DRAWN BY:           | A. TAYLOR  |
| CHECKED BY:         | B. KEAS    |
| FAA AIP NO:         |            |
| WORK BREAKDOWN NO.  |            |
| DESIGN CONTRACT NO. | CE84021    |
| CONST. CONTRACT NO. | 201313528  |
| VOLUME NO.          | 1          |
| SHEET TITLE         |            |

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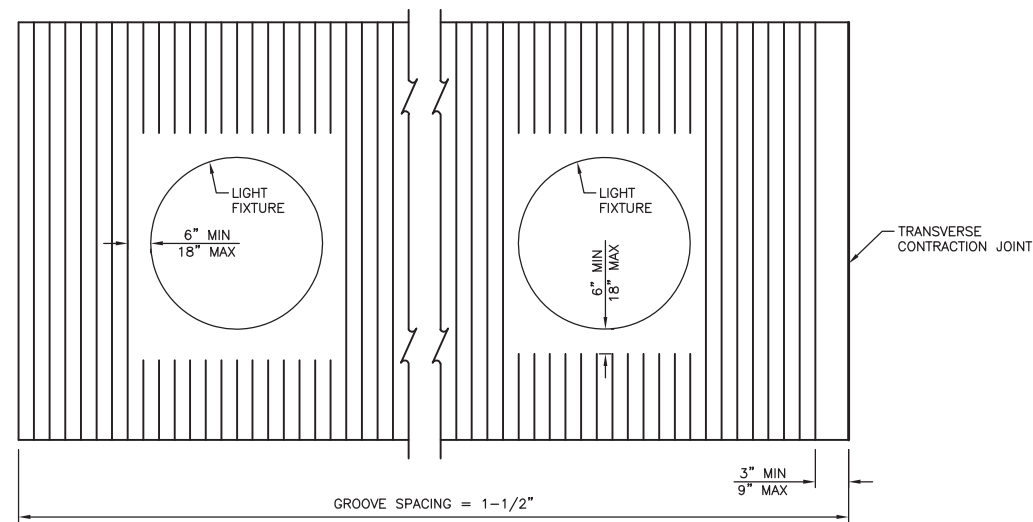
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| SHEET NO.     | CP504                |
|               | 31 OF 115            |
| CADD FILE NO. | _201313528-1CP-504-A |



1 TYPICAL GROOVING DETAIL ADJACENT TO TOUCHDOWN ZONE LIGHTS  
NTS

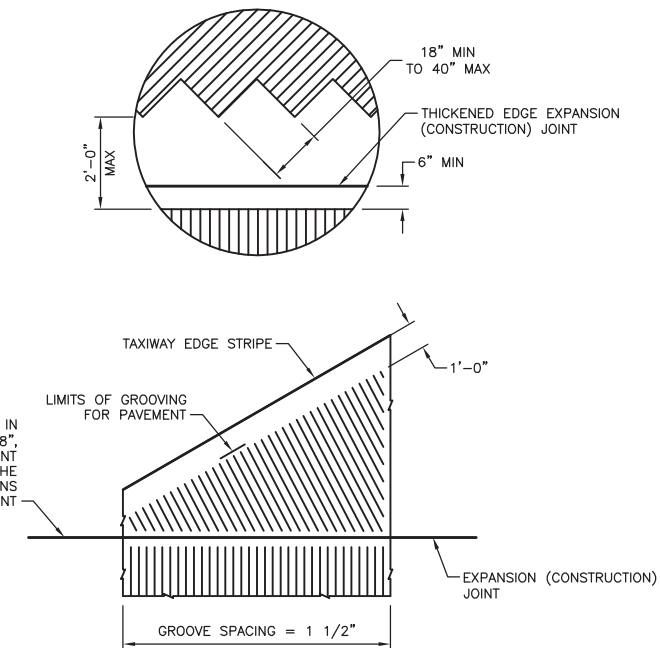


3 TYPICAL SAWCUT GROOVING CONFIGURATIONS  
NTS



2 TYPICAL GROOVING DETAIL ADJACENT TO IN-PAVEMENT FIXTURES  
NTS

GENERALLY AT THE EDGE OF RUNWAY, IN LOCATION OF NEW HIGH SPEED TAXIWAY "F8", THE EXPANSION JOINT IS LOCATED ONE JOINT OFF THE EDGE OF THE RUNWAY AND THE TRANSITION BETWEEN GROOVING DIRECTIONS SHALL OCCUR AT THE OFFSET EXPANSION JOINT



4 TYPICAL GROOVING DETAIL AT RUNWAY AND HIGH SPEED TAXIWAY INTERSECTION  
NTS



| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | BK | CONST   | 07/14/14 | CG   |

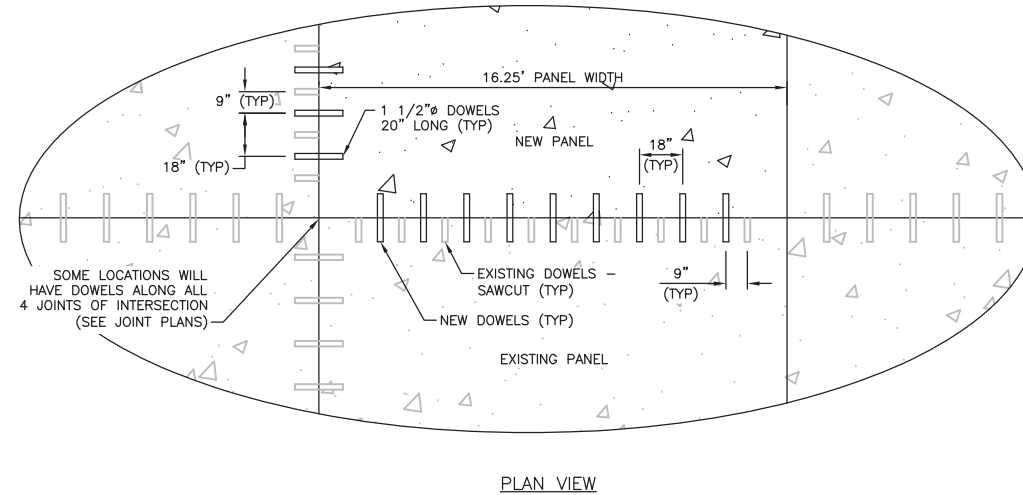
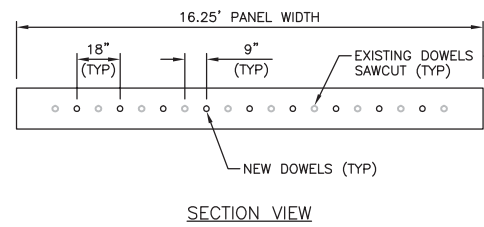
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| DRAWN BY:           | A. TAYLOR  |
| CHECKED BY:         | B. KEAS    |
| FAA AIP NO:         |            |
| WORK BREAKDOWN NO.  |            |
| DESIGN CONTRACT NO. | CE84021    |
| CONST. CONTRACT NO. | 201313528  |
| VOLUME NO.          | 1          |
| SHEET TITLE         |            |

PAVING DETAILS

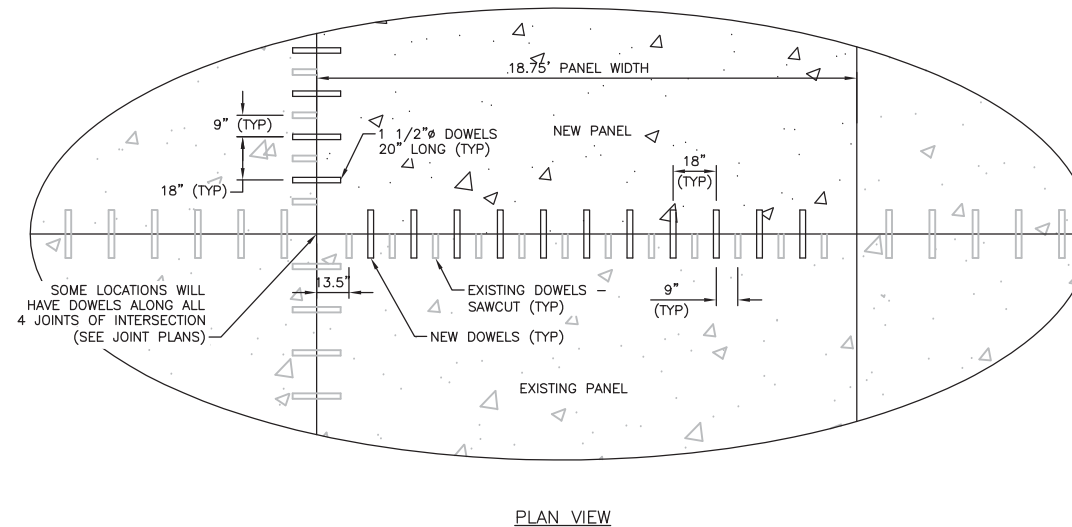
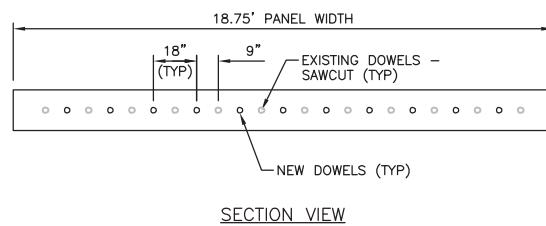
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| SHEET NO.     | CP505                |
|               | 32 OF 115            |
| CADD FILE NO. | _201313528-1CP-505-A |

NOTES:

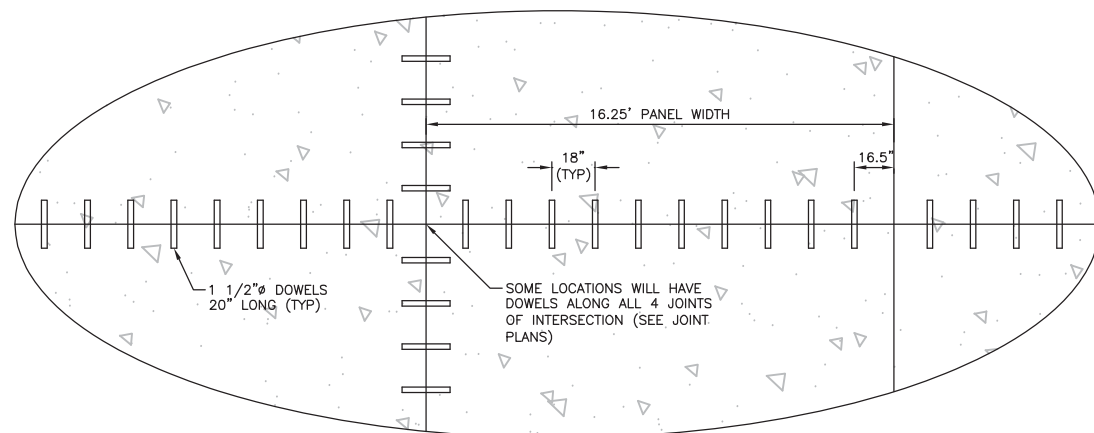
1. THE LOCATIONS OF THE EXISTING DOWELS ARE BASED ON AS-BUILT INFORMATION. ACTUAL LOCATION OF DOWELS IN THE FIELD MAY VARY. THE CONTRACTOR SHALL NOTIFY THE DIA PROJECT MANAGER IF THE EXISTING DOWELS VARY FROM THESE PLANS BY MORE THAN 1/2".
2. DOWELS SHALL BE NO CLOSER THAN 10" TO THE JOINT.



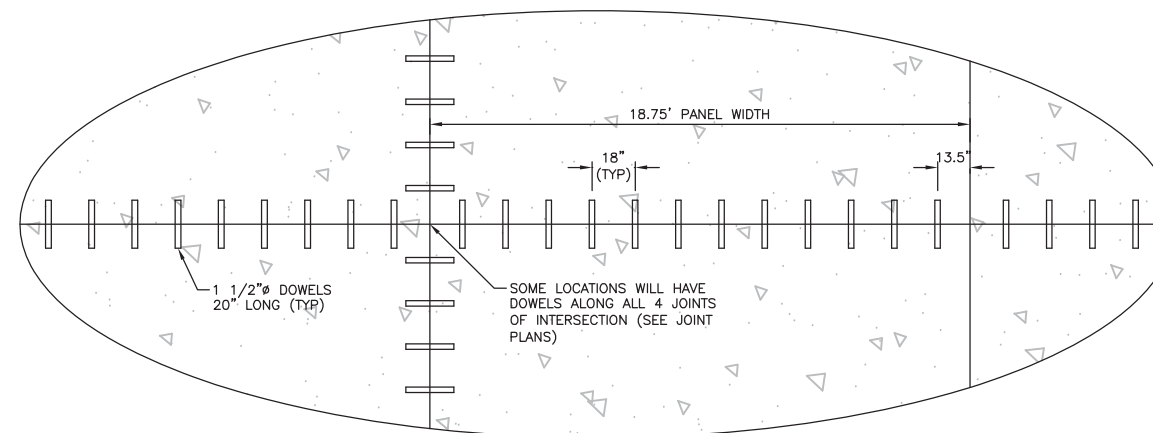
1 TYPICAL DOWEL LAYOUT - NEW PCC (16.25' PANELS) TO EXISTING PCC  
NTS



2 TYPICAL DOWEL LAYOUT - NEW PCC (18.75' PANELS) TO EXISTING PCC  
NTS



3 TYPICAL DOWEL LAYOUT - NEW PCC TO NEW PCC (16.25' PANELS)  
NTS



4 TYPICAL DOWEL LAYOUT - NEW PCC TO NEW PCC (18.75' PANELS)  
NTS

**ELECTRICAL NOTES:**

1. MANHOLES TO BE ACCESSED SHALL BE POWER WASHED AND DRAINED PRIOR TO GAINING ENTRY TO COMPLETE INVESTIGATION OF CONDUIT FILL AND REMOVAL OR INSTALLATION OF CABLE. THE MANHOLES SHALL BE THOROUGHLY CLEANED SO THAT THE ELECTRICIAN IS NOT COVERED IN GRIME OR FOUL MUCK AFTER EXITING THE MANHOLE. THIS WORK SHALL BE INCIDENTAL TO THE INSTALLATION OF CABLE.
2. THE CONTRACTOR SHALL SALVAGE CROUSE-HINDS PRO 3, LED, NEW ADB FIXTURES, L-852GS, ELEVATED STOP BAR, ELEVATED RGL FIXTURES, ANY BLANK COVERS REMOVED, EDGE LIGHTS, WIND CONES, AND POWER ADAPTERS. TURN OVER SALVAGED EQUIPMENT TO DIA MAINTENANCE TO A LOCATION ON AIRPORT PROPERTY DESIGNATED BY THE DIA PROJECT MANAGER. ALL OTHER EQUIPMENT AND MATERIAL SHALL BECOME THE CONTRACTOR'S PROPERTY AND REMOVED FROM THE AIRPORT.
3. CONTRACTOR SHALL FIELD VERIFY CONDUIT AND DUCTBANK ROUTING PRIOR TO REMOVAL AND INSTALLATION OF CABLE. THE DIA PROJECT MANAGER SHALL BE NOTIFIED OF ANY DISCREPANCIES FROM THE PLANS.
4. PRIOR TO REMOVAL/INSTALLATION OF CABLE IN AN ALD BETWEEN MANHOLES, THE CONTRACTOR SHALL VERIFY CABLE ROUTING FOR THE FULL DUCT RUN. CABLES SHALL BE INSTALLED IN THE SAME CONDUIT POSITION THROUGH THE FULL LENGTH OF THE ALD SYSTEM AS SHOWN ON THE PLANS.
5. THE CONTRACTOR SHALL CEASE PULLING THE MANDREL THROUGH CONDUIT IF IT DOES NOT PULL FREELY. NOTIFY THE DIA PROJECT MANAGER WHERE THIS OCCURS.
6. CABLES SHALL BE TERMINATED AT EACH MANHOLE. THE CONTRACTOR SHALL APPLY RUBBER TAPE TO CONNECTIONS OF NEW AND OLD L-823 CONNECTORS WHERE THE OLD CONNECTOR AND CABLE WILL BE REPLACED LATER DURING CONSTRUCTION. ALL CONNECTORS ON NEW AND OLD CABLE SHALL BE NEW PRIOR TO FINAL WALK THROUGH. THE SAME MANUFACTURER SHALL BE USED FOR COMMON TERMINATIONS.
7. THE CABLES SHALL BE RACKED AND TIED BY CIRCUIT IN A NEAT AND ORDERLY MANNER TO THE CABLE RACKS IN EACH MANHOLE. EACH CIRCUIT SHALL HAVE TIE WRAPS INSTALLED EVERY TWO (2) FEET FROM DUCT ENTRANCE TO DUCT ENTRANCE.
8. SIGN FIXTURE ID MARKERS BEGINNING WITH 'GS1-XXXX' OR 'GS2-XXXX' SHALL BE REMOVED AND REPLACED WITH 'TRS1-XXXX' AND 'TRS2-XXXX', WHERE 'XXXX' REFERS TO EACH SIGN'S UNIQUE IDENTIFIER.
9. THE 3/4" NOMINAL SPACER RING CALLED FOR IN THE ITEM DESCRIPTION IS AN ARBITRARY THICKNESS USED TO INDICATE THAT A SPACER RING (WITH CONCRETE RING) IS REQUIRED ON THE NOTED FIXTURES. THE ACTUAL THICKNESS WILL BE DETERMINED BY THE ACTUAL SITE CONDITIONS. THE CONTRACTOR IS RESPONSIBLE FOR FURNISHING THE REQUIRED SPACER RING(S), IRREGARDLESS OF THE THICKNESS, BEVEL, ETC. NECESSARY, TO INSTALL THE LIGHT AT THE PROPER ELEVATION, AZIMUTH, AND ROTATION.
10. JOINT LAYOUTS ARE SHOWN ON ELECTRICAL DRAWINGS FOR REFERENCE ONLY.
11. BASE CANS SHALL BE MADE OF GALVANIZED STEEL AND MEET THE REQUIREMENTS OF FAA BASE CAN TYPES L-867 AND L-868, CLASS 1A AND SPECIFICATION L-125.
12. EXISTING UTILITY LOCATIONS SHOWN ON THE PLANS ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCING ANY WORK. ANY INTERRUPTION OF UTILITY SERVICE SHALL BE COORDINATED AND APPROVED BY THE AUTHORITY HAVING JURISDICTION, PRIOR TO COMMENCING WORK.
13. 1/4" BOLTS AND LARGER SHALL BE HEX HEAD. SMALLER THAN 1/4" SHALL BE HEX SOCKET. ANTI-SEIZING COMPOUND SHALL BE APPLIED TO ALL FRANGIBLE COUPLINGS AND STEEL-TO-STEEL THREADED CONNECTIONS.
14. CONTRACTOR SHALL PROVIDE ALL NEW CERAMIC COATED BOLTS FOR INSTALLATION OF FIXTURES AND COVER PLATES. AIRFIELD LIGHTING BOLTING MATERIAL SHALL BE SAE GRADE 2 BOLTS WITH CERAMIC-METALLIC/FLUOROCARBON POLYMER COATING PER FAA ENGINEERING BRIEF 83. PROVIDE BOLTS MANUFACTURED BY MCB OR APPROVED EQUAL. THE FIXTURE MOUNTING BOLTS SHALL EXTEND THROUGH THE BASE CAN MOUNTING FLANGE INTO THE BASE CAN A MINIMUM OF 1/2" AND A MAXIMUM OF 1-1/2". THE BOLTS SHALL HAVE ENOUGH THREAD LENGTH SO THEY DO NOT SHOULDER OUT BEFORE THE FIXTURE IS SECURELY TIGHTENED. DO NOT APPLY ANTI-SEIZE COMPOUND TO CERAMIC COATED BOLTS.
15. IN NEW OR EXISTING PAVEMENT REPLACEMENT, ALL CONDUITS, DUCTBANKS, COUNTERPOISE AND GROUND GRID CONDUCTORS, ETC. SHALL BE INSTALLED PRIOR TO PLACEMENT OF ANY PAVEMENT.
16. CONTRACTOR SHALL TEMPORARILY SET BASE CANS AT THEIR SURVEYED LOCATIONS IN TRACK OF NEW PAVEMENT SECTIONS TO ASSURE THE CONDUIT IS ALIGNED PRIOR TO CONCRETE PLACEMENT.
17. IF A LIGHT CAN IS INSTALLED INCORRECTLY OR THE CONCRETE JOINTS ARE INSTALLED INCORRECTLY AND THE LIGHT CAN IS SAWED BY THE CONCRETE SAW, THE CONCRETE SLAB CONTAINING THE LIGHT CAN AND THE LIGHT SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE.
18. DUCT AND CONDUIT LOCATED IN OR UNDER PAVED AREAS, INCLUDING ASPHALT, SHALL BE CONCRETE ENCASED DUCT. ALL OTHER DUCT TRENCHES SHALL BE BACKFILLED RED FLOW FILL. DUCTBANKS IN ALL SITE CONDITIONS SHALL BE CONCRETE ENCASED.

19. TOUCHDOWN ZONE LIGHTS ARE TYPICALLY LOCATED SUCH THAT A LINE THROUGH ALL LIGHTS AT ONE STATION IS PERPENDICULAR TO THE RUNWAY CENTERLINE AND ALIGNED WITH EVERY OTHER RUNWAY CENTERLINE LIGHT.
20. TAXIWAY CENTERLINE "LEAD OFF" LIGHTS SHALL BE LOCATED ON THE RUNWAY EXIT SIDE OF THE TAXIWAY CENTERLINE MARKING. THE CENTER OF EACH LIGHT SHALL BE APPROXIMATELY 2.5 FEET FROM THE CENTER OF THE TAXIWAY CENTERLINE MARKING.
21. RUNWAY EDGE LIGHTS SHALL BE SET USING A MANUFACTURER PROVIDED LEVELING/AIMING DEVICE. THE CONTRACTOR SHALL TURN OVER THE DEVICE TO DIA AT THE COMPLETION OF THE PROJECT.
22. WHERE PAVEMENT PANELS ARE REPLACED AFTER NEW CANS ARE SET AND BEFORE AND AFTER PAVING, THE CONTRACTOR SHALL MEASURE COUNTERPOISE CONTINUITY. ANY MEASUREMENTS THAT INDICATE AN OPEN CIRCUIT SHALL BE CORRECTED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE.
23. PHOTOMETRIC TESTING SHALL BE ACCOMPLISHED FOR ALL NEW INSET LIGHTS AND RUNWAY EDGE LIGHTS. NO TESTING OF TAXIWAY EDGE LIGHTS IS REQUIRED. SEE SPECIFICATION L-140 FOR PHOTOMETRIC TESTING REQUIREMENTS. CONTRACTOR SHALL BE PREPARED TO GRIND CONCRETE TO ELIMINATE ANY LIGHT BEAM BLOCKAGE PER DIRECTION OF THE DIA PROJECT MANAGER. THIS SHALL BE INCIDENTAL TO THE INSTALLATION OF THE FIXTURE LINE ITEM.
24. ONCE ALL CIRCUITS ARE INSTALLED AND CONTINUITY IS VERIFIED, THE CONTRACTOR SHALL MEGGER EACH CIRCUIT AND PROVIDE THE READINGS IN WRITING TO THE DIA PROJECT MANAGER. ANY MEASUREMENTS NOT MEETING MINIMUM REQUIREMENT SHALL REQUIRE THE CONTRACTOR TO LOCATE AND REPLACE CABLE/CONNECTORS OR ISOLATION TRANSFORMERS AS NECESSARY.
25. NEW ISOLATION TRANSFORMERS SHALL BE INSTALLED WITH EACH NEW INSTALLED AND REINSTALLED FIXTURE. ALL SIGNS WITHIN PROJECT LIMITS SHALL HAVE NEW ISOLATION TRANSFORMERS INSTALLED. SEE TABLES FOR NUMBER OF TRANSFORMERS PER SIGN MODULE LENGTH. THE TRANSFORMERS SHALL BE 5.5A PRIMARY/6.2A SECONDARY.
26. THE CONTRACTOR SHALL PROVIDE QUARTZ FIXTURES WITH A MINIMUM OF TWO (2) YEAR WARRANTY AND LED FIXTURES WITH A MINIMUM OF FIVE (5) YEAR WARRANTY.
27. ALL LED FIXTURES SHALL BE PROVIDED WITH A HEATER KIT.
28. REMOVAL OF EXISTING CABLE SHALL BE INCIDENTAL TO THE PROJECT.
29. CONTRACTOR SHALL FIELD VERIFY BASE CAN DEPTHS PRIOR TO CONSTRUCTION. IT IS BELIEVED THE MAJORITY OF BASE CANS ON RUNWAY 8-26 COMPLEX ARE 24" DEEP.
30. THE CONTRACTOR SHALL PROVIDE MONITORING OF CIRCUIT SELECTOR SWITCHES INSTALLED ON THE REMOTE I/O RACKS NEAR TAXIWAYS "M", "R3", AND "R8" FOR LOCAL OR REMOTE CONTROL OF THE CSS. MONITORING SHALL BE TIED INTO THE ALCMS.
31. THE EXISTING ALCMS IS PROVIDED BY ADB. ADB TECHNICIANS SHALL BE ON-SITE TO UPDATE THE CONTROL SYSTEM AND CALIBRATE THE NEW ADB BRITE REMOTES AND ACE UNITS. ALL MODIFICATIONS SHALL BE COORDINATED WITH ADB.
32. CIRCUIT ROUTING SHALL FOLLOW THE NUMBERING SEQUENCE FOR THE LIGHT FIXTURES. A MALE CONNECTOR SHALL BE USED FOR THE CABLES FROM THE PREVIOUS LIGHT FIXTURE. A FEMALE CONNECTOR WILL BE ATTACHED TO THE NEXT FIXTURE IN THE SEQUENCE. WHERE CABLES PASS THROUGH BASE CANS OF LIGHTS NOT IN SEQUENCE, WHITE TAPE SHALL BE WRAPPED AROUND THE CONDUCTOR IN THOSE BASE CANS. INSTALL CABLE WITH A MANUFACTURER APPLIED WHITE STRIPE FROM THE LAST LIGHT IN A CIRCUIT BACK TO THE CCR.
33. TO MEET SPECIFICATION L-108, SECTION 3.03, THE CONTRACTOR SHALL HAVE A REPRESENTATIVE OF THE L-823 CONNECTOR MANUFACTURER ON-SITE TO PRESENT A CLASS ON THE PROPER INSTALLATION OF THE CONNECTOR. ALL CONTRACTOR PERSONNEL INTENDING TO INSTALL CONNECTOR IN THE FIELD WILL BE REQUIRED TO ATTEND. ANYONE WITHOUT THIS TRAINING WILL NOT BE ALLOWED TO TERMINATE AIRFIELD LIGHTING CABLES IN THE FIELD.
34. CONTRACTOR SHALL REMOVE AND INSTALL NEW CABLE IN AIRFIELD LIGHTING DUCTBANKS (ALD) AS INDICATED ON THE PLANS. THIS IS SPECIFIED BY BOLD CIRCUIT NAMES. DESIGNATION "SPARE" REFERS TO AN EMPTY CONDUIT WITHIN THE SPECIFIED ALD.

| SCHEDULE A              |                      |       |
|-------------------------|----------------------|-------|
| SIGN                    | TRANSFORMER SIZE [W] | TOTAL |
| RDR SIGN SIZE 4         | 150                  | 11    |
| 3 MODULE (CROUSE-HINDS) | 200                  | 12    |

| SCHEDULE B              |                      |       |
|-------------------------|----------------------|-------|
| SIGN                    | TRANSFORMER SIZE [W] | TOTAL |
| 1 MODULE (CROUSE-HINDS) | 100                  | 4     |
| 2 MODULE (CROUSE-HINDS) | 150                  | 20    |
| 3 MODULE (CROUSE-HINDS) | 200                  | 8     |

| SCHEDULE C              |                      |       |
|-------------------------|----------------------|-------|
| SIGN                    | TRANSFORMER SIZE [W] | TOTAL |
| 2 MODULE (CROUSE-HINDS) | 150                  | 2     |
| 3 MODULE (CROUSE-HINDS) | 200                  | 15    |

| SCHEDULE D              |                      |       |
|-------------------------|----------------------|-------|
| SIGN                    | TRANSFORMER SIZE [W] | TOTAL |
| 2 MODULE (CROUSE-HINDS) | 150                  | 1     |
| 3 MODULE (CROUSE-HINDS) | 200                  | 2     |



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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| ISSUE RECORD | NO. | BY | PURPOSE | DATE     | CHKD |
|--------------|-----|----|---------|----------|------|
|              | 1   | SJ | CONST   | 07/14/14 | MS   |

SCALE: AS SHOWN

DATE: 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**ELECTRICAL NOTES**

SHEET NO.

EL001  
33 OF 115

CADD FILE NO. 201313528-1EL-001-A





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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**



| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/14/14 | MS   |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

**AIRFIELD  
ELECTRICAL PLAN**

|               |                      |
|---------------|----------------------|
| SHEET NO.     | EL101                |
| CADD FILE NO. | 35 OF 115            |
|               | _201313528-1EL-101-A |

**NOTES:**

- SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
- CIRCUITS TR9SB2A AND TR9SB2B ARE TAXIWAY LEAD-OFF. CIRCUIT TR9SB3 ARE TAXIWAY LEAD-OFF. SEE DETAIL 2 ON SHEET EL502.

- A-SPARE  
 B-SPARE  
 C-SPARE  
 D-2-1/C #8 (5KV) TRWW,  
 2-1/C #8 (5KV) TRSB,  
 2-1/C #8 (5KV) RDRWC

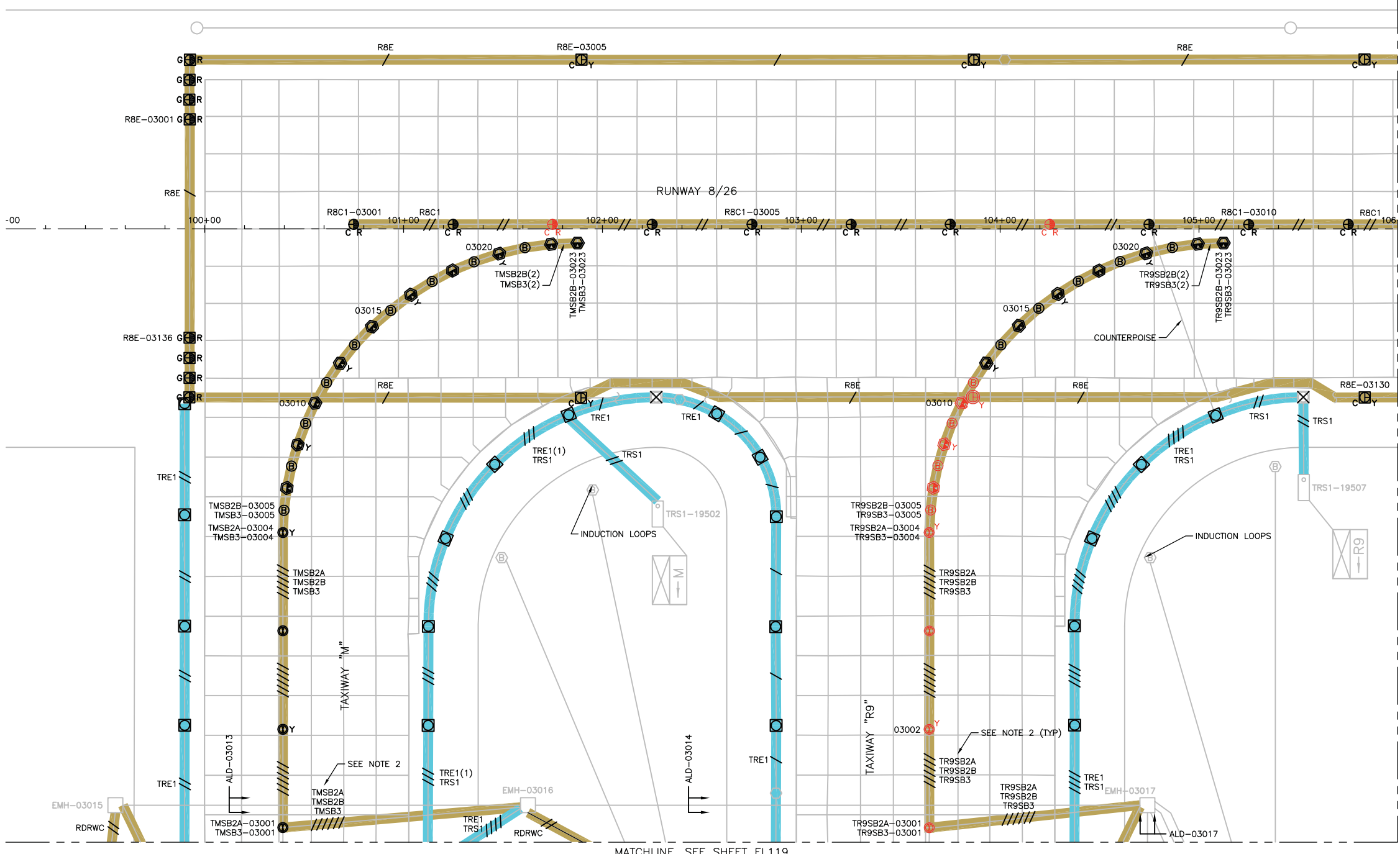
**ALD-03013**

- A-SPARE  
 B-SPARE  
 C-2-1/C #8 (5KV) TMSB2A,  
 2-1/C #8 (5KV) TMSB2B,  
 2-1/C #8 (5KV) TMSB3,  
 2-1/C #8 (5KV) TRE1,  
 2-1/C #8 (5KV) TRS1,  
 D-2-1/C #8 (5KV) TRSB,  
 2-1/C #8 (5KV) RDRWC,  
 2-1/C #8 (5KV) TRWW

**ALD-03014**

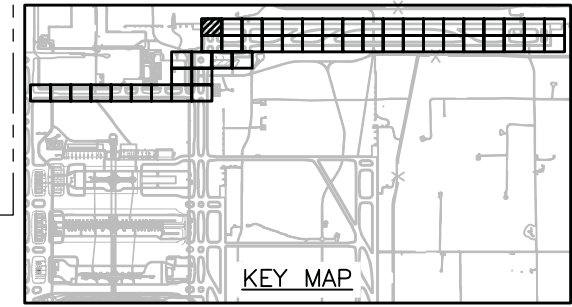
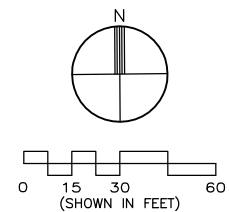
- A-SPARE  
 B-3-1/C #8 (5KV) TRCP  
 C-2-1/C #8 (5KV) TRC1,  
 2-1/C #8 (5KV) TEEC1,  
 2-1/C #8 (5KV) TRE1,  
 2-1/C #8 (5KV) TRS1  
 D-2-1/C #8 (5KV) RDRWC,  
 2-1/C #8 (5KV) TRSB,  
 2-1/C #8 (5KV) TRWW

**ALD-03017**



MATCHLINE STA 106+00.00, SEE SHEET EL102

MATCHLINE, SEE SHEET EL119



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NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**



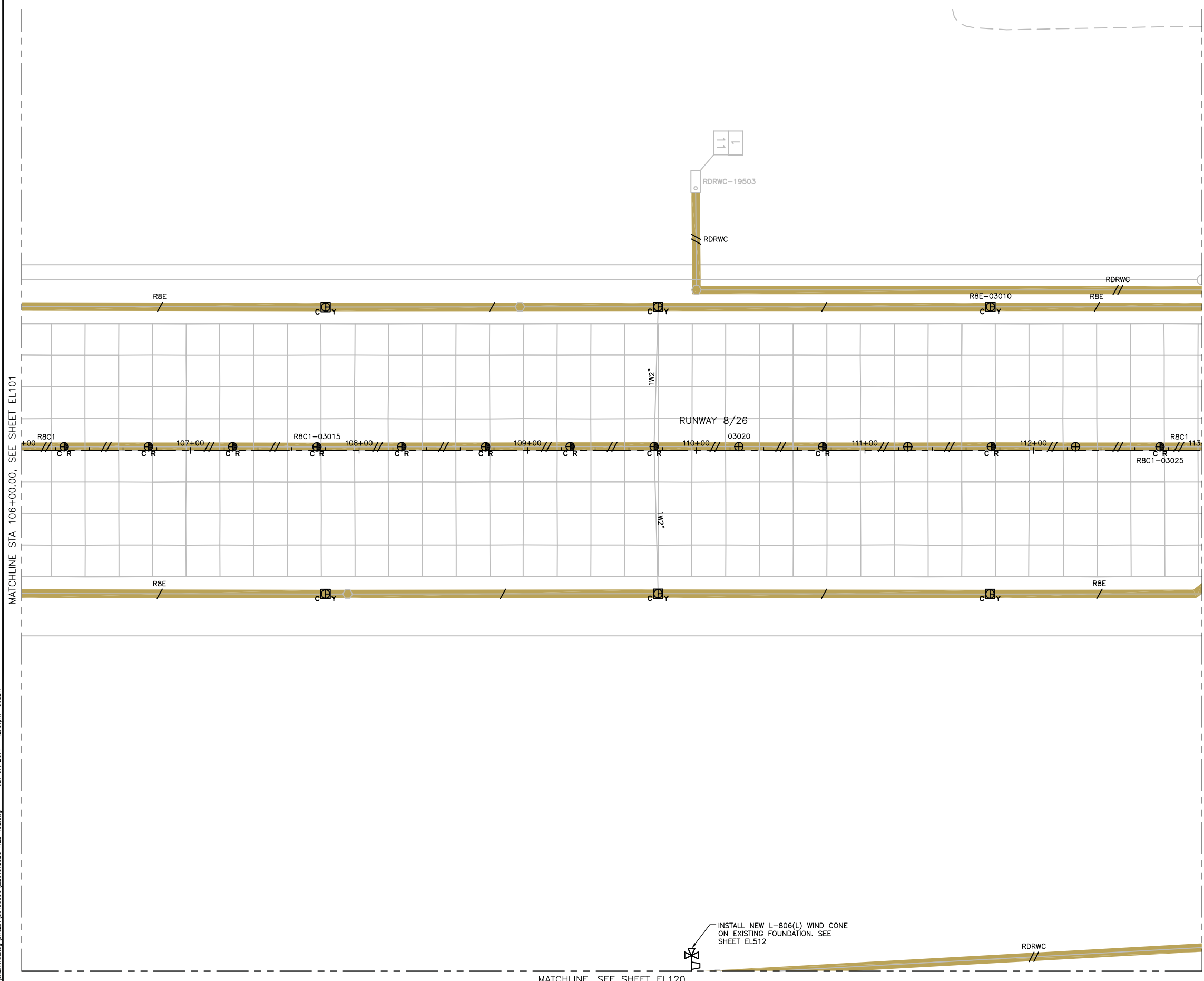
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|-----|----|---------|---------|-----|
| 1   | SJ | CONST   | 07/JA14 | MS  |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO.  
**EL102**  
36 OF 115  
CADD FILE NO.  
\_201313528-1EL-102-A

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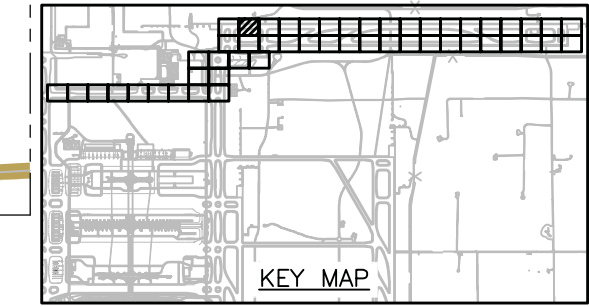
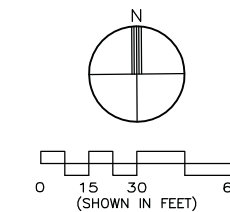


MATCHLINE STA 106+00.00, SEE SHEET EL101

MATCHLINE STA 113+00.00, SEE SHEET EL103

INSTALL NEW L-806(L) WIND CONE  
ON EXISTING FOUNDATION. SEE  
SHEET EL512

MATCHLINE, SEE SHEET EL120



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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**



| ISSUE RECORD | NO. | BY    | PURPOSE | DATE     | CHKD |
|--------------|-----|-------|---------|----------|------|
| 1            | SJ  | CONST |         | 07/14/14 | MS   |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

**AIRFIELD  
ELECTRICAL PLAN**

|               |                      |
|---------------|----------------------|
| SHEET NO.     | EL103                |
| CADD FILE NO. | 37 OF 115            |
|               | _201313528-1EL-103-A |

**NOTE:**  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

- A-SPARE
- B-SPARE
- C-SPARE
- D-SPARE
- E-SPARE
- F-3-1/C #8 (5KV) TRCP
- F-2-1/C #8 (5KV) RBC1
- 2-1/C #8 (5KV) RBE
- G-2-1/C #8 (5KV) TRS1
- 2-1/C #8 (5KV) TRC1
- 1-1/C #8 (5KV) TRE1
- H-2-1/C #8 (5KV) TRSB
- 2-1/C #8 (5KV) TRWW
- 1-1/C #8 (5KV) RDRWC

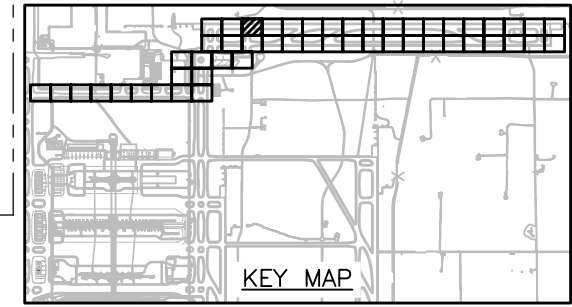
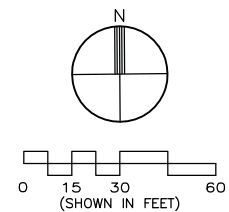
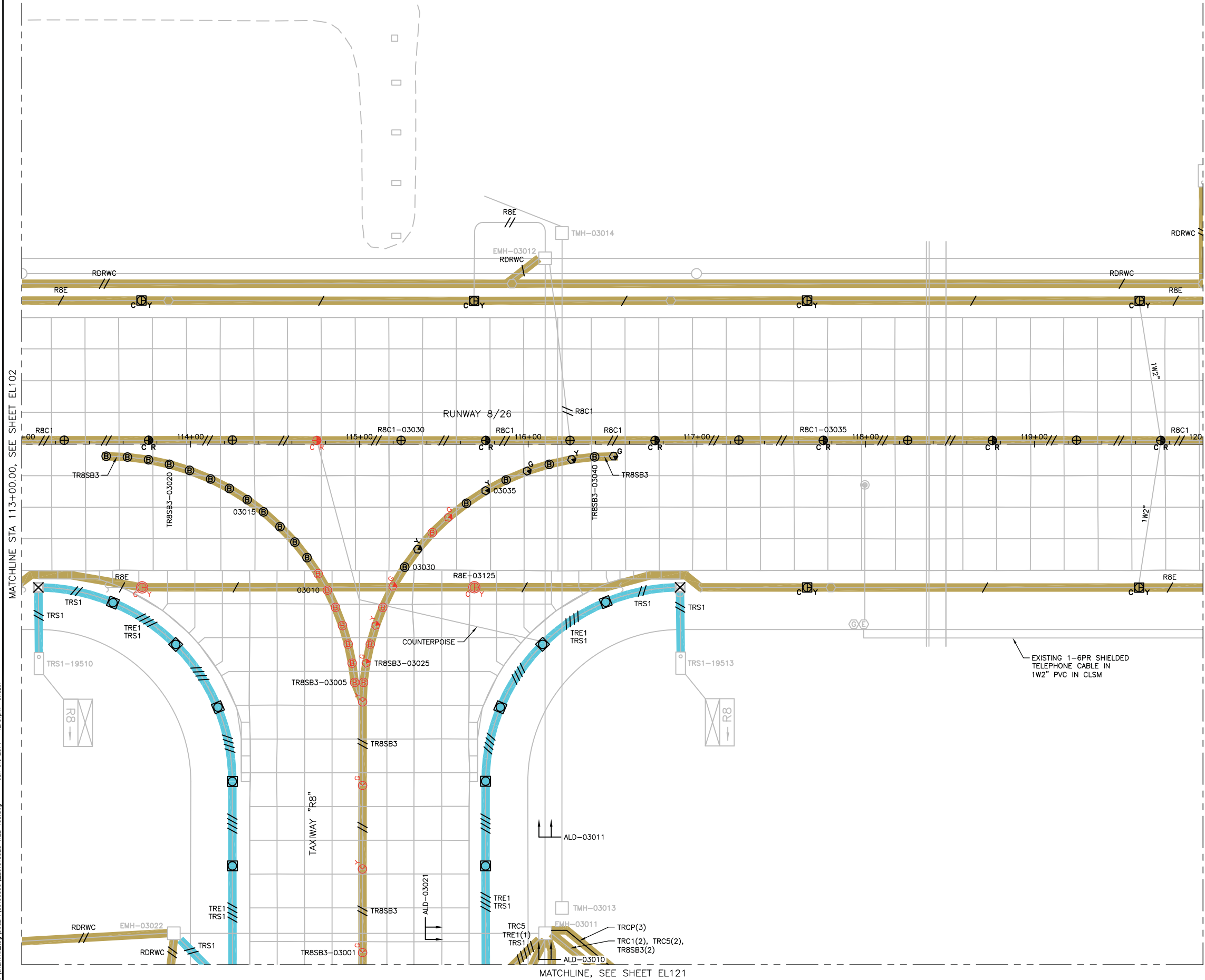
ALD-03010

- A-SPARE
- B-SPARE
- C-SPARE
- D-SPARE
- E-SPARE
- F-2-1/C #8 (5KV) RBE
- 2-1/C #8 (5KV) RBC1
- G-SPARE
- H-1-1/C #8 (5KV) RDRWC

ALD-03011

- A-SPARE
- B-SPARE
- C-2-1/C #8 (5KV) TRS1
- D-2-1/C #8 (5KV) RDRWC

ALD-03021



MATCHLINE STA 113+00.00, SEE SHEET EL102

MATCHLINE STA 120+00.00, SEE SHEET EL104

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NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

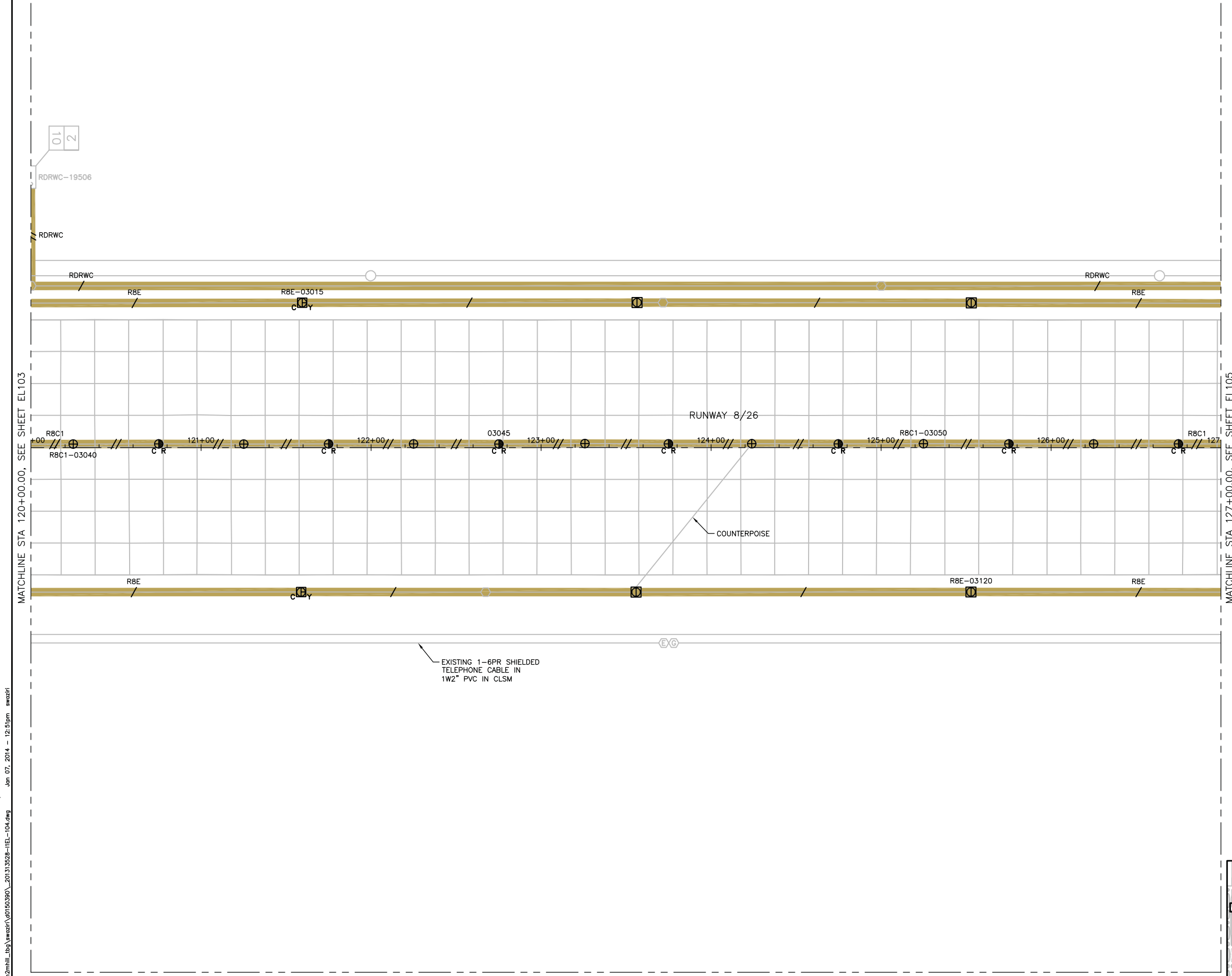
**CH2MHILL**

| NO. | BY | PURPOSE | DATE    | CKD |
|-----|----|---------|---------|-----|
| 1   | SJ | CONST   | 07/JA14 | MS  |

|                     |              |
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| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

**AIRFIELD  
ELECTRICAL PLAN**

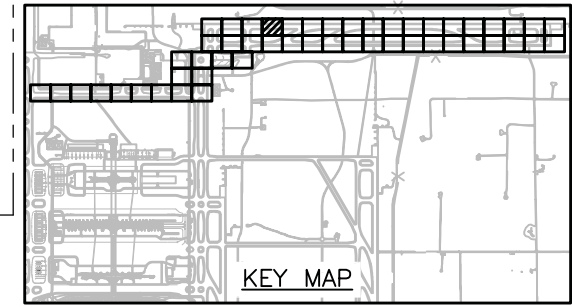
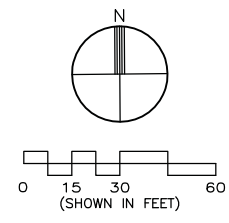
SHEET NO. **EL104**  
38 OF 115  
CADD FILE NO. **\_201313528-1EL-104-A**



MATCHLINE STA 120+00.00, SEE SHEET EL103

MATCHLINE STA 127+00.00, SEE SHEET EL105

MATCHLINE, SEE SHEET EL122



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- NOTES:
- SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
  - CONTRACTOR SHALL INSTALL NEW FIXTURE ID MARKER "TRSB" AT EACH ELEVATED STOP BAR AND RUNWAY GUARD/STOP BAR LIGHT.

- A-SPARE
- B-SPARE
- C-1-1/C #8 (5KV) TRE1
- D-2-1/C #8 (5KV) RDRWC

ALD-03027

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Denver, CO 80249-6340



**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE    | CHKD |
|-----|----|---------|---------|------|
| 1   | SJ | CONST   | 07/JA14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

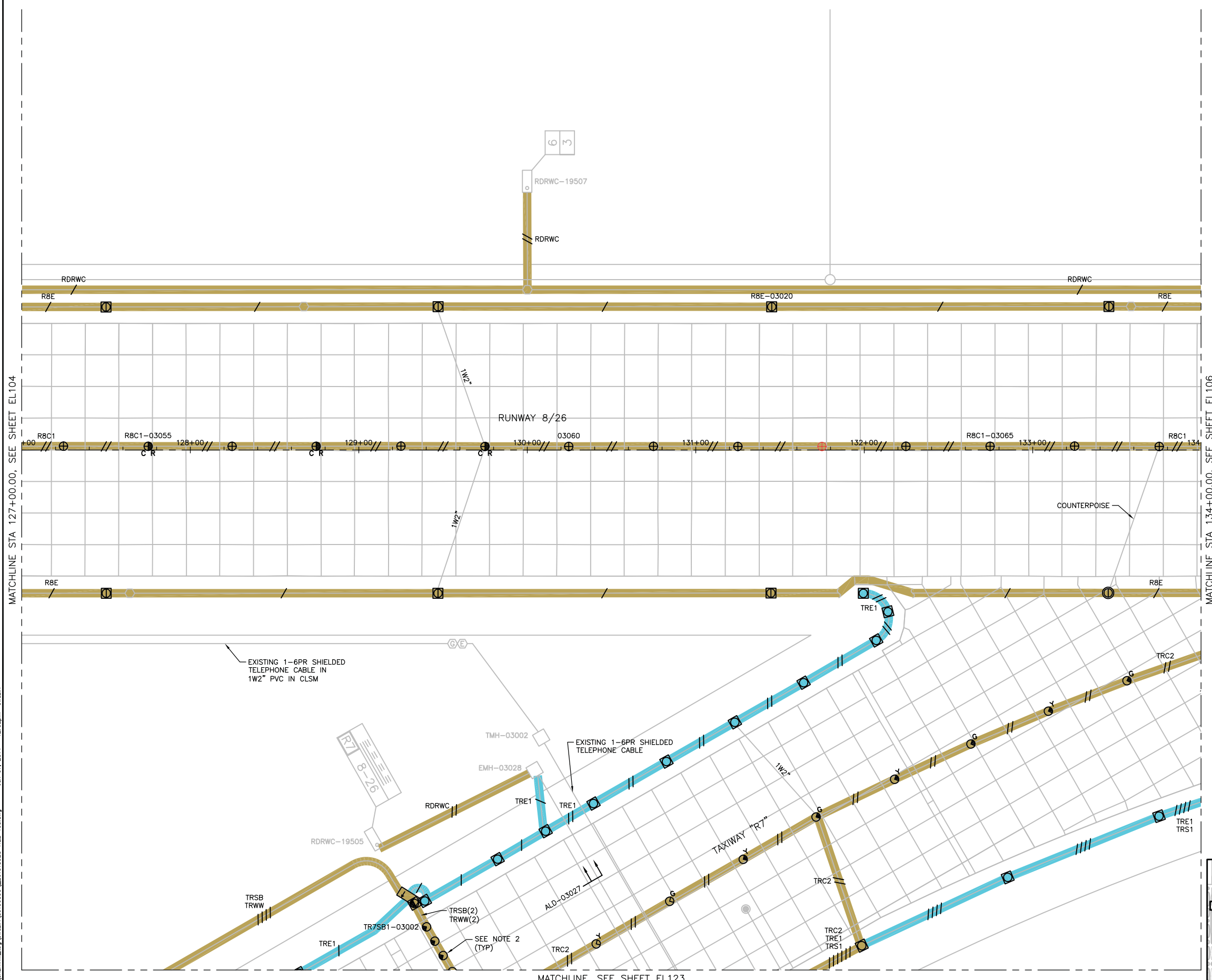
SHEET TITLE

**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO. EL105

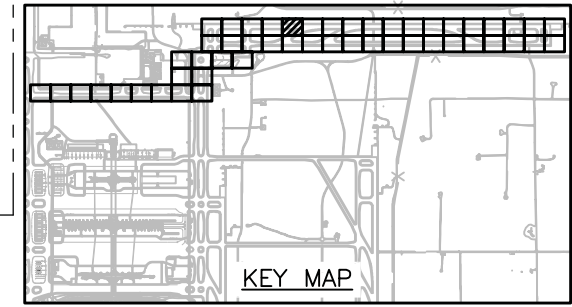
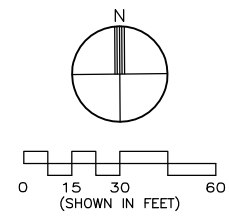
39 OF 115

CADD FILE NO. \_201313528-1E1-105-A



MATCHLINE STA 134+00.00, SEE SHEET EL106

MATCHLINE STA 127+00.00, SEE SHEET EL104



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NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE   | CHKD |
|--------------|-----|-------|---------|--------|------|
| 1            | SJ  | CONST |         | 07JA14 | MS   |

SCALE: AS SHOWN

DATE: 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

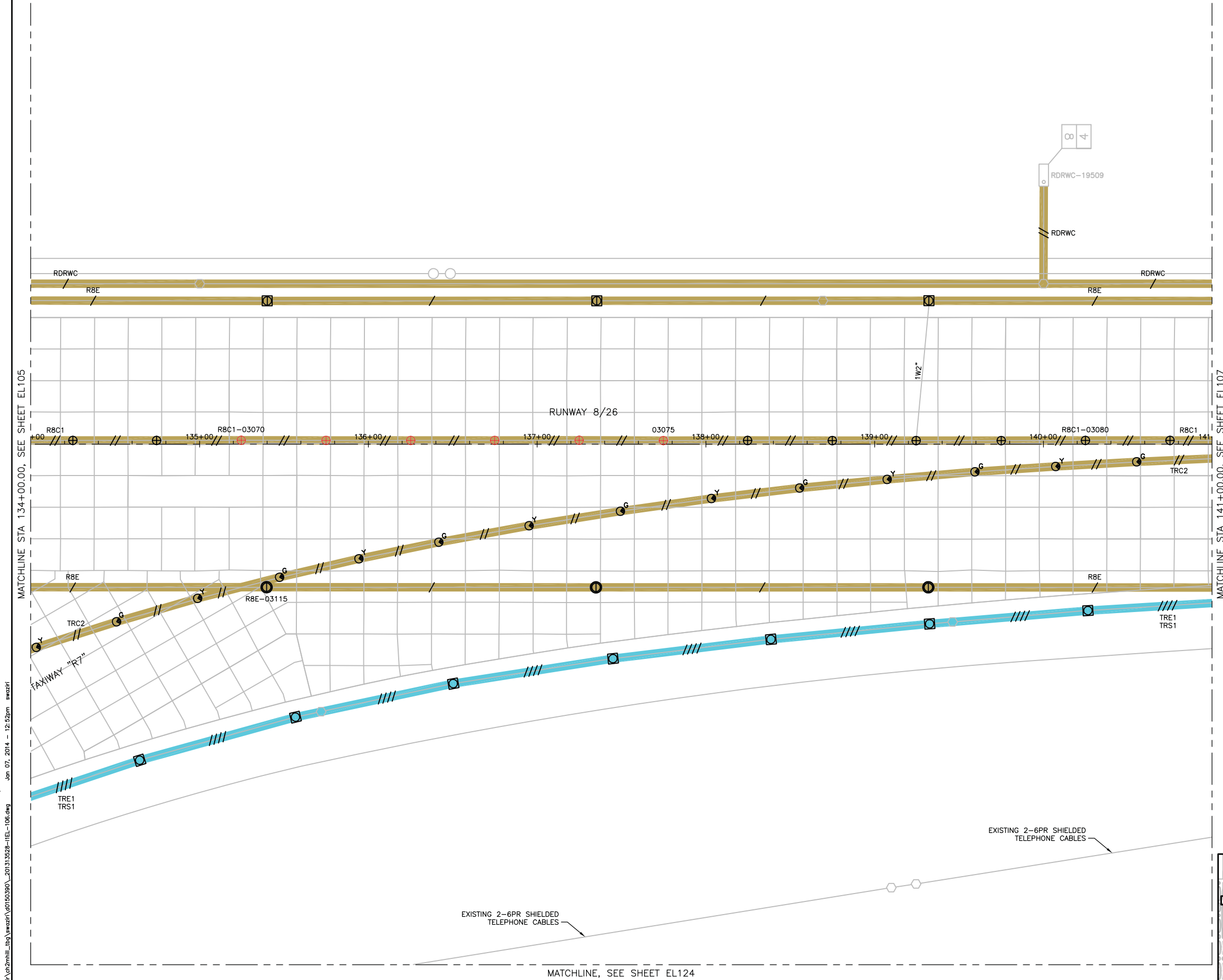
SHEET TITLE

**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO. EL106

40 OF 115

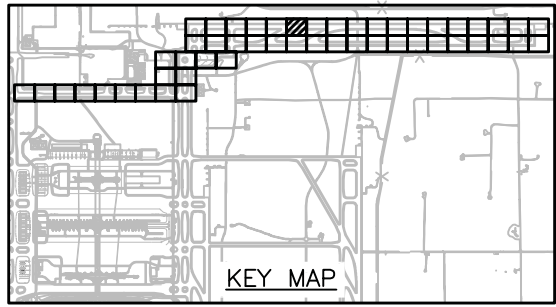
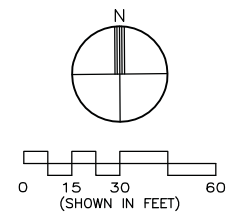
CADD FILE NO. \_201313528-1EL-106-A



MATCHLINE STA 134+00.00, SEE SHEET EL105

MATCHLINE STA 141+00.00, SEE SHEET EL107

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**



| ISSUE RECORD | NO. | BY    | PURPOSE | DATE     | CHKD |
|--------------|-----|-------|---------|----------|------|
| 1            | SJ  | CONST |         | 07/JA/14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO. EL107

41 OF 115

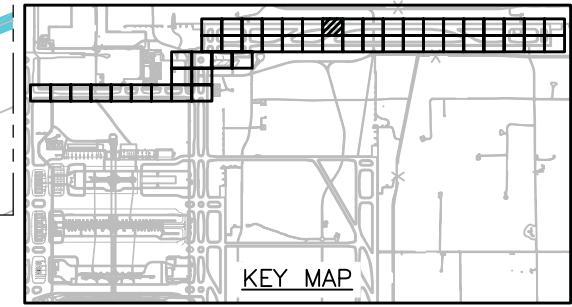
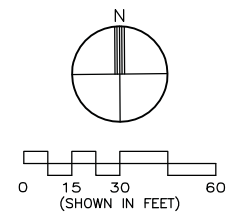
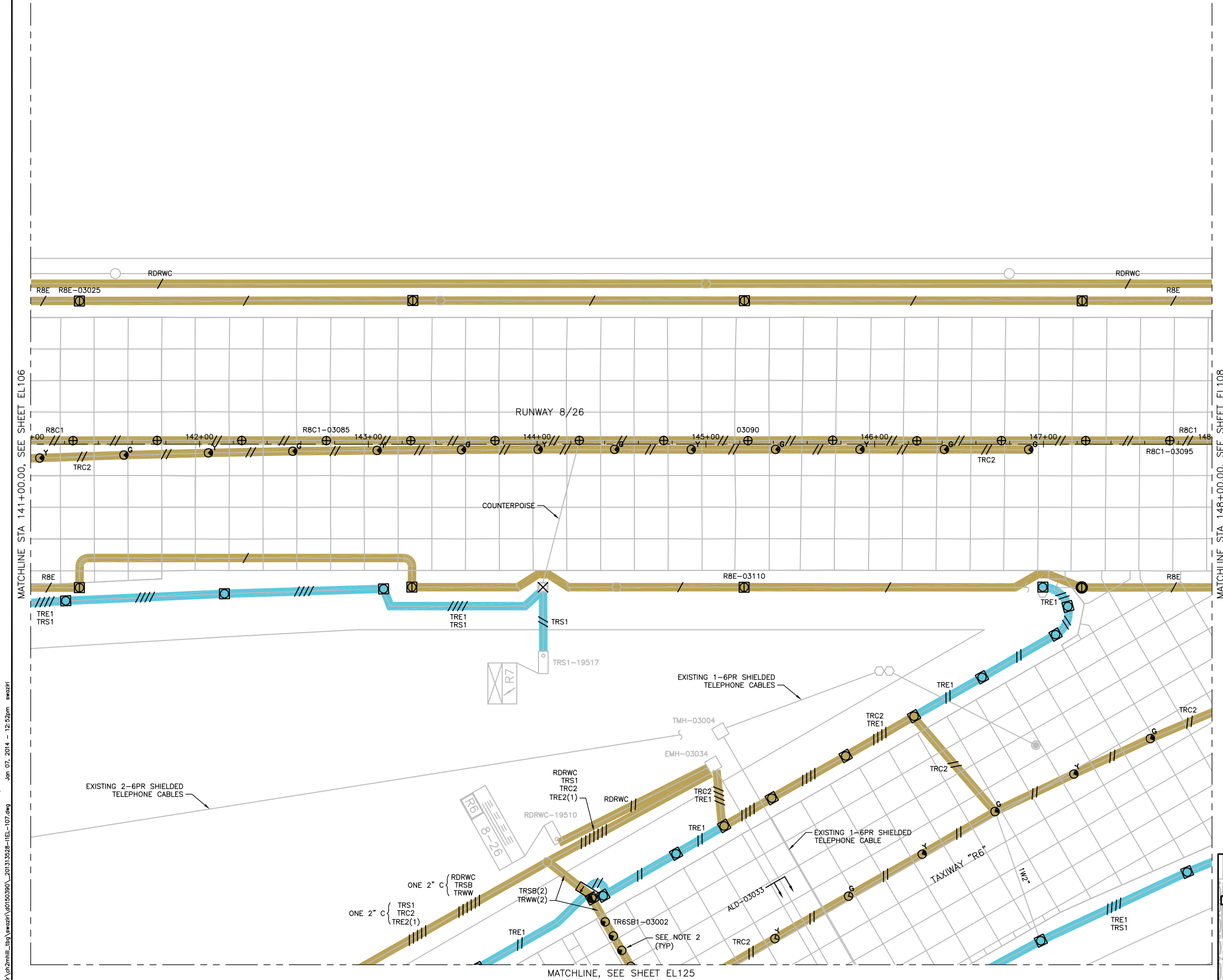
CADD FILE NO. \_201313528-1E1-107-A

**NOTES:**

- SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
- CONTRACTOR SHALL INSTALL NEW FIXTURE ID MARKER "TRSB" AT EACH ELEVATED STOP BAR AND RUNWAY GUARD/STOP BAR LIGHT.

- A-SPARE
- B-SPARE
- C-2-1/C #8 (5KV) TRS1,
- 2-1/C #8 (5KV) TRE1,
- 1-1/C #8 (5KV) TRE2
- D-2-1/C #8 (5KV) RDRWC

ALD-03033



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NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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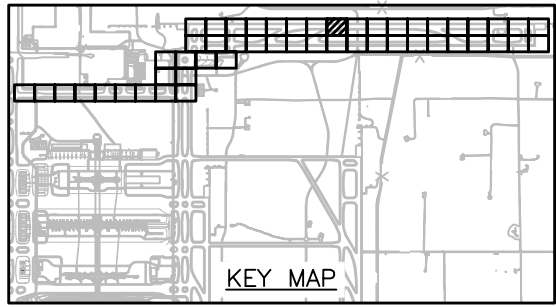
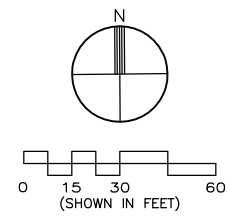
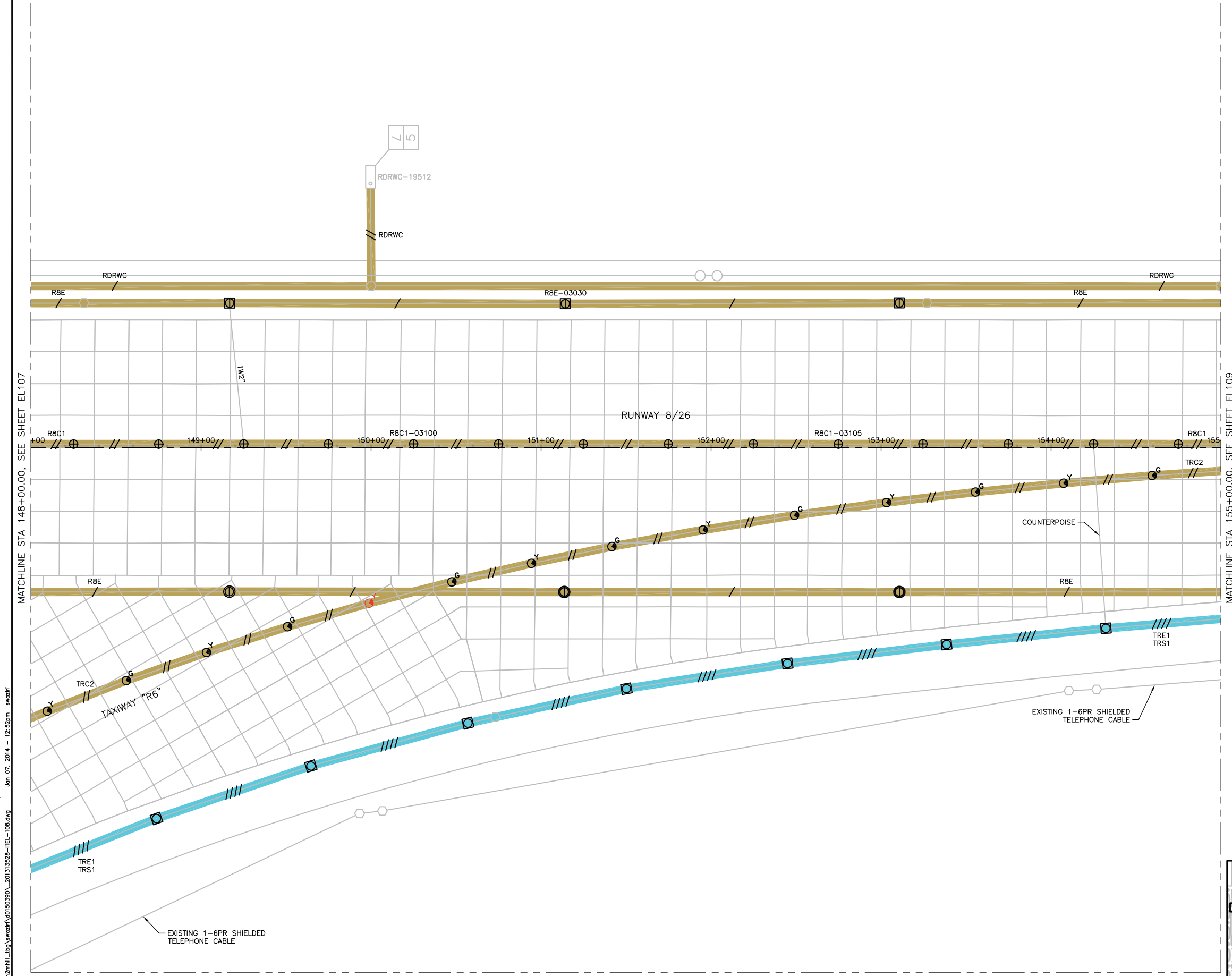
**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**



| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | SJ  | CONST | 07JA14  | MS   |      |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

|                                       |
|---------------------------------------|
| AIRFIELD<br>ELECTRICAL PLAN           |
| SHEET NO.<br>EL108                    |
| 42 OF 115                             |
| CADD FILE NO.<br>_201313528-1EL-108-A |



MATCHLINE STA 148+00.00, SEE SHEET EL107

MATCHLINE STA 155+00.00, SEE SHEET EL109

MATCHLINE, SEE SHEET EL126

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NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

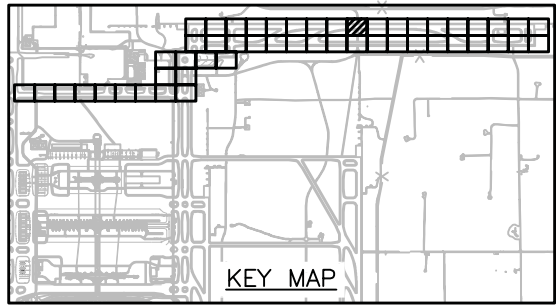
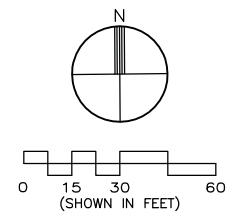
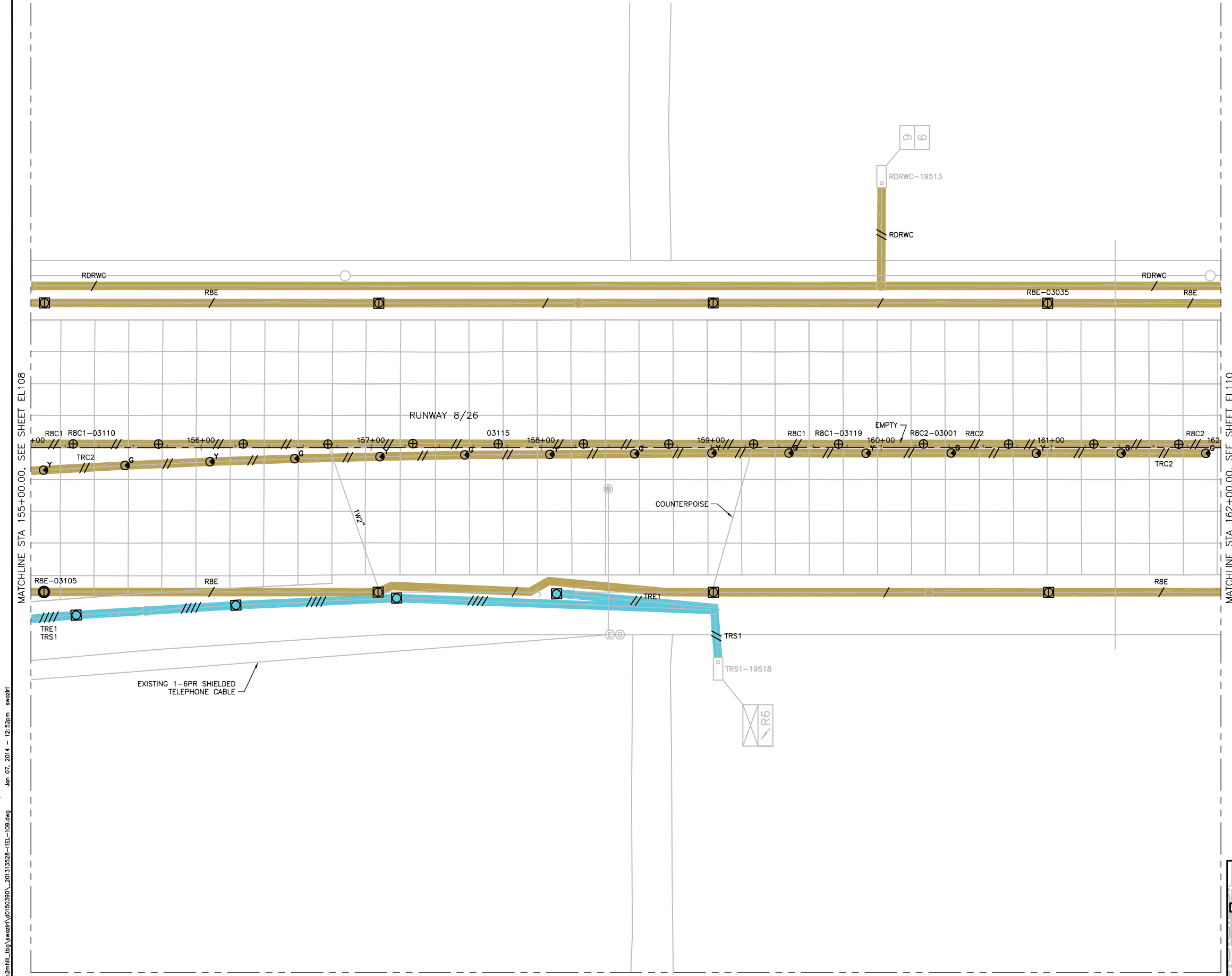
**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | SJ  | CONST | 07JA14  | MS   |      |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO.  
**EL109**  
43 OF 115  
CADD FILE NO.  
\_201313528-1EL-109-A



MATCHLINE STA 155+00.00, SEE SHEET EL108

MATCHLINE STA 162+00.00, SEE SHEET EL110

MATCHLINE, SEE SHEET EL127

EXISTING 1-6PR SHIELDED TELEPHONE CABLE

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NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE   | CKD |
|-----|----|---------|--------|-----|
| 1   | SJ | CONST   | 07JA14 | MS  |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO.

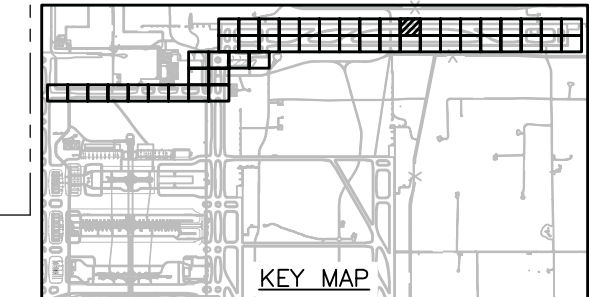
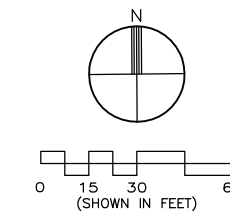
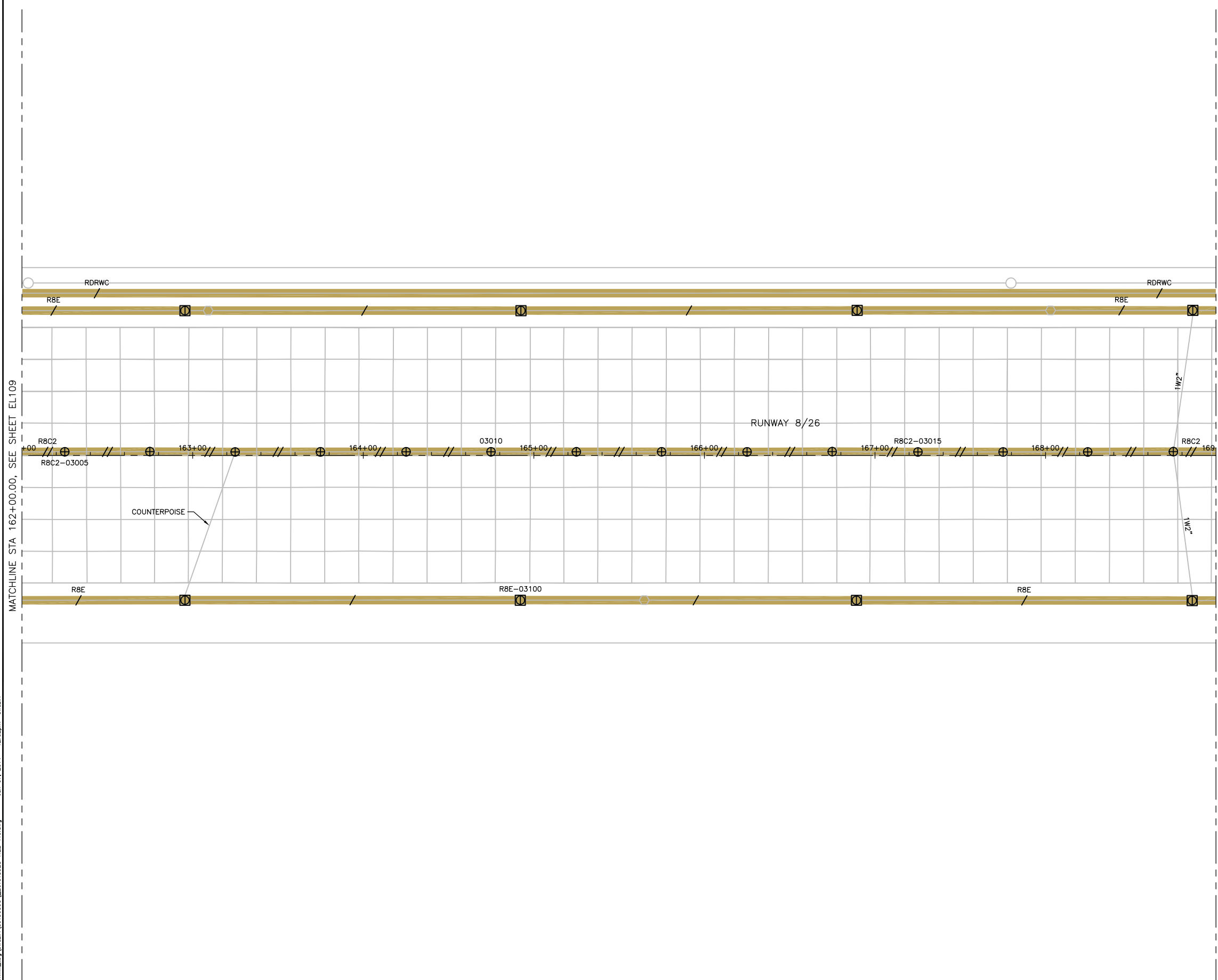
EL110

44 OF 115

CADD FILE NO.

\_201313528-1EL-110-A

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NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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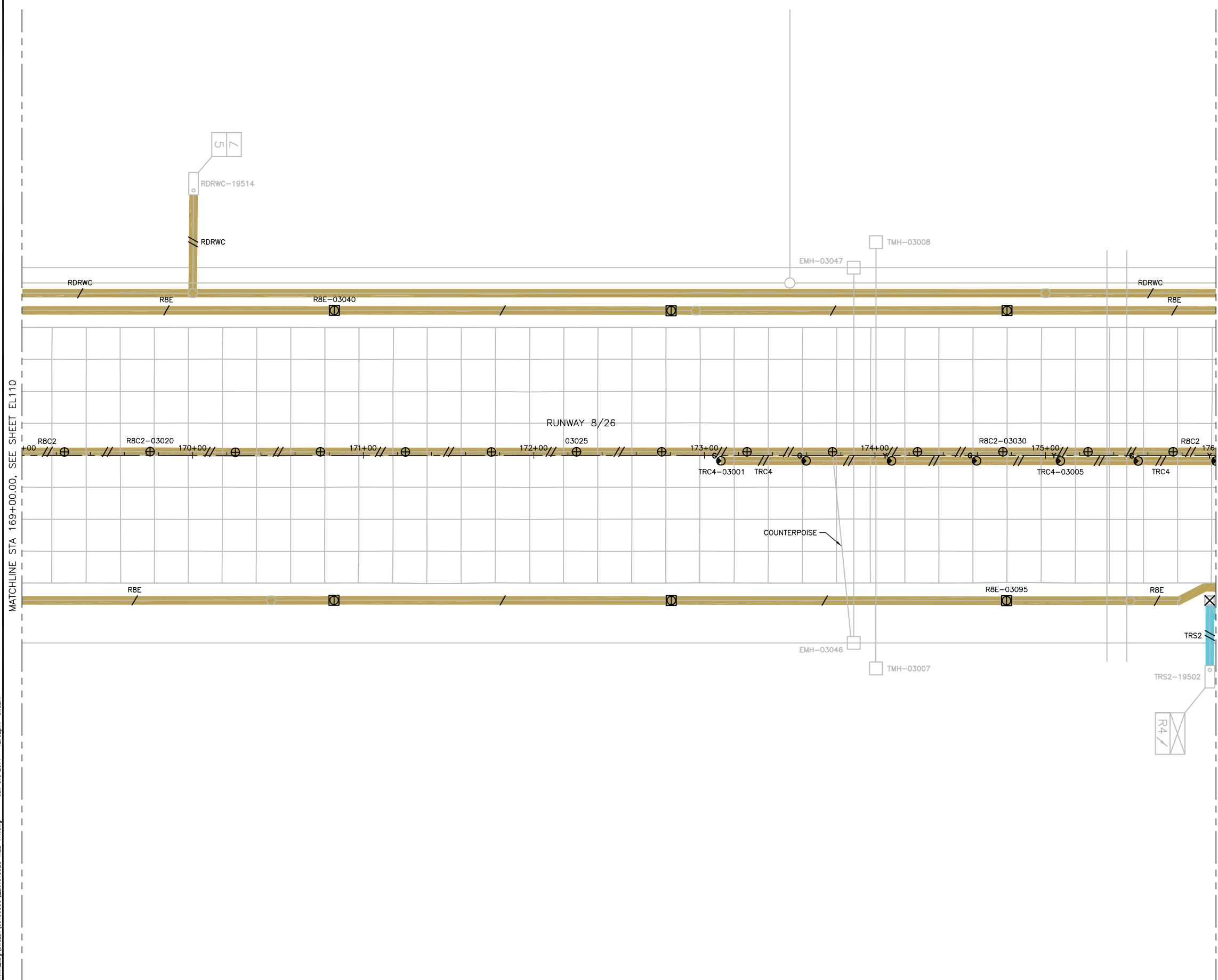
**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**



| NO. | BY | PURPOSE | DATE    | CKD |
|-----|----|---------|---------|-----|
| 1   | SJ | CONST   | 07/JA14 | MS  |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

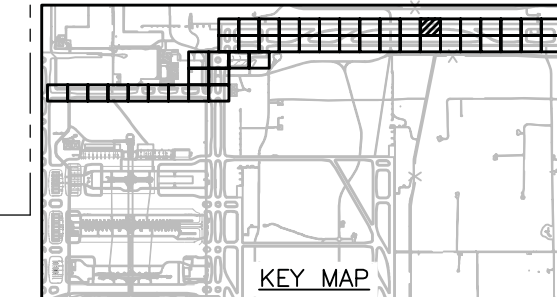
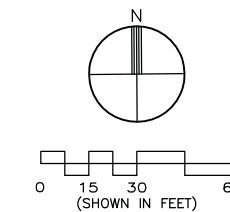
|                             |
|-----------------------------|
| AIRFIELD<br>ELECTRICAL PLAN |
| SHEET NO.                   |
| EL111                       |
| 45 OF 115                   |
| CADD FILE NO.               |
| _201313528-1EL-111-A        |



MATCHLINE STA 169+00.00, SEE SHEET EL110

MATCHLINE STA 176+00.00, SEE SHEET EL112

MATCHLINE, SEE SHEET EL129



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NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE    | CHKD |
|--------------|-----|-------|---------|---------|------|
| 1            | SJ  | CONST |         | 07/JA14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**AIRFIELD  
ELECTRICAL PLAN**

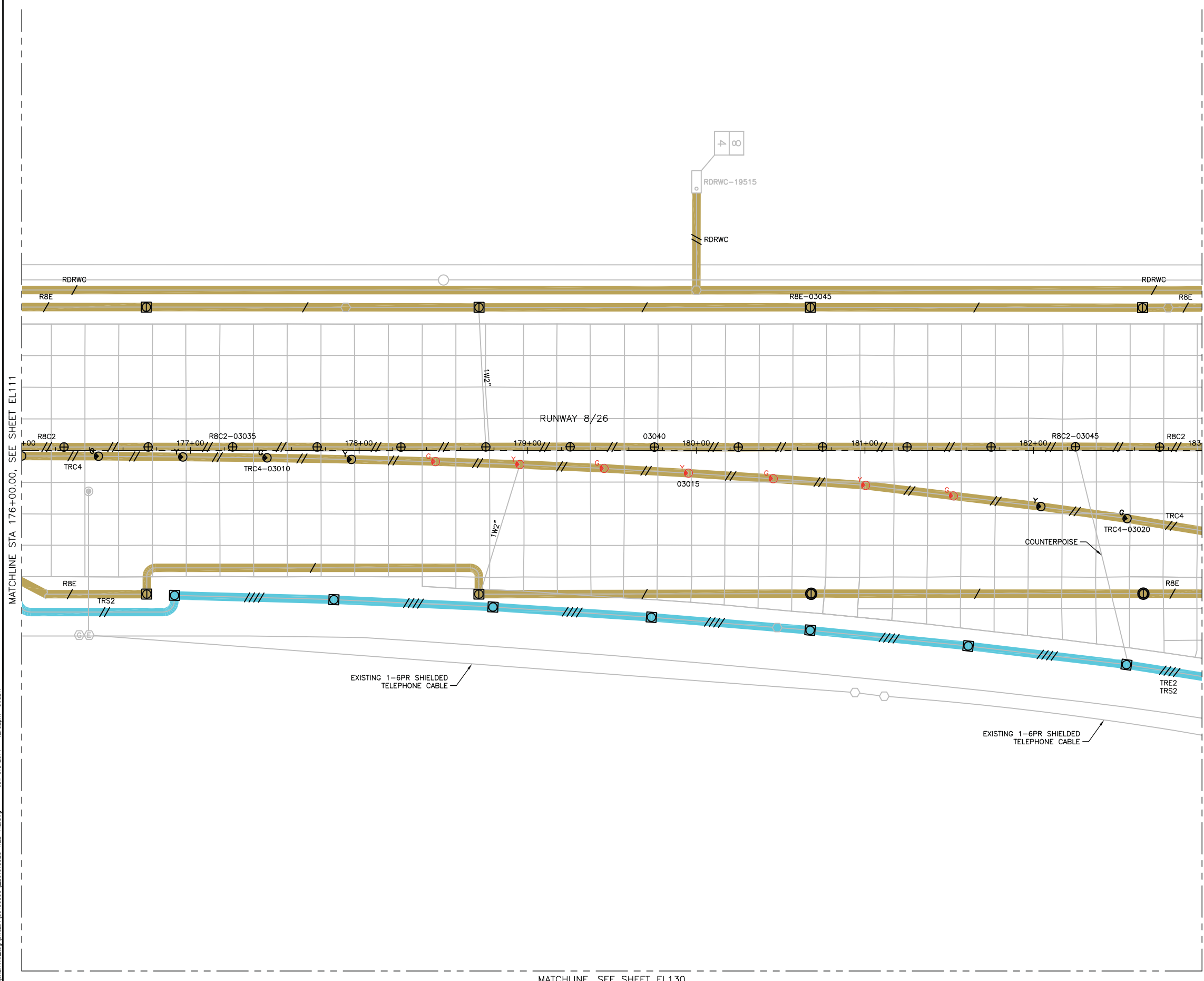
SHEET NO. EL112

46 OF 115

CADD FILE NO. \_201313528-1EL-112-A

ISSUED FOR CONSTRUCTION

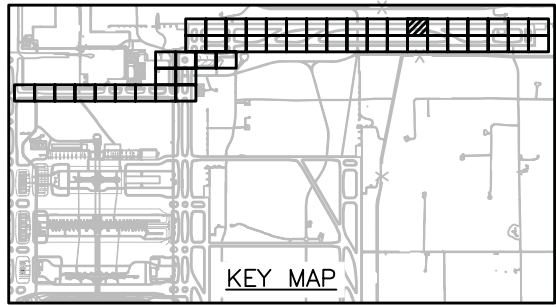
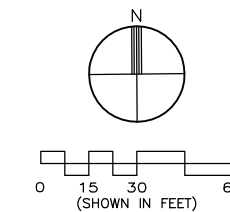
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MATCHLINE STA 176+00.00, SEE SHEET EL111

MATCHLINE STA 183+00.00, SEE SHEET EL113

MATCHLINE, SEE SHEET EL130



NOTE:  
1. SEE SHEET ELO01 FOR ELECTRICAL NOTES AND SHEET ELO02 FOR LEGEND AND CIRCUIT INFORMATION.

A-SPARE  
B-SPARE  
C-1-1/C #8 (5KV) TRE2  
2-1/C #8 (5KV) TRS2  
D-2-1/C #8 (5KV) RDRWC

ALD-03046

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| ISSUE RECORD | NO. | BY | PURPOSE | DATE    | CHKD |
|--------------|-----|----|---------|---------|------|
|              | 1   | SJ | CONST   | 07/JA14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO.

EL113

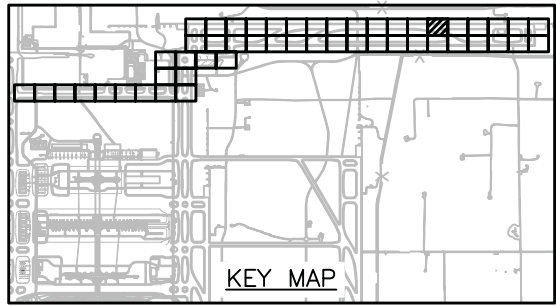
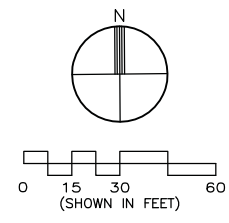
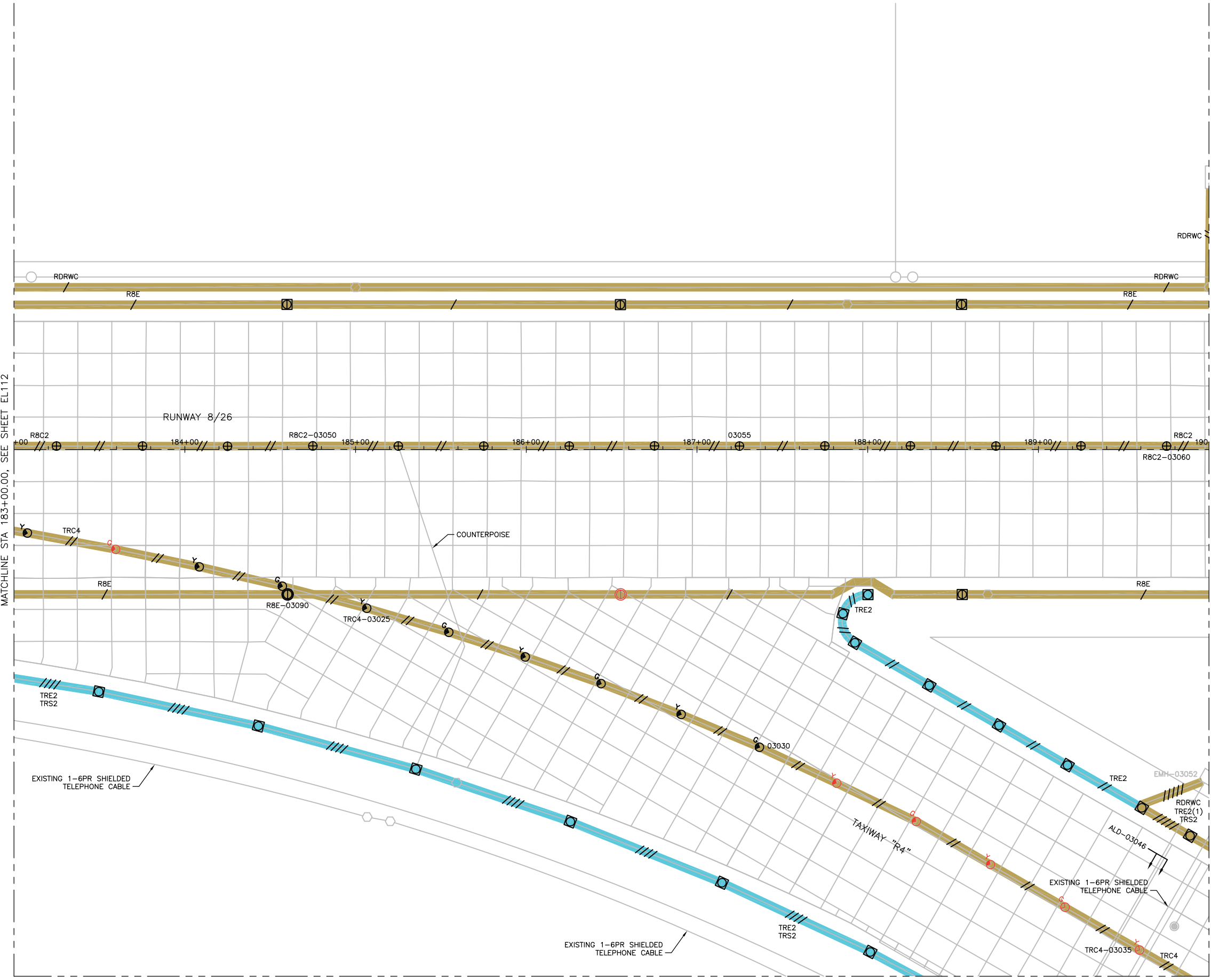
47 OF 115

CADD FILE NO. \_201313528-1E1-113-A

MATCHLINE STA 183+00.00, SEE SHEET EL112

MATCHLINE STA 190+00.00, SEE SHEET EL114

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ISSUED FOR CONSTRUCTION

- NOTES:
- SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
  - CONTRACTOR SHALL INSTALL NEW FIXTURE ID MARKER "TRSB" AT EACH ELEVATED STOP BAR AND RUNWAY GUARD/STOP BAR LIGHT.

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RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

**CH2MHILL**

| NO. | BY | PURPOSE | DATE    | CHKD |
|-----|----|---------|---------|------|
| 1   | SJ | CONST   | 07/JA14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

AIRFIELD  
ELECTRICAL PLAN

SHEET NO.

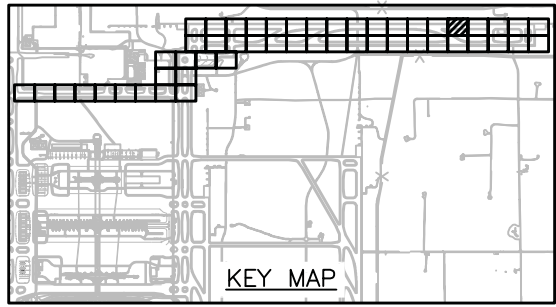
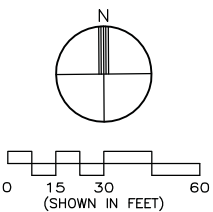
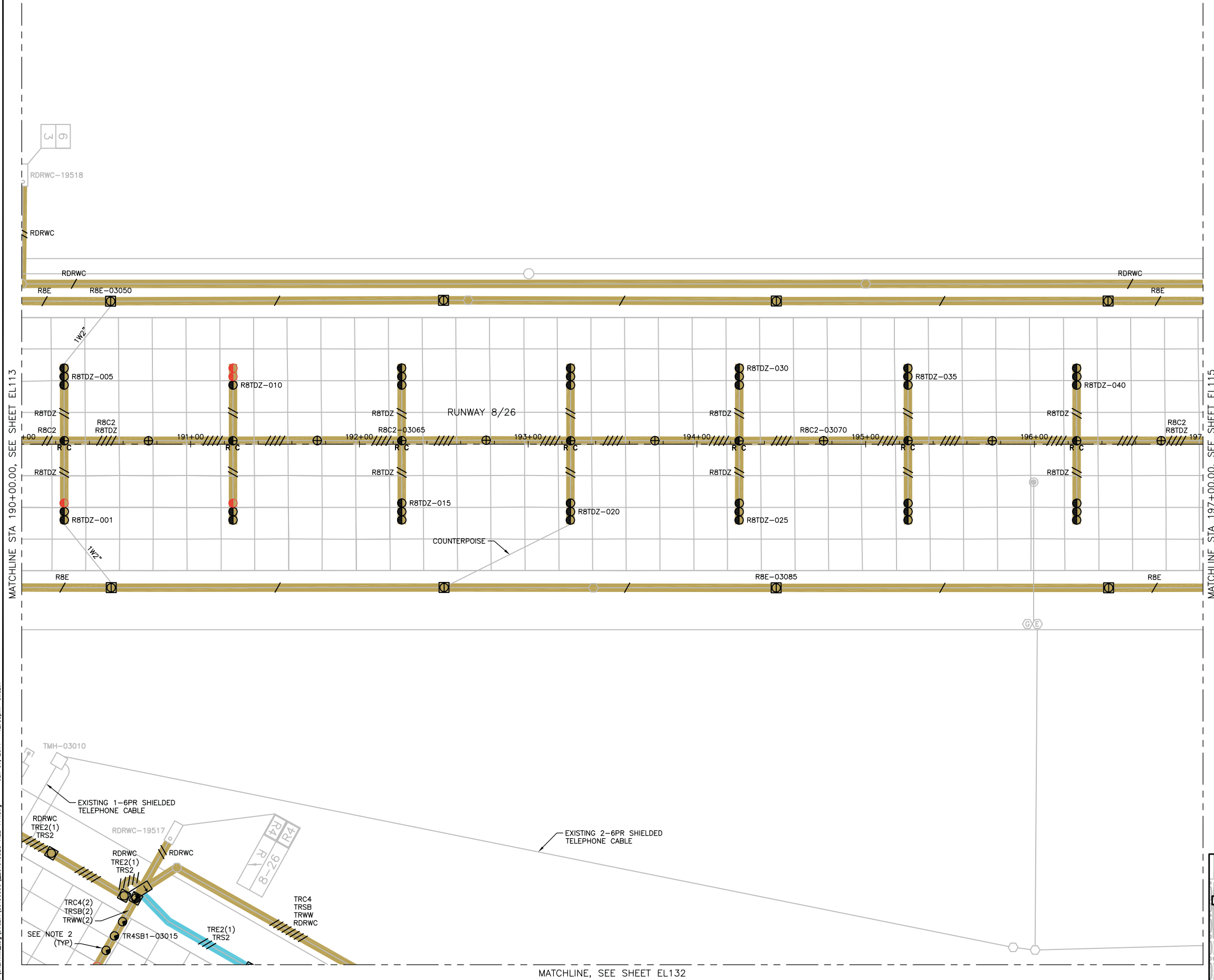
EL114

48 OF 115

CADD FILE NO.

\_201313528-1EL-114-A

ISSUED FOR CONSTRUCTION



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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | SJ  | CONST | 07JA14  | MS   |      |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO. EL115

49 OF 115

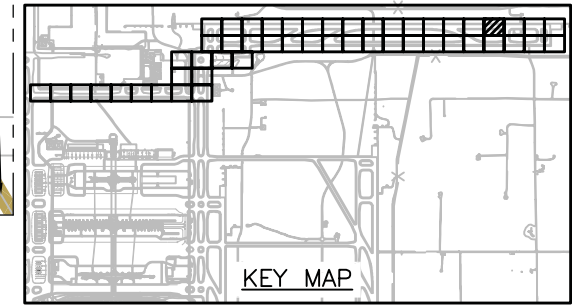
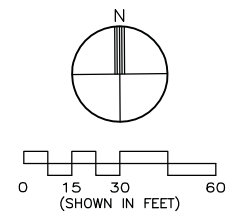
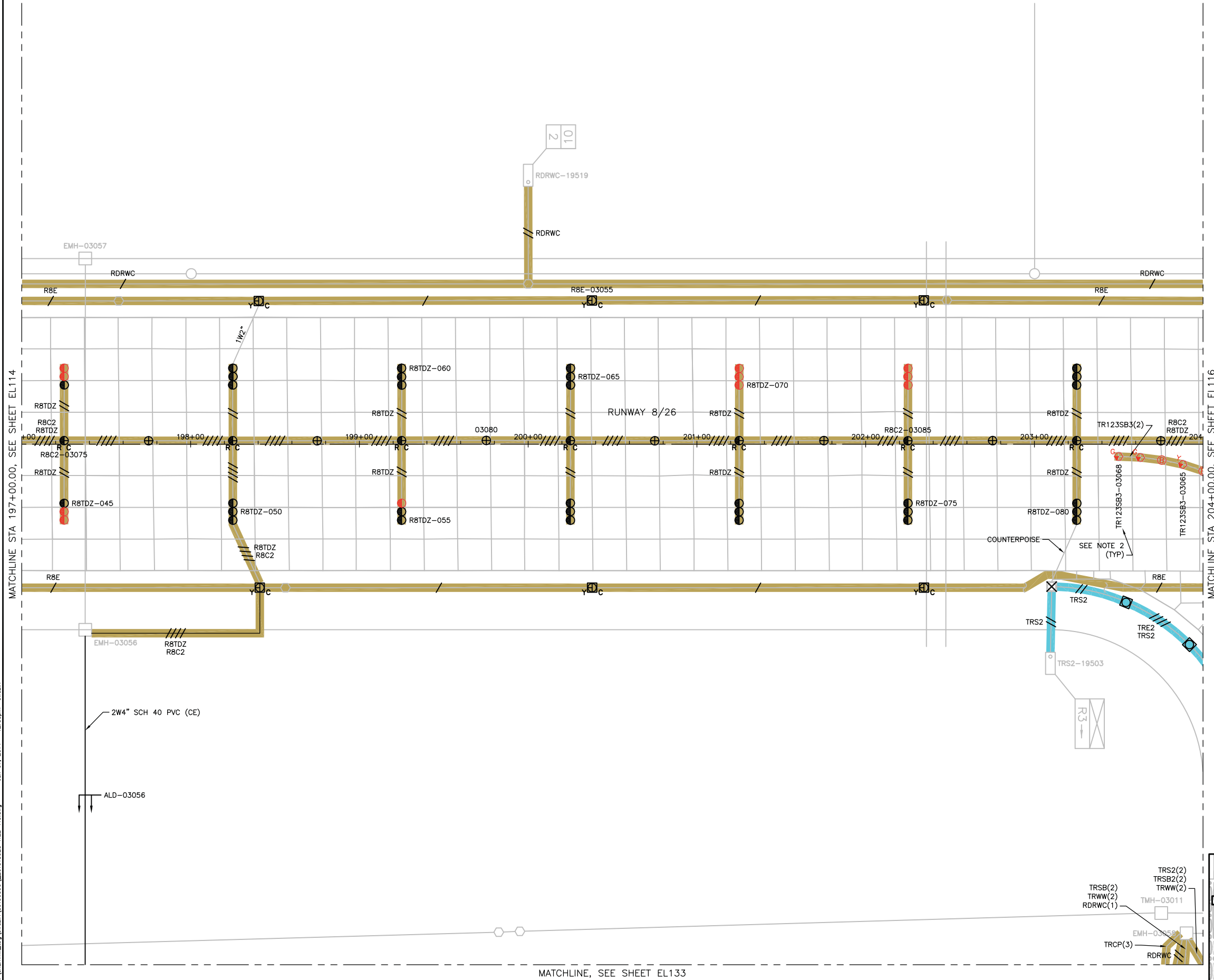
CADD FILE NO. \_201313528-1EL-115-A

**NOTES:**

- SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
- INSTALL NEW FIXTURE ID MARKERS FOR TAXIWAY "R3" LEAD-OFF CENTERLINE LIGHTS.

- A-SPARE
- B-2-1/C #8 (5KV) R8TDZ,  
2-1/C #8 (5KV) R8C2

ALD-03056



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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**



| ISSUE RECORD | NO. | BY    | PURPOSE | DATE    | CHKD |
|--------------|-----|-------|---------|---------|------|
| 1            | SJ  | CONST |         | 07/JA14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO.

EL116

50 OF 115

CADD FILE NO.

\_201313528-1EL-116-A

NOTES:

- SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
- INSTALL NEW FIXTURE ID MARKERS FOR TAXIWAY "R3" LEAD-OFF CENTERLINE LIGHTS.

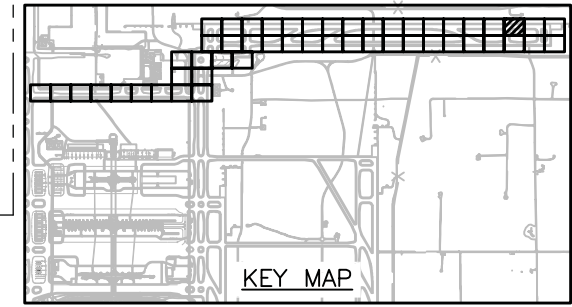
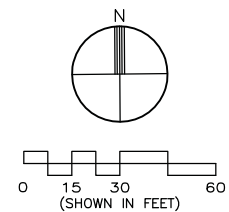
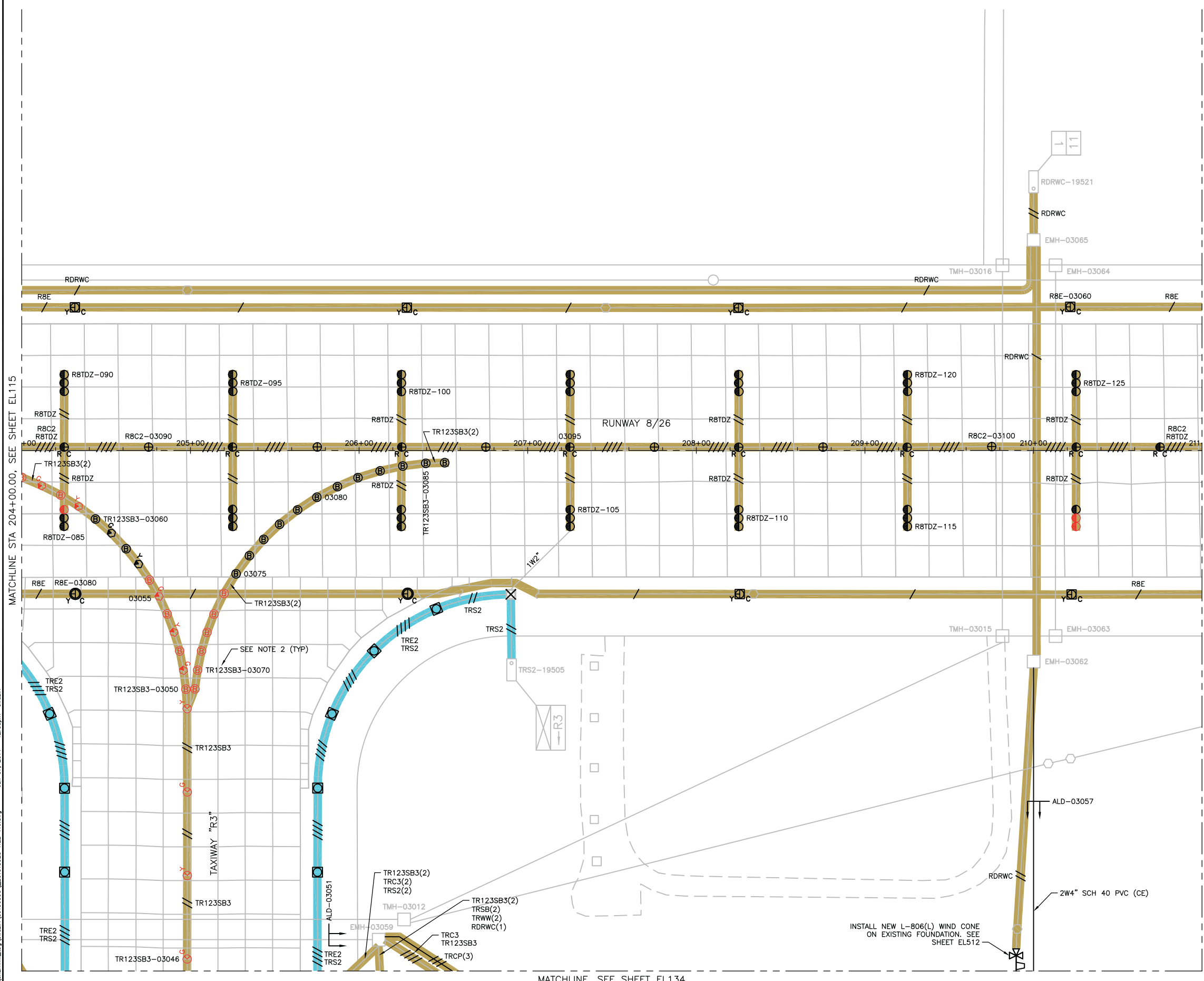
- A-SPARE
- B-3-1/C #8 (5KV) TRCP
- C-2-1/C #8 (5KV) TRS2
- D-2-1/C #8 (5KV) TRWW
- 2-1/C #8 (5KV) TRSB
- 1-1/C #8 (5KV) RDRWC



ALD-03051

- A-SPARE
- B-1-1/C #8 (5KV) RDRWC

ALD-03057



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Denver, CO 80249-6340



**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE    | CHKD |
|-----|----|---------|---------|------|
| 1   | SJ | CONST   | 07/JA14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO. EL117

51 OF 115

CADD FILE NO. \_201313528-1EL-117-A

ISSUED FOR CONSTRUCTION

**NOTES:**

- SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
- INSTALL NEW FIXTURE ID MARKERS FOR TAXIWAY "R2" LEAD-OFF CENTERLINE LIGHTS.

- A-SPARE  
B-SPARE  
C-2-1/C #8 (5KV) TR123SB3,  
2-1/C #8 (5KV) TRS2  
D-2-1/C #8 (5KV) TRSB,  
2-1/C #8 (5KV) TRWW,  
2-1/C #8 (5KV) RDRWC

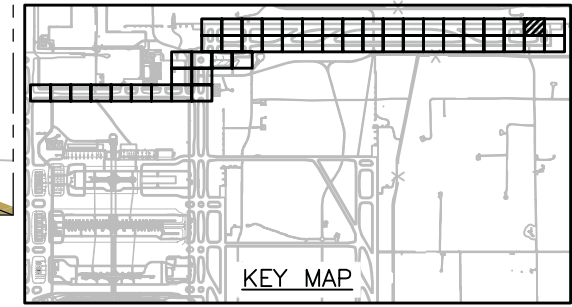
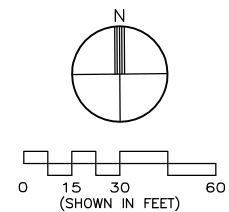
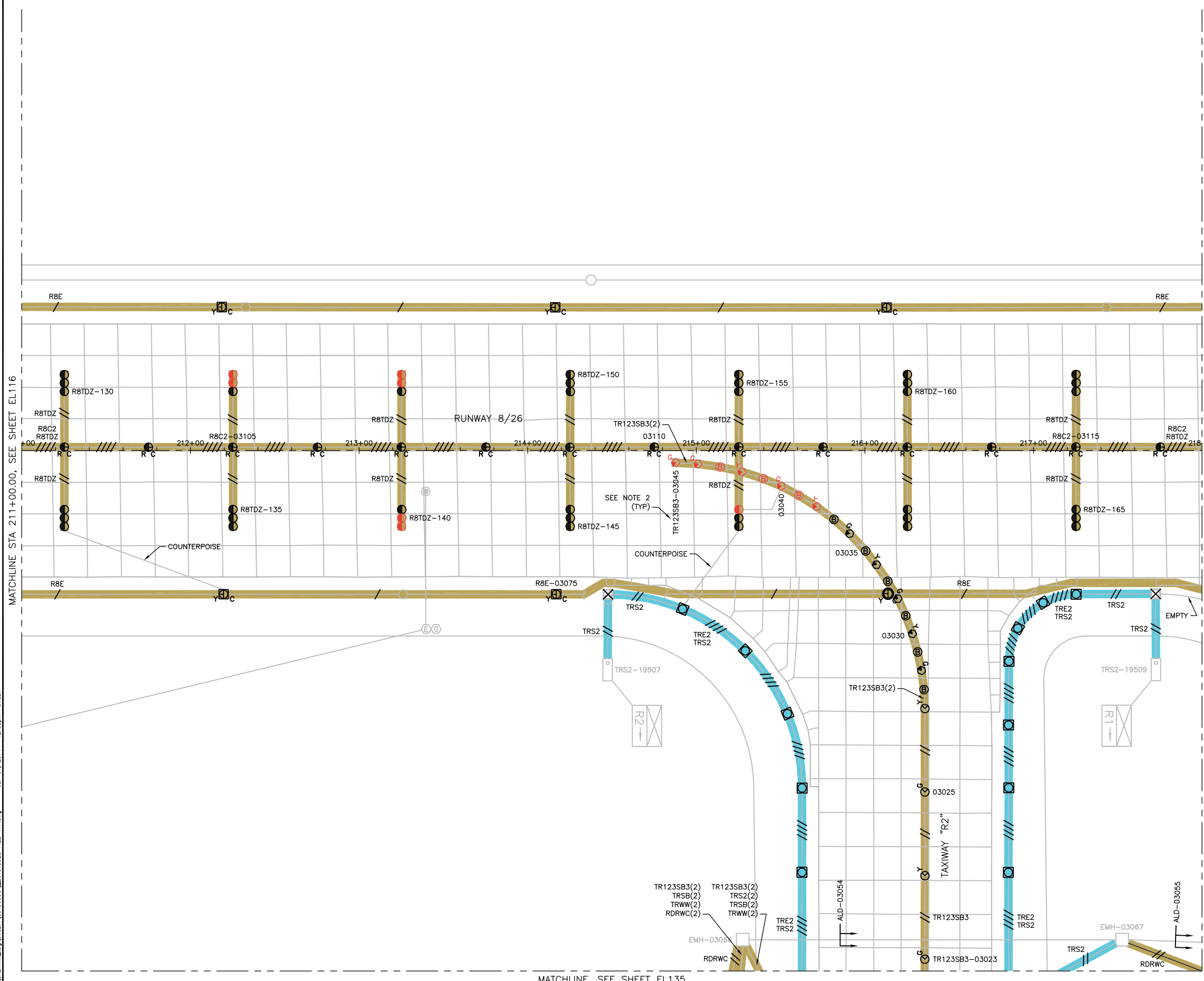


ALD-03054

- A-SPARE  
B-SPARE  
C-2-1/C #8 (5KV) TR123SB3,  
2-1/C #8 (5KV) TRS2  
D-2-1/C #8 (5KV) TRWW,  
2-1/C #8 (5KV) TRSB



ALD-03055



MATCHLINE STA 211+00.00, SEE SHEET EL116

MATCHLINE STA 218+00.00, SEE SHEET EL118

MATCHLINE, SEE SHEET EL135

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**



| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | SJ  | CONST | 07JA14  | MS   |      |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

**AIRFIELD  
ELECTRICAL PLAN**

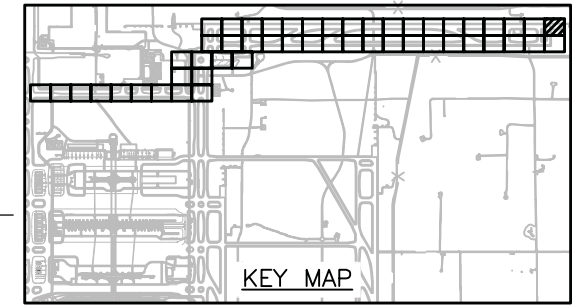
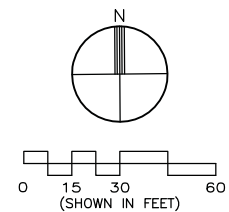
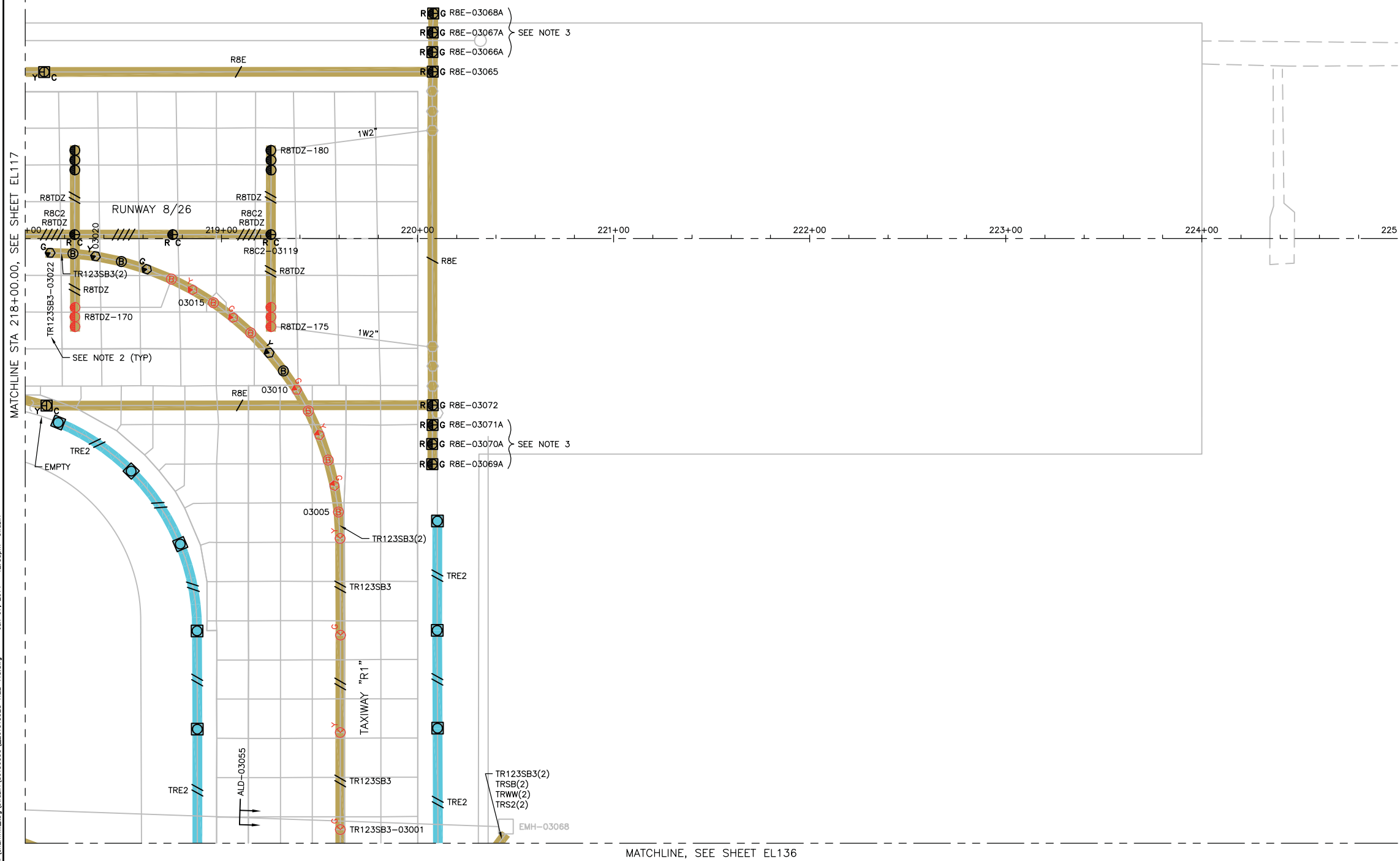
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| SHEET NO.     | EL118                |
| 52 OF 115     |                      |
| CADD FILE NO. | _201313528-1EL-118-A |

**NOTES:**

- SEE SHEET ELO01 FOR ELECTRICAL NOTES AND SHEET ELO02 FOR LEGEND AND CIRCUIT INFORMATION.
- INSTALL NEW FIXTURE ID MARKERS FOR TAXIWAY "R1" LEAD-OFF CENTERLINE LIGHTS.
- INSTALL NEW FIXTURE ID MARKERS FOR OUTBOARD THRESHOLD LIGHTS.

- A-SPARE
- B-SPARE
- C-2-1/C #8 (5KV) TR123SB3,
- 2-1/C #8 (5KV) TRS2
- D-2-1/C #8 (5KV) TRWW,
- 2-1/C #8 (5KV) TRSB

ALD-03055



MATCHLINE STA 218+00.00, SEE SHEET EL117

MATCHLINE, SEE SHEET EL136

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/14/14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**AIRFIELD ELECTRICAL PLAN**

SHEET NO. EL119

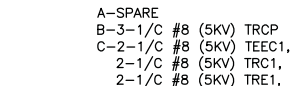
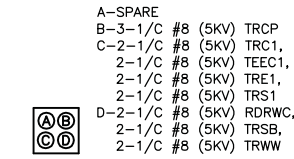
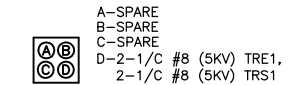
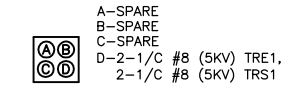
53 OF 115

CADD FILE NO. \_201313528-11EL-119-A

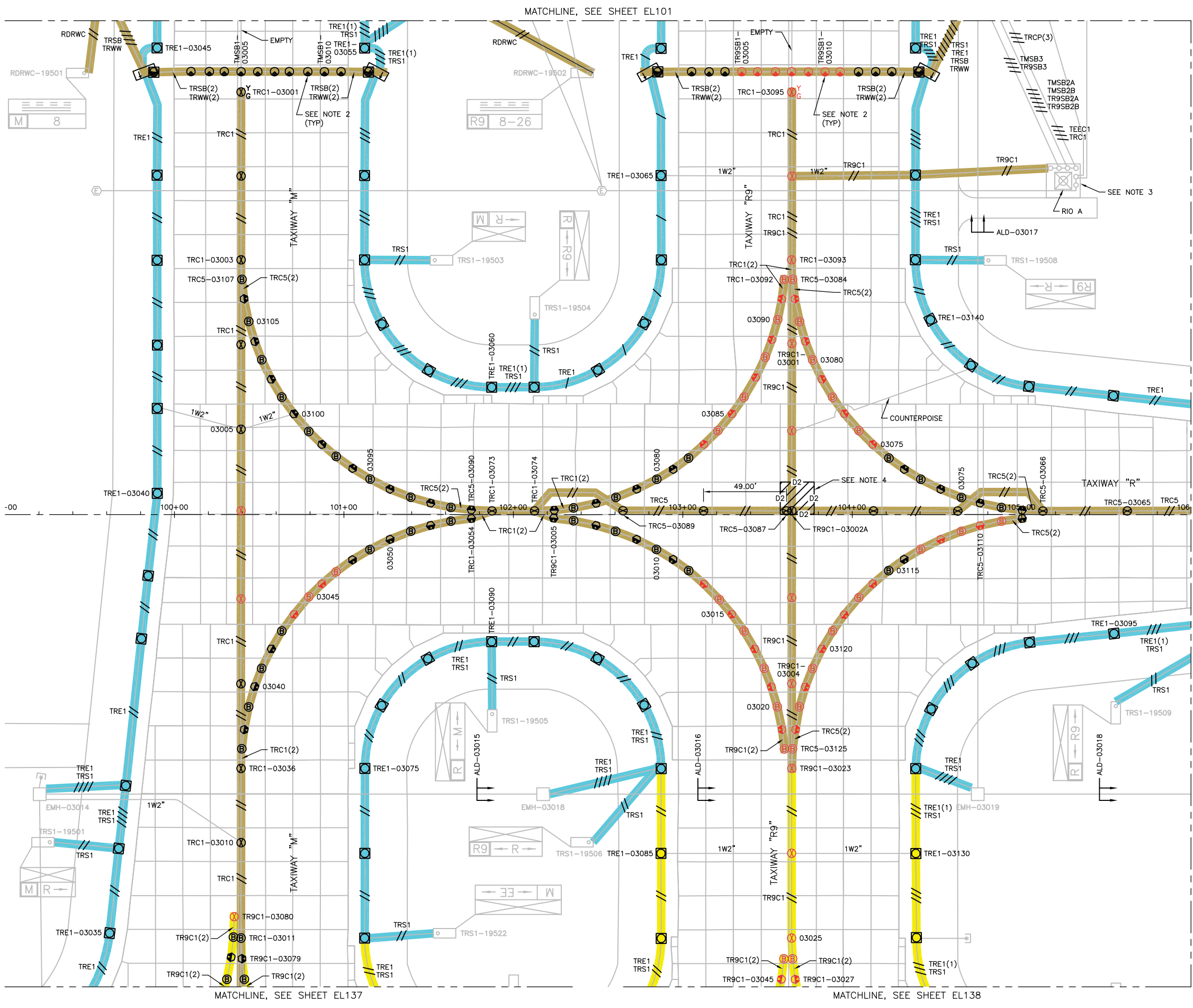
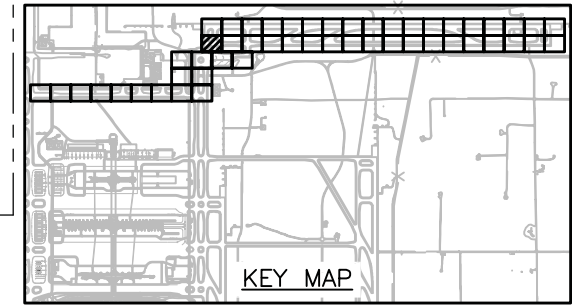
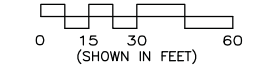
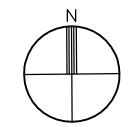
ISSUED FOR CONSTRUCTION

**NOTES:**

- SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
- CONTRACTOR SHALL INSTALL NEW FIXTURE ID MARKER "TRSB" AT EACH ELEVATED STOP BAR AND RUNWAY GUARD/STOP BAR LIGHT.
- MODIFY CURRENT TRANSFORMER INSTALLATION, SEE SHEET EL510.
- REMOVE AND REPLACE CONCRETE PANEL SURVEY EXISTING LIGHT LOCATION AND ORIENTATION PRIOR TO DEMOLISHING CONCRETE PANEL REINSTALL NEW LIGHT IN THE SAME LOCATION AND ORIENTATION AS THE ORIGINAL LIGHT. FOR DEMOLITION, SEE SHEET CD001. FOR TYPICAL SECTIONS, SEE SHEET C-301. FOR PAVING DETAILS, SEE SHEETS CP501 THROUGH CP505.



ALD-03018



MATCHLINE, SEE SHEET EL101

MATCHLINE STA 106+00.00, SEE SHEET EL120

MATCHLINE, SEE SHEET EL137

MATCHLINE, SEE SHEET EL138

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MATCHLINE, SEE SHEET EL102

NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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- A-SPARE
- B-3-1/C #8 (5KV) TRCP
- C-2-1/C #8 (5KV) TEEC1,
- 2-1/C #8 (5KV) TRC1,
- 2-1/C #8 (5KV) TRE1,
- 2-1/C #8 (5KV) TRS1
- D-2-1/C #8 (5KV) TRSB,
- 2-1/C #8 (5KV) TRWW,
- 2-1/C #8 (5KV) RDRWC



ALD-03018

- A-SPARE
- B-3-1/C #8 (5KV) TRCP
- C-2-1/C #8 (5KV) TEEC1,
- 2-1/C #8 (5KV) TRC1,
- 2-1/C #8 (5KV) TRE1,
- 2-1/C #8 (5KV) TRS1
- D-2-1/C #8 (5KV) TRSB,
- 2-1/C #8 (5KV) TRWW,
- 2-1/C #8 (5KV) RDRWC



ALD-03019

# RUNWAY 8-26 COMPLEX LIGHTING REHABILITATION

## CH2MHILL

| NO. | BY | PURPOSE | DATE     | CHKD |
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| 1   | SJ | CONST   | 07/14/14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

### AIRFIELD ELECTRICAL PLAN

SHEET NO.

EL120

54 OF 115

CADD FILE NO.

\_201313528-1EL-120-A

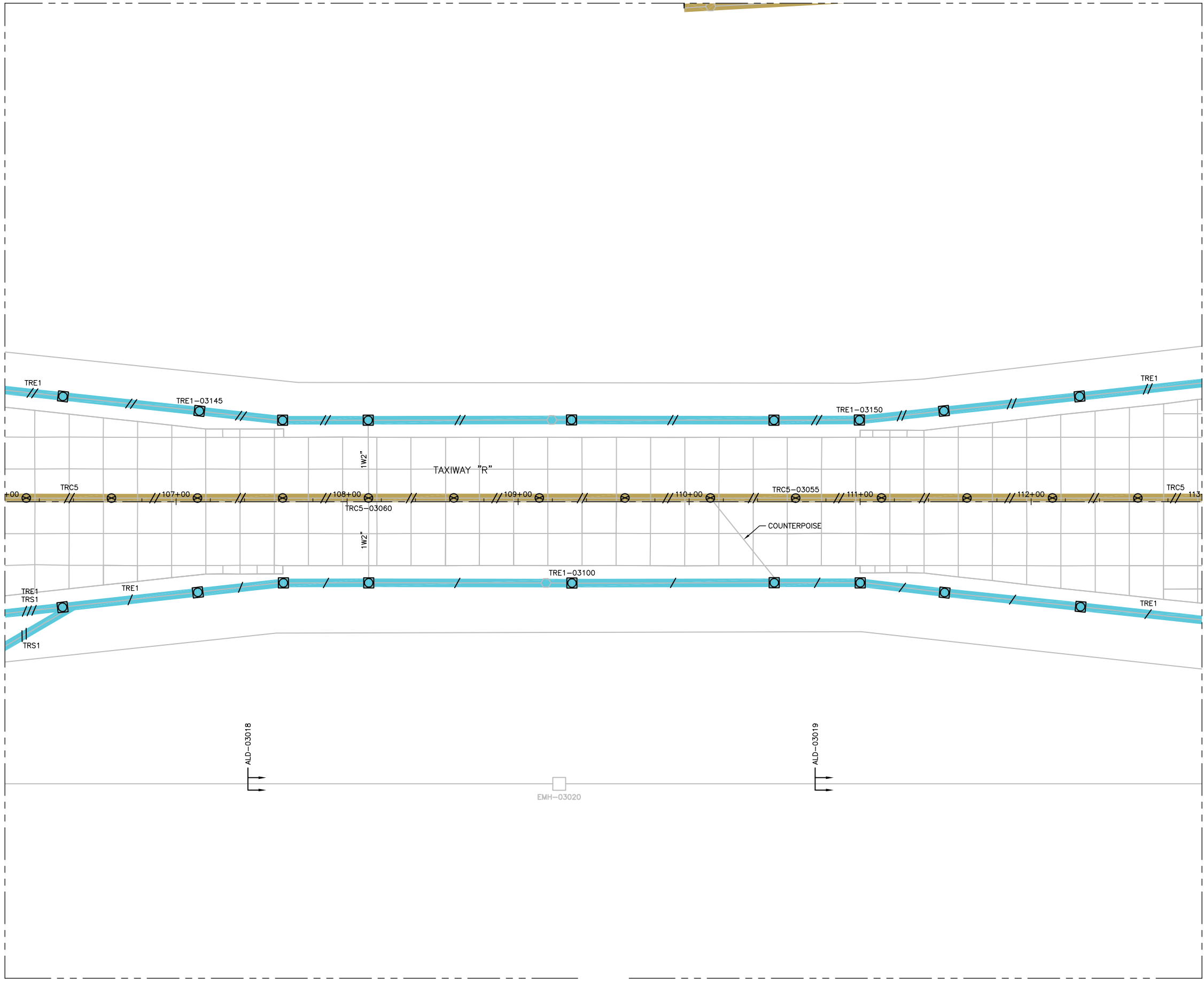
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MATCHLINE STA 106+00.00, SEE SHEET EL119

MATCHLINE STA 113+00.00, SEE SHEET EL121

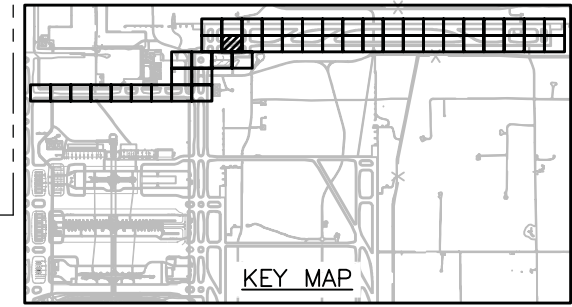
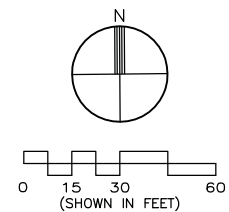
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MATCHLINE, SEE SHEET EL138

MATCHLINE, SEE SHEET EL139



KEY MAP



RUNWAY 8-26 COMPLEX LIGHTING REHABILITATION



ISSUE RECORD table with columns: NO., BY, PURPOSE, DATE, CKD

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE AIRFIELD ELECTRICAL PLAN

SHEET NO. EL121

55 OF 115

CADD FILE NO. \_201313528-1EL-121-A

ISSUED FOR CONSTRUCTION

NOTES:

- 1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
2. CONTRACTOR SHALL INSTALL NEW FIXTURE ID MARKER "TRSB" AT EACH ELEVATED STOP BAR AND RUNWAY GUARD/STOP BAR LIGHT.
3. MODIFY CURRENT TRANSFORMER INSTALLATION, SEE SHEET EL510.
4. MODIFY RIO FOUNDATION, SEE SHEET EL509.
5. REMOVE AND REPLACE CONCRETE PANEL FOR DEMOLITION, SEE SHEET CD001. FOR TYPICAL SECTIONS, SEE SHEET C-301. FOR PAVING DETAILS, SEE SHEETS CP501 THROUGH CP505.

- A-SPARE
B-SPARE
C-SPARE
D-3-1/C #8 (5KV) TRCP
E-2-1/C #8 (5KV) RBE,
2-1/C #8 (5KV) RBC1,
2-1/C #8 (5KV) RBC2,
2-1/C #8 (5KV) R8TDZ,
2-1/C #8 (5KV) TRS1,
F-2-1/C #8 (5KV) TRC1,
2-1/C #8 (5KV) TRC2,
2-1/C #8 (5KV) TRC3,
2-1/C #8 (5KV) TRC4,
2-1/C #8 (5KV) TRS2,
H-2-1/C #8 (5KV) TRSB,
2-1/C #8 (5KV) TRSB,
2-1/C #8 (5KV) TRWW,
2-1/C #8 (5KV) RDRWC

- A-SPARE
B-SPARE
C-SPARE
D-SPARE
E-3-1/C #8 (5KV) TRCP
F-2-1/C #8 (5KV) RBC1,
2-1/C #8 (5KV) RBE,
G-2-1/C #8 (5KV) TRS1,
2-1/C #8 (5KV) TRC1,
1-1/C #8 (5KV) TRS1,
H-2-1/C #8 (5KV) TRSB,
2-1/C #8 (5KV) TRWW,
1-1/C #8 (5KV) RDRWC

- A-SPARE
B-3-1/C #8 (5KV) TRCP
C-2-1/C #8 (5KV) TEEC1,
2-1/C #8 (5KV) TRC1,
2-1/C #8 (5KV) TRS1,
2-1/C #8 (5KV) TRS1,
D-2-1/C #8 (5KV) TRSB,
2-1/C #8 (5KV) TRWW,
2-1/C #8 (5KV) RDRWC

- A-SPARE
B-3-1/C #8 (5KV) TRCP
C-2-1/C #8 (5KV) TRC1,
2-1/C #8 (5KV) TRC1,
2-1/C #8 (5KV) TRS1,
2-1/C #8 (5KV) TRS1,
D-2-1/C #8 (5KV) TRSB,
2-1/C #8 (5KV) TRWW,
2-1/C #8 (5KV) RDRWC

- A-SPARE
B-3-1/C #8 (5KV) TRCP
C-2-1/C #8 (5KV) TRC1,
2-1/C #8 (5KV) TRC2,
2-1/C #8 (5KV) TRC3,
2-1/C #8 (5KV) TRC4,
2-1/C #8 (5KV) TRS1,
2-1/C #8 (5KV) RBC2,
2-1/C #8 (5KV) R8TDZ,
2-1/C #8 (5KV) TRS1,
2-1/C #8 (5KV) TRS2,
D-2-1/C #8 (5KV) TRSB,
2-1/C #8 (5KV) TRWW,
1-1/C #8 (5KV) RDRWC

- A-SPARE
B-3-1/C #8 (5KV) TRCP
C-2-1/C #8 (5KV) TRC4,
2-1/C #8 (5KV) TRC2,
2-1/C #8 (5KV) TRC3,
2-1/C #8 (5KV) TRS1,
2-1/C #8 (5KV) R8TDZ,
2-1/C #8 (5KV) TRS2,
D-2-1/C #8 (5KV) TRSB,
2-1/C #8 (5KV) TRWW,
1-1/C #8 (5KV) RDRWC



ALD-03010



ALD-03019



ALD-03020



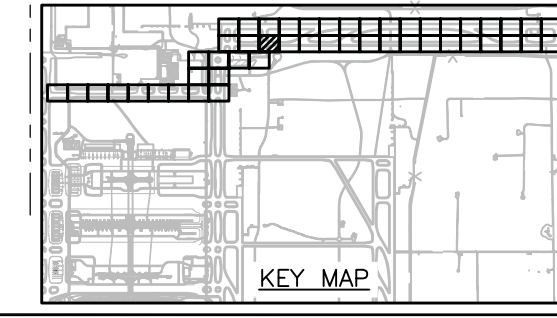
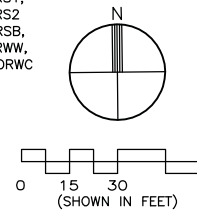
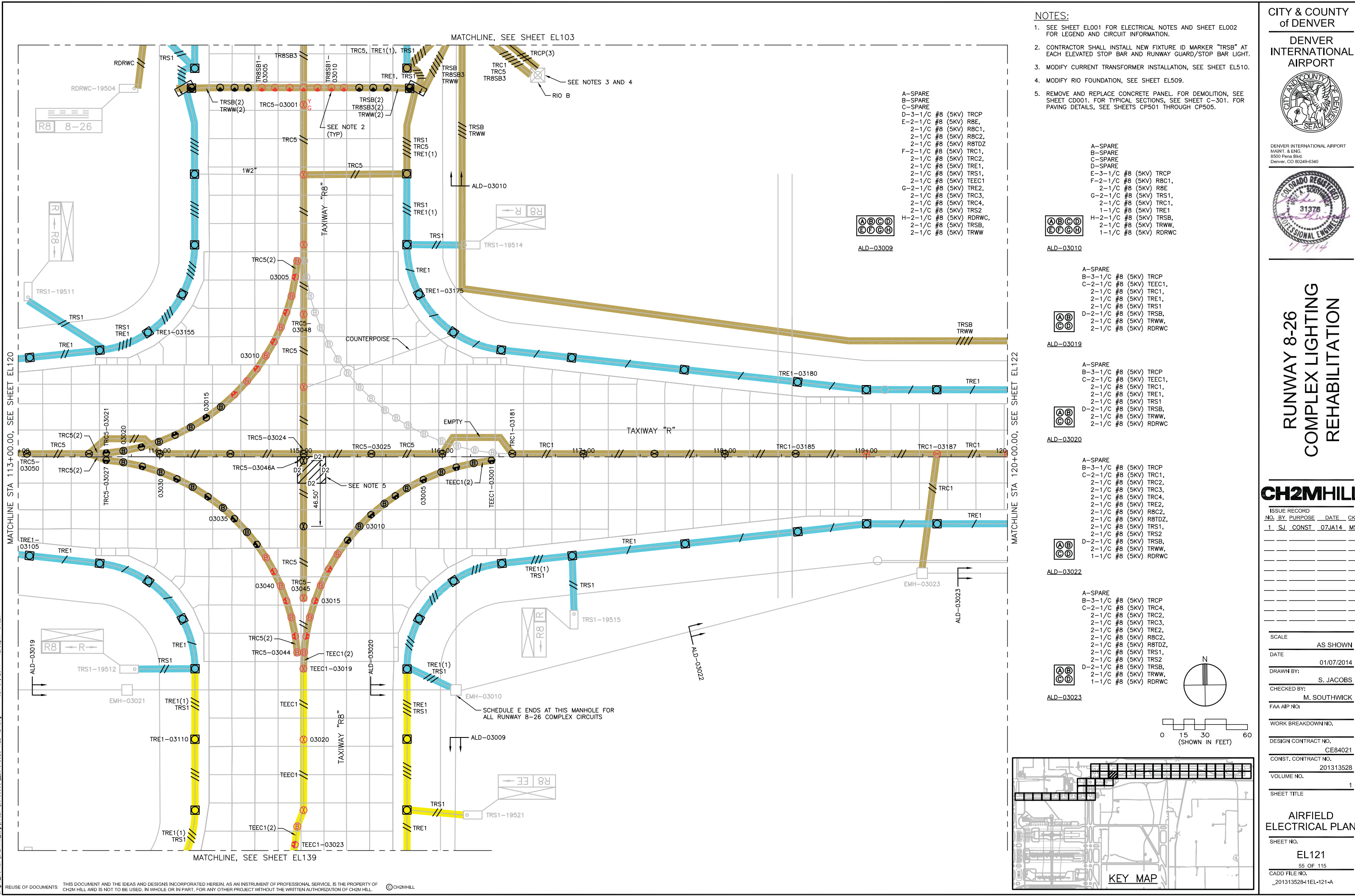
ALD-03022



ALD-03023



ALD-03009



MATCHLINE, SEE SHEET EL104

NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/JA/14 | MS   |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO.  
**EL122**  
56 OF 115  
CADD FILE NO.  
\_201313528-1EL-122-A

- A-SPARE
- B-3-1/C #8 (5KV) TRCP
- C-2-1/C #8 (5KV) TRC4,
- 2-1/C #8 (5KV) TRC2,
- 2-1/C #8 (5KV) TRC3,
- 2-1/C #8 (5KV) TRE2,
- 2-1/C #8 (5KV) R8C2,
- 2-1/C #8 (5KV) R8TDZ,
- 2-1/C #8 (5KV) TRS1,
- 2-1/C #8 (5KV) TRS2
- D-2-1/C #8 (5KV) TRSB,
- 2-1/C #8 (5KV) TRWW,
- 1-1/C #8 (5KV) RDRWC

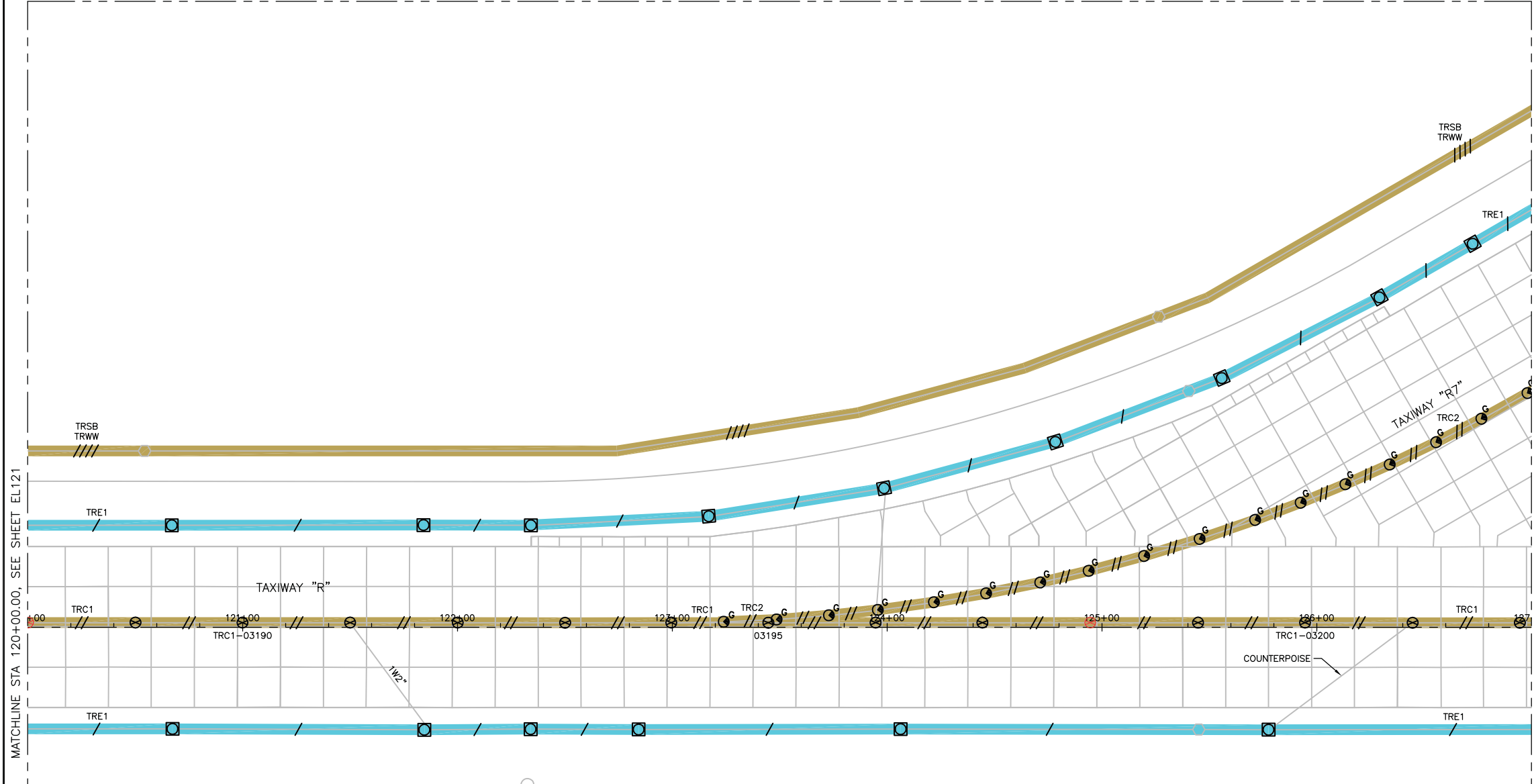


ALD-03023

- A-SPARE
- B-3-1/C #8 (5KV) TRCP
- C-2-1/C #8 (5KV) TRC4,
- 2-1/C #8 (5KV) TRC2,
- 2-1/C #8 (5KV) TRC3,
- 2-1/C #8 (5KV) TRE2,
- 2-1/C #8 (5KV) R8C2,
- 2-1/C #8 (5KV) R8TDZ,
- 2-1/C #8 (5KV) TRS1,
- 2-1/C #8 (5KV) TRS2
- D-2-1/C #8 (5KV) TRSB,
- 2-1/C #8 (5KV) TRWW,
- 1-1/C #8 (5KV) RDRWC

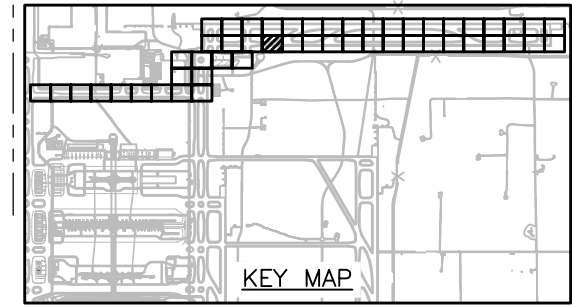
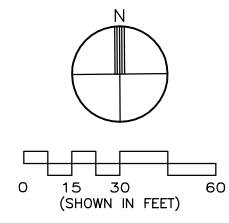


ALD-03024



MATCHLINE STA 120+00.00, SEE SHEET EL121

MATCHLINE STA 127+00.00, SEE SHEET EL123



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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**



| NO. | BY | PURPOSE | DATE   | CHKD |
|-----|----|---------|--------|------|
| 1   | SJ | CONST   | 07JA14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO.

EL123

57 OF 115

CADD FILE NO.

\_201313528-1EL-123-A

NOTES:

- SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
- CONTRACTOR SHALL INSTALL NEW FIXTURE ID MARKER "TRSB" AT EACH ELEVATED STOP BAR AND RUNWAY GUARD/STOP BAR LIGHT.
- REMOVE AND REPLACE 2-PART EPOXY SEALANT AND SPACER RINGS, SEE SHEET EL507.

- A-SPARE  
B-3-1/C #8 (5KV) TRCP  
C-2-1/C #8 (5KV) TRC4,  
2-1/C #8 (5KV) TRC2,  
2-1/C #8 (5KV) TRC3,  
2-1/C #8 (5KV) TRE2,  
2-1/C #8 (5KV) R8C2,  
2-1/C #8 (5KV) R8TDZ,  
2-1/C #8 (5KV) TRS1,  
2-1/C #8 (5KV) TRS2  
D-2-1/C #8 (5KV) TRSB,  
2-1/C #8 (5KV) TRWW,  
1-1/C #8 (5KV) RDRWC



ALD-03024

- A-SPARE  
B-SPARE  
C-2-1/C #8 (5KV) TRS1,  
2-1/C #8 (5KV) TRC2,  
1-1/C #8 (5KV) TRE1  
D-2-1/C #8 (5KV) RDRWC



ALD-03025

- A-SPARE  
B-SPARE  
C-2-1/C #8 (5KV) TRS1,  
2-1/C #8 (5KV) TRC2,  
1-1/C #8 (5KV) TRE1  
D-2-1/C #8 (5KV) RDRWC



ALD-03026

- A-SPARE  
B-SPARE  
C-1-1/C #8 (5KV) TRE1  
D-2-1/C #8 (5KV) RDRWC

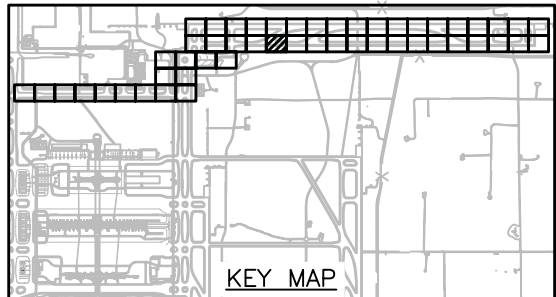
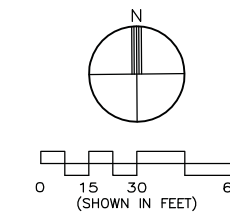
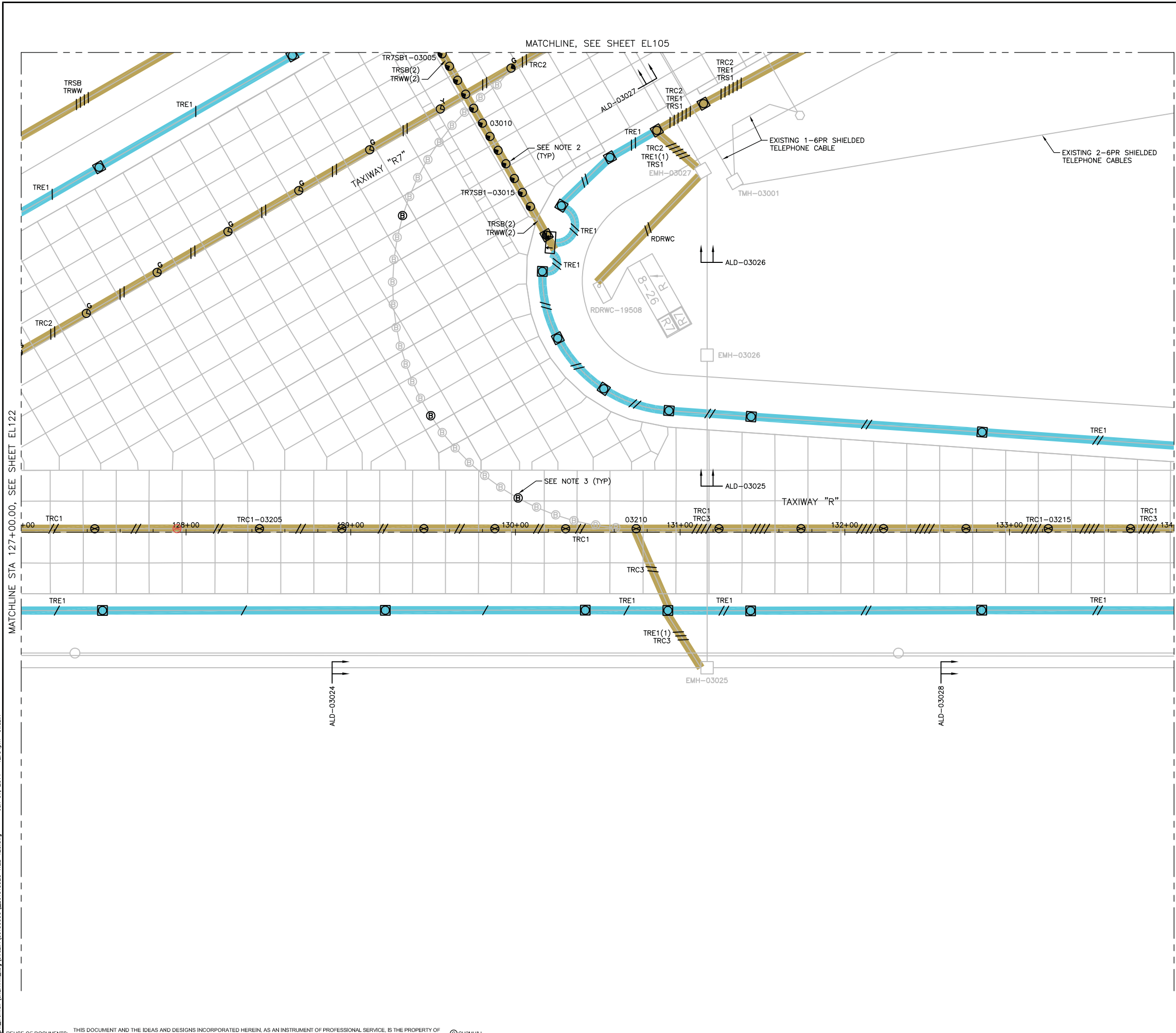


ALD-03027

- A-SPARE  
B-3-1/C #8 (5KV) TRCP  
C-2-1/C #8 (5KV) TRC2,  
2-1/C #8 (5KV) TRC4,  
2-1/C #8 (5KV) TRE2,  
2-1/C #8 (5KV) TRS1,  
2-1/C #8 (5KV) TRS2,  
2-1/C #8 (5KV) R8C2,  
2-1/C #8 (5KV) R8TDZ,  
2-1/C #8 (5KV) TRS1,  
2-1/C #8 (5KV) TRSB,  
1-1/C #8 (5KV) RDRWC



ALD-03028



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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/JA/14 | MS   |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

**AIRFIELD  
ELECTRICAL PLAN**

|               |                      |
|---------------|----------------------|
| SHEET NO.     | EL125                |
| 59 OF 115     |                      |
| CADD FILE NO. | _201313528-1EL-125-A |

**NOTES:**

- SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
- CONTRACTOR SHALL INSTALL NEW FIXTURE ID MARKER "TRSB" AT EACH ELEVATED STOP BAR AND RUNWAY GUARD/STOP BAR LIGHT.
- REMOVE AND REPLACE 2-PART EPOXY SEALANT AND SPACER RINGS, SEE SHEET EL507.

- A-SPARE  
 B-3-1/C #8 (5KV) TRCP  
 C-2-1/C #8 (5KV) TRC4,  
 2-1/C #8 (5KV) TRS2,  
 2-1/C #8 (5KV) R8C2,  
 2-1/C #8 (5KV) R8TDZ  
 D-2-1/C #8 (5KV) TRSB,  
 2-1/C #8 (5KV) TRWW,  
 1-1/C #8 (5KV) RDRWC

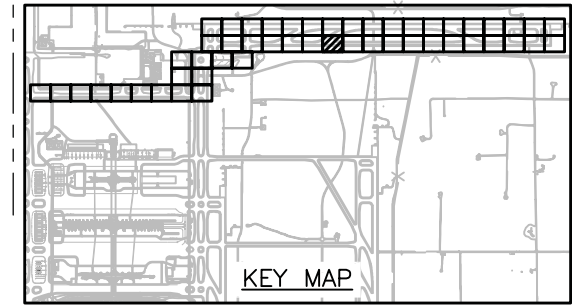
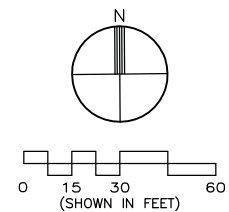
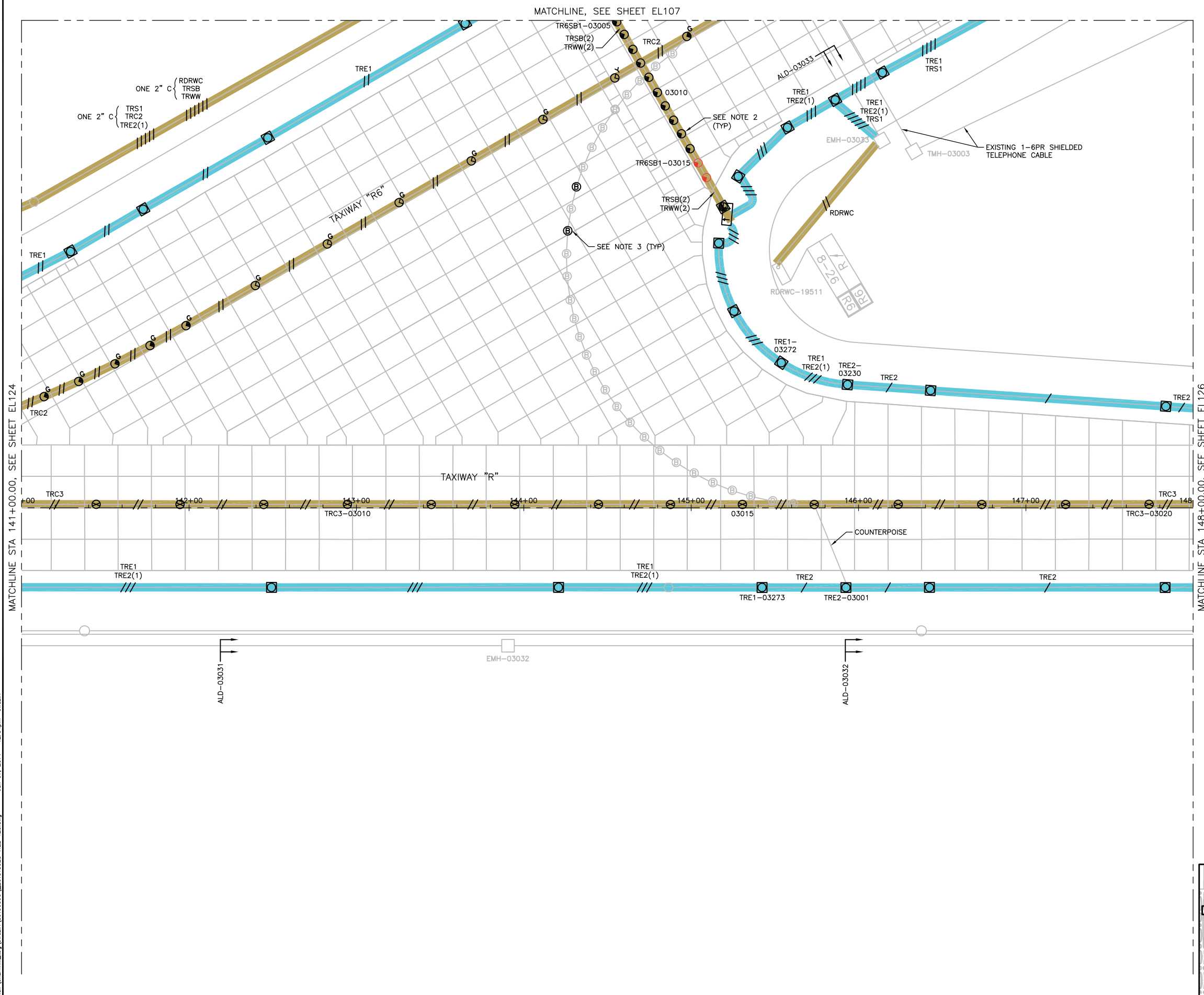
**ALD-03031**

- A-SPARE  
 B-3-1/C #8 (5KV) TRCP  
 C-2-1/C #8 (5KV) TRC4,  
 2-1/C #8 (5KV) TRS2,  
 2-1/C #8 (5KV) R8C2,  
 2-1/C #8 (5KV) R8TDZ  
 D-2-1/C #8 (5KV) TRSB,  
 2-1/C #8 (5KV) TRWW,  
 1-1/C #8 (5KV) RDRWC

**ALD-03032**

- A-SPARE  
 B-SPARE  
 C-2-1/C #8 (5KV) TRS1,  
 2-1/C #8 (5KV) TRE1,  
 1-1/C #8 (5KV) TRE2  
 D-2-1/C #8 (5KV) RDRWC

**ALD-03033**



MATCHLINE STA 141+00.00, SEE SHEET EL124

MATCHLINE STA 148+00.00, SEE SHEET EL126

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MATCHLINE, SEE SHEET EL108

NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

CH2MHILL

| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/JA/14 | MS   |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

AIRFIELD  
ELECTRICAL PLAN  
SHEET NO.  
EL126  
60 OF 115  
CADD FILE NO.  
\_201313528-1EL-126-A

- A-SPARE
- B-3-1/C #8 (5KV) TRCP
- C-2-1/C #8 (5KV) TRC4,
- 2-1/C #8 (5KV) TRS2,
- 2-1/C #8 (5KV) R8C2,
- 2-1/C #8 (5KV) R8TDZ
- D-2-1/C #8 (5KV) TRSB,
- 2-1/C #8 (5KV) TRWW,
- 1-1/C #8 (5KV) RDRWC

ALD-03032

- A-SPARE
- B-3-1/C #8 (5KV) TRCP
- C-2-1/C #8 (5KV) TRC4,
- 2-1/C #8 (5KV) TRS2,
- 2-1/C #8 (5KV) R8C2,
- 2-1/C #8 (5KV) R8TDZ
- D-2-1/C #8 (5KV) TRSB,
- 2-1/C #8 (5KV) TRWW,
- 1-1/C #8 (5KV) RDRWC

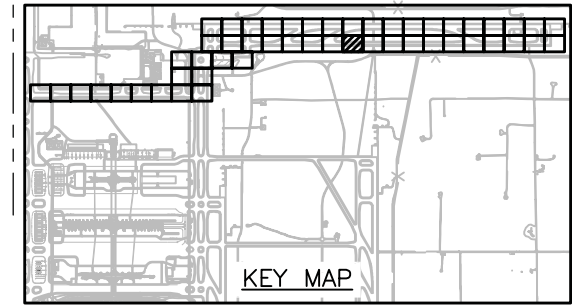
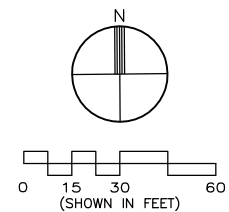
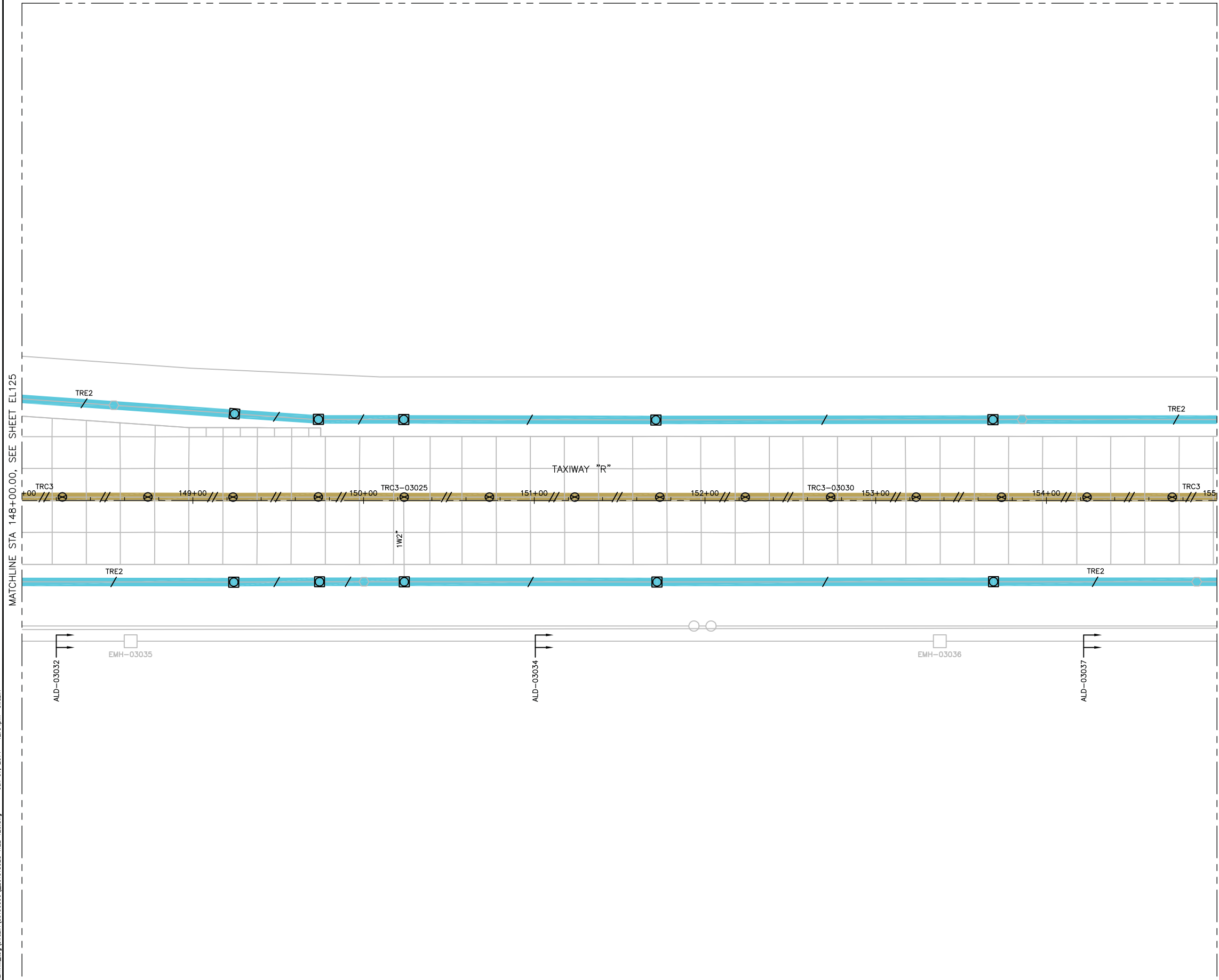
ALD-03034

- A-SPARE
- B-3-1/C #8 (5KV) TRCP
- C-2-1/C #8 (5KV) TRC4,
- 2-1/C #8 (5KV) TRS2,
- 2-1/C #8 (5KV) R8C2,
- 2-1/C #8 (5KV) R8TDZ
- D-2-1/C #8 (5KV) TRSB,
- 2-1/C #8 (5KV) TRWW,
- 1-1/C #8 (5KV) RDRWC

ALD-03037

MATCHLINE STA 148+00.00, SEE SHEET EL125

MATCHLINE STA 155+00.00, SEE SHEET EL127



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ISSUED FOR CONSTRUCTION



MATCHLINE, SEE SHEET EL109

**NOTE:**  
 1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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- A-SPARE
- B-3-1/C #8 (5KV) TRCP
- C-2-1/C #8 (5KV) TRC4,
- 2-1/C #8 (5KV) TRS2,
- 2-1/C #8 (5KV) R8C2,
- 2-1/C #8 (5KV) R8TDZ
- D-2-1/C #8 (5KV) TRSB,
- 2-1/C #8 (5KV) TRWW,
- 1-1/C #8 (5KV) RDRWC

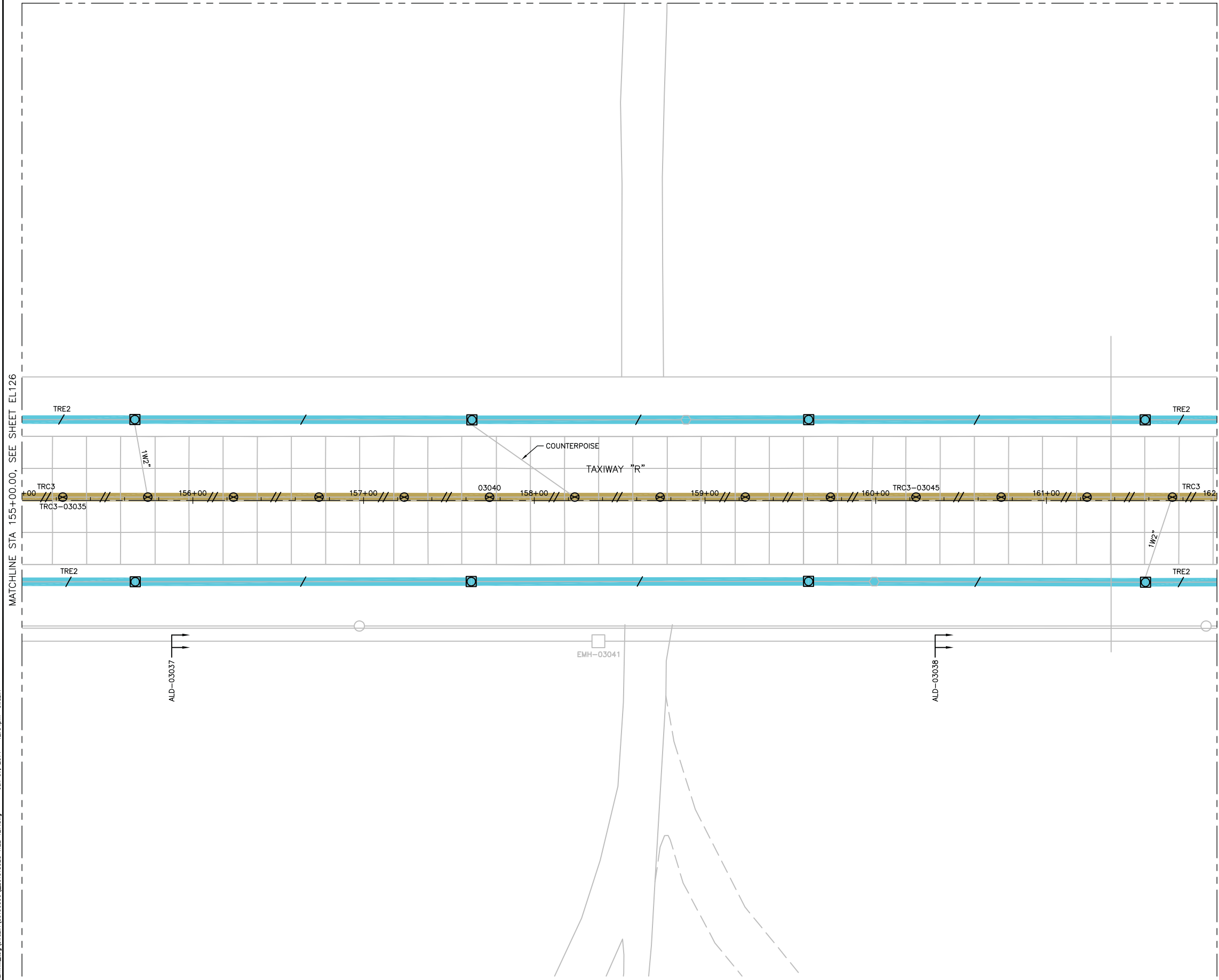
ALD-03037

- A-SPARE
- B-3-1/C #8 (5KV) TRCP
- C-2-1/C #8 (5KV) TRC4,
- 2-1/C #8 (5KV) TRS2,
- 2-1/C #8 (5KV) R8C2,
- 2-1/C #8 (5KV) R8TDZ
- D-2-1/C #8 (5KV) TRSB,
- 2-1/C #8 (5KV) TRWW,
- 1-1/C #8 (5KV) RDRWC

ALD-03038

MATCHLINE STA 155+00.00, SEE SHEET EL126

MATCHLINE STA 162+00.00, SEE SHEET EL128



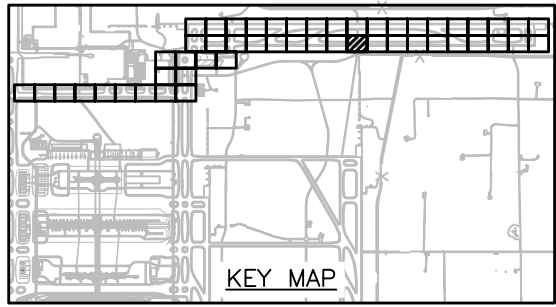
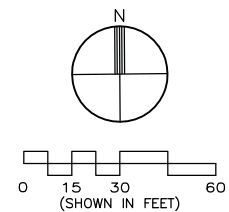
**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**



| ISSUE RECORD |    |         |        |
|--------------|----|---------|--------|
| NO.          | BY | PURPOSE | DATE   |
| 1            | SJ | CONST   | 07JA14 |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

**AIRFIELD  
ELECTRICAL PLAN**  
 SHEET NO. **EL127**  
 61 OF 115  
 CADD FILE NO. **\_201313528-1EL-127-A**



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ISSUED FOR CONSTRUCTION

MATCHLINE, SEE SHEET EL110

NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

CH2MHILL

| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/JA/14 | MS   |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

AIRFIELD  
ELECTRICAL PLAN

SHEET NO.  
EL128

62 OF 115

CADD FILE NO.  
\_201313528-1EL-128-A

- A-SPARE
- B-3-1/C #8 (5KV) TRCP
- C-2-1/C #8 (5KV) TRC4,
- 2-1/C #8 (5KV) TRS2,
- 2-1/C #8 (5KV) R8C2,
- 2-1/C #8 (5KV) R8TDZ
- D-2-1/C #8 (5KV) TRSB,
- 2-1/C #8 (5KV) TRWW,
- 1-1/C #8 (5KV) RDRWC

ALD-03038

- A-SPARE
- B-3-1/C #8 (5KV) TRCP
- C-2-1/C #8 (5KV) TRC4,
- 2-1/C #8 (5KV) TRS2,
- 2-1/C #8 (5KV) R8C2,
- 2-1/C #8 (5KV) R8TDZ
- D-2-1/C #8 (5KV) TRSB,
- 2-1/C #8 (5KV) TRWW,
- 1-1/C #8 (5KV) RDRWC

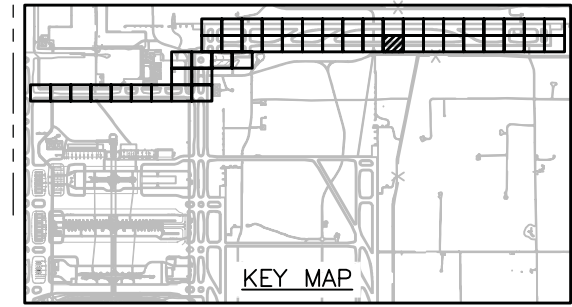
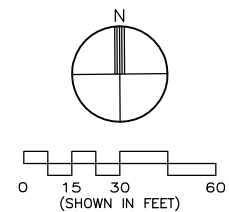
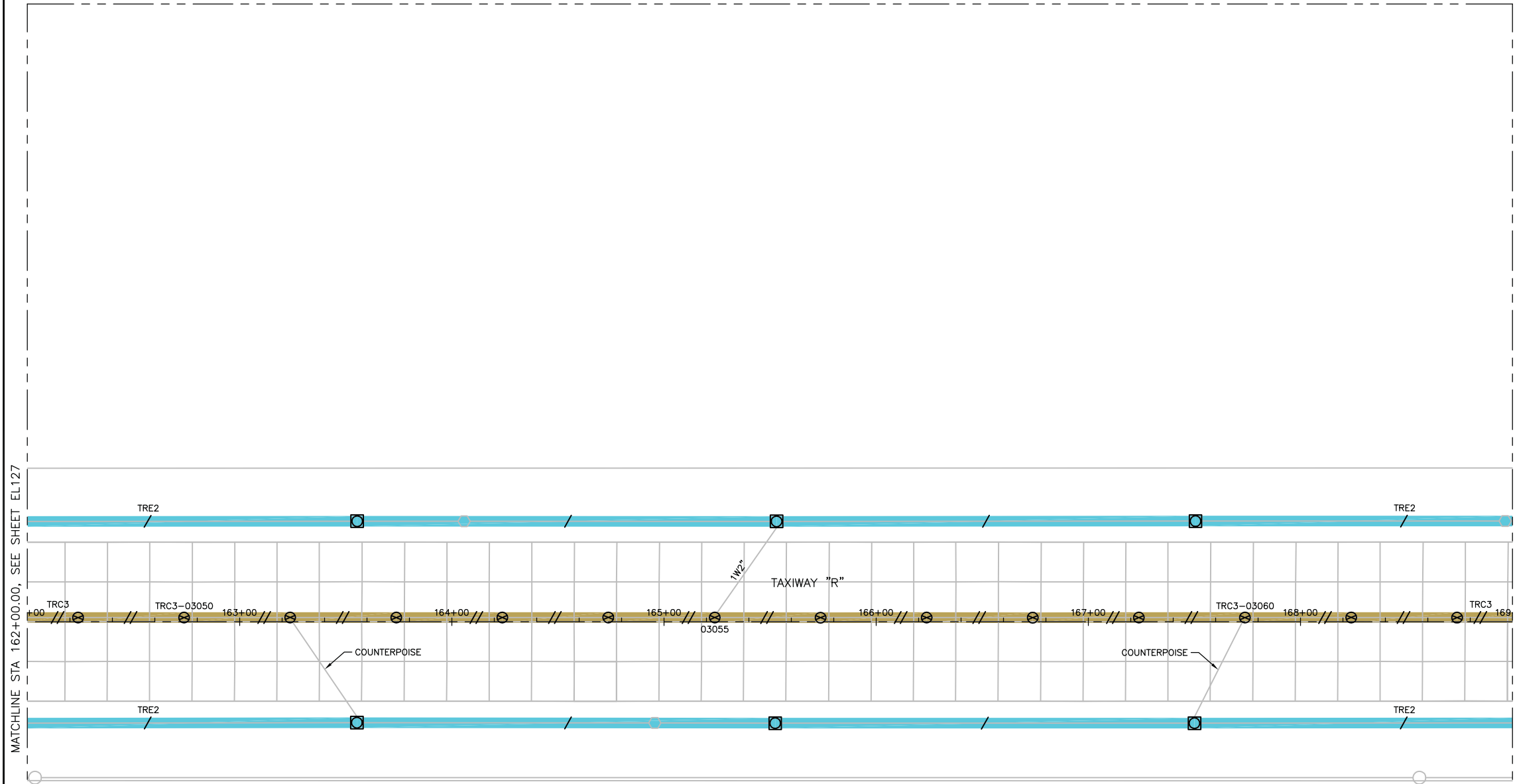
ALD-03039

- A-SPARE
- B-3-1/C #8 (5KV) TRCP
- C-2-1/C #8 (5KV) TRC4,
- 2-1/C #8 (5KV) TRS2,
- 2-1/C #8 (5KV) R8C2,
- 2-1/C #8 (5KV) R8TDZ
- D-2-1/C #8 (5KV) TRSB,
- 2-1/C #8 (5KV) TRWW,
- 1-1/C #8 (5KV) RDRWC

ALD-03040

MATCHLINE STA 162+00.00, SEE SHEET EL127

MATCHLINE STA 169+00.00, SEE SHEET EL129



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MATCHLINE, SEE SHEET EL111

NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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Denver, CO 80249-6340



RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

**CH2MHILL**

| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/JA/14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

AIRFIELD  
ELECTRICAL PLAN

SHEET NO. EL129

63 OF 115

CADD FILE NO. \_201313528-1EL-129-A

ISSUED FOR CONSTRUCTION

- ALD-03040
- A-SPARE
  - B-3-1/C #8 (5KV) TRCP
  - C-2-1/C #8 (5KV) TRC4
  - 2-1/C #8 (5KV) TRS2
  - 2-1/C #8 (5KV) R8C2
  - 2-1/C #8 (5KV) R8TDZ
  - D-2-1/C #8 (5KV) TRSB
  - 2-1/C #8 (5KV) TRWW
  - 1-1/C #8 (5KV) RDRWC

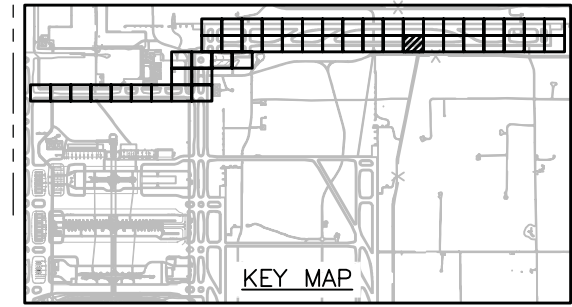
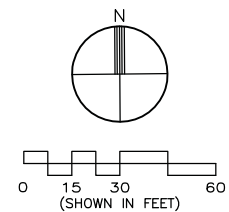
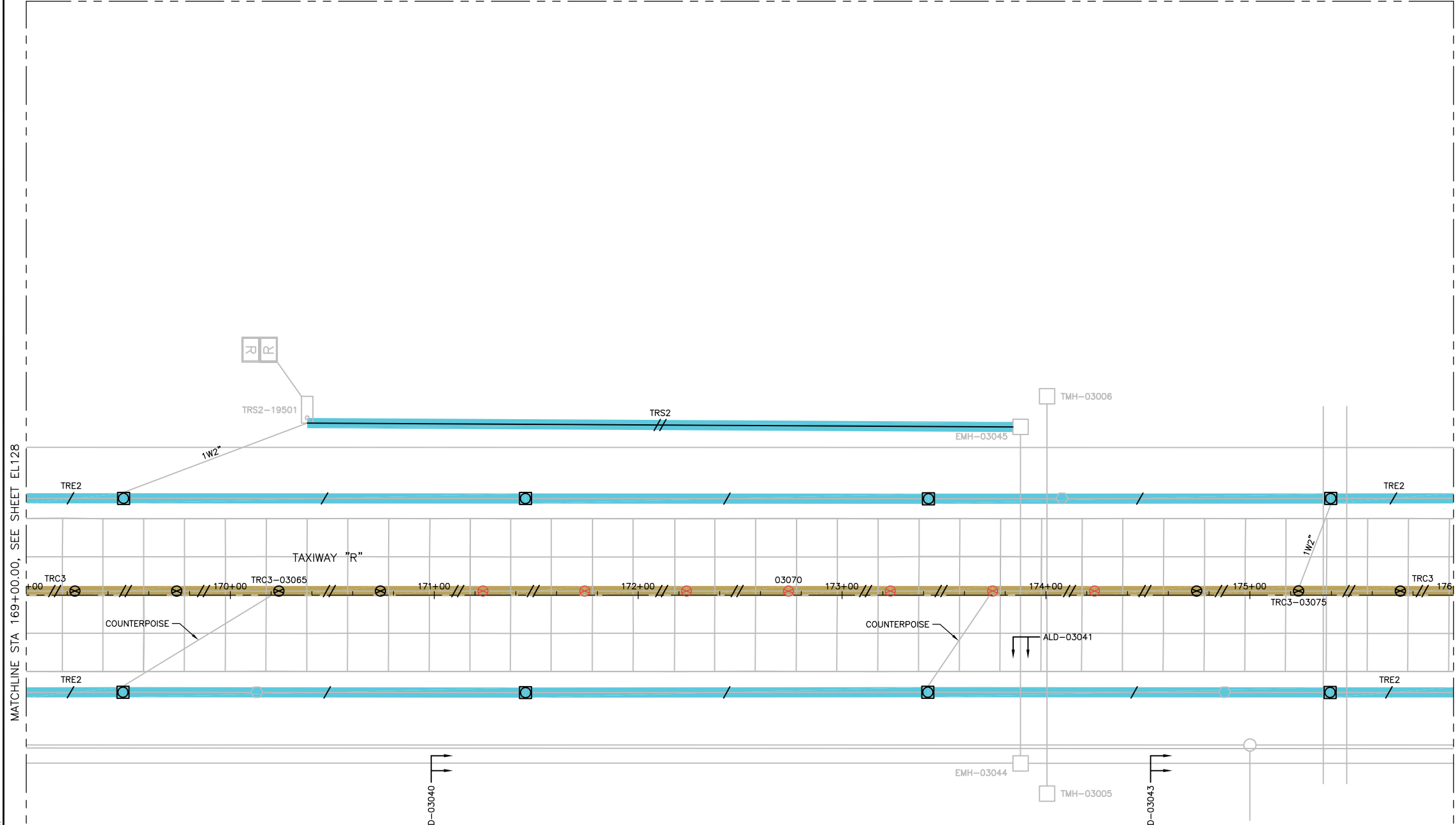
ALD-03040

- ALD-03041
- A-SPARE
  - B-SPARE
  - C-2-1/C #8 (5KV) TRS2
  - D-SPARE

ALD-03041

- ALD-03043
- A-SPARE
  - B-3-1/C #8 (5KV) TRCP
  - C-2-1/C #8 (5KV) TRC4
  - 2-1/C #8 (5KV) TRS2
  - 2-1/C #8 (5KV) R8C2
  - 2-1/C #8 (5KV) R8TDZ
  - D-2-1/C #8 (5KV) TRSB
  - 2-1/C #8 (5KV) TRWW
  - 1-1/C #8 (5KV) RDRWC

ALD-03043



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MATCHLINE, SEE SHEET EL112

NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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Denver, CO 80249-6340



A-SPARE  
B-3-1/C #8 (5KV) TRCP  
C-2-1/C #8 (5KV) TRC4,  
2-1/C #8 (5KV) TRS2,  
2-1/C #8 (5KV) R8C2,  
2-1/C #8 (5KV) R8TDZ  
D-2-1/C #8 (5KV) TRSB,  
2-1/C #8 (5KV) TRWW,  
1-1/C #8 (5KV) RDRWC



ALD-03043

A-SPARE  
B-3-1/C #8 (5KV) TRCP  
C-2-1/C #8 (5KV) TRC4,  
2-1/C #8 (5KV) TRS2,  
2-1/C #8 (5KV) R8C2,  
2-1/C #8 (5KV) R8TDZ  
D-2-1/C #8 (5KV) TRSB,  
2-1/C #8 (5KV) TRWW,  
1-1/C #8 (5KV) RDRWC



ALD-03044

RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | SJ  | CONST | 07JA14  | MS   |      |

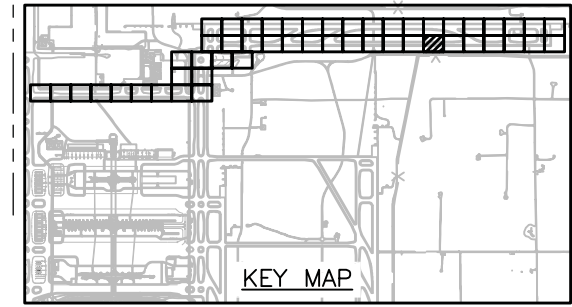
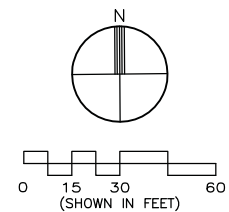
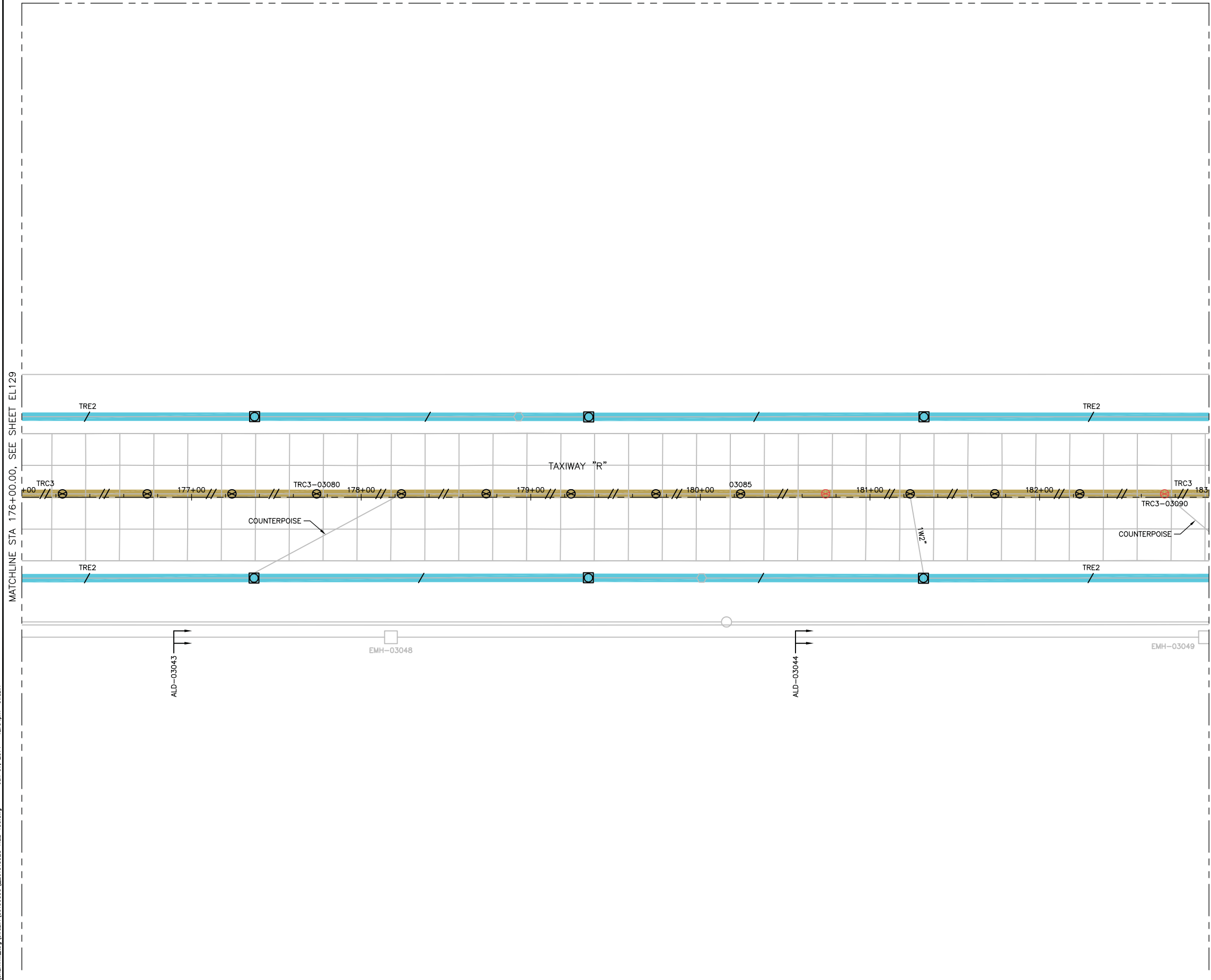
|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

AIRFIELD  
ELECTRICAL PLAN

SHEET NO.  
EL130  
64 OF 115  
CADD FILE NO.  
\_201313528-1EL-130-A

MATCHLINE STA 176+00.00, SEE SHEET EL129

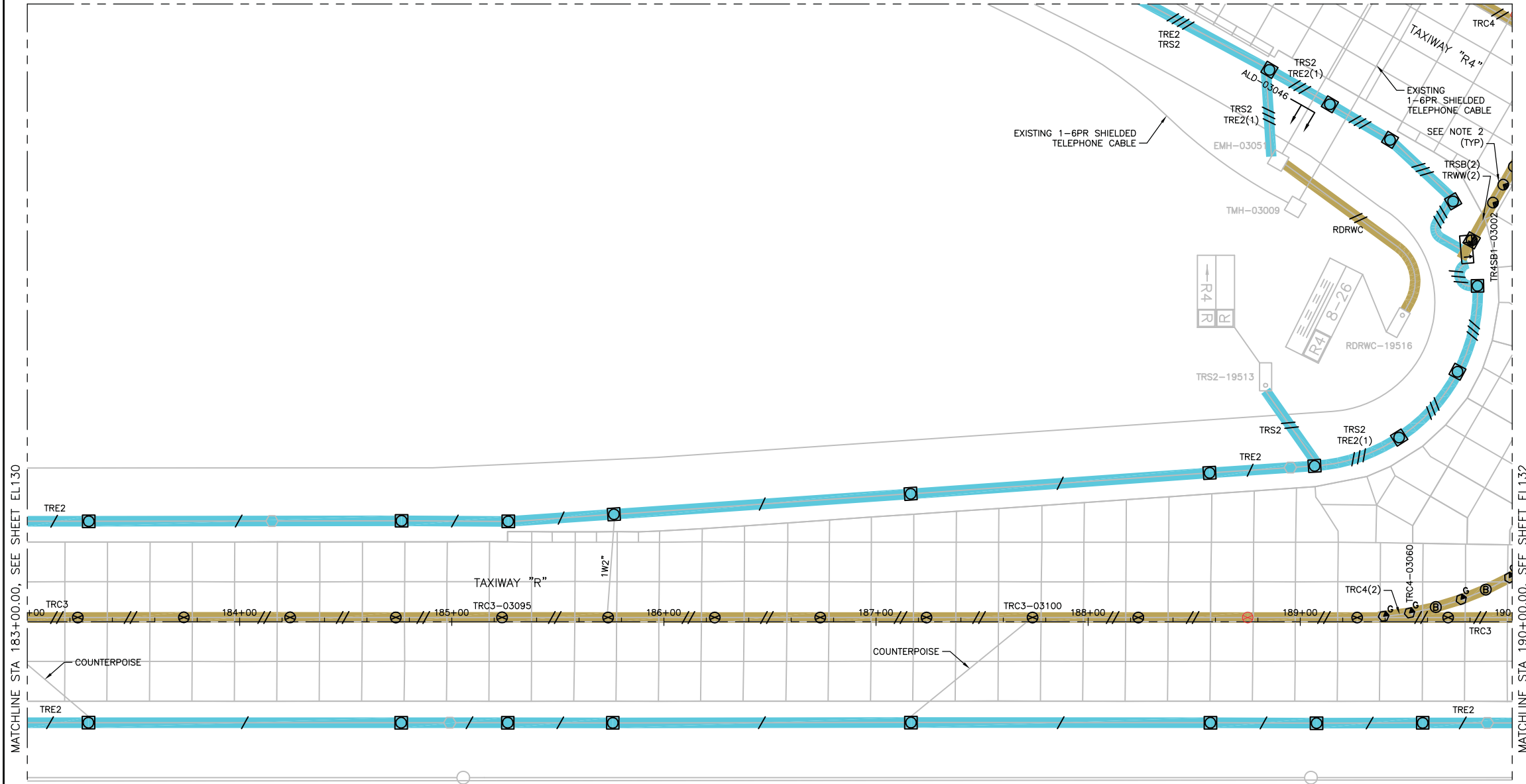
MATCHLINE STA 183+00.00, SEE SHEET EL131



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ISSUED FOR CONSTRUCTION

MATCHLINE, SEE SHEET EL113



**NOTES:**

- SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
- CONTRACTOR SHALL INSTALL NEW FIXTURE ID MARKER "TRSB" AT EACH ELEVATED STOP BAR AND RUNWAY GUARD/STOP BAR LIGHT.

- ALD-03045**
- A-SPARE
  - B-3-1/C #8 (5KV) TRCP
  - C-2-1/C #8 (5KV) TRC4,
  - 2-1/C #8 (5KV) TRS2,
  - 2-1/C #8 (5KV) R8C2,
  - 2-1/C #8 (5KV) R8TDZ
  - D-2-1/C #8 (5KV) TRSB,
  - 2-1/C #8 (5KV) TRWW,
  - 1-1/C #8 (5KV) RDRWC

- ALD-03046**
- A-SPARE
  - B-SPARE
  - C-1-1/C #8 (5KV) TRE2,
  - 2-1/C #8 (5KV) TRS2
  - D-2-1/C #8 (5KV) RDRWC

- ALD-03047**
- A-SPARE
  - B-3-1/C #8 (5KV) TRCP
  - C-2-1/C #8 (5KV) TRC4,
  - 2-1/C #8 (5KV) TRS2,
  - 2-1/C #8 (5KV) R8C2,
  - 2-1/C #8 (5KV) R8TDZ
  - D-2-1/C #8 (5KV) TRSB,
  - 2-1/C #8 (5KV) TRWW,
  - 1-1/C #8 (5KV) RDRWC

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/JA/14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

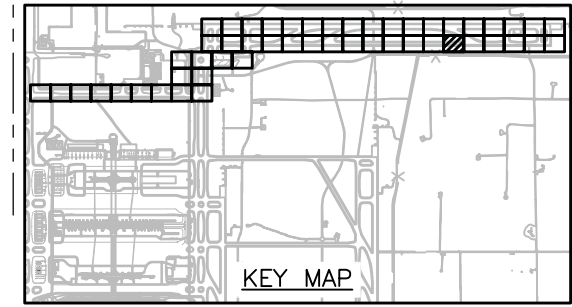
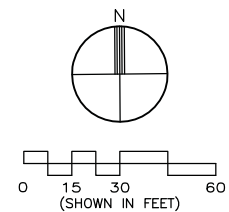
SHEET TITLE

**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO. EL131

65 OF 115

CADD FILE NO. \_201313528-1EL-131-A



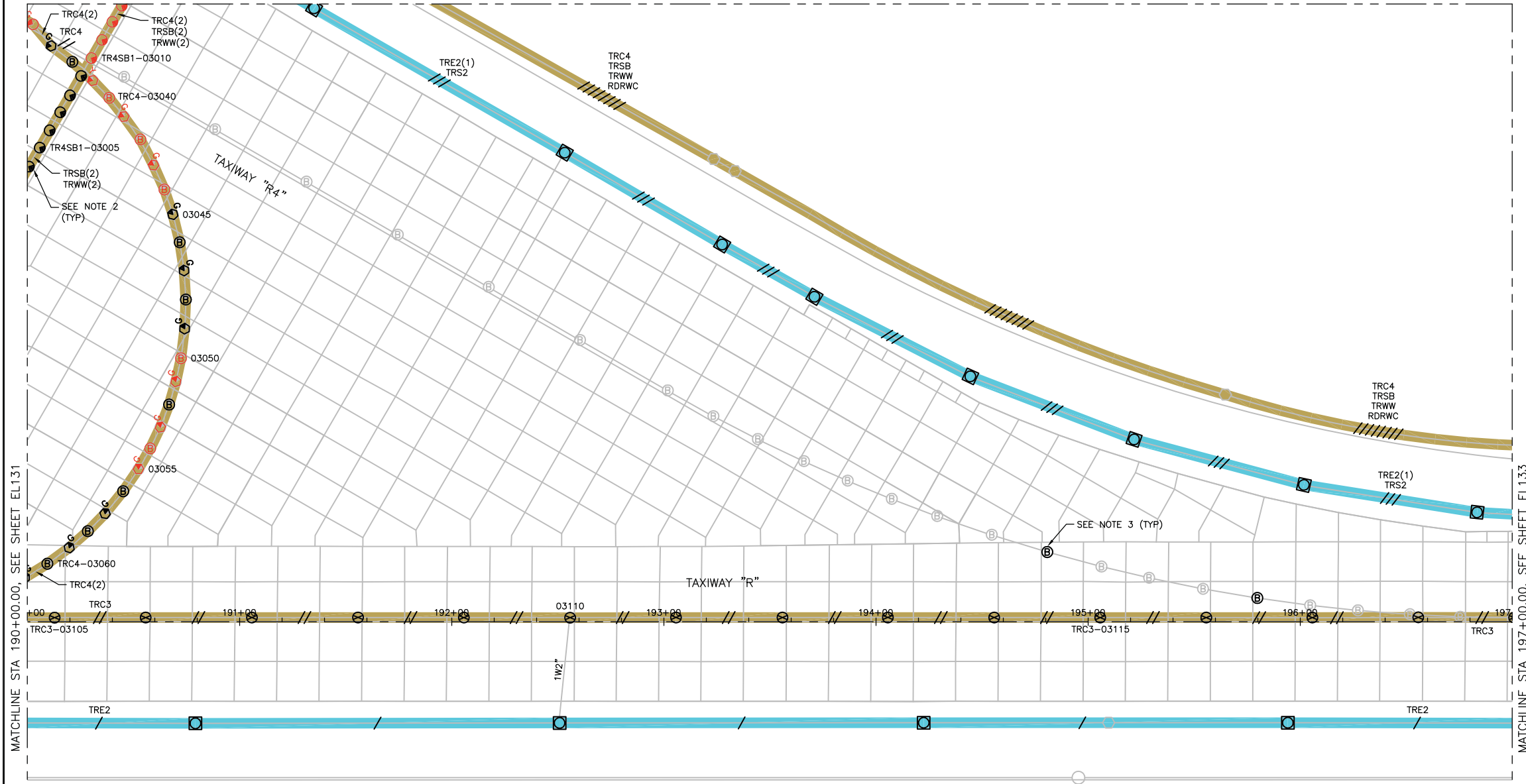
MATCHLINE STA 183+00.00, SEE SHEET EL130

MATCHLINE STA 190+00.00, SEE SHEET EL132

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ISSUED FOR CONSTRUCTION

MATCHLINE, SEE SHEET EL114



NOTES:

- SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
- CONTRACTOR SHALL INSTALL NEW FIXTURE ID MARKER "TRSB" AT EACH ELEVATED STOP BAR AND RUNWAY GUARD/STOP BAR LIGHT.
- REMOVE AND REPLACE 2-PART EPOXY SEALANT AND SPACER RINGS, SEE SHEET EL507.

- A-SPARE  
 B-3-1/C #8 (5KV) TRCP  
 C-2-1/C #8 (5KV) TRC4,  
 2-1/C #8 (5KV) TRS2,  
 2-1/C #8 (5KV) R8C2,  
 2-1/C #8 (5KV) R8DZ  
 D-2-1/C #8 (5KV) TRSB,  
 2-1/C #8 (5KV) TRWW,  
 1-1/C #8 (5KV) RDRWC



ALD-03047

- A-SPARE  
 B-3-1/C #8 (5KV) TRCP  
 C-2-1/C #8 (5KV) TRC4,  
 2-1/C #8 (5KV) TRS2,  
 2-1/C #8 (5KV) R8C2,  
 2-1/C #8 (5KV) R8DZ  
 D-2-1/C #8 (5KV) TRSB,  
 2-1/C #8 (5KV) TRWW,  
 1-1/C #8 (5KV) RDRWC



ALD-03048

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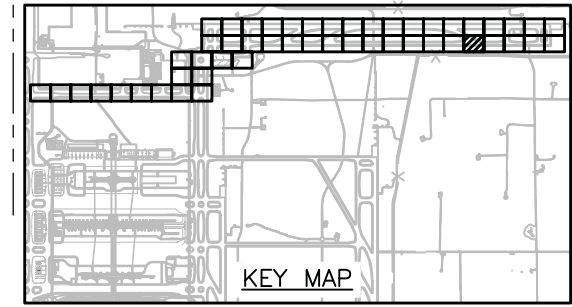
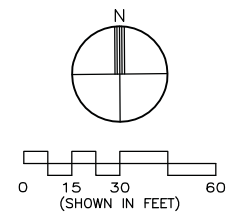


RUNWAY 8-26  
 COMPLEX LIGHTING  
 REHABILITATION

CH2MHILL

| NO. | BY | PURPOSE | DATE   | CHKD |
|-----|----|---------|--------|------|
| 1   | SJ | CONST   | 07JA14 | MS   |

|                     |                          |
|---------------------|--------------------------|
| SCALE               | AS SHOWN                 |
| DATE                | 01/07/2014               |
| DRAWN BY:           | S. JACOBS                |
| CHECKED BY:         | M. SOUTHWICK             |
| FAA AIP NO:         |                          |
| WORK BREAKDOWN NO.  |                          |
| DESIGN CONTRACT NO. | CE84021                  |
| CONST. CONTRACT NO. | 201313528                |
| VOLUME NO.          | 1                        |
| SHEET TITLE         | AIRFIELD ELECTRICAL PLAN |
| SHEET NO.           | EL132                    |
| CADD FILE NO.       | 66 OF 115                |
|                     | _201313528-1EL-132-A     |



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MATCHLINE, SEE SHEET EL115

NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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- A-SPARE
- B-3-1/C #8 (5KV) TRCP
- C-2-1/C #8 (5KV) TRC4,
- 2-1/C #8 (5KV) TRS2,
- 2-1/C #8 (5KV) R8C2,
- 2-1/C #8 (5KV) R8TDZ
- D-2-1/C #8 (5KV) TRSB,
- 2-1/C #8 (5KV) TRWW,
- 1-1/C #8 (5KV) RDRWC



ALD-03048

- A-SPARE
- B-3-1/C #8 (5KV) TRCP
- C-2-1/C #8 (5KV) TRC4,
- 2-1/C #8 (5KV) TRS2,
- 2-1/C #8 (5KV) R8C2,
- 2-1/C #8 (5KV) R8TDZ
- D-2-1/C #8 (5KV) TRSB,
- 2-1/C #8 (5KV) TRWW,
- 1-1/C #8 (5KV) RDRWC

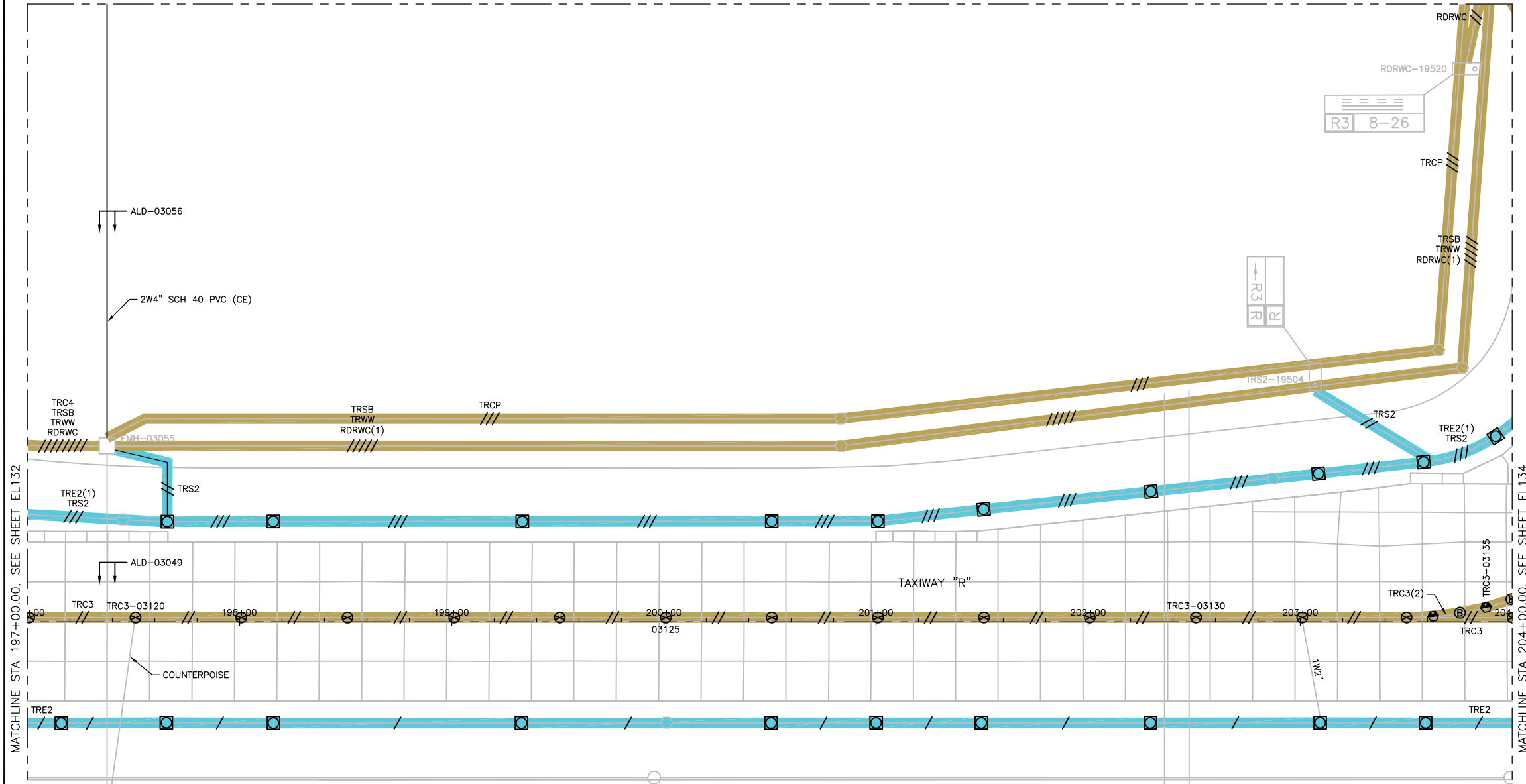


ALD-03049

- A-SPARE
- B-2-1/C #8 (5KV) R8TDZ,
- 2-1/C #8 (5KV) R8C2



ALD-03056



MATCHLINE STA 197+00.00, SEE SHEET EL132

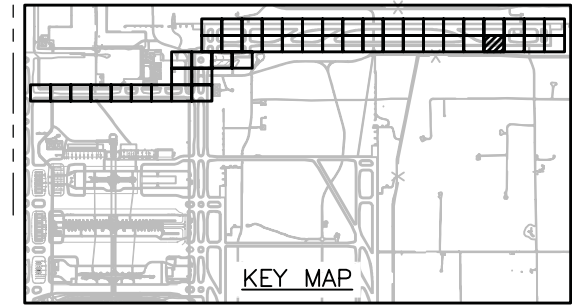
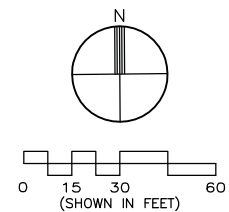
MATCHLINE STA 204+00.00, SEE SHEET EL134

**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**



| NO. | BY | PURPOSE | DATE   | CHKD |
|-----|----|---------|--------|------|
| 1   | SJ | CONST   | 07JA14 | MS   |

|                     |                          |
|---------------------|--------------------------|
| SCALE               | AS SHOWN                 |
| DATE                | 01/07/2014               |
| DRAWN BY:           | S. JACOBS                |
| CHECKED BY:         | M. SOUTHWICK             |
| FAA AIP NO:         |                          |
| WORK BREAKDOWN NO.  |                          |
| DESIGN CONTRACT NO. | CE84021                  |
| CONST. CONTRACT NO. | 201313528                |
| VOLUME NO.          | 1                        |
| SHEET TITLE         | AIRFIELD ELECTRICAL PLAN |
| SHEET NO.           | EL133                    |
| CADD FILE NO.       | 67 OF 115                |
|                     | 201313528-1EL-133-A      |



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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

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| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/14/14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO. EL134

68 OF 115

CADD FILE NO. \_201313528-1EL-134-A

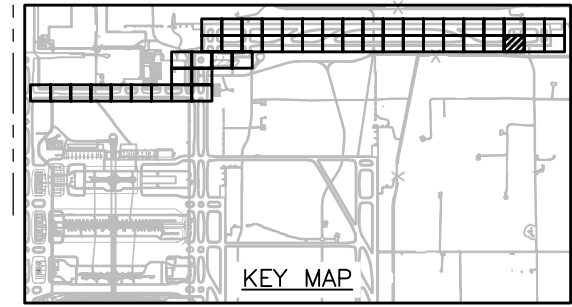
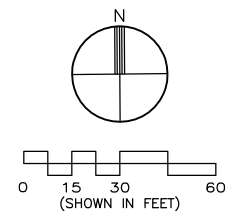
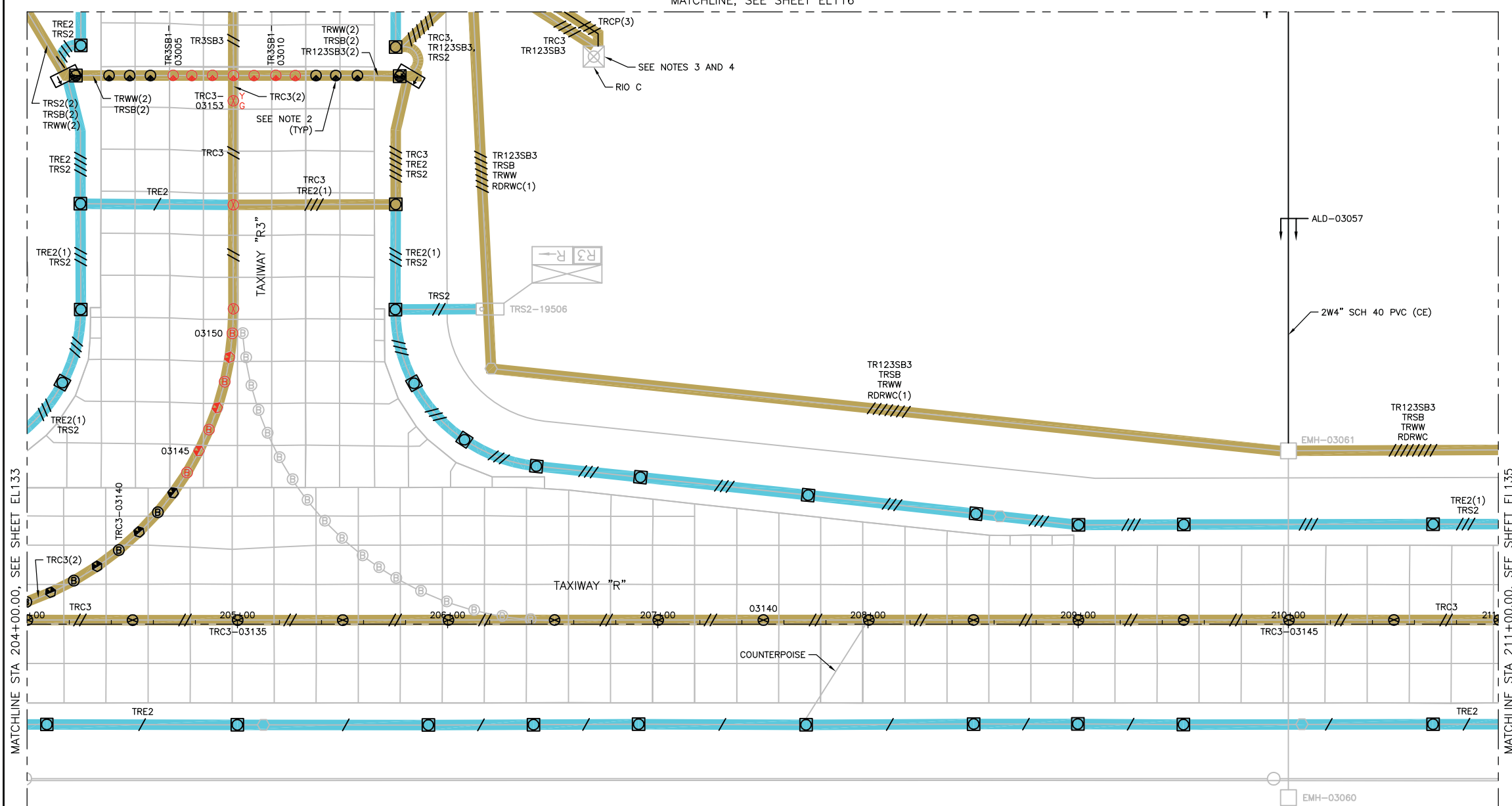
ISSUED FOR CONSTRUCTION

**NOTES:**

- SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
- CONTRACTOR SHALL INSTALL NEW FIXTURE ID MARKER "TRSB" AT EACH ELEVATED STOP BAR AND RUNWAY GUARD/STOP BAR LIGHT.
- MODIFY CURRENT TRANSFORMER INSTALLATION, SEE SHEET EL510.
- MODIFY RIO FOUNDATION, SEE SHEET EL509.

A-SPARE  
B-1-1/C #8 (5KV) RDRWC  
ALD-03057

MATCHLINE, SEE SHEET EL116



MATCHLINE STA 204+00.00, SEE SHEET EL133

MATCHLINE STA 211+00.00, SEE SHEET EL135

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RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION



| ISSUE RECORD | NO. | BY    | PURPOSE | DATE     | CHKD |
|--------------|-----|-------|---------|----------|------|
| 1            | SJ  | CONST |         | 07/JA/14 | MS   |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

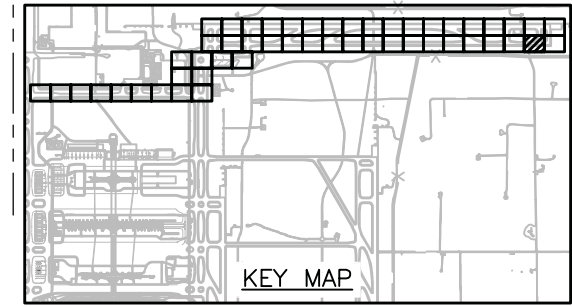
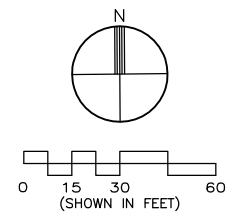
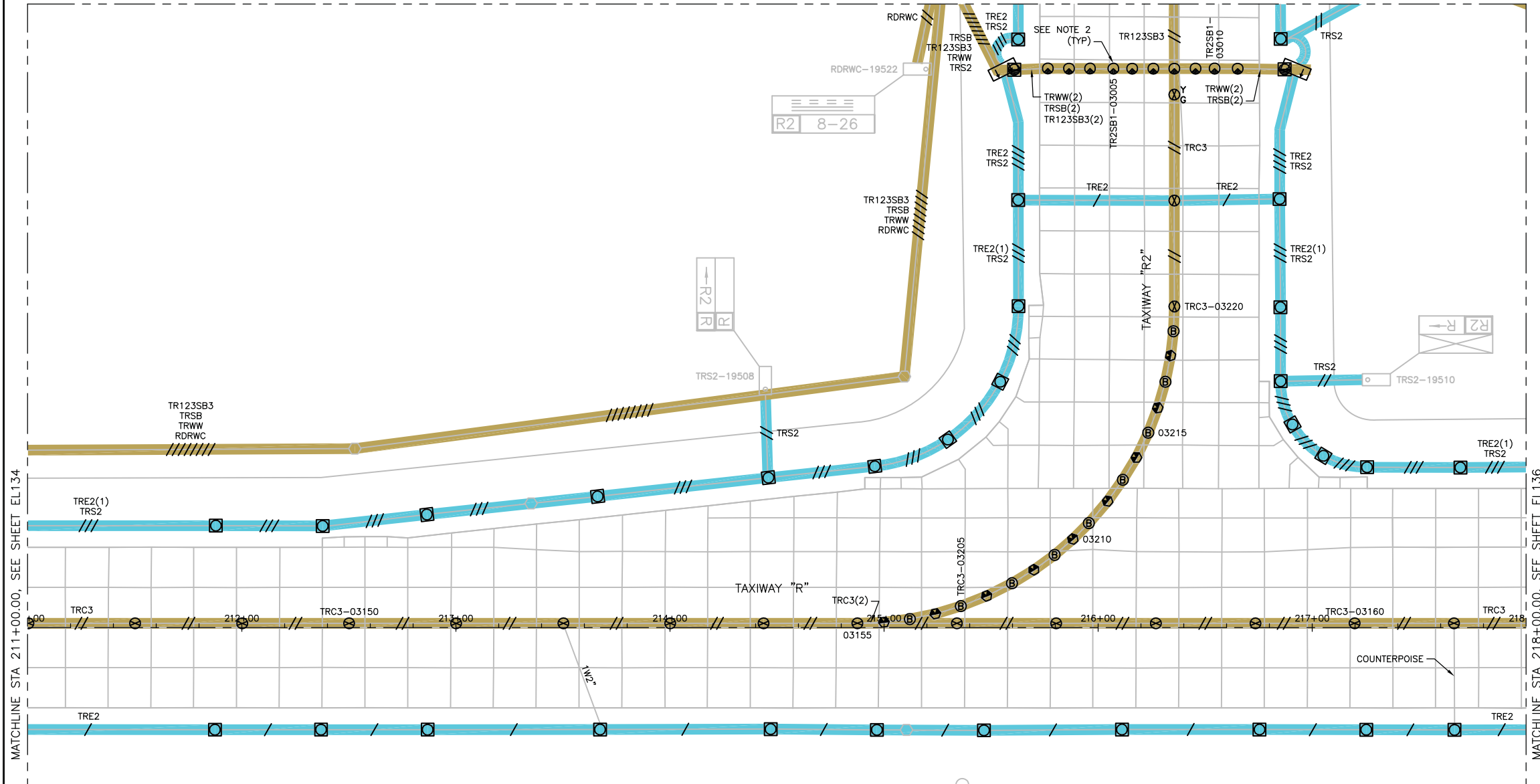
AIRFIELD  
ELECTRICAL PLAN

|               |                      |
|---------------|----------------------|
| SHEET NO.     | EL135                |
|               | 69 OF 115            |
| CADD FILE NO. | _201313528-1EL-135-A |

NOTES:

- SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
- CONTRACTOR SHALL INSTALL NEW FIXTURE ID MARKER "TRSB" AT EACH ELEVATED STOP BAR AND RUNWAY GUARD/STOP BAR LIGHT.

MATCHLINE, SEE SHEET EL117



KEY MAP

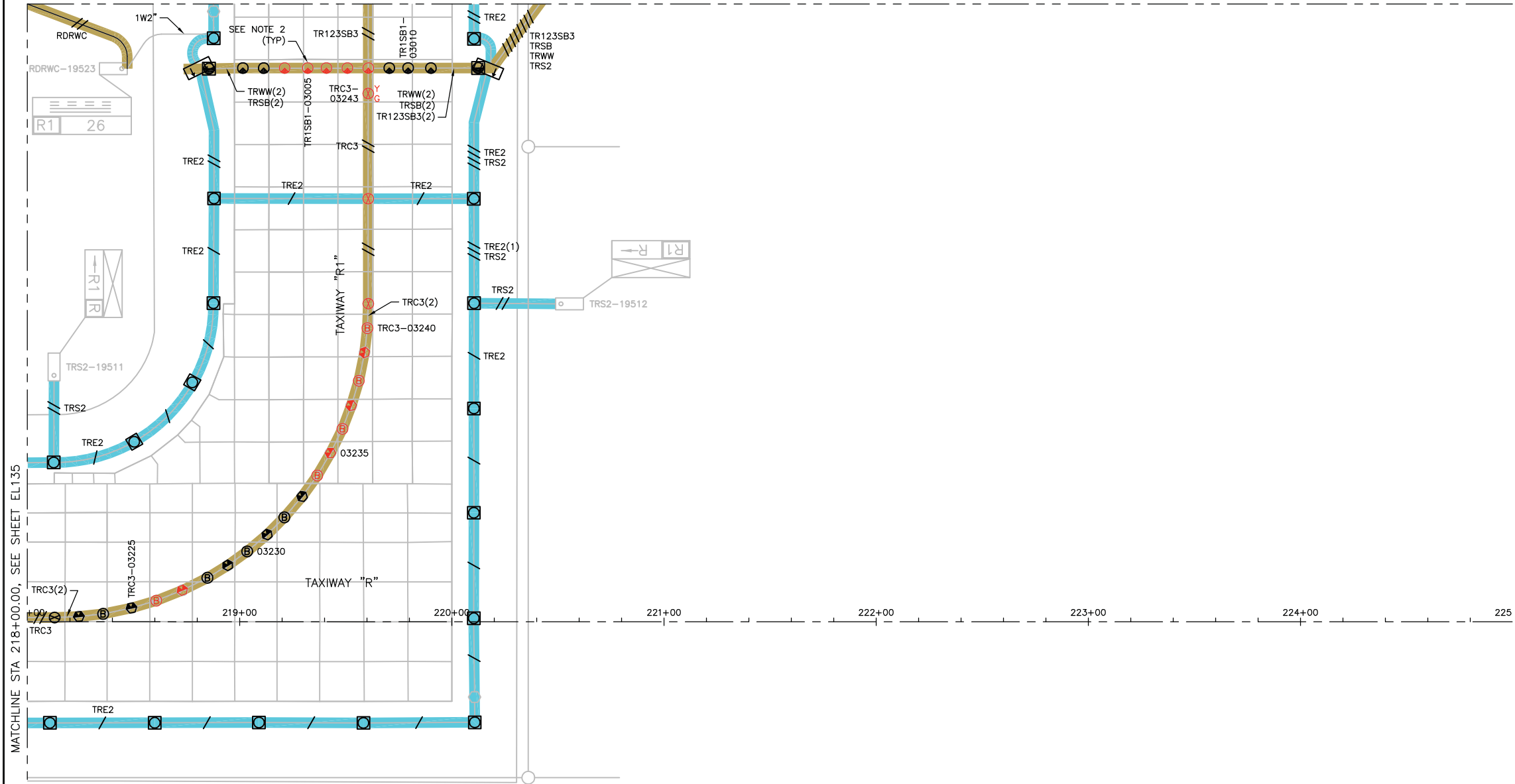
MATCHLINE STA 211+00.00, SEE SHEET EL134

MATCHLINE STA 218+00.00, SEE SHEET EL136

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MATCHLINE, SEE SHEET EL118



- NOTES:**
- SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
  - CONTRACTOR SHALL INSTALL NEW FIXTURE ID MARKER "TRSB" AT EACH ELEVATED STOP BAR AND RUNWAY GUARD/STOP BAR LIGHT.

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# RUNWAY 8-26 COMPLEX LIGHTING REHABILITATION

## CH2MHILL

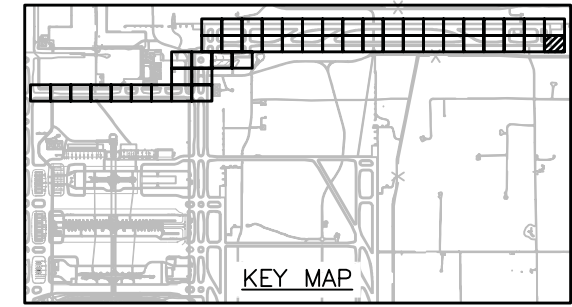
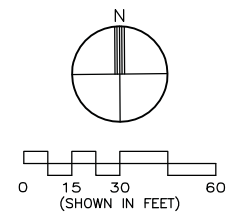
| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/14/14 | MS   |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

AIRFIELD ELECTRICAL PLAN

SHEET NO. EL136  
70 OF 115

CADD FILE NO. \_201313528-11EL-136-A



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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

| ISSUE RECORD | NO. | BY | PURPOSE | DATE     | CHKD |
|--------------|-----|----|---------|----------|------|
|              | 1   | SJ | CONST   | 07/14/14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**AIRFIELD ELECTRICAL PLAN**

SHEET NO. EL137

71 OF 115

CADD FILE NO. \_201313528-1EL-137-A

**NOTES:**

- SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
- SIGN (TLS2-19513) IS FED FROM NEAREST MANHOLE (EMH-02522).
- REMOVE AND REPLACE CONCRETE PANEL. SURVEY EXISTING LIGHT LOCATION AND ORIENTATION PRIOR TO DEMOLISHING CONCRETE PANEL. REINSTALL NEW LIGHT IN THE SAME LOCATION AND ORIENTATION AS THE ORIGINAL LIGHT. FOR DEMOLITION, SEE SHEET CDD01. FOR TYPICAL SECTIONS, SEE SHEET C-301. FOR PAVING DETAILS, SEE SHEETS CP501 THROUGH CP505.
- INSTALL NEW FIXTURE ID MARKERS FOR TAXIWAY "L" TO TAXIWAY "ZN".
- INSTALL NEW FIXTURE ID MARKERS FOR TAXIWAY CENTERLINE FIXTURES LEADING FROM TAXIWAY "M" TO TAXIWAY "EE".

(A) A-2-1/C #8 (5KV) TLS2  
(B) B-SPARE

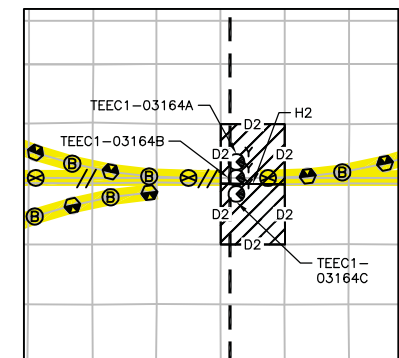
ALD-02521

(A) A-2-1/C #8 (5KV) TLE2,  
2-1/C #8 (5KV) TLS2  
(B) B-SPARE

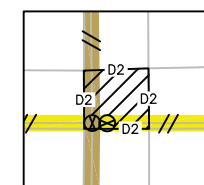
ALD-02522

(A) A-2-1/C #8 (5KV) TLE2,  
2-1/C #8 (5KV) TLS2,  
2-1/C #8 (5KV) TMS3,  
2-1/C #8 (5KV) TMS3  
(B) B-SPARE

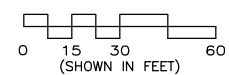
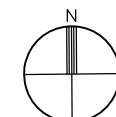
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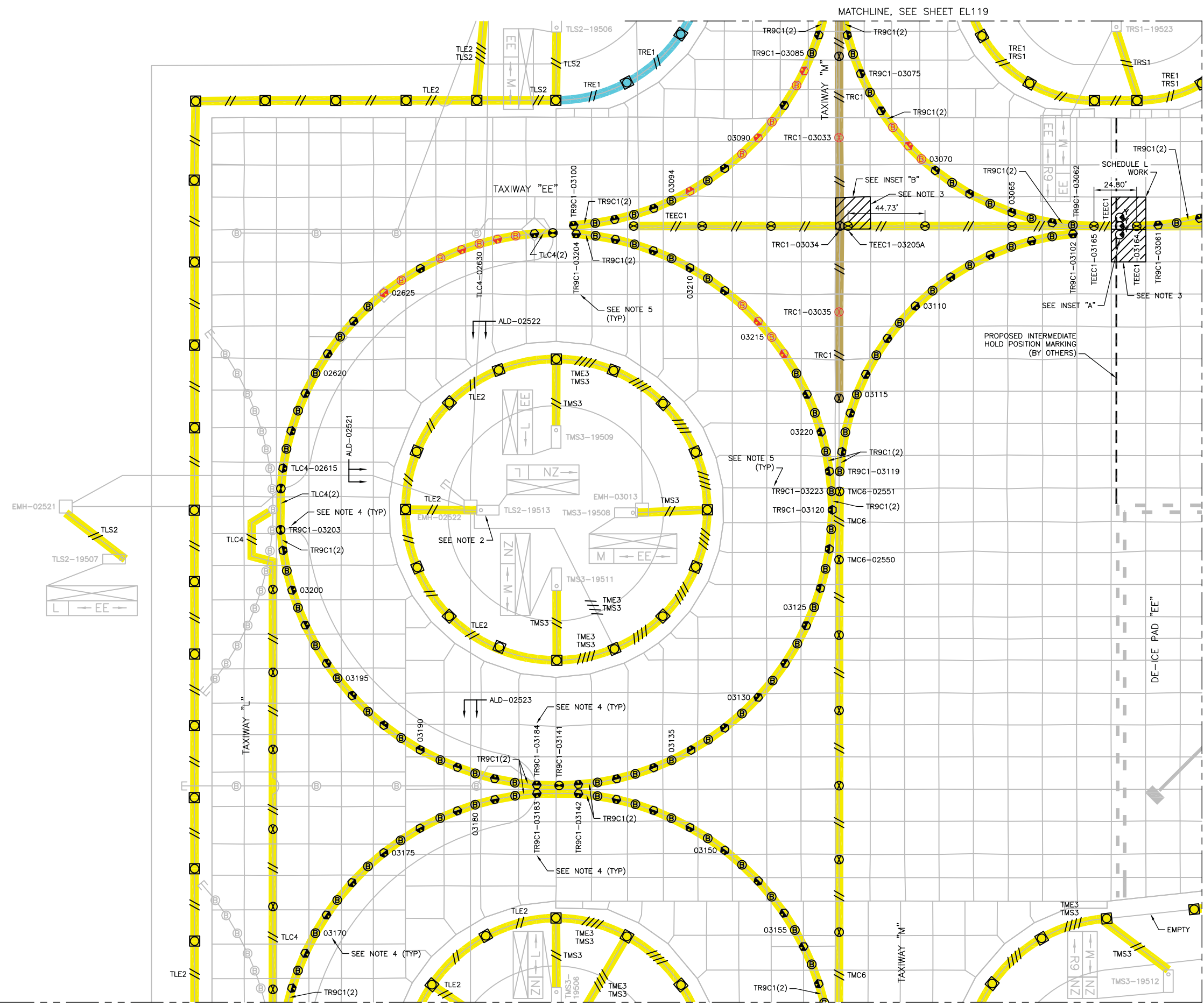
INSET "A"



INSET "B"

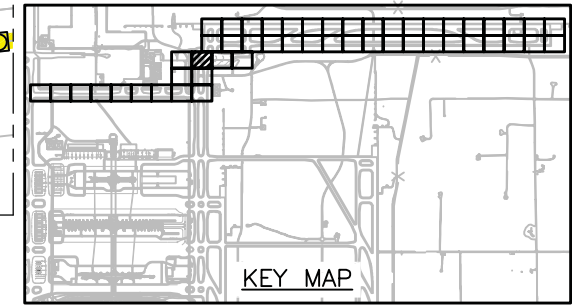


MATCHLINE STA 102+50.00, SEE SHEET EL138



MATCHLINE, SEE SHEET EL140

MATCHLINE, SEE SHEET EL119



KEY MAP

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NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | SJ  | CONST | 07JA14  | MS   |      |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

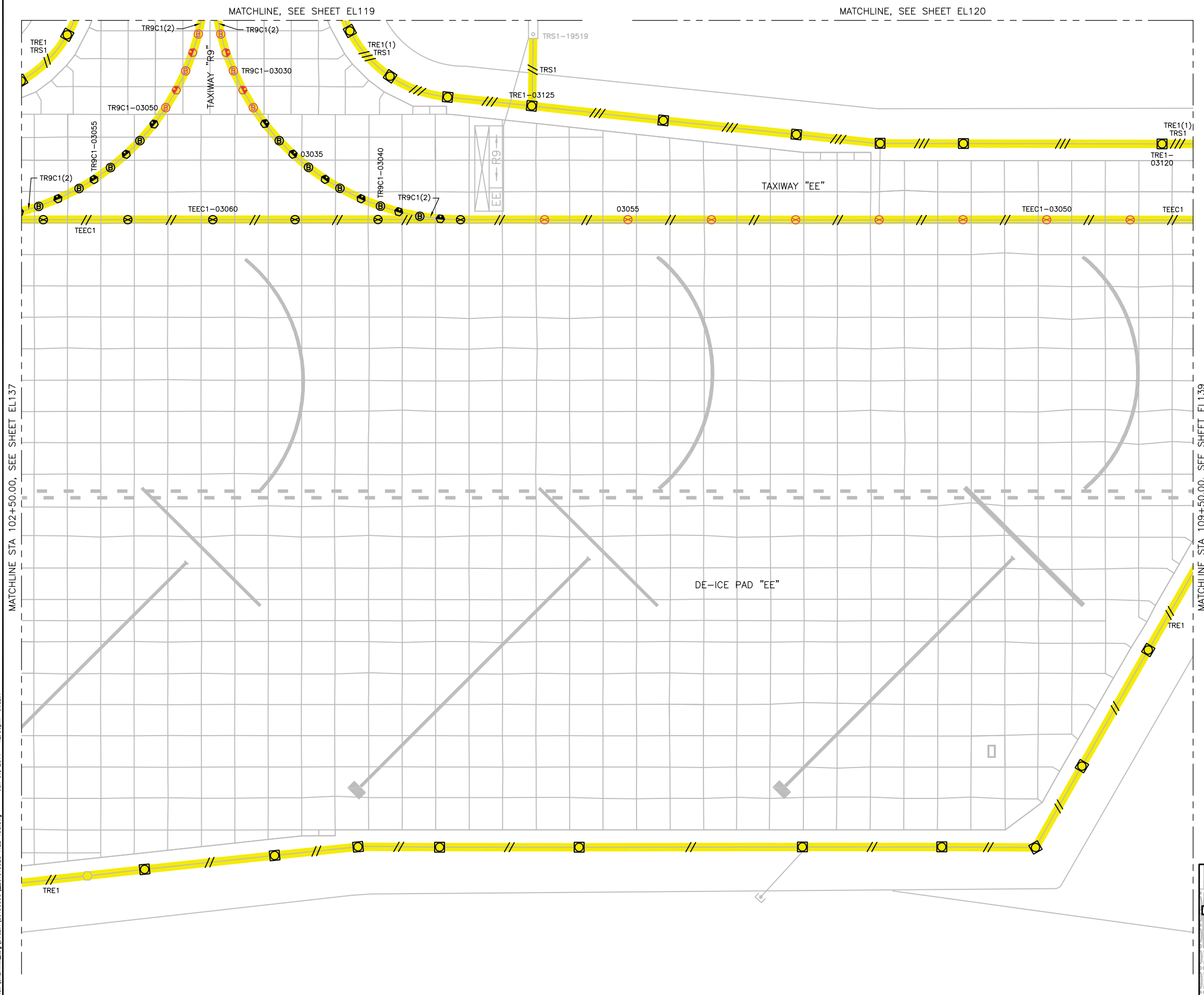
**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO.

**EL138**

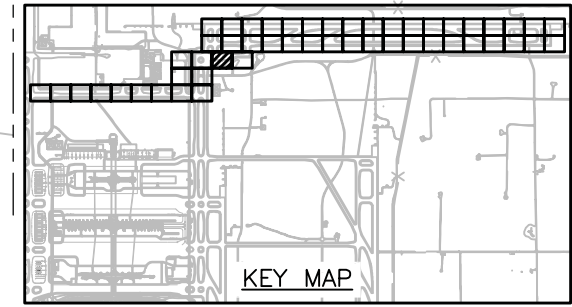
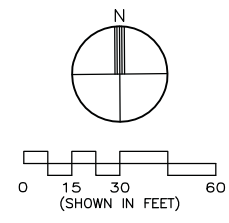
72 OF 115

CADD FILE NO. \_201313528-1EL-138-A



MATCHLINE STA 109+50.00, SEE SHEET EL139

MATCHLINE STA 102+50.00, SEE SHEET EL137



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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/14/14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO. EL139

73 OF 115

CADD FILE NO. \_201313528-1E1-139-A

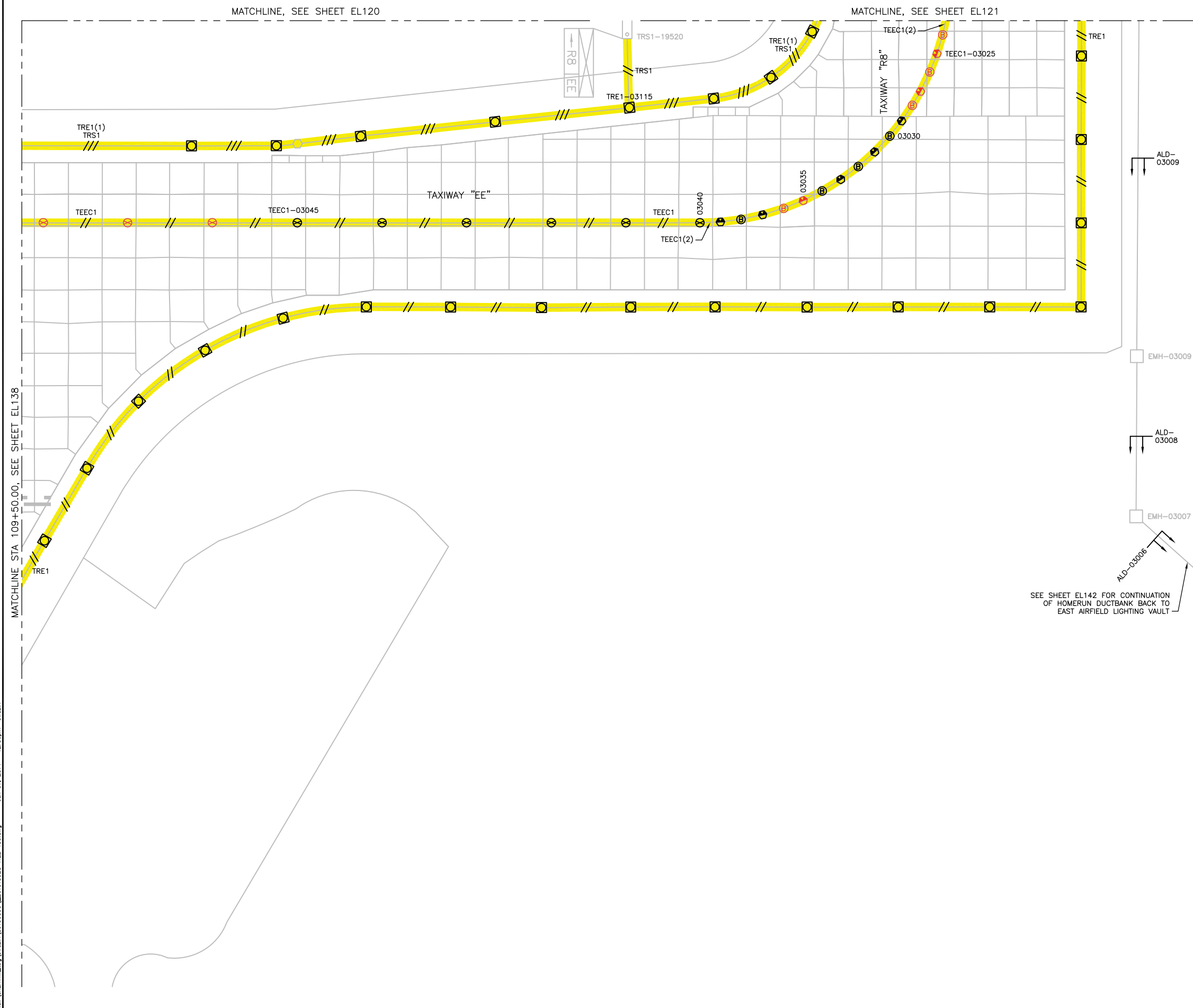
ISSUED FOR CONSTRUCTION

**NOTE:**  
1. SEE SHEET ELO01 FOR ELECTRICAL NOTES AND SHEET ELO02 FOR LEGEND AND CIRCUIT INFORMATION.

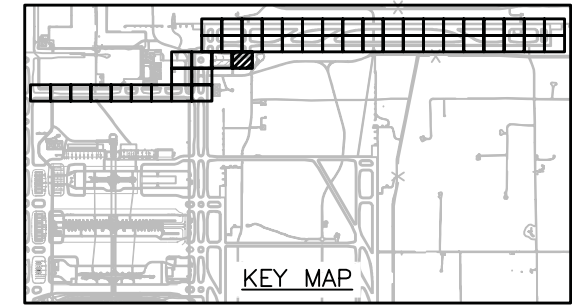
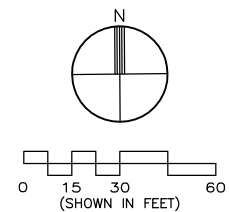
- A- SPARE
- B- SPARE
- C- SPARE
- D- 3-1/C #8 (5KV) TRCP
- E- 2-1/C #8 (5KV) R8E,
- 2-1/C #8 (5KV) R8C1,
- 2-1/C #8 (5KV) R8C2,
- 2-1/C #8 (5KV) R8TDZ
- F- 2-1/C #8 (5KV) TRC1,
- 2-1/C #8 (5KV) TRC2,
- 2-1/C #8 (5KV) TRS1,
- 2-1/C #8 (5KV) TREC1
- G- 2-1/C #8 (5KV) TRE2,
- 2-1/C #8 (5KV) TRC3,
- 2-1/C #8 (5KV) TRC4,
- 2-1/C #8 (5KV) TRS2
- H- 2-1/C #8 (5KV) RDRWC,
- 2-1/C #8 (5KV) TRSB,
- 2-1/C #8 (5KV) TRWW



ALD-03006, ALD-03008, ALD-03009



SEE SHEET EL142 FOR CONTINUATION  
OF HOMERUN DUCTBANK BACK TO  
EAST AIRFIELD LIGHTING VAULT



MATCHLINE STA 109+50.00, SEE SHEET EL138

MATCHLINE, SEE SHEET EL120

MATCHLINE, SEE SHEET EL121

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/14/14 | MS   |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO.  
**EL 140**  
74 OF 115  
CADD FILE NO.  
\_201313528-1EL-140-A

**NOTES:**

- SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
- INSTALL NEW FIXTURE ID MARKERS FOR TAXIWAY CENTERLINE FIXTURES LEADING FROM TAXIWAY "L" TO TAXIWAY "ZN".

**(A)(B)**  
A-2-1/C #8 (5KV) TLE2,  
2-1/C #8 (5KV) TLS2,  
2-1/C #8 (5KV) TMS3,  
2-1/C #8 (5KV) TMS3  
B-SPARE

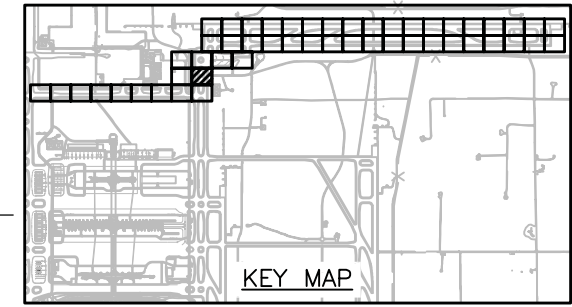
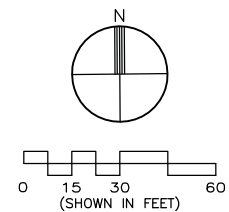
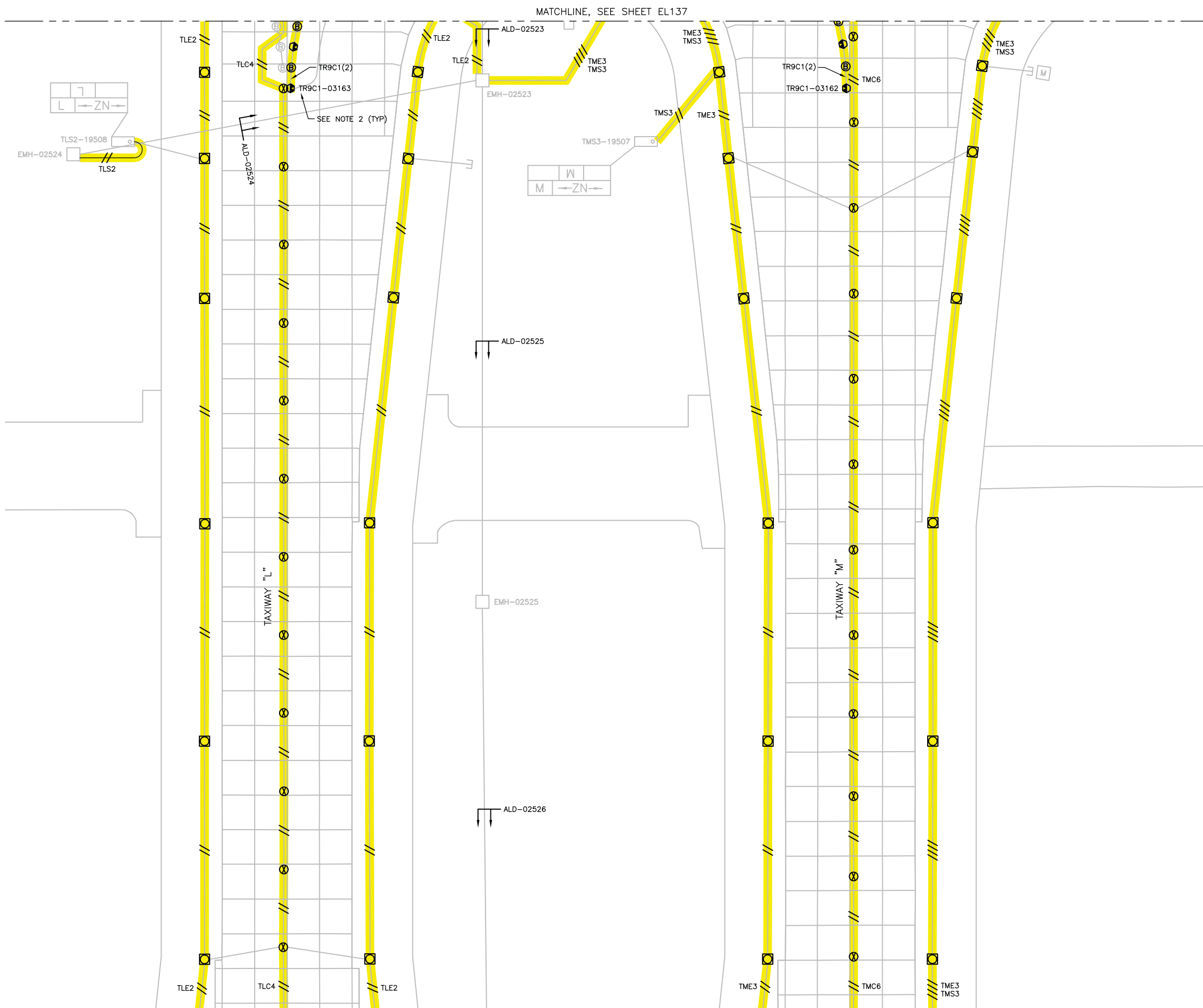
ALD-02523

**(A)(B)**  
A-2-1/C #8 (5KV) TLS2  
B-SPARE

ALD-02524

**(A)(B)**  
A-2-1/C #8 (5KV) TLS2,  
2-1/C #8 (5KV) TMS3  
B-SPARE

ALD-02525, ALD-02526



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MATCHLINE, SEE SHEET EL140

NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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A-2-1/C #8 (5KV) TKE2,  
2-1/C #8 (5KV) TLE2,  
2-1/C #8 (5KV) TLS2,  
2-1/C #8 (5KV) TWCE2,  
2-1/C #8 (5KV) TXC1,  
2-1/C #8 (5KV) TZE1  
B-SPARE

(A)(B)

ALD-02520

A-2-1/C #8 (5KV) TLS2,  
2-1/C #8 (5KV) TMS3  
B-SPARE

(A)(B)

ALD-02526

A-SPARE  
B-SPARE  
C-2-1/C #8 (5KV) TLE2,  
2-1/C #8 (5KV) TLS2,  
2-1/C #8 (5KV) TMC6,  
2-1/C #8 (5KV) TME3,  
2-1/C #8 (5KV) TMS3  
D-2-1/C #8 (5KV) TKE2,  
2-1/C #8 (5KV) TWCE2,  
2-1/C #8 (5KV) TXC1,  
2-1/C #8 (5KV) TZE1

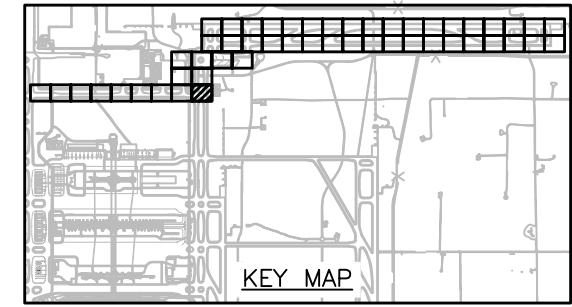
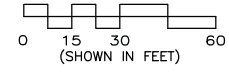
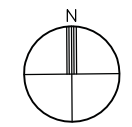
(A)(B)  
(C)(D)

ALD-02527



MATCHLINE STA 95+50.00, SEE SHEET EL208

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | SJ  | CONST | 07JA14  | MS   |      |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

**AIRFIELD  
ELECTRICAL PLAN**  
SHEET NO.  
**EL141**  
75 OF 115  
CADD FILE NO.  
\_201313528-1EL-141-A

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE   | CHKD |
|-----|----|---------|--------|------|
| 1   | SJ | CONST   | 07JA14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO.

EL 142

76 OF 115

CADD FILE NO.

\_201313528-1EL-142-A

**NOTE:**

1. SEE SHEET ELO01 FOR ELECTRICAL NOTES AND SHEET ELO02 FOR LEGEND AND CIRCUIT INFORMATION.

- A-SPARE
- B-SPARE
- C-SPARE
- D-3-1/C #8 (5KV) TRCP
- E-2-1/C #8 (5KV) RBE,
- 2-1/C #8 (5KV) R8C1,
- 2-1/C #8 (5KV) R8C2,
- 2-1/C #8 (5KV) R8TDZ
- F-2-1/C #8 (5KV) TRC1,
- 2-1/C #8 (5KV) TRC2,
- 2-1/C #8 (5KV) TRE1,
- 2-1/C #8 (5KV) TRS1,
- 2-1/C #8 (5KV) TEEC1
- G-2-1/C #8 (5KV) TRE2,
- 2-1/C #8 (5KV) TRC3,
- 2-1/C #8 (5KV) TRC4,
- 2-1/C #8 (5KV) TRS2
- H-2-1/C #8 (5KV) RDRWC,
- 2-1/C #8 (5KV) TRSB,
- 2-1/C #8 (5KV) TRWW



ALD-03001 TO ALD-03005,  
ALD-03101 TO ALD-03104

- A-SPARE
- B-SPARE
- C-2-1/C #8 (5KV) TEDC1,
- 2-1/C #8 (5KV) TEDP7E1,
- 2-1/C #8 (5KV) TP7C1,
- 2-1/C #8 (5KV) TPS2
- D-3-1/C #8 (5KV) TRCP
- E-2-1/C #8 (5KV) RBE,
- 2-1/C #8 (5KV) R8C1,
- 2-1/C #8 (5KV) R8C2,
- 2-1/C #8 (5KV) R8TDZ
- F-2-1/C #8 (5KV) TRC1,
- 2-1/C #8 (5KV) TRC2,
- 2-1/C #8 (5KV) TRE1,
- 2-1/C #8 (5KV) TRS1,
- 2-1/C #8 (5KV) TEEC1
- G-2-1/C #8 (5KV) TRE2,
- 2-1/C #8 (5KV) TRC3,
- 2-1/C #8 (5KV) TRC4,
- 2-1/C #8 (5KV) TRS2
- H-2-1/C #8 (5KV) RDRWC,
- 2-1/C #8 (5KV) TRSB,
- 2-1/C #8 (5KV) TRWW

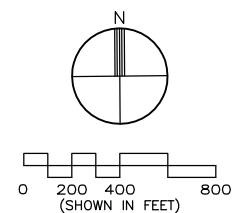
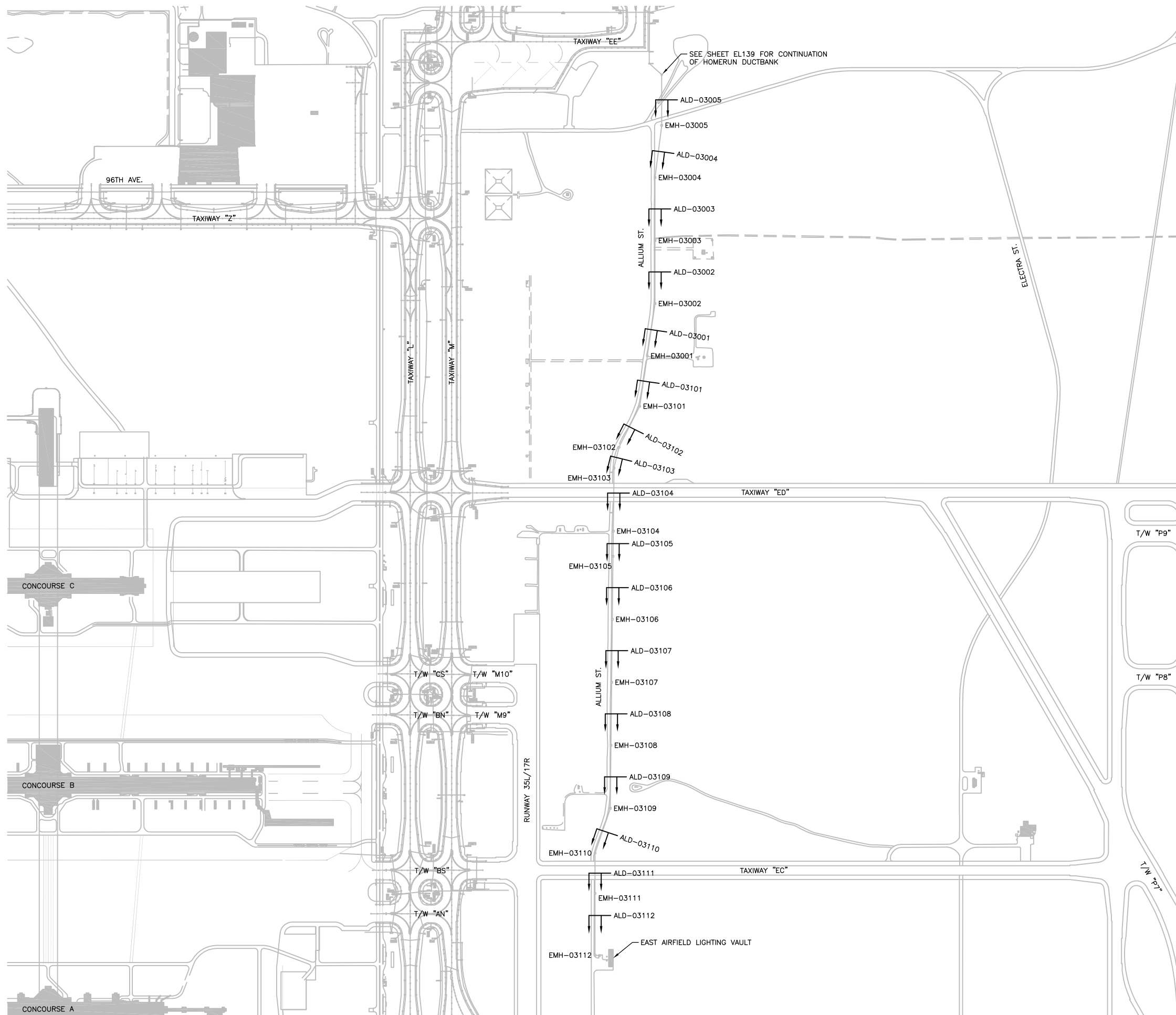


ALD-03105 TO ALD-03111

- A-SPARE
- B-2-1/C #8 (5KV) TECE1,
- 2-1/C #8 (5KV) TECC2,
- 2-1/C #8 (5KV) TECSB4,
- 2-1/C #8 (5KV) TECSB5
- C-2-1/C #8 (5KV) TEDC1,
- 2-1/C #8 (5KV) TEDP7E1,
- 2-1/C #8 (5KV) TP7C1,
- 2-1/C #8 (5KV) TPS2
- D-3-1/C #8 (5KV) TRCP
- E-2-1/C #8 (5KV) RBE,
- 2-1/C #8 (5KV) R8C1,
- 2-1/C #8 (5KV) R8C2,
- 2-1/C #8 (5KV) R8TDZ
- F-2-1/C #8 (5KV) TRC1,
- 2-1/C #8 (5KV) TRC2,
- 2-1/C #8 (5KV) TRE1,
- 2-1/C #8 (5KV) TRS1,
- 2-1/C #8 (5KV) TEEC1
- G-2-1/C #8 (5KV) TRE2,
- 2-1/C #8 (5KV) TRC3,
- 2-1/C #8 (5KV) TRC4,
- 2-1/C #8 (5KV) TRS2
- H-2-1/C #8 (5KV) RDRWC,
- 2-1/C #8 (5KV) TRSB,
- 2-1/C #8 (5KV) TRWW



ALD-03112



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NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE     | CHKD |
|--------------|-----|-------|---------|----------|------|
| 1            | SJ  | CONST |         | 07/14/14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

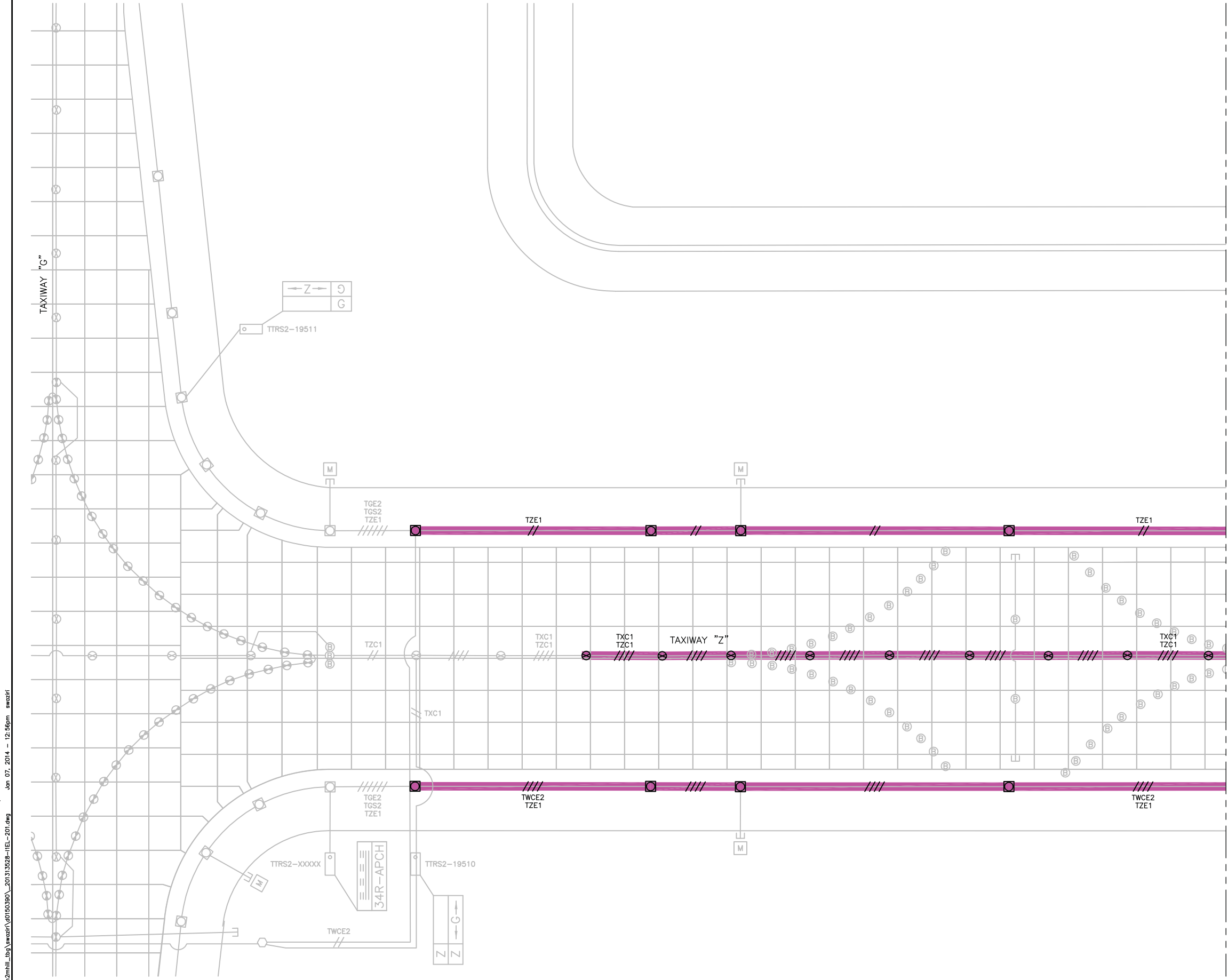
**AIRFIELD  
ELECTRICAL PLAN**

SHEET NO. EL201

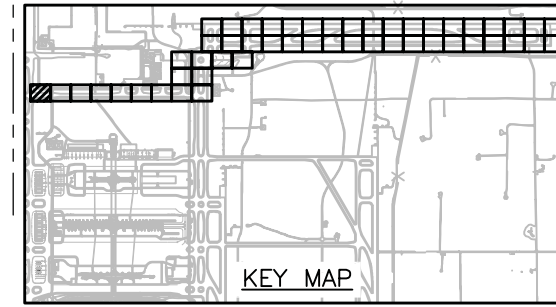
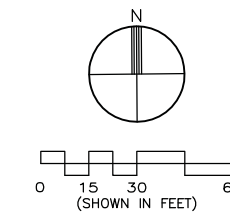
77 OF 115

CADD FILE NO. \_201313528-1EL-201-A

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MATCHLINE STA 46+50.00. SEE SHEET EL202



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NOTE:  
 1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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RUNWAY 8-26  
 COMPLEX LIGHTING  
 REHABILITATION

**CH2MHILL**

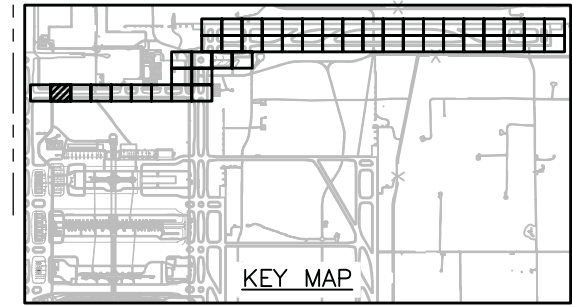
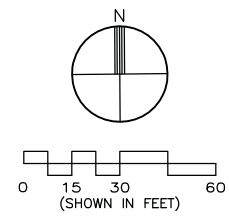
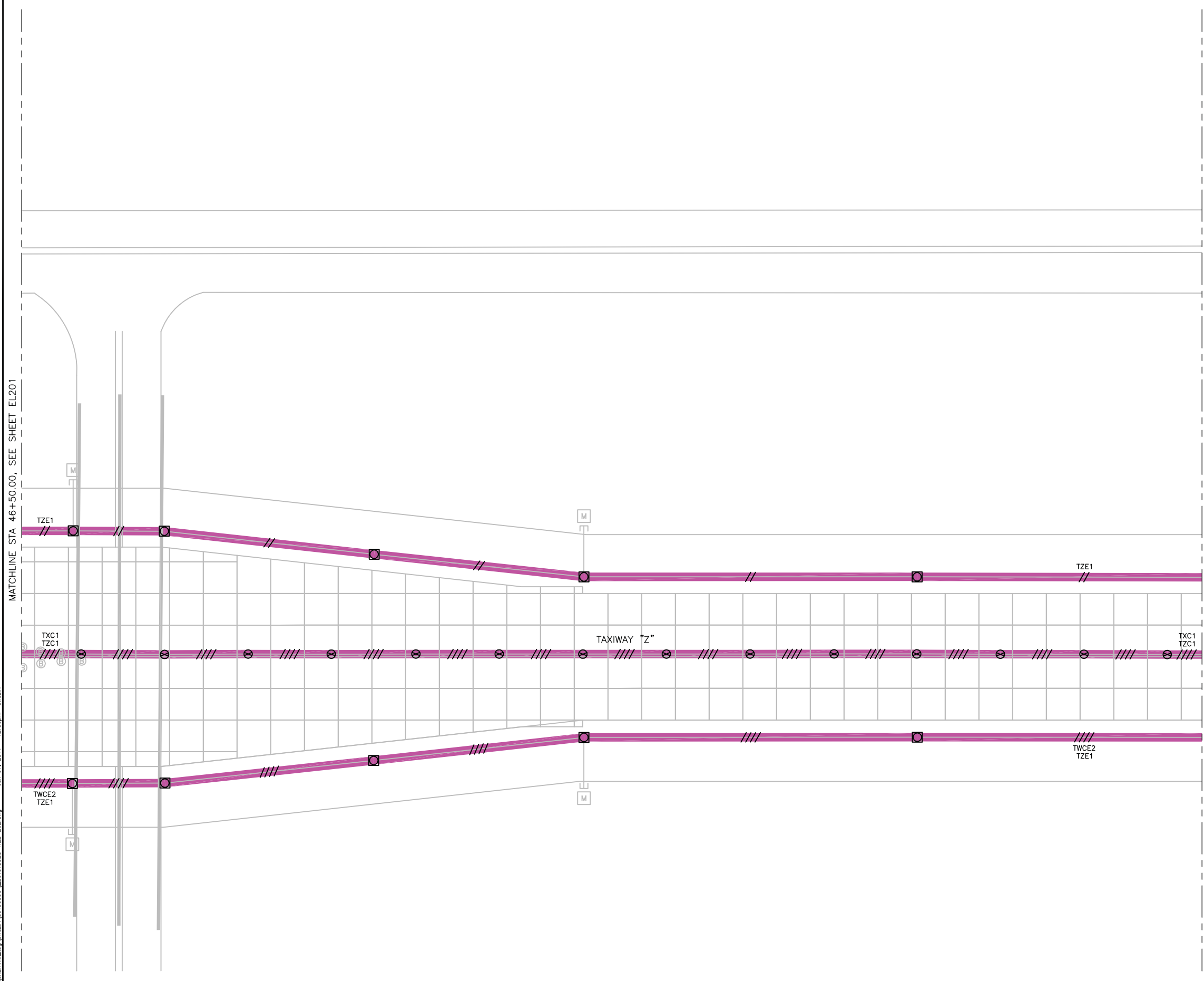
| ISSUE RECORD | NO. | BY    | PURPOSE | DATE     | CHKD |
|--------------|-----|-------|---------|----------|------|
| 1            | SJ  | CONST |         | 07/14/14 | MS   |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

AIRFIELD  
 ELECTRICAL PLAN

SHEET NO.  
 EL202  
 78 OF 115  
 CADD FILE NO.  
 \_201313528-11EL-202-A

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**RUNWAY 8-26  
 COMPLEX LIGHTING  
 REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE   | CHKD |
|-----|----|---------|--------|------|
| 1   | SJ | CONST   | 07JA14 | MS   |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

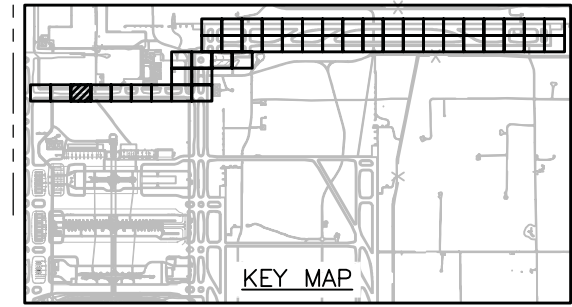
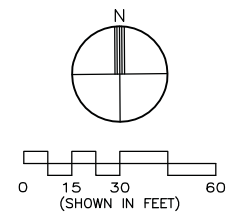
**AIRFIELD  
 ELECTRICAL PLAN**

SHEET NO.  
**EL203**  
 79 OF 115  
 CADD FILE NO.  
 \_201313528-1EL-203-A



MATCHLINE STA 53+50.00. SEE SHEET EL202

MATCHLINE STA 60+50.00. SEE SHEET EL204



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NOTE:  
 1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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RUNWAY 8-26  
 COMPLEX LIGHTING  
 REHABILITATION

**CH2MHILL**

| NO. | BY | PURPOSE | DATE   | CHKD |
|-----|----|---------|--------|------|
| 1   | SJ | CONST   | 07JA14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

AIRFIELD  
 ELECTRICAL PLAN

SHEET NO. EL204

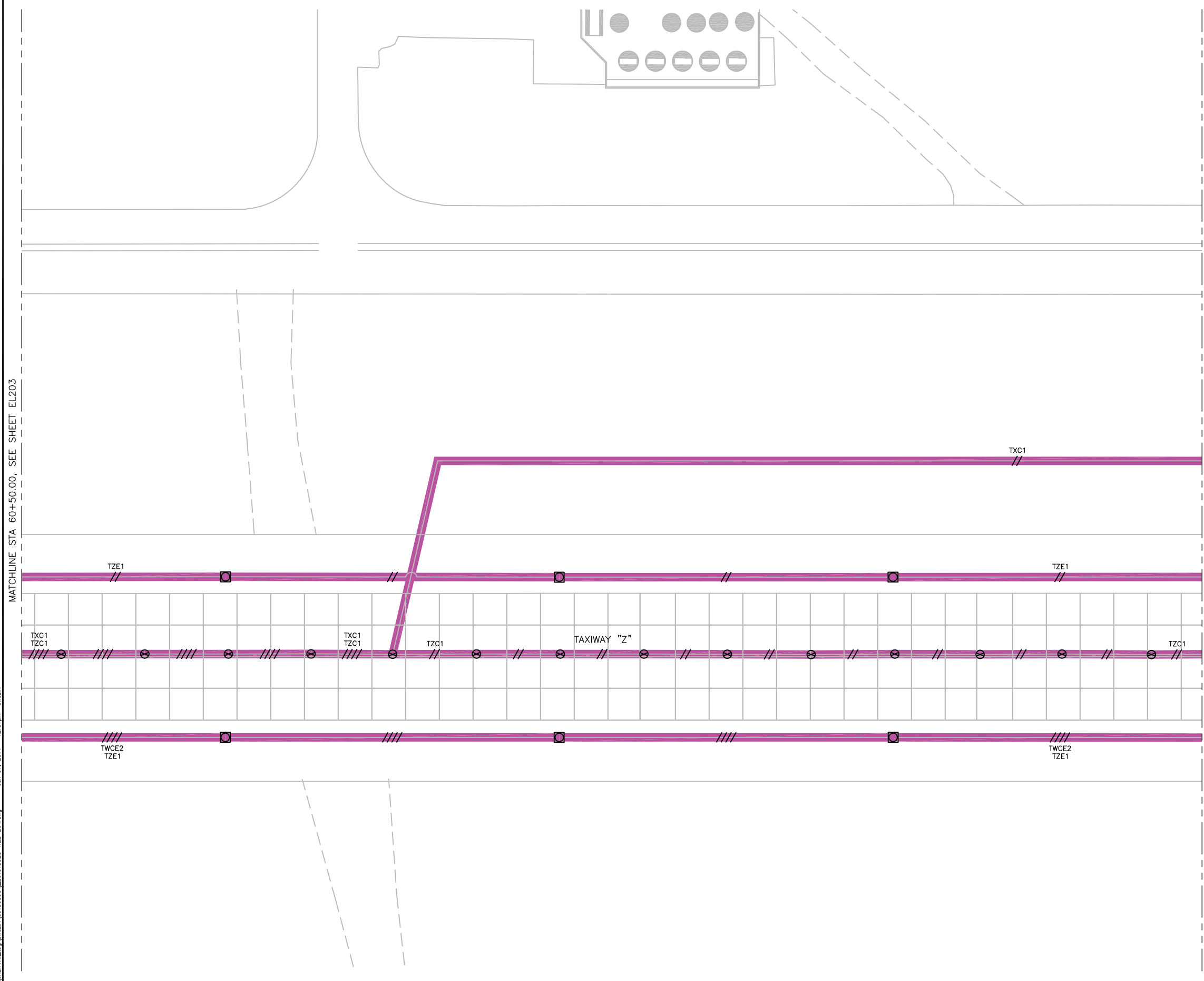
80 OF 115

CADD FILE NO. \_201313528-1EL-204-A

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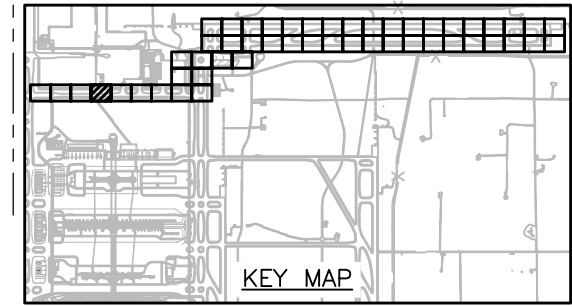
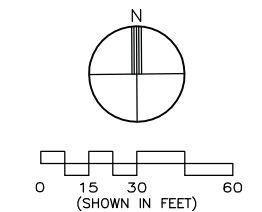
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MATCHLINE STA 60+50.00, SEE SHEET EL203

MATCHLINE STA 67+50.00, SEE SHEET EL205



NOTE:  
 1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

ⓐⓑ A-2-1/C #8 (5KV) TXC1  
 B-SPARE

ALD-02551, ALD-02552

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RUNWAY 8-26  
 COMPLEX LIGHTING  
 REHABILITATION

**CH2MHILL**

| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/JA/14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

AIRFIELD  
 ELECTRICAL PLAN

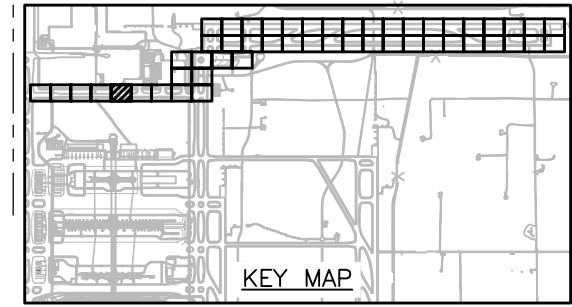
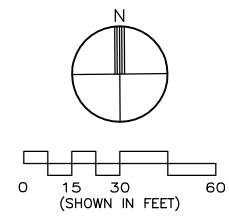
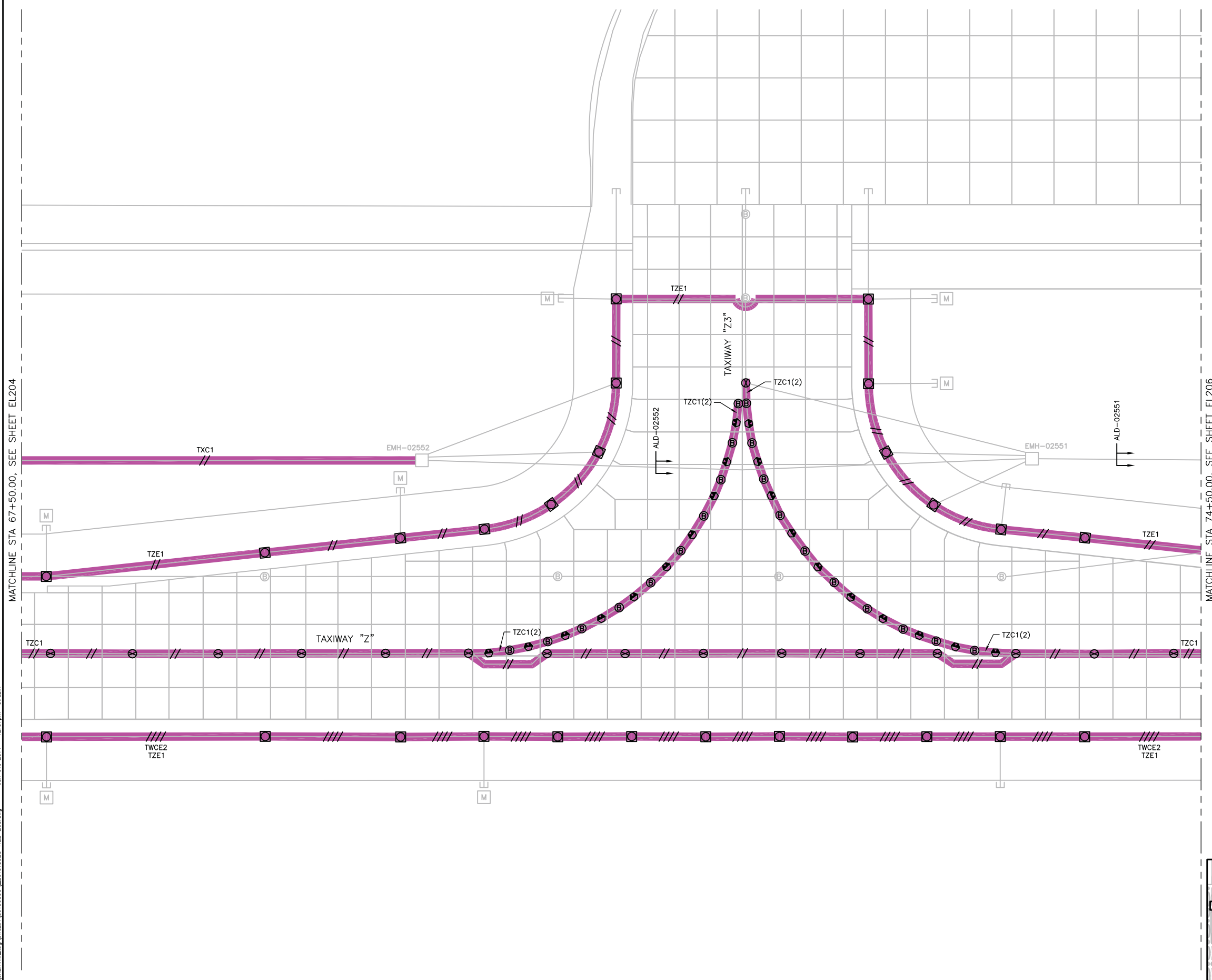
SHEET NO.

EL205

81 OF 115

CADD FILE NO. \_201313528-1EL-205-A

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KEY MAP

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**



| ISSUE RECORD | NO. | BY    | PURPOSE | DATE     | CHKD |
|--------------|-----|-------|---------|----------|------|
| 1            | SJ  | CONST |         | 07/JA/14 | MS   |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

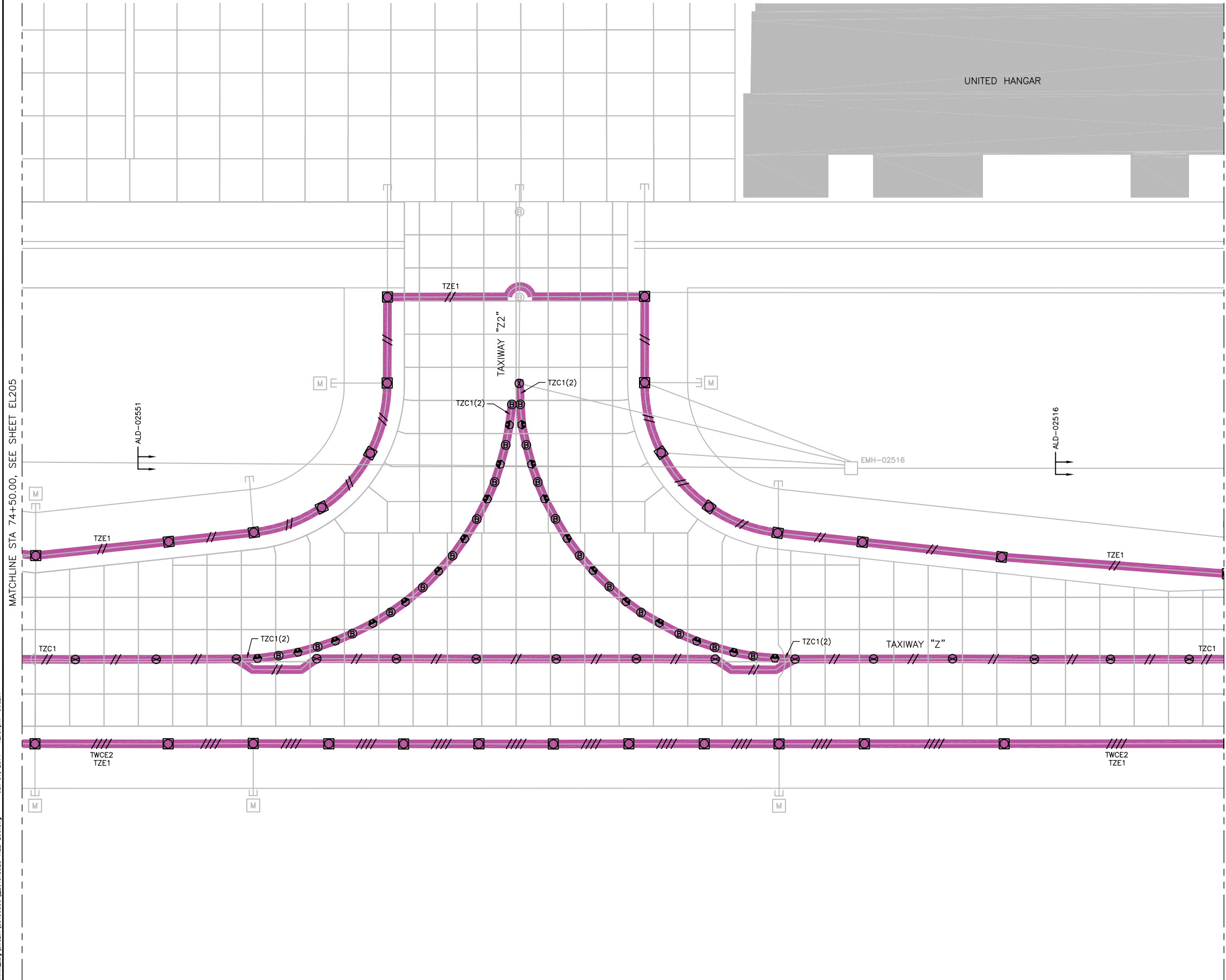
**AIRFIELD  
ELECTRICAL PLAN**

|               |                      |
|---------------|----------------------|
| SHEET NO.     | EL206                |
| 82 OF 115     |                      |
| CADD FILE NO. | _201313528-1EL-206-A |

NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET  
EL002 FOR LEGEND AND CIRCUIT INFORMATION.

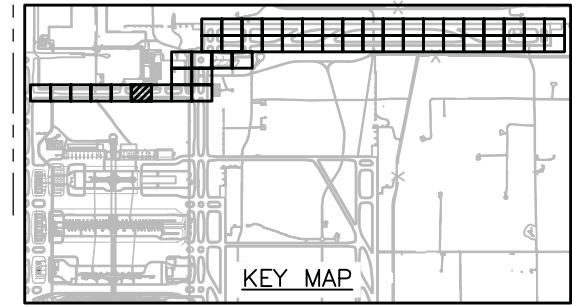
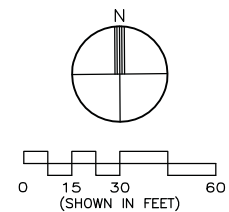
ⓐ ⓑ A-2-1/C #8 (5KV) TXC1  
B-SPARE

ALD-02516, ALD-02551



MATCHLINE STA 74+50.00, SEE SHEET EL205

MATCHLINE STA 81+50.00, SEE SHEET EL207



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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**



| ISSUE RECORD | NO. | BY    | PURPOSE | DATE   | CHKD |
|--------------|-----|-------|---------|--------|------|
| 1            | SJ  | CONST |         | 07JA14 | MS   |

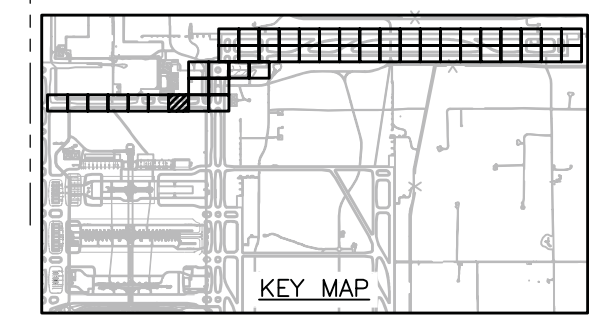
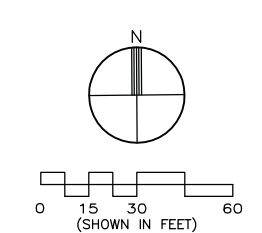
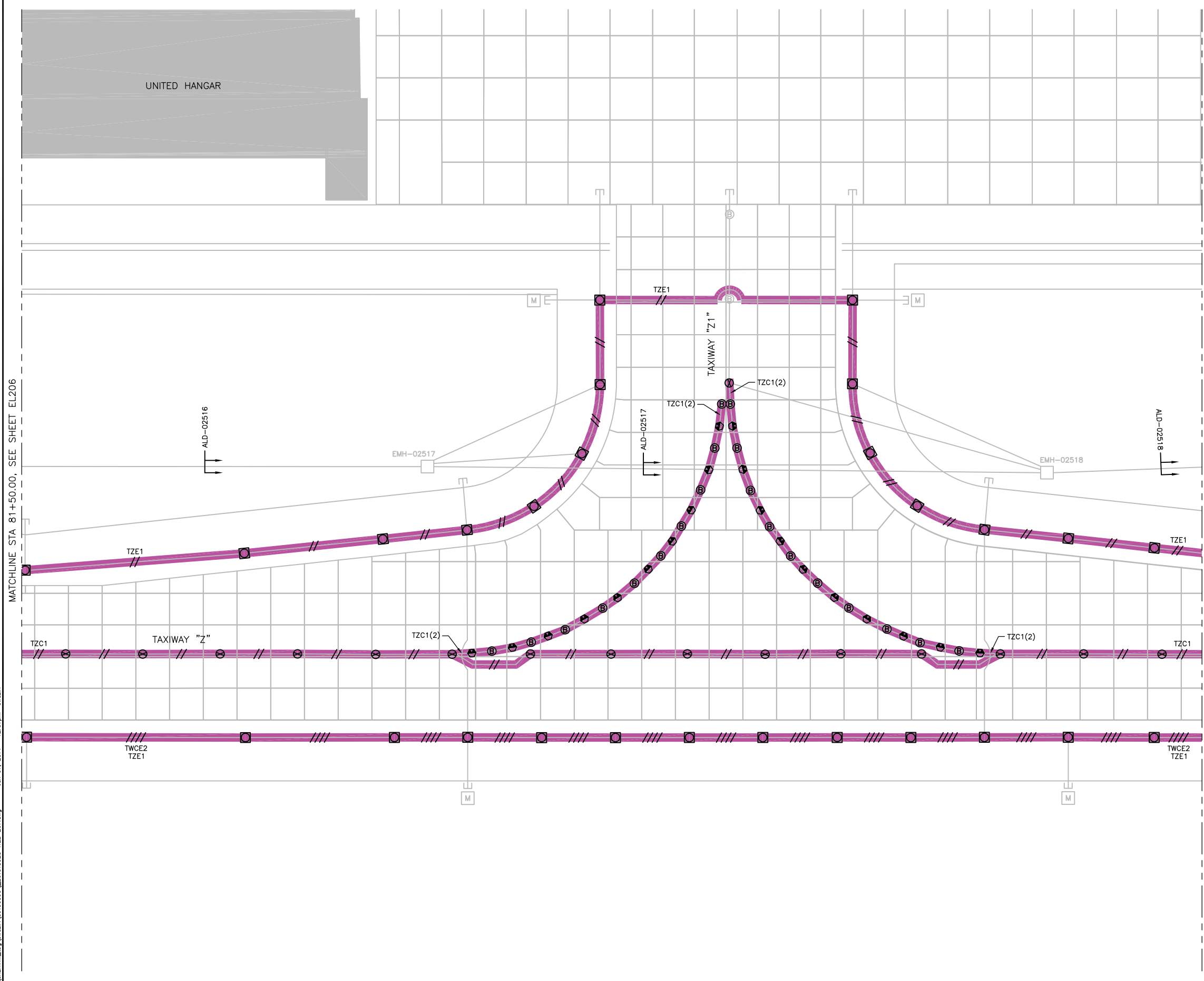
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| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

|                             |
|-----------------------------|
| AIRFIELD<br>ELECTRICAL PLAN |
| SHEET NO.                   |
| EL207                       |
| 83 OF 115                   |
| CADD FILE NO.               |
| _201313528-1EL-207-A        |

NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

ⓐⓑ A-2-1/C #8 (5KV) TXC1  
B-SPARE

ALD-02516, ALD-02517, ALD-02518



MATCHLINE STA 81+50.00, SEE SHEET EL206  
 MATCHLINE STA 88+50.00, SEE SHEET EL208  
 Jan 07, 2014 - 12:57pm swazrl  
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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE   | CHKD |
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| 1   | SJ | CONST   | 07JA14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

AIRFIELD ELECTRICAL PLAN

SHEET NO. EL208

84 OF 115

CADD FILE NO. \_201313528-11EL-208-A

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NOTES:

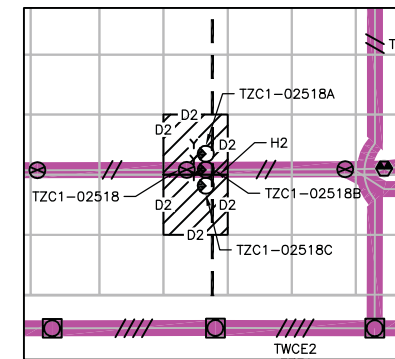
- SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.
- REMOVE AND REPLACE CONCRETE PANEL SURVEY EXISTING LIGHT LOCATION AND ORIENTATION PRIOR TO DEMOLISHING CONCRETE PANEL. REINSTALL NEW LIGHT IN THE SAME LOCATION AND ORIENTATION AS THE ORIGINAL LIGHT. FOR DEMOLITION, SEE SHEET CD001. FOR TYPICAL SECTIONS, SEE SHEET C-301. FOR PAVING DETAILS, SEE SHEETS CP501 THROUGH CP505.

(A)(B) A-2-1/C #8 (5KV) TXC1  
B-SPARE

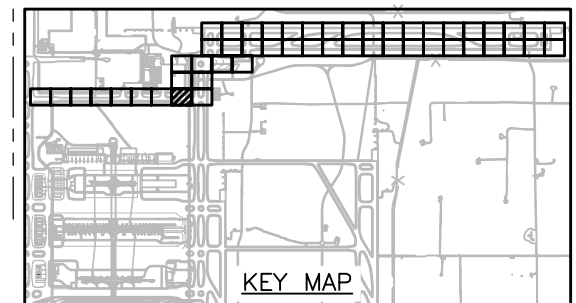
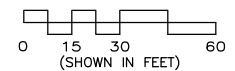
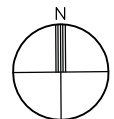
ALD-02518

A-2-1/C #8 (5KV) TLE2,  
2-1/C #8 (5KV) TLS2,  
2-1/C #8 (5KV) TWCE2,  
2-1/C #8 (5KV) TXC1,  
2-1/C #8 (5KV) TZE1  
(A)(B) B-SPARE

ALD-02519, ALD-02520

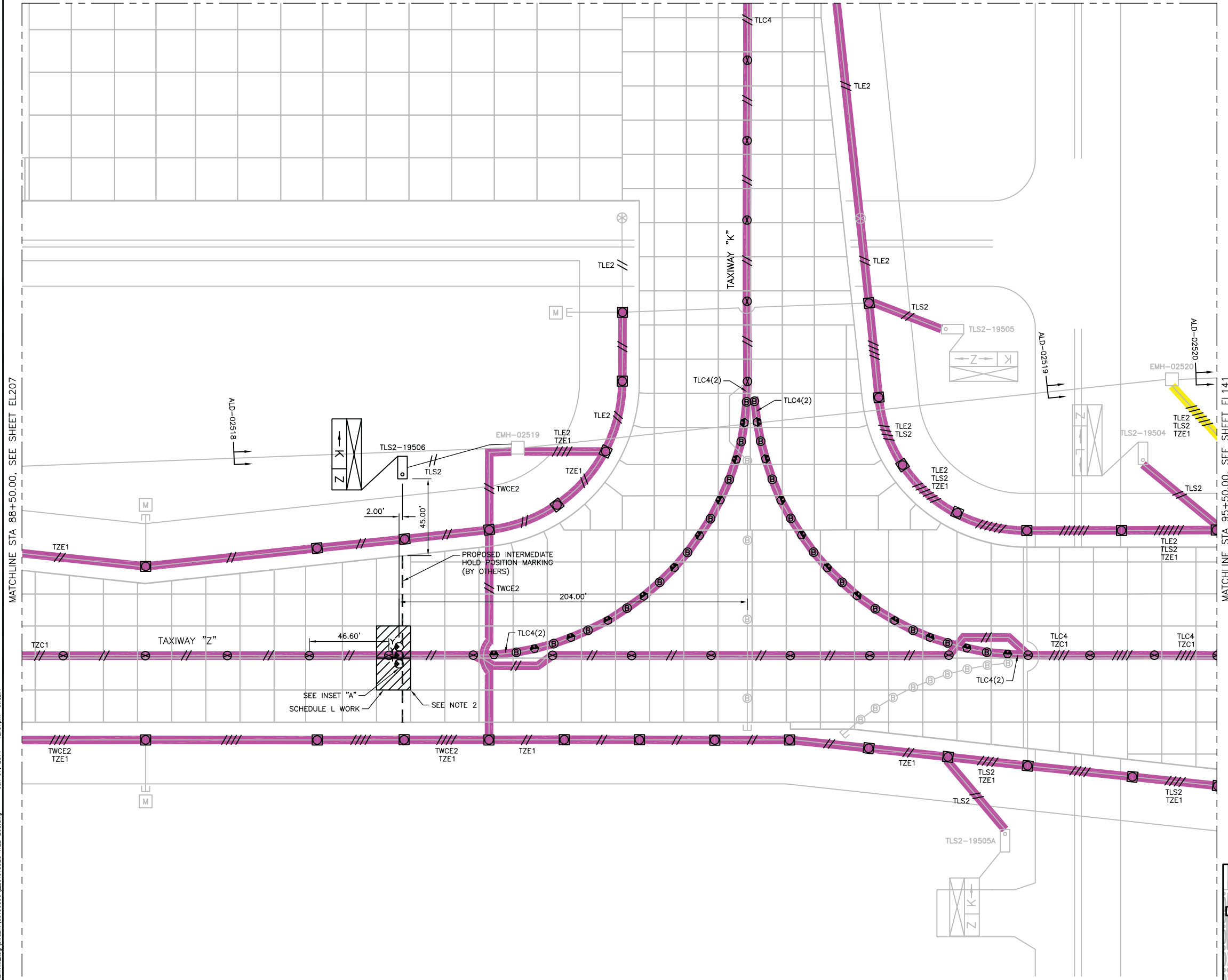


INSET "A"



KEY MAP

MATCHLINE, SEE SHEET EL209



MATCHLINE STA 88+50.00, SEE SHEET EL207

MATCHLINE STA 95+50.00, SEE SHEET EL141

PROPOSED INTERMEDIATE HOLD POSITION MARKING (BY OTHERS)

SEE INSET "A" SCHEDULE L WORK

SEE NOTE 2

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MATCHLINE, SEE SHEET EL210

NOTE:  
1. SEE SHEET EL001 FOR ELECTRICAL NOTES AND SHEET EL002 FOR LEGEND AND CIRCUIT INFORMATION.

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RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

**CH2MHILL**

| NO. | BY | PURPOSE | DATE   | CHKD |
|-----|----|---------|--------|------|
| 1   | SJ | CONST   | 07JA14 | MS   |

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CHECKED BY: M. SOUTHWICK

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DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

AIRFIELD  
ELECTRICAL PLAN

SHEET NO.

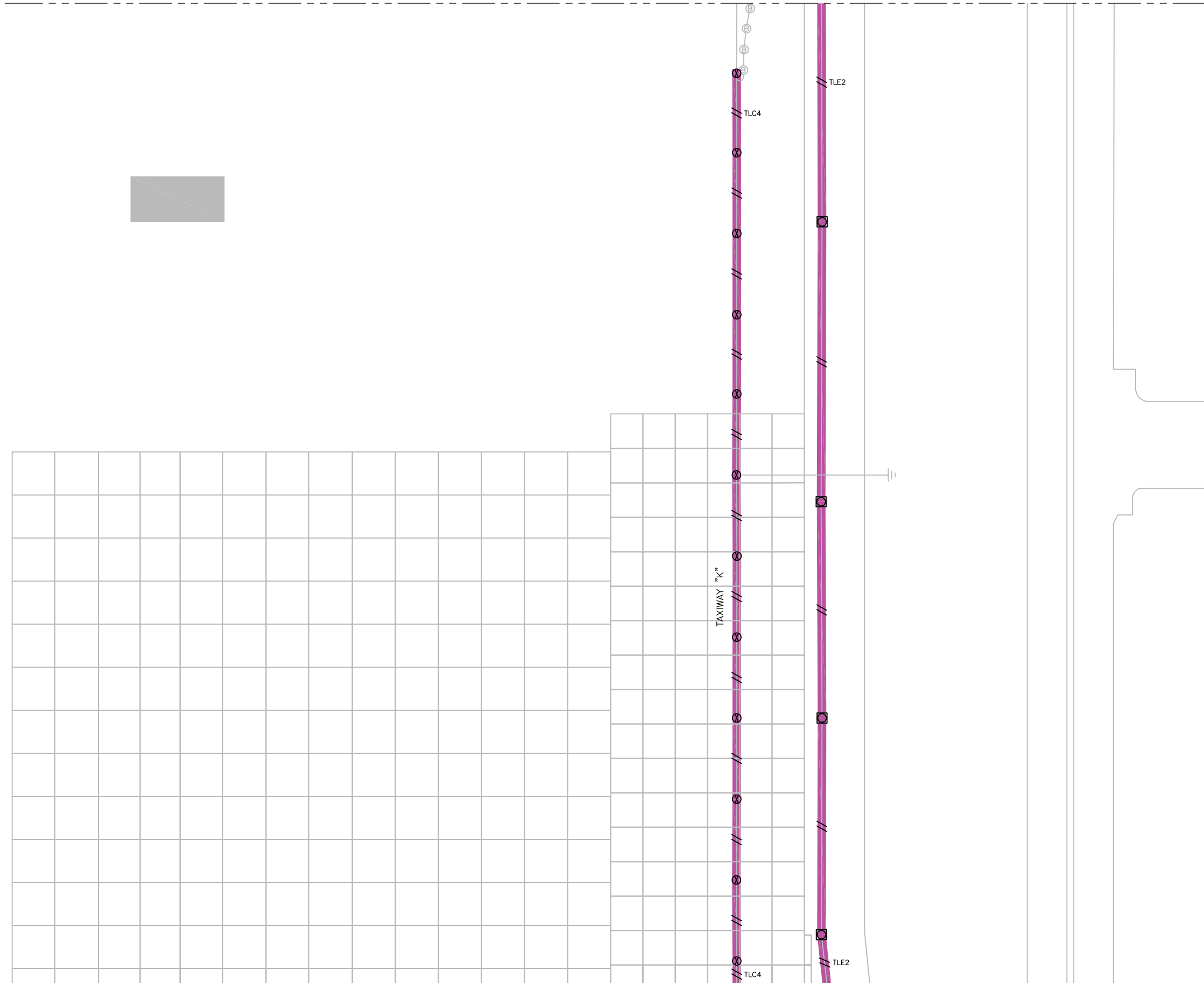
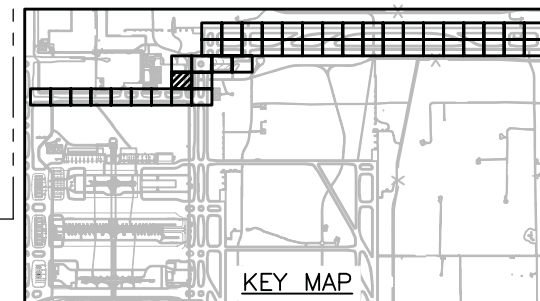
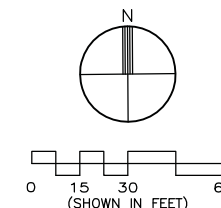
EL209

85 OF 115

CADD FILE NO.  
\_201313528-11EL-209-A

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MATCHLINE STA 95+50.00, SEE SHEET EL140



MATCHLINE, SEE SHEET EL208

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NOTE:  
 1. SEE SHEET ELO01 FOR ELECTRICAL NOTES AND SHEET ELO02 FOR LEGEND AND CIRCUIT INFORMATION.

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RUNWAY 8-26  
 COMPLEX LIGHTING  
 REHABILITATION

**CH2MHILL**

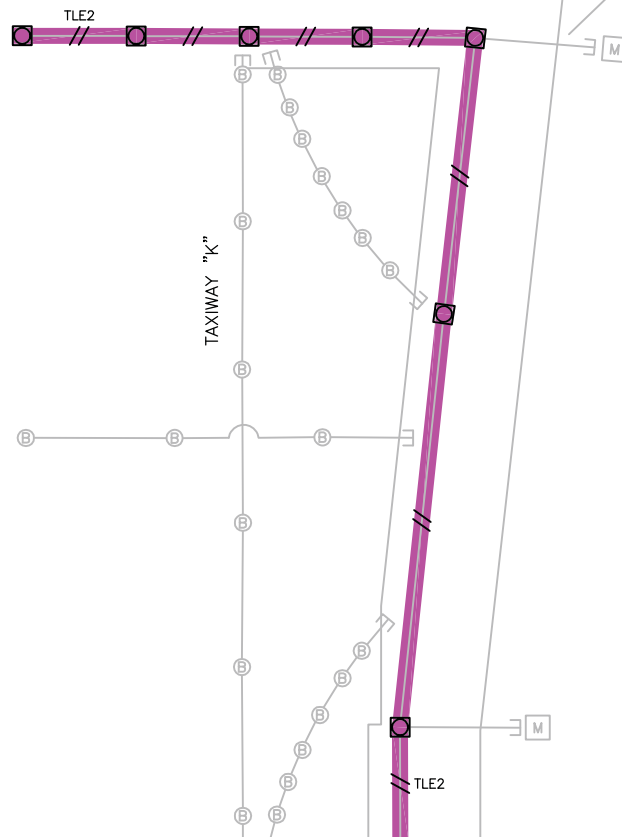
| NO. | BY | PURPOSE | DATE   | CHKD |
|-----|----|---------|--------|------|
| 1   | SJ | CONST   | 07JA14 | MS   |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

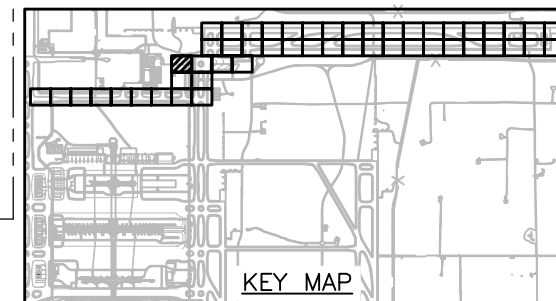
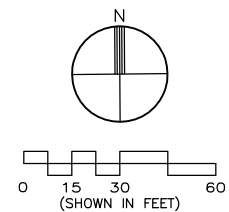
AIRFIELD  
 ELECTRICAL PLAN

SHEET NO.  
 EL210  
 86 OF 115  
 CADD FILE NO.  
 \_201313528-1EL-210-A

MATCHLINE STA 95+50.00, SEE SHEET EL137

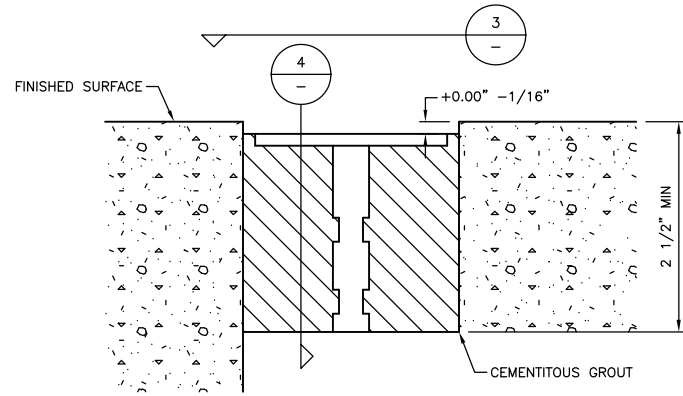
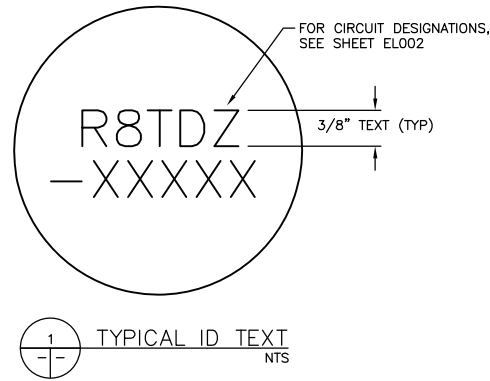


MATCHLINE, SEE SHEET EL209



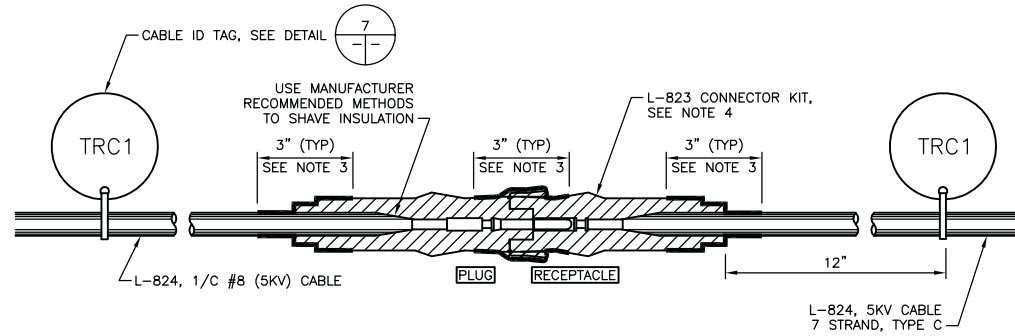
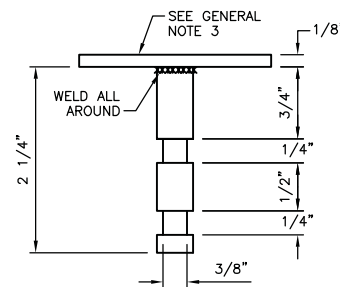
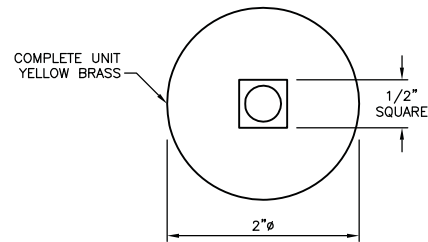
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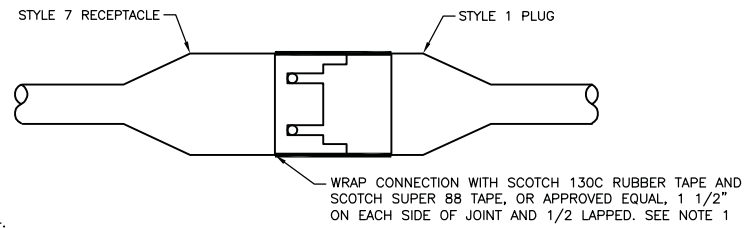
NOTE:

1. INSTALL ID MARKERS BY DRILLING IN AFTER CONCRETE HAS SET.



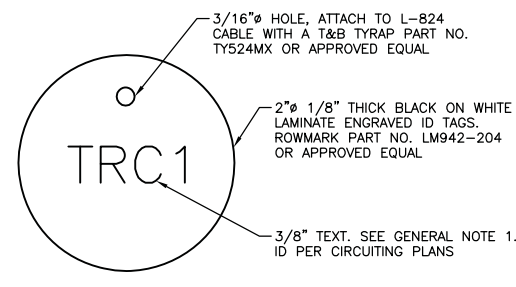
- NOTES:
1. THE CABLE SHALL BE THOROUGHLY CLEANED PRIOR TO THE INSTALLATION OF THE L-823 CONNECTOR KIT.
  2. INSTALLATION OF THE PIN/RECEPTACLE SHALL BE COMPLETED WITH "CRIMPING" TOOL SUPPLIED OR RECOMMENDED BY THE MANUFACTURER AND DESIGNED FOR THIS SPECIFIC PURPOSE.
  3. ALL FIELD MADE JOINTS SHALL BE WRAPPED WITH 3" OF SCOTCH 130C RUBBER TAPE AND HELD IN PLACE WITH SCOTCH SUPER 88 TAPE, OR APPROVED EQUAL, 1 1/2" ON EACH SIDE OF JOINT AND HALF LAPPED.
  4. PROVIDE CONNECTOR KITS THAT INCLUDE AN INTEGRAL FLAP/BOOT TO SEAL THE JOINT BETWEEN THE PLUG AND RECEPTACLE. WRAP JOINT WITH RUBBER TAPE.
  5. CONTRACTOR SHALL REMOVE AMERACE CABLE SPREADER PRIOR TO INSTALLATION OR BE HELD IN PLACE WITH CABLE ID ZIP TIE TO PREVENT IT FROM ENTERING THE CONDUIT.
  6. SPLICE THE RETURN CONDUCTOR IF IN SAME CONDUIT WITH THE SUPPLY CONDUCTOR AT FIXTURE LOCATIONS ENDING WITH 5 OR 0. CONTRACTOR SHALL SPLICE ONLY WHEN REQUIRED. LOCATIONS OF RETURN SPLICE ARE TO BE AS-BUILT.

5 TYPICAL L-824 (5KV) CABLE CONNECTOR DETAIL NTS

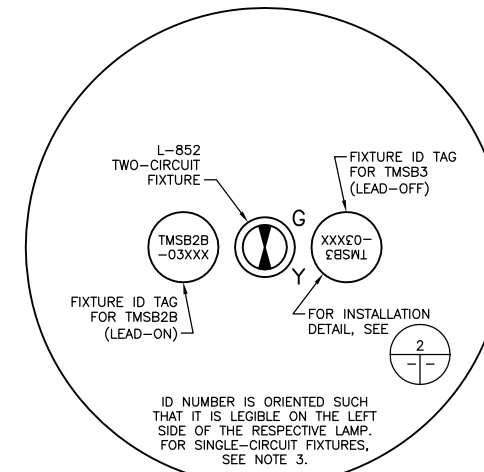


- NOTE:
1. CONTRACTOR SHALL INSTALL TAPE ON CONNECTION BETWEEN THE SECONDARY OF ISOLATION TRANSFORMER AND EXTENSION LEAD FOR SIGNS, INSET FIXTURES, AND BRITE UNITS.

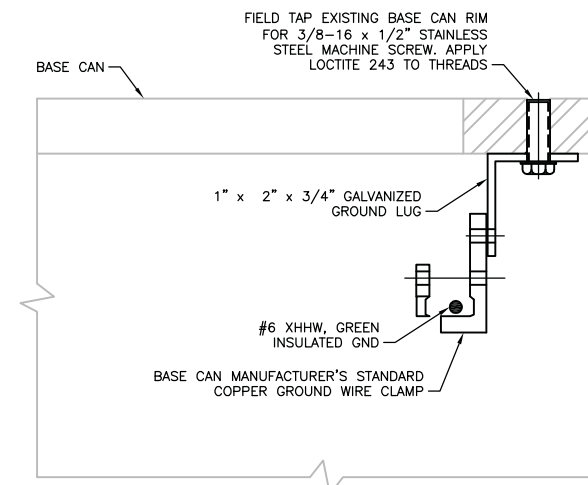
6 SECONDARY CONNECTOR DETAIL NTS



7 TYPICAL L-824 CABLE ID TAG NTS



ID NUMBER IS ORIENTED SUCH THAT IT IS LEGIBLE ON THE LEFT SIDE OF THE RESPECTIVE LAMP. FOR SINGLE-CIRCUIT FIXTURES, SEE NOTE 3.



- NOTES:
1. LENGTH OF #6 INSULATED GROUND CONDUCTOR SHALL BE OF SUFFICIENT LENGTH TO ALLOW THE INSET LIGHT FIXTURE OR BASE PLATE TO BE EASILY SET ASIDE WITHOUT REMOVAL.
  2. AFTER TAPPING OF THE BASE CAN RIM IS COMPLETE, VACUUM OUT ANY DEBRIS AND METAL SHAVINGS FROM THE BOTTOM OF THE CAN.
  3. EXISTING L-868 BASE CANS INCLUDE 12 THREADED BOLT HOLES, OF WHICH ONLY SIX ARE REQUIRED FOR THE MOUNTING OF A LIGHT FIXTURE. THE CONTRACTOR MAY ATTACH THE GROUND LUG USING ONE OF THE UNUSED THREADED BOLT HOLES. THERE MAY BE SOME EXCESS SILICONE IN THE BOLT HOLES THAT WILL REQUIRE REMOVAL.

9 RETROFIT EXISTING BASE CAN DETAIL NTS

GENERAL NOTES:

1. ALL L-824 CABLES SHALL BE IDENTIFIED WITH A BLACK ON WHITE LAMINATE FACTORY ENGRAVED ID TAG WITH ITS RESPECTIVE CIRCUIT/LOOP NUMBER AT ALL ACCESSIBLE LOCATIONS. ATTACH THE ID TAG 12" FROM THE L-823 CONNECTORS, OR MIDLOOP IF NO CONNECTORS ARE REQUIRED. THE LOOPS SHALL BE IDENTIFIED ON EACH SIDE OF THE L-823 CONNECTORS.
2. ALL BASE CAN AND DUCT BANK COUNTERPOISE CONDUCTORS SHALL BE EXOTHERMICALLY WELDED TO THE EXISTING COUNTERPOISE SYSTEM.
3. BRASS ID MARKER TO BE INSTALLED ON OPPOSITE SIDE OF STRIPING ON SINGLE CIRCUIT FIXTURES.

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RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

CH2MHILL

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
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| 1            | SJ  | CONST | 07/1A14 | MS   |      |

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DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

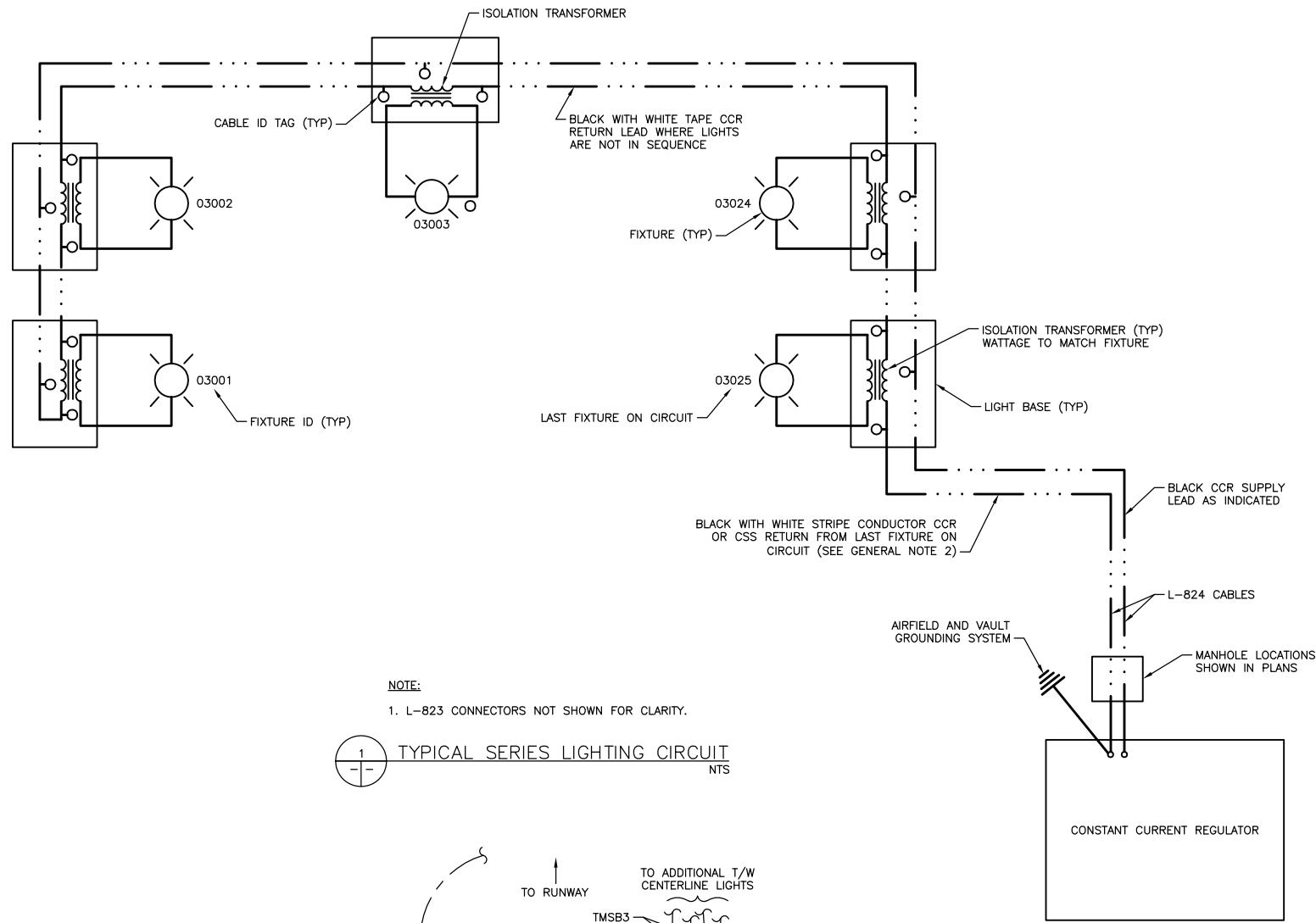
ELECTRICAL  
DETAILS

SHEET NO.

EL501

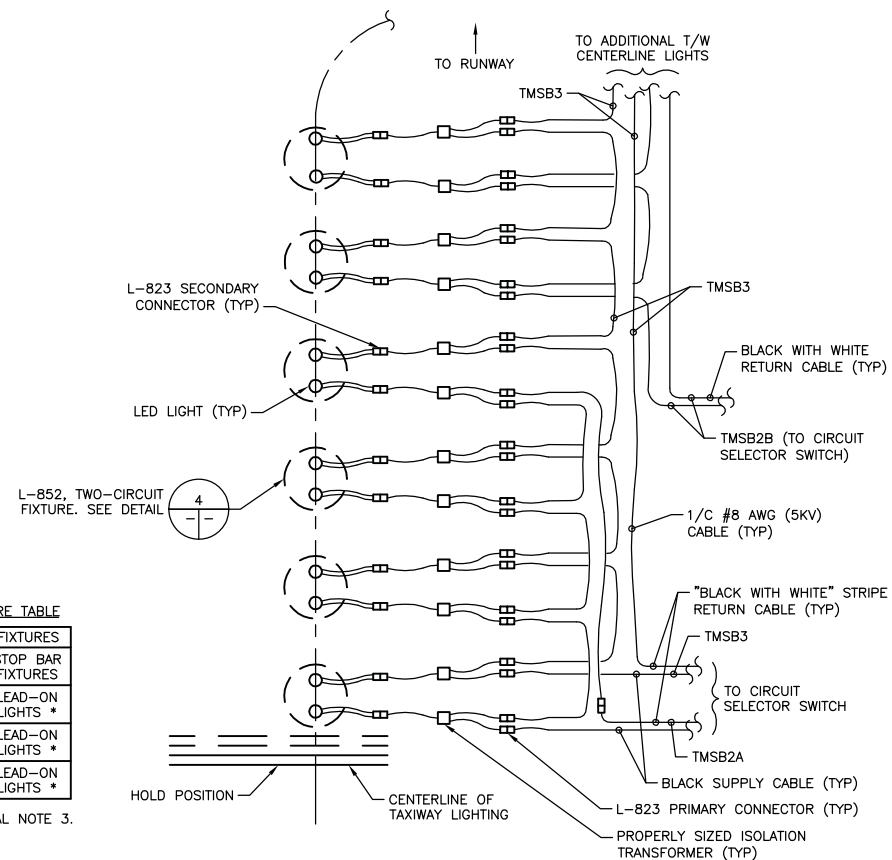
87 OF 115

CADD FILE NO. \_201313528-1E1-501-A



NOTE:  
1. L-823 CONNECTORS NOT SHOWN FOR CLARITY.

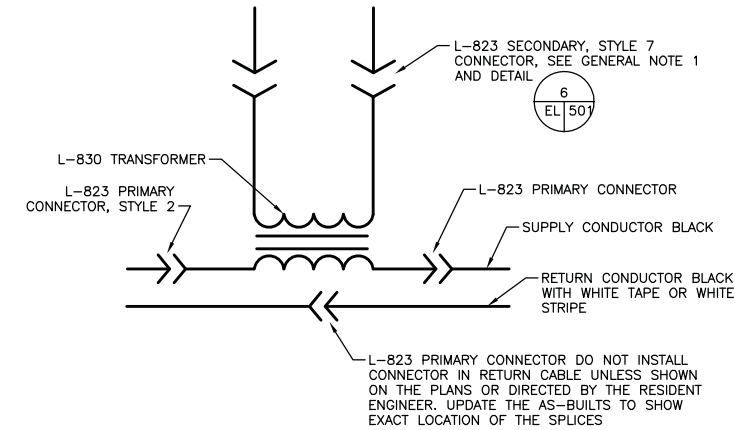
1 TYPICAL SERIES LIGHTING CIRCUIT  
NTS



| LIGHT FIXTURE TABLE |                   |
|---------------------|-------------------|
| CIRCUIT             | FIXTURES          |
| TRSB                | STOP BAR FIXTURES |
| TMSB2A              | LEAD-ON LIGHTS *  |
| TMSB2B              | LEAD-ON LIGHTS *  |
| TMSB3               | LEAD-ON LIGHTS *  |

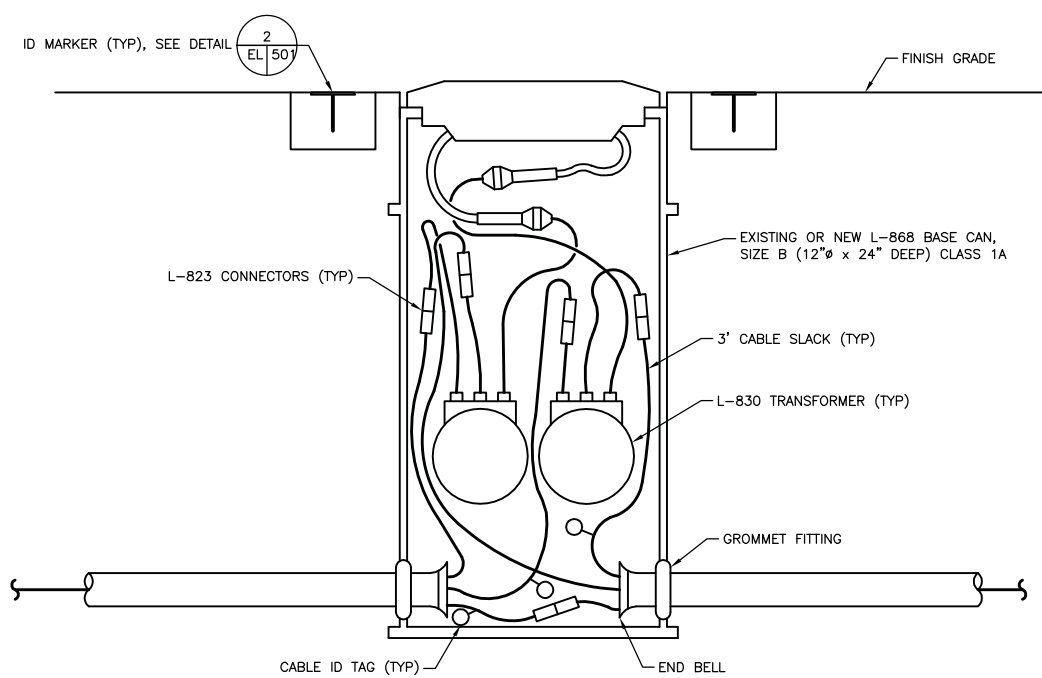
\* SEE GENERAL NOTE 3.

2 TYPICAL TAXIWAY "LEAD-ON/LEAD-OFF" CENTERLINE SERIES LIGHTING CIRCUIT WIRING  
NTS



NOTE:  
1. DO NOT USE RUBBER TAPE ON THE SECONDARY OF THE L-830 TRANSFORMER WHEN CONNECTED TO AN ELEVATED FIXTURE.

3 TYPICAL LIGHTING CONNECTION SCHEMATIC IN BASE CAN  
NTS



NOTE:  
1. TRANSFORMER STANDS, SAFETY GROUND, AND COUNTERPOISE NOT SHOWN FOR CLARITY.

4 TYPICAL LEAD-ON/LEAD-OFF LIGHT WIRING  
NTS

GENERAL NOTES:

- L-823 CONNECTORS SHALL BE INSTALLED ON ALL CABLES, IN BASE CAN, OR OTHER ACCESSIBLE LOCATIONS EXCEPT AS MODIFIED BELOW: CONNECTORS ARE NOT REQUIRED IN CABLES PASSING THROUGH A LIGHT BASE WITH A FIXTURE AND NOT FEEDING THAT FIXTURE. THESE CABLES SHALL HAVE THE REQUIRED SLACK AND CABLE ID TAGS IN EACH BASE CAN. CONNECTORS ARE REQUIRED IN ALL CABLES IN ALL LIGHT BASE CANS THAT ARE USED ONLY AS PULL-CANS (WITH NO FIXTURES).
- ONLY THE LAST FIXTURE IN A CIRCUIT SHALL BE CONNECTED TO THE RETURN LEAD (WHITE INSULATED CONDUCTOR) OF THE CCR.
- THE LEAD-ON LIGHTS ARE POWERED BY THE TMSB2A AND TMSB2B CIRCUITS. THE LEAD-OFF LIGHTS ARE POWERED BY THE TMSB3 CIRCUIT. THE LEAD-ON LIGHTS ARE THE LIGHT BEAMS THE PILOT WOULD SEE ENTERING THE RUNWAY FROM THE TAXIWAY. THE LEAD-OFF LIGHTS ARE THE LIGHT BEAMS THE PILOT WOULD SEE ENTERING THE TAXIWAY FROM THE RUNWAY. CIRCUITING FOR TAXIWAY "R9" IS SIMILAR TO TAXIWAY "M".

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RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

CH2MHILL

| ISSUE RECORD | NO. | BY    | PURPOSE  | DATE | CHKD |
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| 1            | SJ  | CONST | 07/14/14 | MS   |      |

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CONST. CONTRACT NO. 201313528

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SHEET TITLE

ELECTRICAL  
DETAILS

SHEET NO.

EL502

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CADD FILE NO.  
\_201313528-1EL-502-A



**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
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| 1            | SJ  | CONST | 07JA14  | MS   |      |

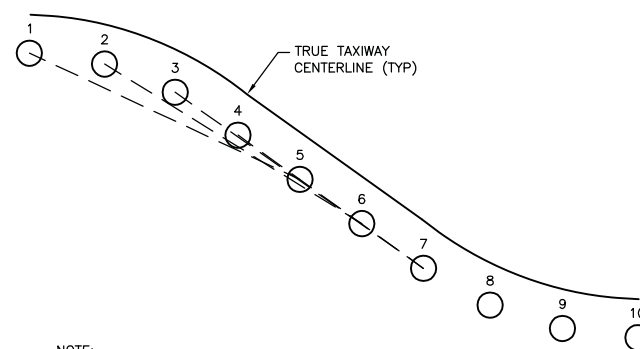
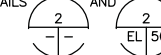
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| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

**ELECTRICAL  
DETAILS**

SHEET NO.  
**EL503**  
89 OF 115  
CADD FILE NO.  
\_201313528-11EL-503-A

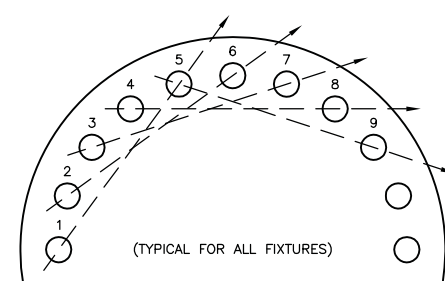
**GENERAL NOTES:**

- CONTRACTOR SHALL INSTALL ALL LIGHT FIXTURES AT THE PROPER AIMING ANGLE PER FAA AC 150/5340-30 (LATEST EDITION).
- DETAILS 1, 3, 4, AND 5 ON THIS SHEET ARE PROVIDED AS REFERENCE IN THE INSTANCE A CONCRETE PANEL IS DISCOVERED TO REQUIRE REPLACEMENT.
- THE CONTRACTOR MAY BE REQUIRED TO GRIND PAVEMENT IN FRONT OF A FIXTURE TO MEET FAA PHOTOMETRIC REQUIREMENTS AFTER INITIAL PHOTOMETRIC TESTING (L-140) OCCURS, EVEN THOUGH A LIGHT IS PROPERLY SET TO MEET ELEVATION REQUIREMENTS OF DETAILS 2 AND 3.

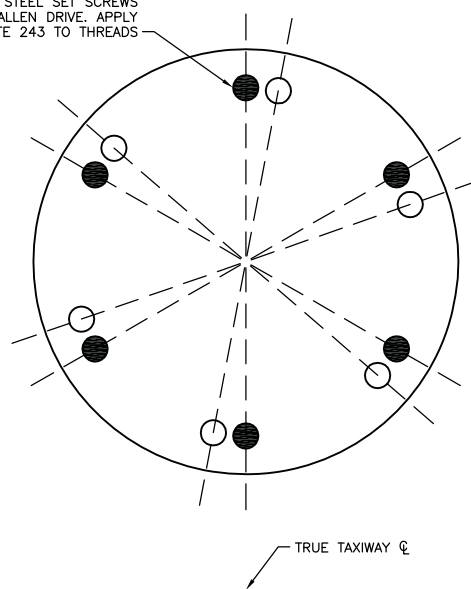


**NOTE:**

- THE AXIS OF THE BEAM SHALL BE "TOED IN" TO INTERSECT THE CENTERLINE AT A POINT APPROXIMATELY EQUAL TO FOUR TIMES THE SPACING OF LIGHTS (EVERY FOURTH LIGHT) ON THE CURVE PORTION, AND SUCH SPACING SHALL BE MEASURED ALONG THE CHORD OF THE CURVE.

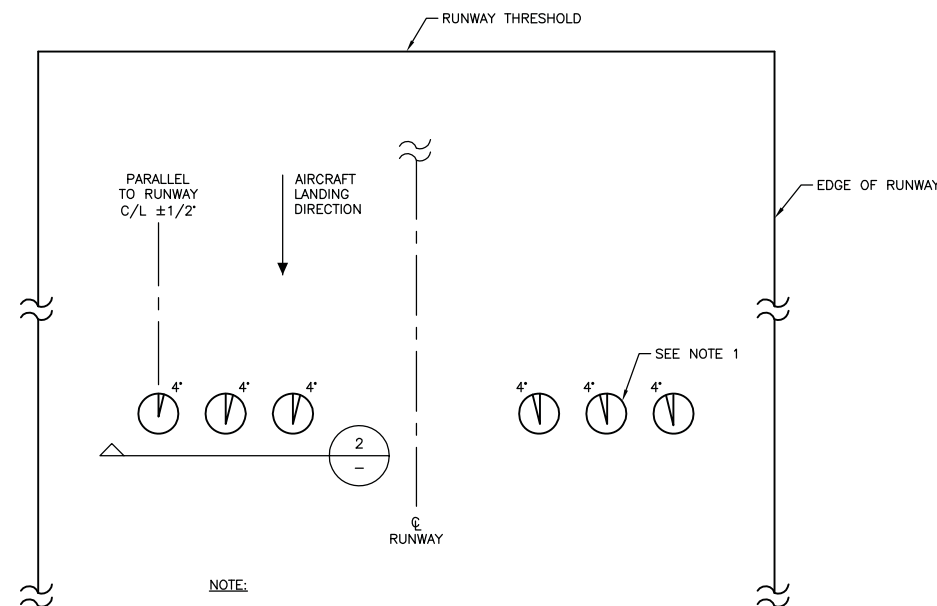


THREADED HOLES ORIENTED ON TRUE TAXIWAY CENTERLINE. PROVIDE 3/8"-16 x 3/4" LONG STAINLESS STEEL SET SCREWS WITH ALLEN DRIVE. APPLY LOCTITE 243 TO THREADS



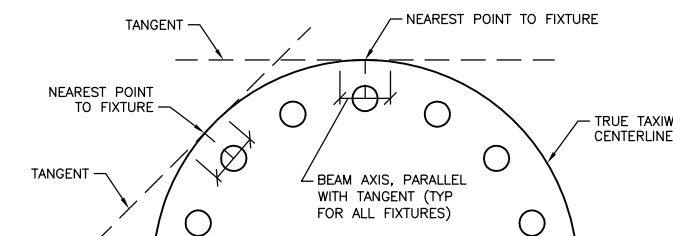
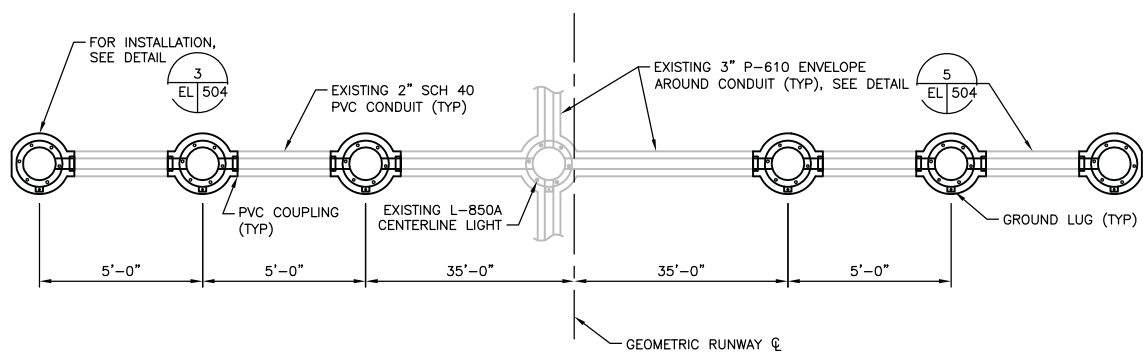
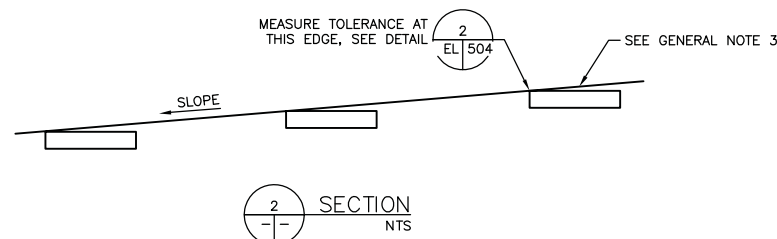
**NOTE:**

- DO NOT INSTALL SET SCREWS WHERE THEY WOULD AFFECT LIGHT INSTALLATION FOR FIXTURE "TOE-IN". REFER TO DETAILS 4 AND 5 ON THIS SHEET.



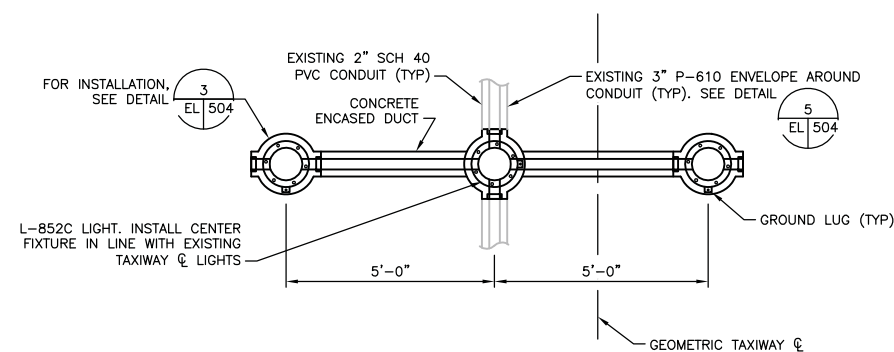
**NOTE:**

- THE BASE CANS ARE TOED-IN 4 DEGREES TOWARD RUNWAY CENTERLINE, NOT THE FIXTURES.



**NOTE:**

- THE AXIS OF THE TWO BEAMS SHALL BE ORIENTED PARALLEL TO THE TANGENT OF THE NEAREST POINT OF THE CURVE DESIGNATED AS THE TRUE CENTERLINE OF THE TAXIING PATH.



**NOTE:**

- MAINTAIN BASE CAN AZIMUTH OF ±1/2" PARALLEL TO TAXIWAY CENTERLINE.



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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONSTR  | 07/14/14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**ELECTRICAL  
DETAILS**

SHEET NO.

EL504

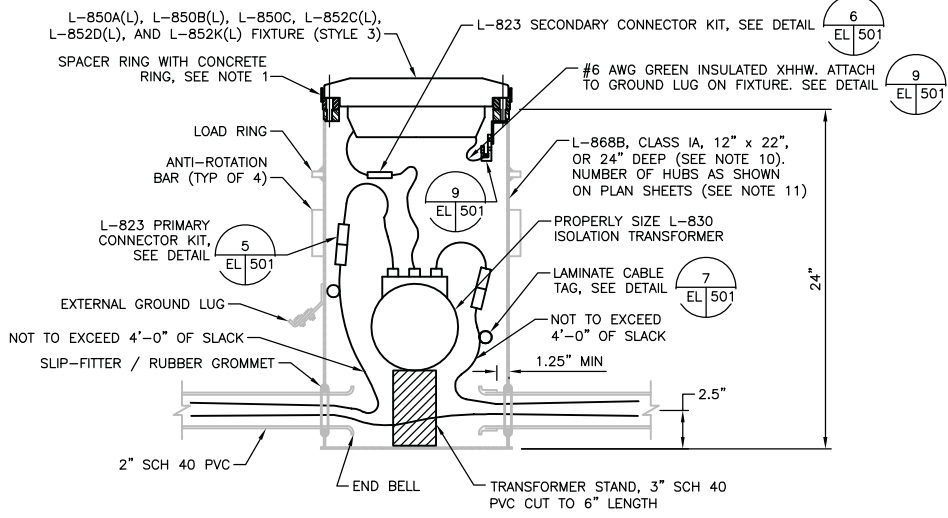
90 OF 115

CADD FILE NO.

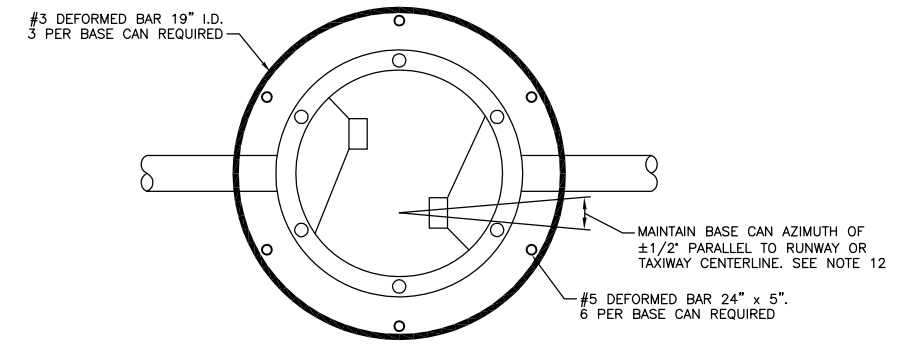
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**NOTES:**

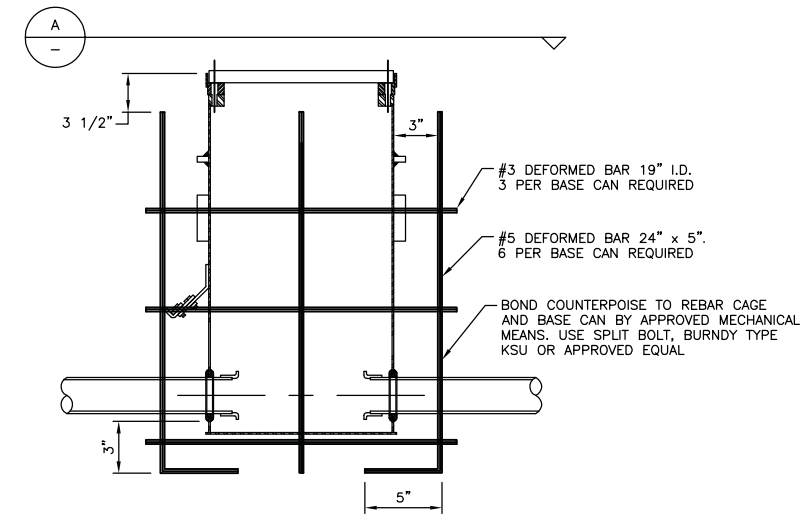
- THE GROOVED SPACER RING IS 3/4" THICK WITH AN ATTACHED PAVEMENT DAM EXTENDING 5/8" ABOVE THE SPACER. GROOVED SPACER RING SHALL BE O-RING GASKETED WITH SURFACE OF FIXTURE. ADDITIONAL NOMINAL 7/8" THICK SPACER RINGS SHALL BE REQUIRED TO MEET THE OVERALL DEPTH OF 2 3/8" TO FINISHED GRADE. TO MEET OVERALL LIGHT INSTALLATION TOLERANCE OF 0" TO 1/16" BELOW GRADE AT THE LOWEST ELEVATION. MAXIMUM OF 3 SPACER RINGS SHALL BE ALLOWED. THE SPACER RING MAY BE REQUIRED TO BE THINNER OR THICKER DEPENDING ON BASE CAN INSTALLATION AND PAVING TECHNIQUES. THIS CONTRACTOR SHALL BE RESPONSIBLE TO MEASURE AND DETERMINE THE EXACT REQUIRED THICKNESS OF EACH INDIVIDUAL SPACER RING REQUIRED TO PUT THE AIRFIELD LIGHTING FIXTURE AT THE CORRECT ELEVATION, AZIMUTH AND ROTATION PER FAA ADVISORY CIRCULAR 150/5345-46 LATEST EDITION. THE CONTRACTOR'S BID PRICE SHALL INCLUDE FURNISHING AND INSTALLING NEW SPACER RINGS. COAT O-RING WITH DOW CORNING III VALVE LUBRICANT AND SEALANT OR APPROVED EQUAL. UNLESS OTHERWISE APPROVED BY DIA PROJECT MANAGER.
- THE P-606 SEALER SHALL FILL THE VOID TO BE FLUSH WITH THE CONCRETE RING OR WITHIN 0.125" BELOW THE TOP EDGE OF THE CONCRETE RING AT THE LOWEST POINT OF THE CONCRETE. ANY OVER POURS SHALL BE REPLACED BY AND AT THE CONTRACTOR'S EXPENSE.
- INSTALL TWO TRANSFORMERS AND TRANSFORMER STANDS FOR TWO-CIRCUIT FIXTURES.
- ALL BASE CAN INSTALLATION TECHNIQUES, METHODS, MATERIALS, ETC. SHALL BE SUBMITTED TO THE DIA PROJECT MANAGER FOR REVIEW AND APPROVAL PRIOR TO THE START OF WORK.
- IMMEDIATELY AFTER THE HOLES ARE CORED IN THE CEMENT TREATED BASE COURSE, THE BASE CANS SHALL BE INSTALLED AND THE P-610 PLACED SO AS TO PREVENT WATER FROM ENTERING THE STABILIZED SUBGRADE.
- BEFORE PAVING MAY PROCEED THE CONTRACTOR SHALL DEMONSTRATE TO THE DIA PROJECT MANAGER BY SURVEY THAT THE BASE CANS ARE AT THE CORRECT NORTHING AND EASTING ELEVATION, AZIMUTH AND ROTATION, PLUMB, AND THAT THE PROPER CLEARANCE EXISTS BETWEEN THE BASE CAN AND THE PAVING OPERATION.
- THE FINISHED PAVEMENT SURFACE SHALL BE PROTECTED FROM FOREIGN SUBSTANCES WHICH COULD CAUSE STAINING, IE. OIL, P-605, ETC. THE CONTRACTOR SHALL IMMEDIATELY CLEAN ALL SPILLS AND CORRECT/CLEAN ANY STAINED SURFACES AT THE CONTRACTORS EXPENSE.
- USE ACEATE RESISTANT, CONDUCTIVE SEALANT (SUREBOND EVERFLEX SB-1800 OR APPROVED EQUAL) BETWEEN ADAPTER/SPACER RINGS. ALSO, USE BETWEEN ADAPTER/SPACER RING AND BASE CAN. DO NOT INSTALL EXCESSIVE AMOUNTS OF SEALANT. DO NOT INSTALL SEALANT IN BASE CAN BOLT HOLES.
- THE FIXTURE MOUNTING BOLTS SHALL EXTEND THROUGH THE BASE CAN MOUNTING FLANGE INTO THE BASE CAN A MINIMUM OF 1/2" AND A MAXIMUM OF 1-1/2". THE BOLTS SHALL HAVE ENOUGH THREAD LENGTH SO THEY DO NOT SHOULDER OUT BEFORE THE FIXTURE IS SECURELY TIGHTENED. THE BOLTS SHALL BE TORQUED PER MANUFACTURERS RECOMMENDATIONS. THE BOLTS SHALL BE SUPPLIED WITH CEC LOCK WASHERS.
- BASE CANS SOUTH OF RUNWAY 8-26 COMPLEX SHALL BE 22" DEEP BASE CANS.
- THE NUMBER OF HUBS FOR A BASE CAN SHALL BE AS SHOWN ON THE PLANS. THE HUBS SHALL BE FACTORY DRILLED PRIOR TO GALVANIZING.
- IF LIGHT IS OBSTRUCTED, THE CONTRACTOR SHALL GRIND THE EDGE OF PAVEMENT IN FRONT OF THE FIXTURE LENS TO A ROUNDED EDGE TO IMPROVE LIGHT OUTPUT AS REQUIRED PER THE DIA PROJECT MANAGER.
- BRITE REMOTES SHALL BE SALVAGED AND DELIVERED TO A SITE ON AIRPORT PROPERTY AS DIRECTED BY THE DIA PROJECT MANAGER. NEW BRITE REMOTES WILL BE INSTALLED WITH THE L-852GS AND L-862S FIXTURES.



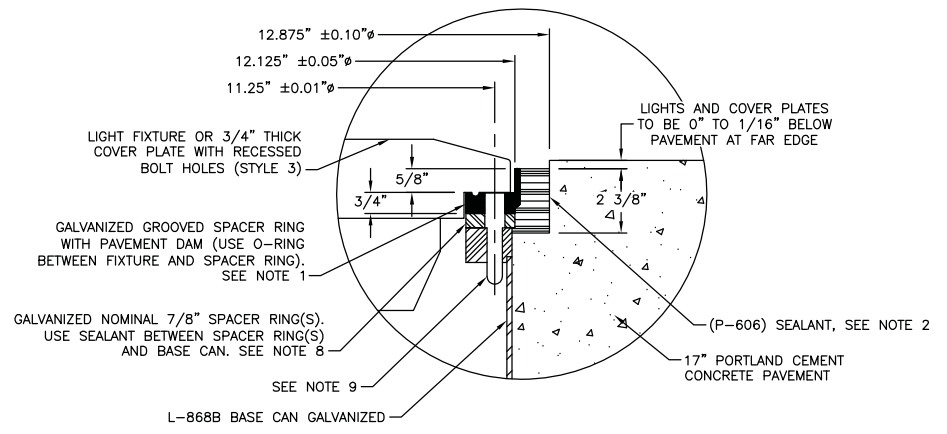
**1** TYPICAL INSET LIGHT FIXTURE INSTALLATION  
NTS



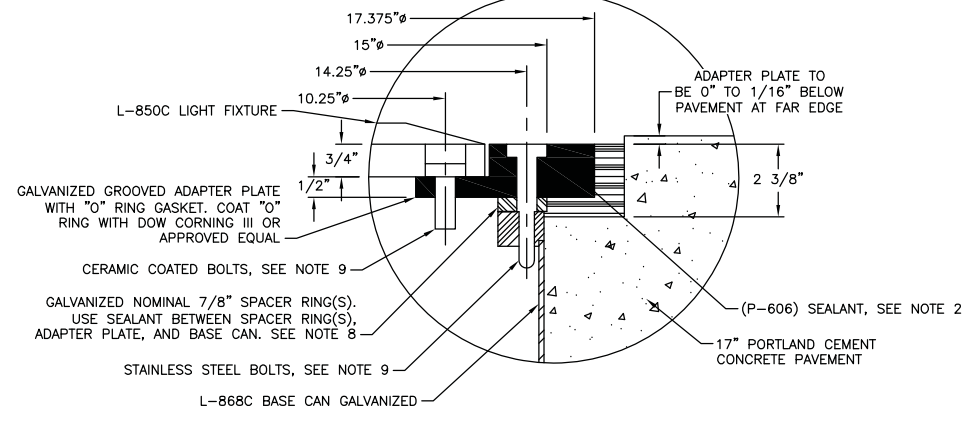
**2** REBAR DETAIL FOR ALL L-868B BASE CANS  
NTS



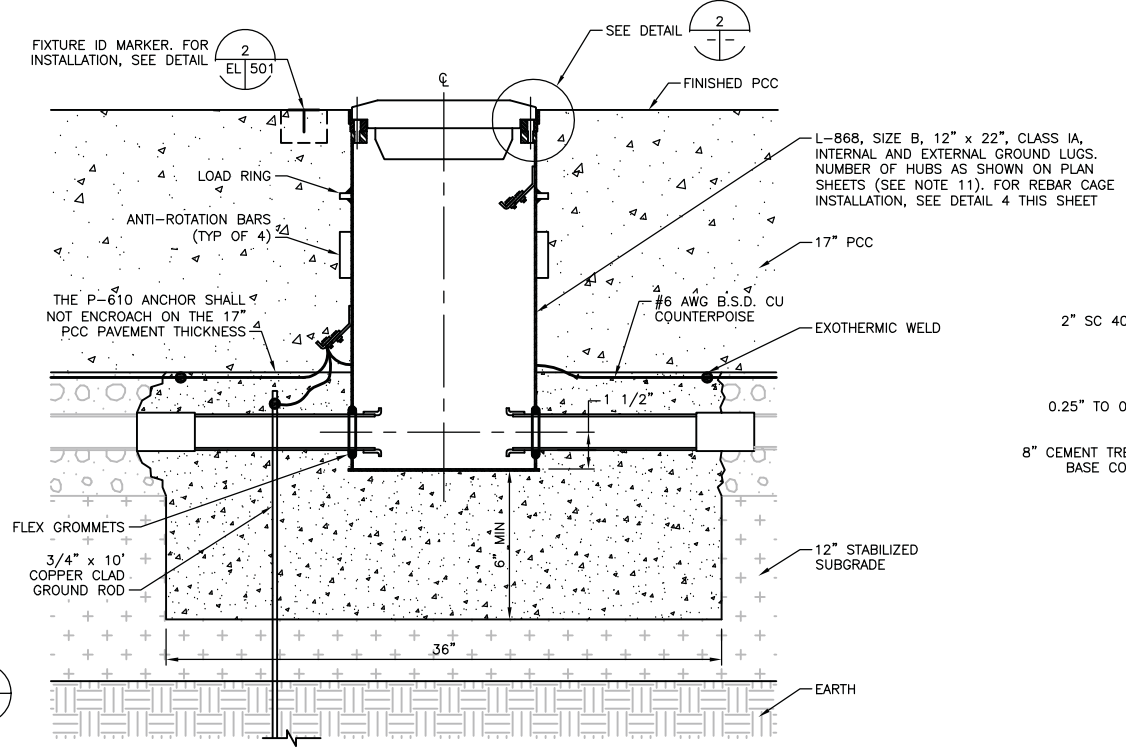
**3** SECTION A-A  
NTS



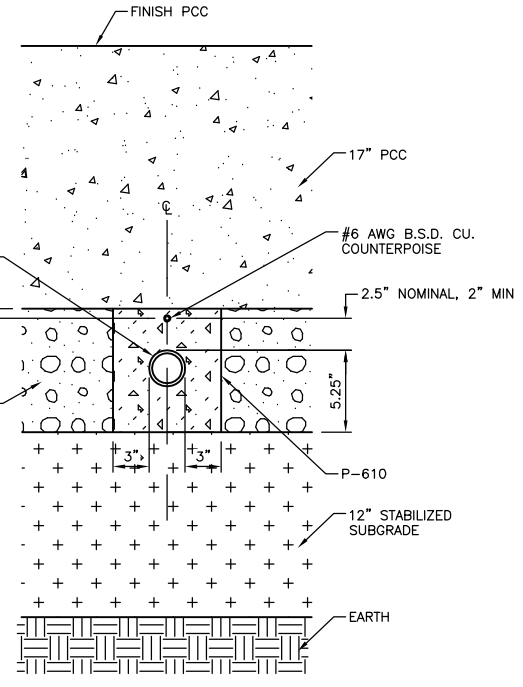
**4** DETAIL FOR L-868B BASE CAN  
NTS



**5** DETAIL FOR L-850C ON L-868C BASE CAN  
NTS



**6** TYPICAL INSTALLATION DETAIL FOR L-868B BASE CAN  
NTS



**7** SECTION A-A  
NTS

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ISSUED FOR CONSTRUCTION



RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | SJ  | CONST | 07JA14  | MS   |      |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

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DESIGN CONTRACT NO. CE84021

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VOLUME NO. 1

SHEET TITLE

ELECTRICAL  
DETAILS

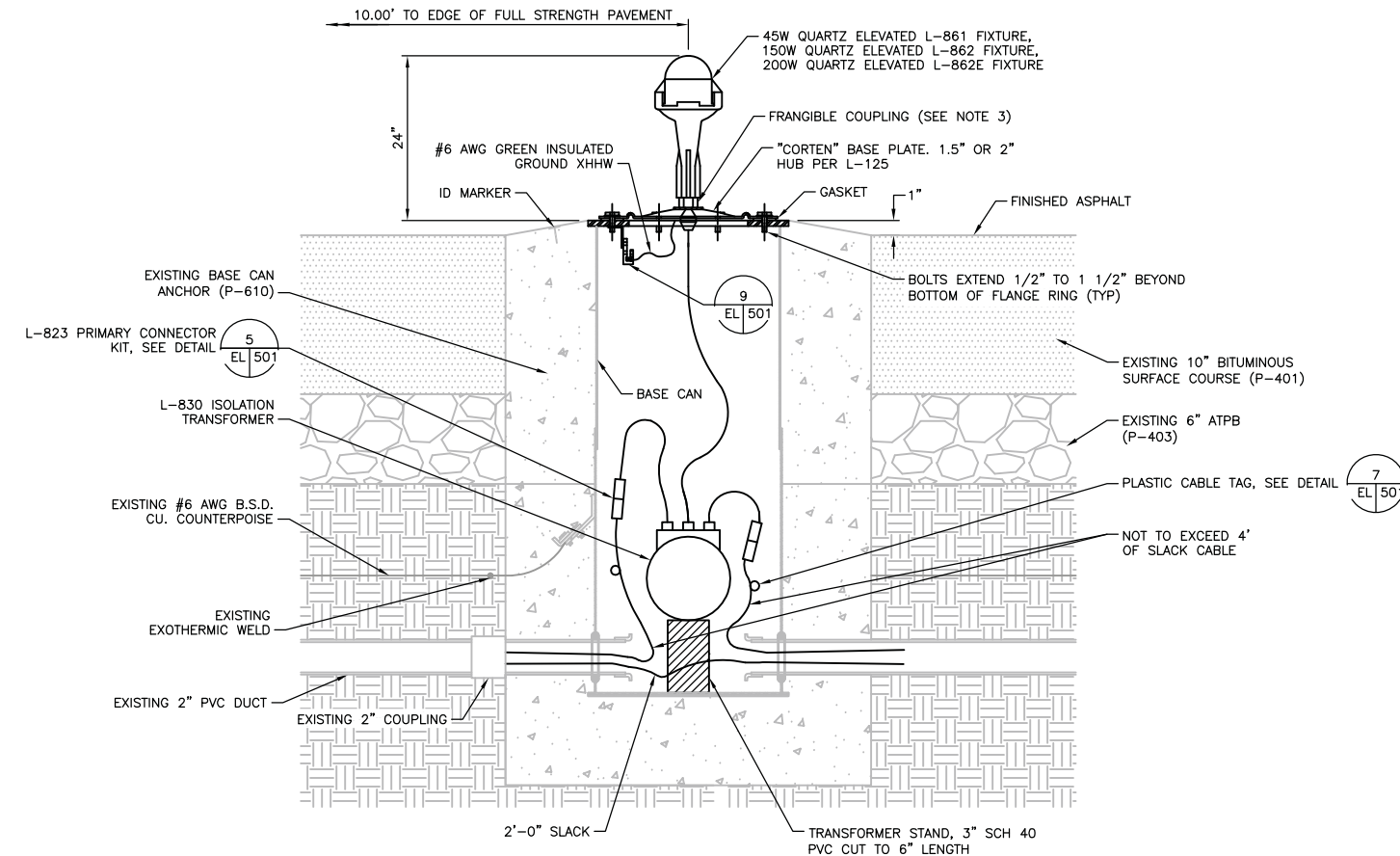
SHEET NO.

EL505

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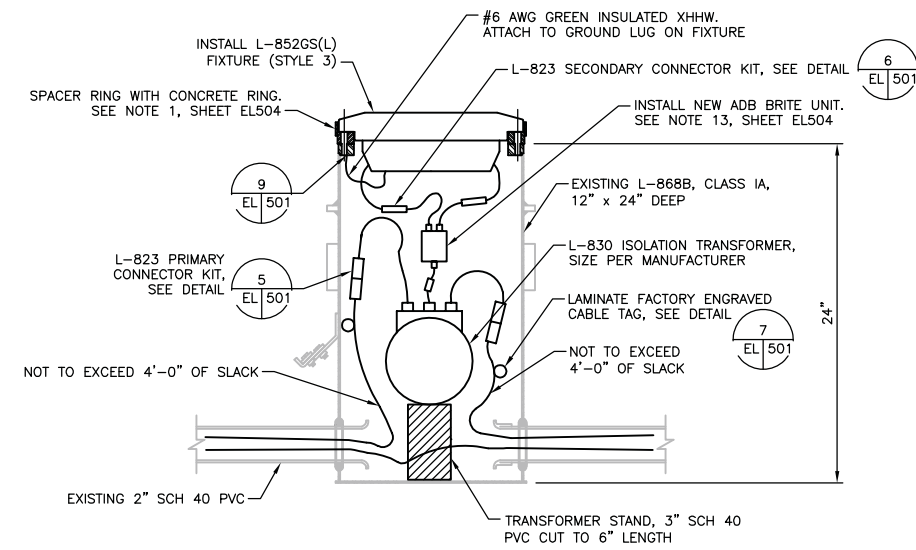
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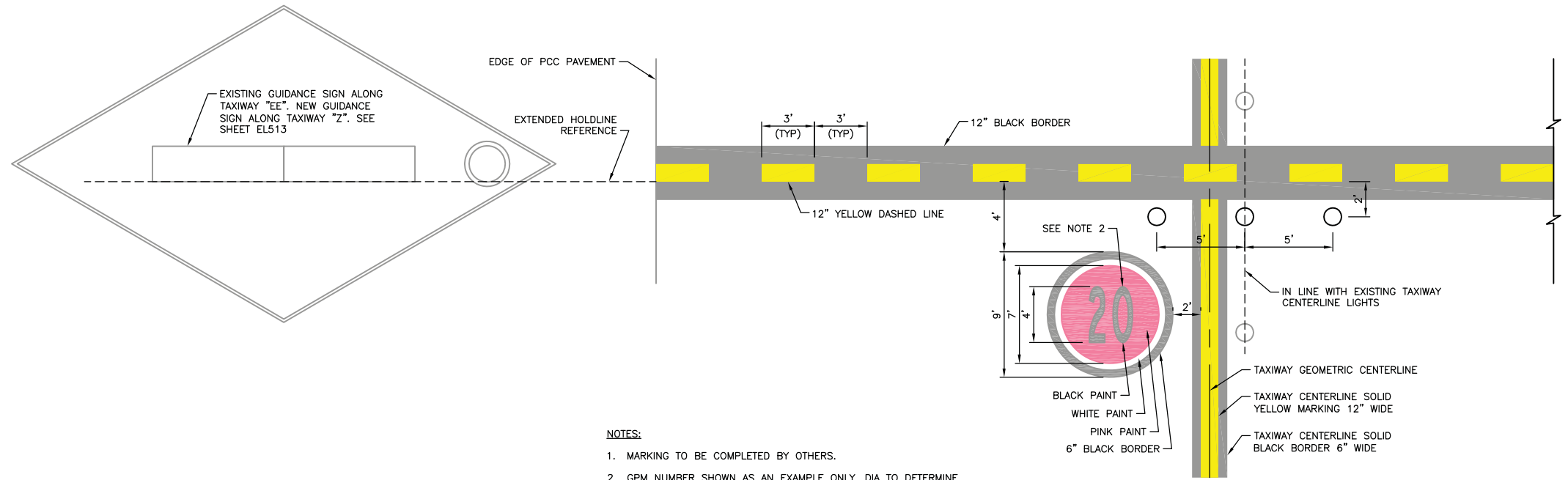


- NOTES:
- CONTRACTOR SHALL INSTALL NEW GASKET, BASE PLATE, FIXTURE, AND APPROPRIATELY SIZED ISOLATION TRANSFORMER FOR ALL NEW ELEVATED FIXTURE INSTALLATIONS.
  - ELEVATED EDGE LIGHTS SHALL BE INSTALLED PLUMB.
  - PROVIDE FOR TAXIWAY EDGE LIGHTS, A FRANGIBLE COUPLING WITH SLOTTED THREADS FOR EASE OF REMOVAL WHEN BROKEN.

2 ELEVATED LIGHT MODIFICATIONS IN EXISTING SHOULDER PAVEMENT  
NTS



1 RUNWAY STOP BAR/GUARD LIGHT INSTALLATION  
NTS



- NOTES:
- MARKING TO BE COMPLETED BY OTHERS.
  - GPM NUMBER SHOWN AS AN EXAMPLE ONLY. DIA TO DETERMINE ACTUAL NUMBER FOR GEOGRAPHIC POSITION MARKINGS.

3 GUIDANCE SIGN AND CLEARANCE BAR LIGHT LAYOUT  
NTS

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RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

CH2MHILL

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CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

ELECTRICAL  
DETAILS

SHEET NO.

EL506

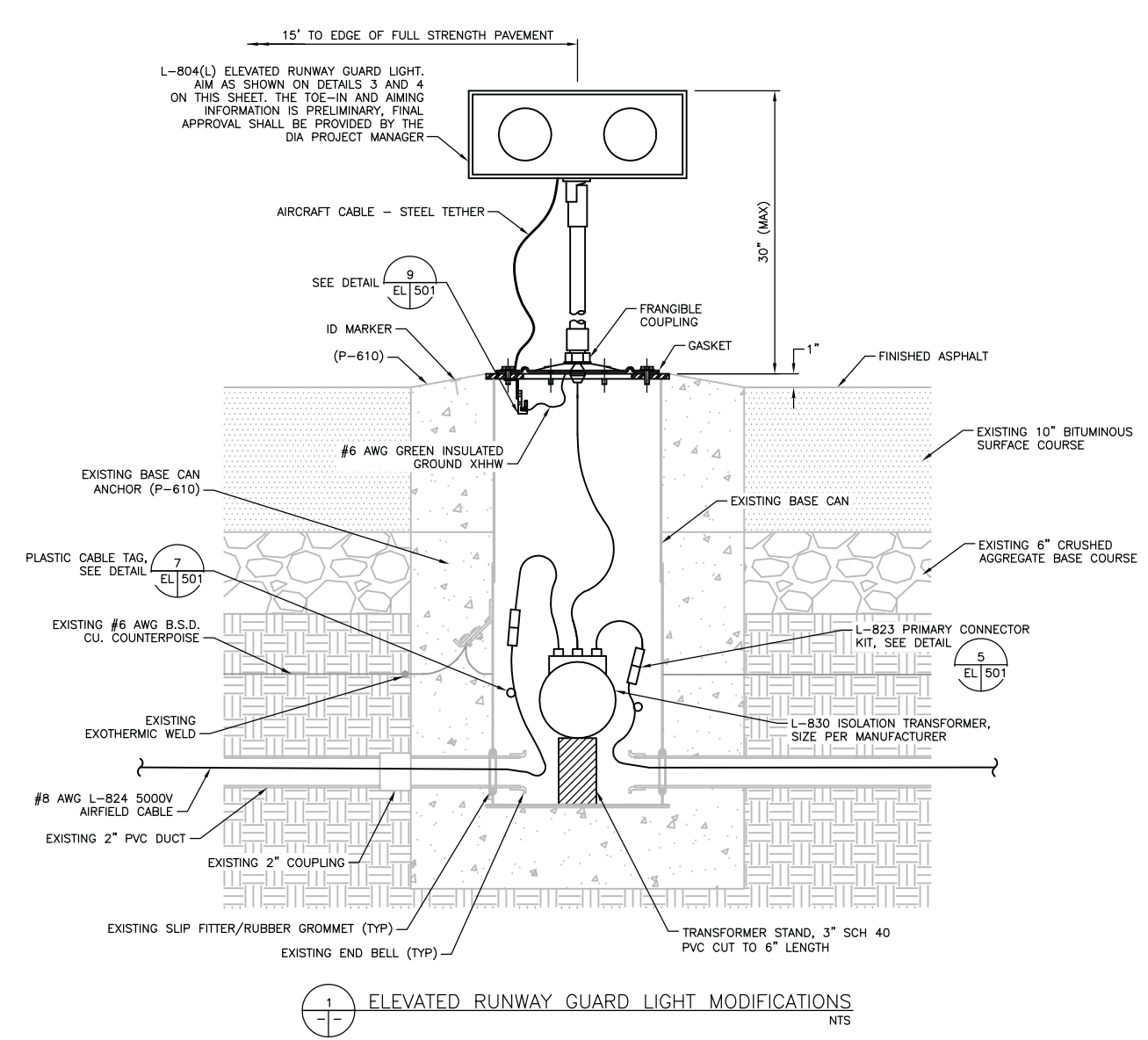
92 OF 115

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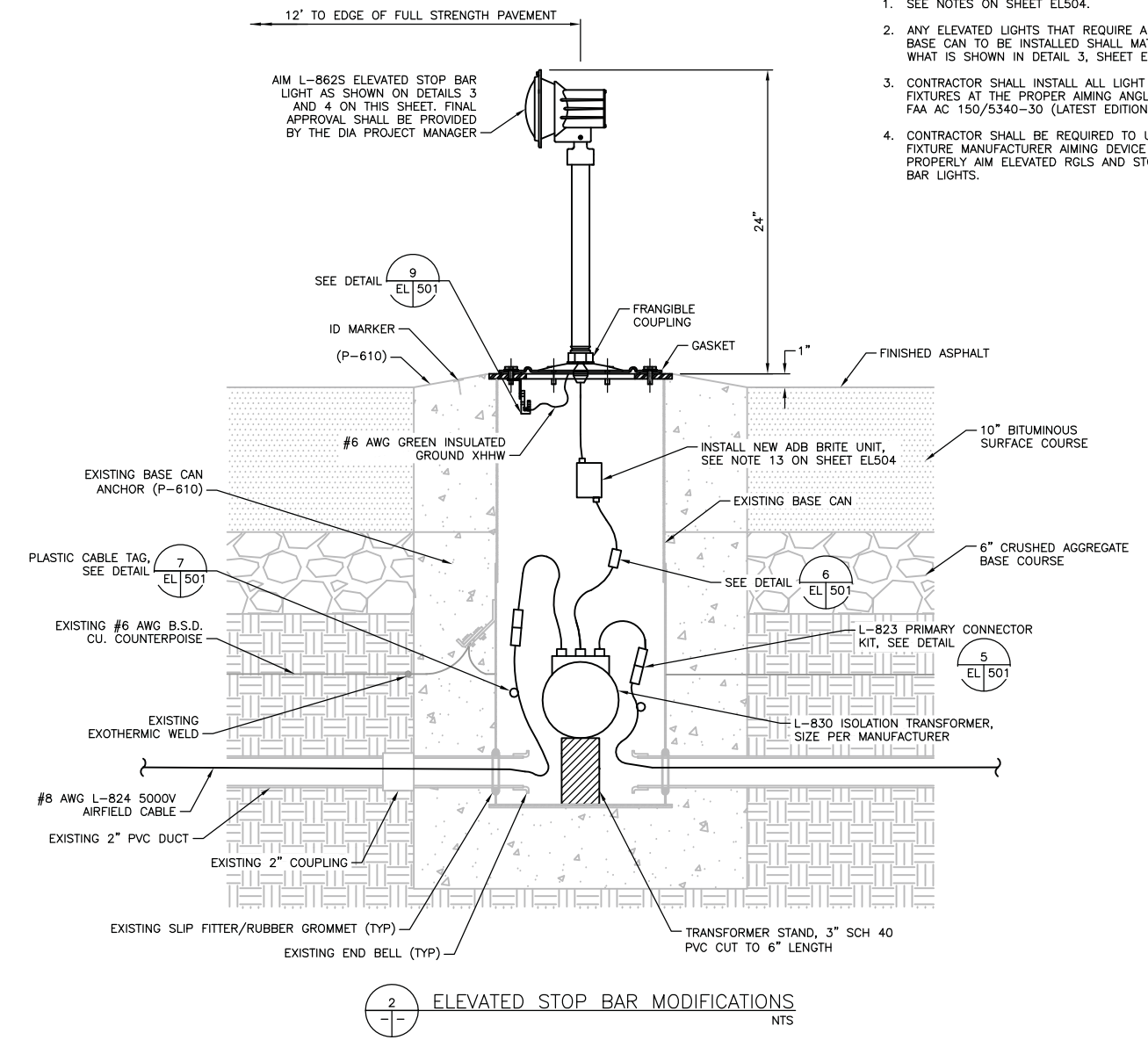
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GENERAL NOTES:

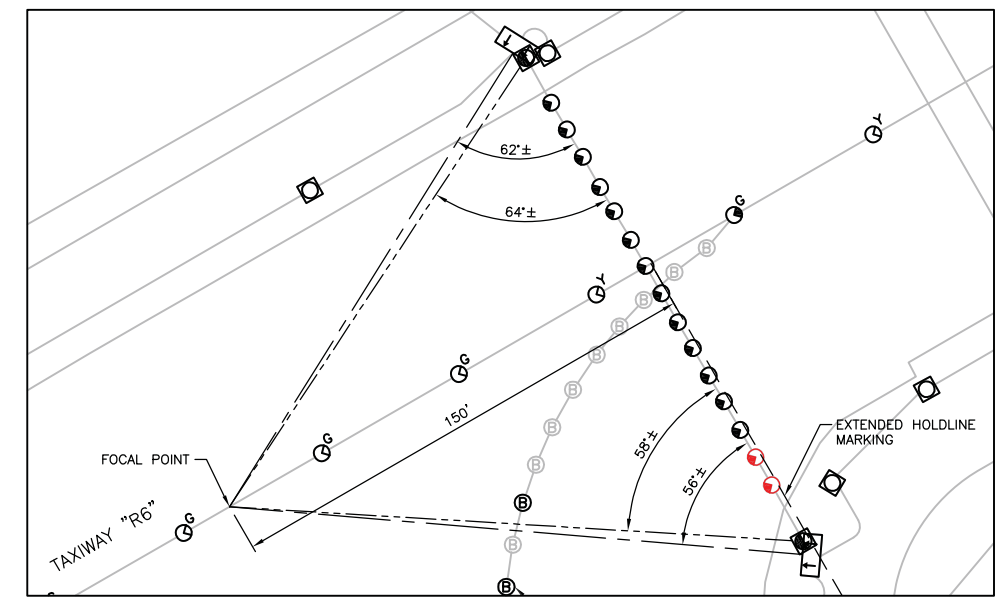
- SEE NOTES ON SHEET EL504.
- ANY ELEVATED LIGHTS THAT REQUIRE A NEW BASE CAN TO BE INSTALLED SHALL MATCH WHAT IS SHOWN IN DETAIL 3, SHEET EL504.
- CONTRACTOR SHALL INSTALL ALL LIGHT FIXTURES AT THE PROPER AIMING ANGLE PER FAA AC 150/5340-30 (LATEST EDITION).
- CONTRACTOR SHALL BE REQUIRED TO USE FIXTURE MANUFACTURER AIMING DEVICE TO PROPERLY AIM ELEVATED RGLS AND STOP BAR LIGHTS.



1 ELEVATED RUNWAY GUARD LIGHT MODIFICATIONS NTS

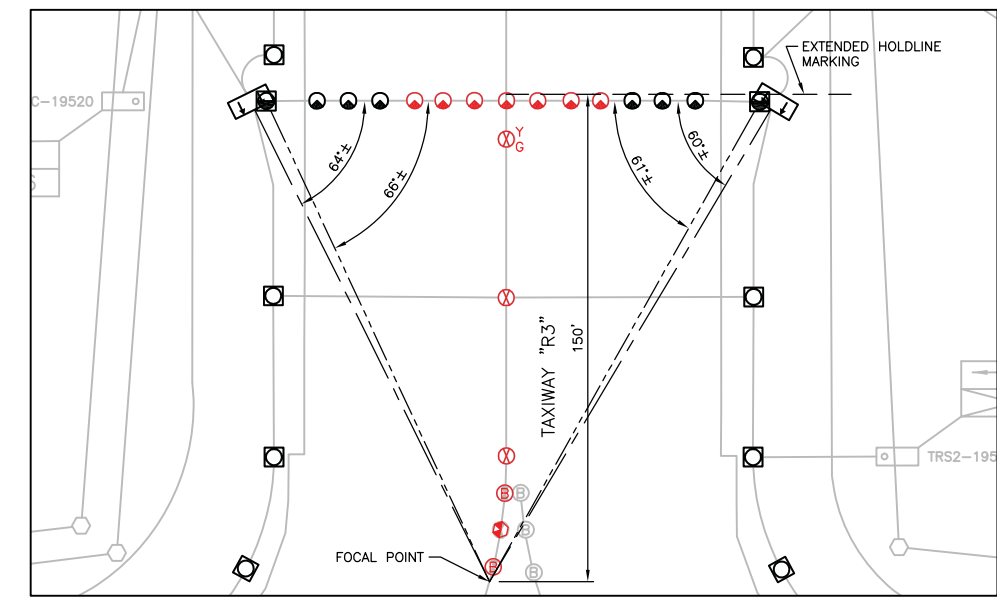


2 ELEVATED STOP BAR MODIFICATIONS NTS



3 ELEVATED RGL AND STOP BAR HIGH SPEED AIMING NTS

- RGL AND STOP BAR AIMING NOTES:
- ELEVATED RGL LIGHTS SHALL BE AIMED 7.5' ABOVE HORIZONTAL.
  - ELEVATED RGL AND STOP BAR LIGHTS SHALL BE AIMED SO THAT THE AXIS OF THE LIGHT BEAM INTERSECTS THE PRIMARY TAXIWAY CENTERLINE 150- FEET FROM THE HOLDING POSITION.
  - NOMINAL ANGLES ARE SHOWN. FINAL ALIGNMENT SHALL BE APPROVED PER DIA PROJECT MANAGER.



4 ELEVATED RGL AND STOP BAR 90° AIMING NTS

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RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

**CH2MHILL**

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| 1   | SJ | CONST   | 07/14/14 | MS   |

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DRAWN BY: S. JACOBS

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VOLUME NO. 1

SHEET TITLE

ELECTRICAL  
DETAILS

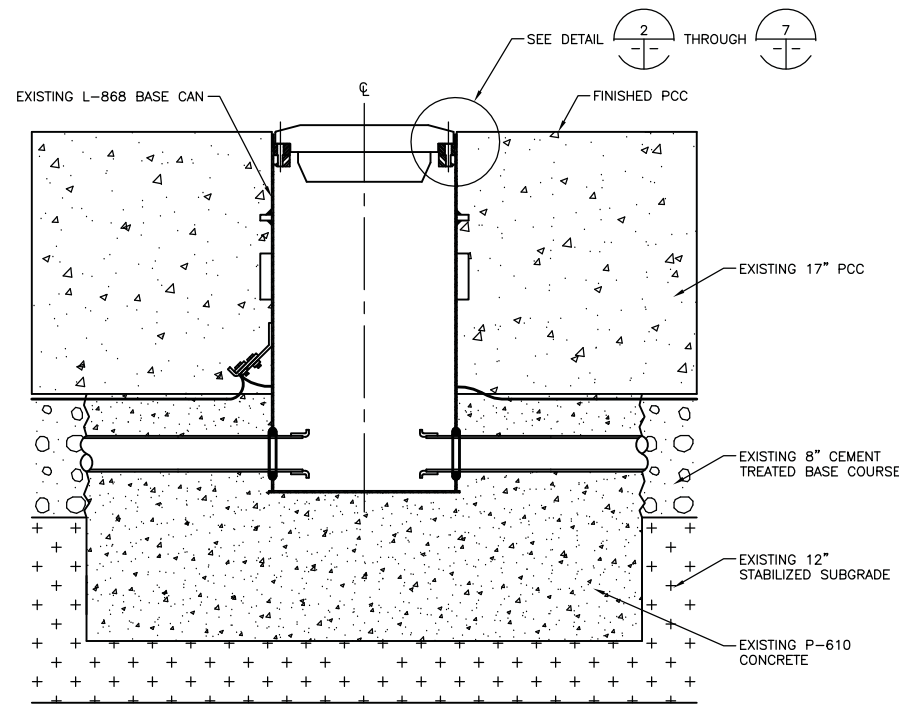
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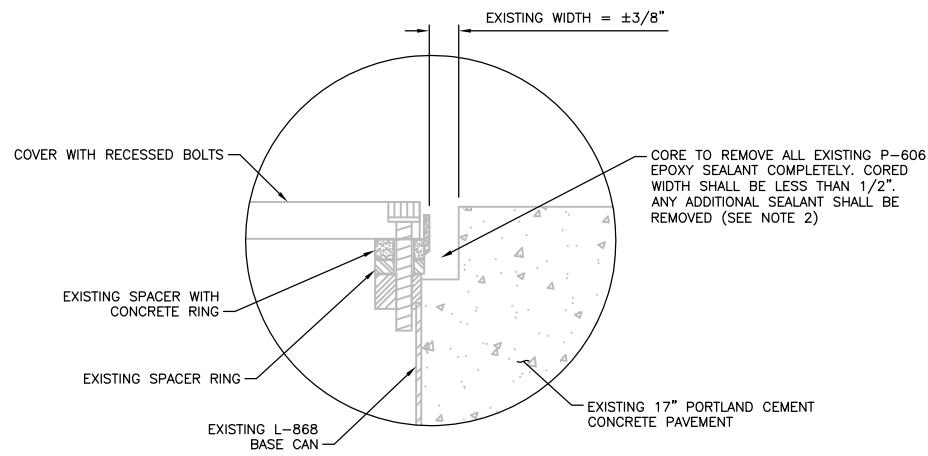
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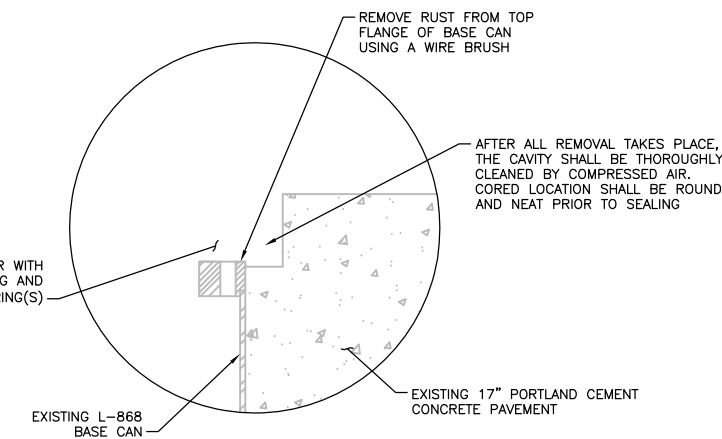
1. PRIOR TO ANY EPOXY SEALANT REMOVAL, THE CONTRACTOR SHALL COORDINATE WITH THE DIA PROJECT MANAGER FOR LOCATIONS WHERE EPOXY SEALANT AROUND BASE CANS WILL TAKE PLACE.
2. THE CONTRACTOR SHALL USE A TEMPLATE THAT WILL PROTECT EXISTING PAVEMENT TO REMAIN AND SHALL BE APPROVED BY THE DIA PROJECT MANAGER.
3. GALVANIZED STEEL SPACER WITH CONCRETE RING, GASKET O-RING, AND SPACER RING(S) SHALL BE PROVIDED NEW ON BASE CANS WHERE EPOXY REMOVAL TAKES PLACE. WHEN THERE IS LESS THAN 1/4" MINIMUM OF SPACE BETWEEN TOP OF EXISTING BASE CAN FLANGE AND FINISHED GRADE, THE CONTRACTOR WILL BE ALLOWED TO USE A NON-GASKET SPACER WITH CONCRETE RING TO INSTALL THE FIXTURE AT THE PROPER ELEVATION.
4. COAT O-RING WITH DOW CORNING 111 VALVE LUBRICANT AND SEALANT OR APPROVED EQUAL. PLACE DOW CORNING 111 OR APPROVED EQUAL BETWEEN FIXTURE AND FLANGE WITH CONCRETE RING. ALL FLANGE RINGS WITH OR WITHOUT O-RING WILL REQUIRE DOW 111 OR APPROVED EQUAL TO BE APPLIED.
5. PLACE SUREBOND EVERFLEX SB-1800 COLD WEATHER SEALANT OR APPROVED EQUAL BETWEEN EACH SPACER RING AND TOP FLANGE OF BASE CAN. DO NOT INSTALL EXCESSIVE AMOUNT OF SEALANT AND DO NOT INSTALL SEALANT IN BASE CAN BOLT HOLES.
6. THE P-606 SEALER SHALL FILL THE VOID TO BE FLUSH WITH THE CONCRETE RING OR WITHIN 0.125" BELOW THE TOP EDGE OF THE CONCRETE RING AT THE LOWEST POINT OF THE CONCRETE. ANY OVER POURS SHALL BE REPLACED BY AND AT THE CONTRACTOR'S EXPENSE.
7. CONTRACTOR SHALL PROVIDE A 14.25" BC TO 11.25" BC ADAPTER PLATE FOR IN-PAVEMENT RUNWAY EDGE LIGHTS.



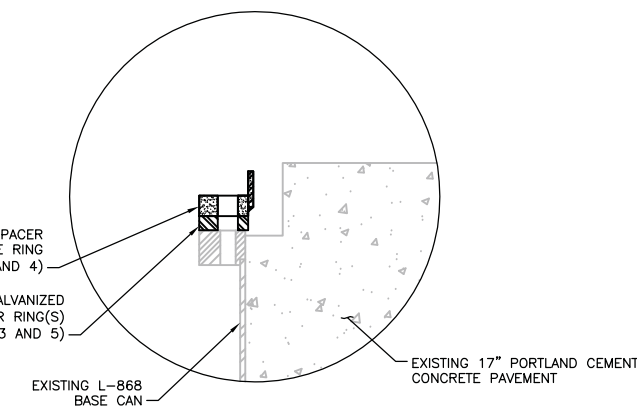
1 REPAIR OF EPOXY SEALANT AROUND LIGHT CANS  
NTS



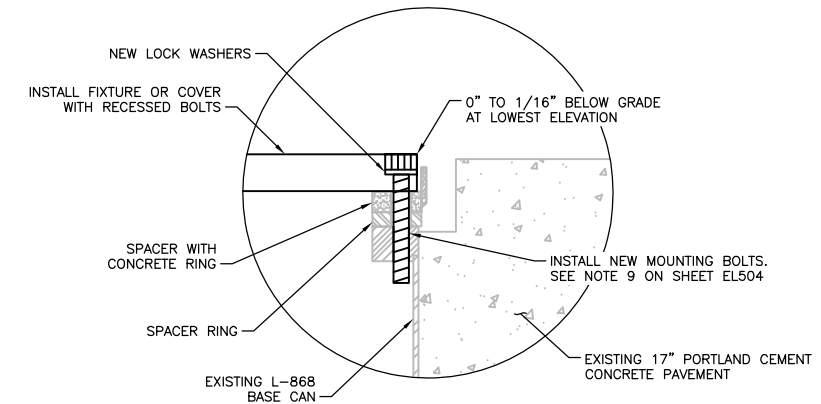
2 EPOXY REMOVAL (STEP 1) DETAIL  
NTS



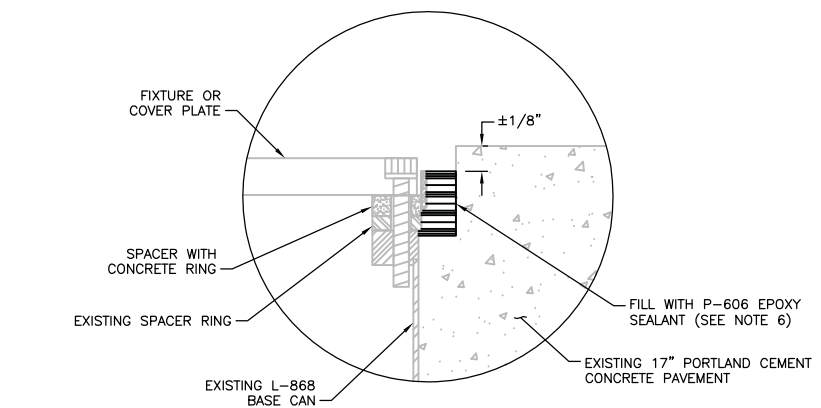
3 EPOXY REMOVAL (STEP 2) DETAIL  
NTS



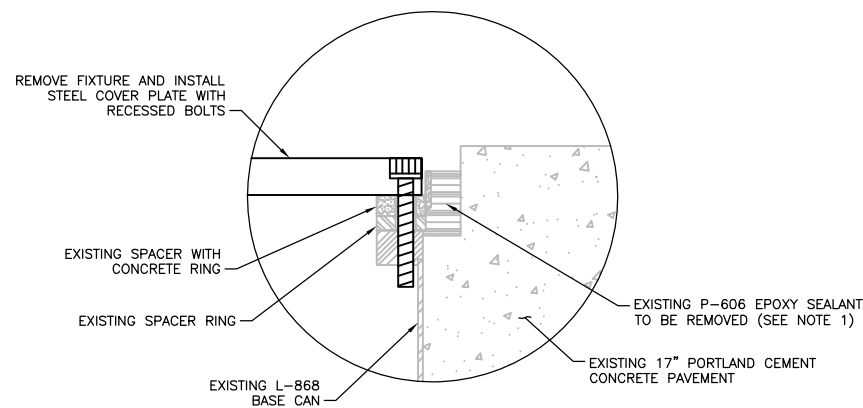
4 EPOXY REMOVAL (STEP 3) DETAIL  
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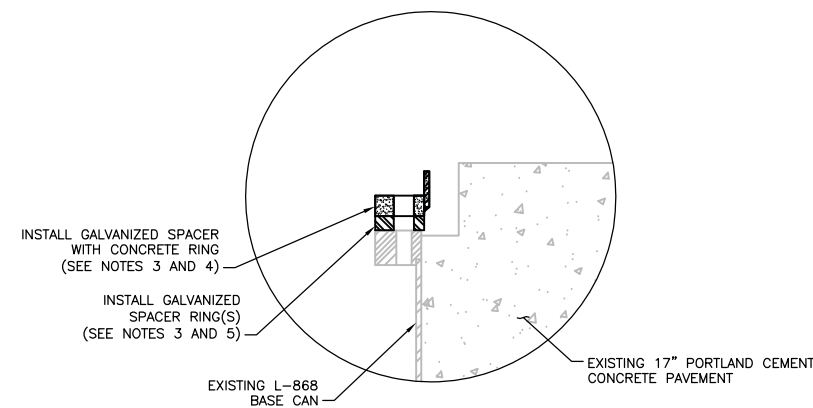
5 EPOXY REMOVAL (STEP 4) DETAIL  
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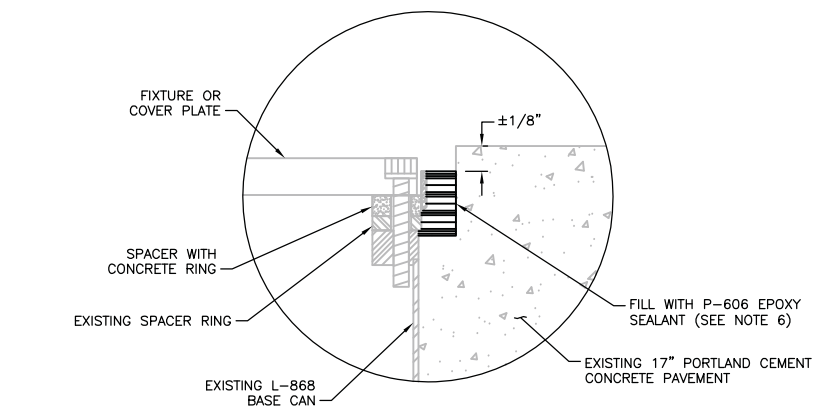
6 EPOXY INSTALLATION (STEP 5) DETAIL  
NTS



7 EPOXY INSTALLATION (STEP 6) DETAIL  
NTS



8 EPOXY INSTALLATION (STEP 7) DETAIL  
NTS



9 EPOXY INSTALLATION (STEP 8) DETAIL  
NTS

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ISSUED FOR CONSTRUCTION



RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | SJ  | CONST | 07JA14  | MS   |      |

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VOLUME NO. 1

SHEET TITLE

ELECTRICAL  
DETAILS

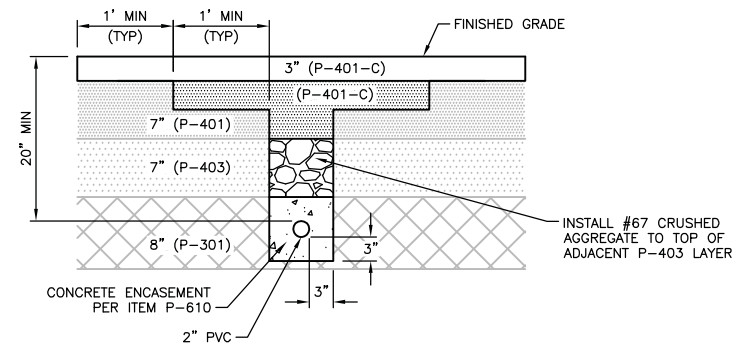
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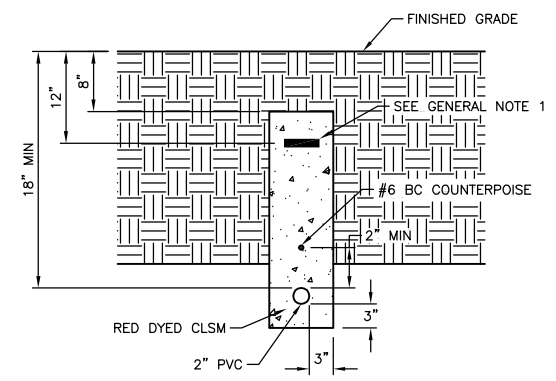
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GENERAL NOTES:

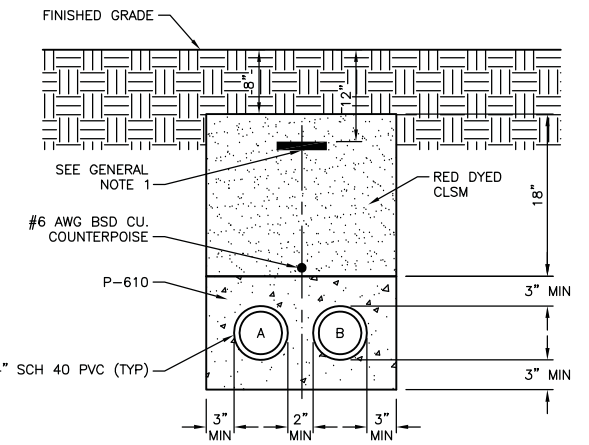
1. INSTALL AN APPROVED RED PLASTIC, DETECTABLE, MAGNETIC, 4" WIDE TAPE 12" BELOW FINISHED GRADE ABOVE ALL PORTIONS OF DUCT BANKS AND CONDUITS IN TURF.
2. SEE BASE CAN INSTALLATION DETAILS FOR 2" SCH 40 PVC INSTALLATION DETAILS UNDER AIRFIELD PAVEMENTS.
3. INSTALL A 200 LB. POLYPROPYLENE PULL STRING IN EACH EMPTY DUCT AND CONDUIT INSTALLED, PLUG OR CAP THE DUCT. THE STRING SHALL BE SECURELY ATTACHED INSIDE EACH BASE CAN, OR A STAKE WHERE THE DUCT TERMINATES UNDERGROUND.
4. ALL PVC CONDUIT AND FITTINGS SHALL CONFORM TO NEMA TC-2, NEMA TC-3, AND SHALL BE U.L. LISTED.
5. PVC PLUGS SHALL BE INSTALLED IN EACH EMPTY SLEEVE AND DUCT.
6. COORDINATE TRENCHING AND CONDUIT PLACEMENT WITH EARTHWORK AND PAVING CONTRACTOR.
7. PROVIDE SPACERS TO SUPPORT ELECTRICAL DUCTS ON 5'-0" MAXIMUM SPACING.



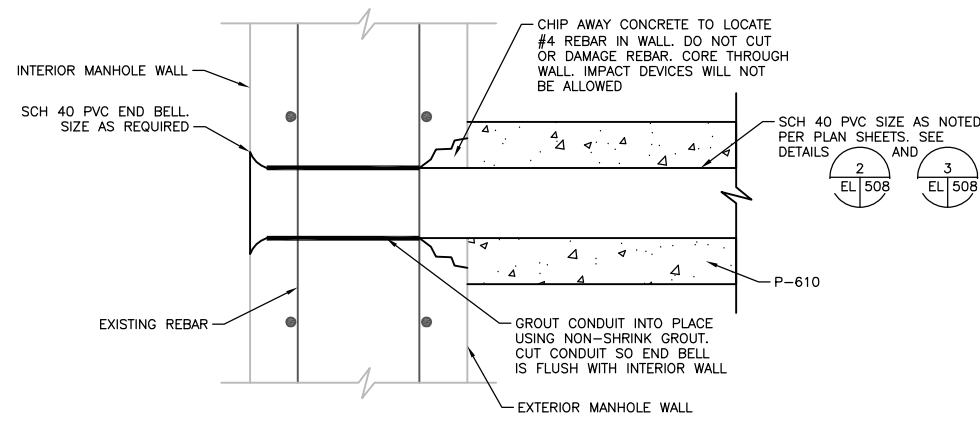
1 CONDUIT IN EXISTING SHOULDER PAVEMENT  
NTS



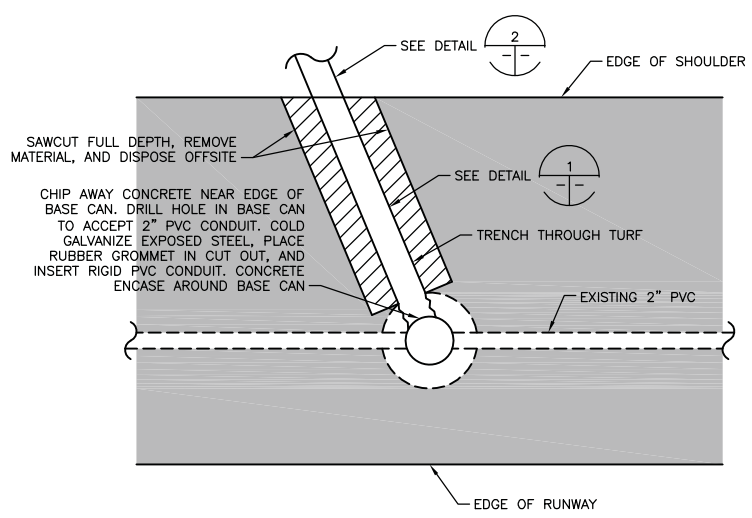
2 CONDUIT IN TURF  
NTS



3 2 WAY 4" DUCTBANK CONCRETE ENCASED  
NTS



4 MANHOLE WALL CONDUIT PENETRATION  
NTS



5 EXISTING BASE CAN TIE-IN DETAIL  
NTS

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RUNWAY 8-26  
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REHABILITATION

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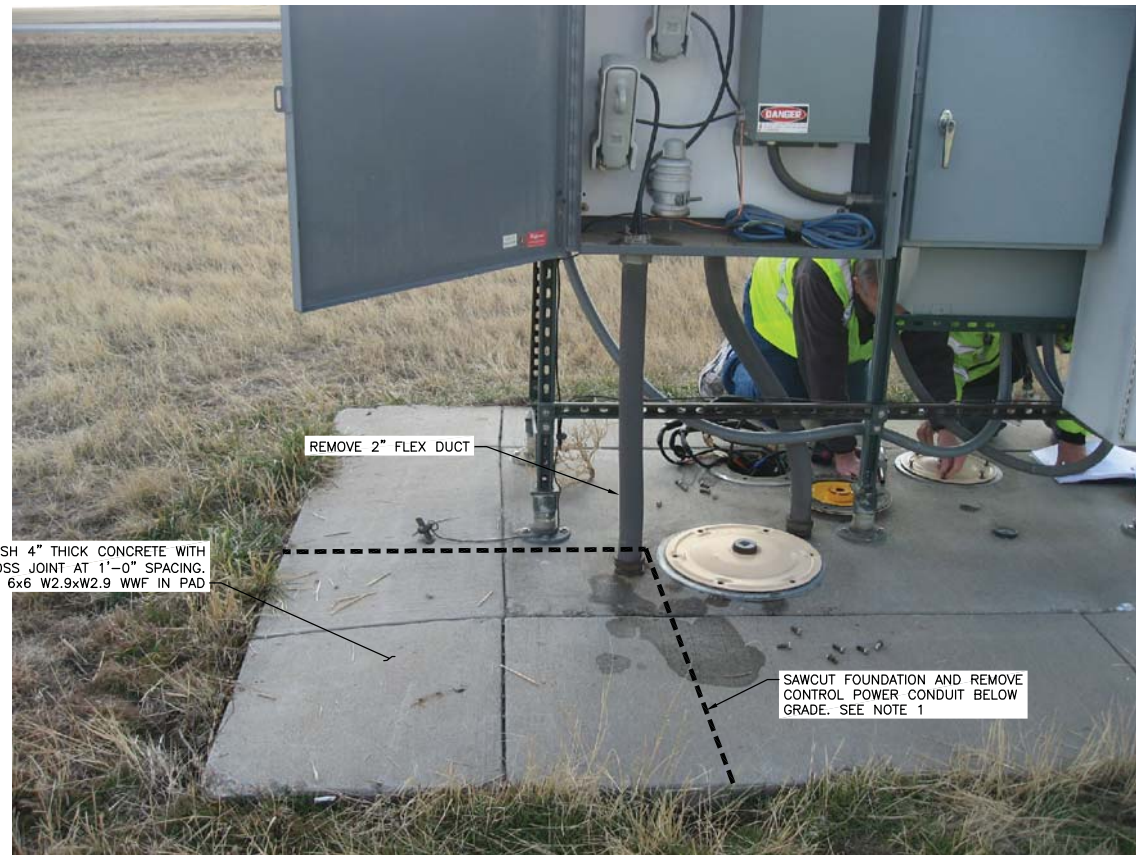
SHEET NO. EL509

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CADD FILE NO. \_201313528-1E1-509-A

NOTE:

- CONTRACTOR SHALL POTHOLE USING NON-EVASIVE MEANS PRIOR TO ANY SAWCUTTING OR EXCAVATION DUE TO THE NUMBER OF CONDUITS IN THE AREA. ANY DAMAGE CAUSED TO EXISTING CONDUITS SHALL BE CORRECTED BY THE CONTRACTOR AT NO EXPENSE TO DIA.

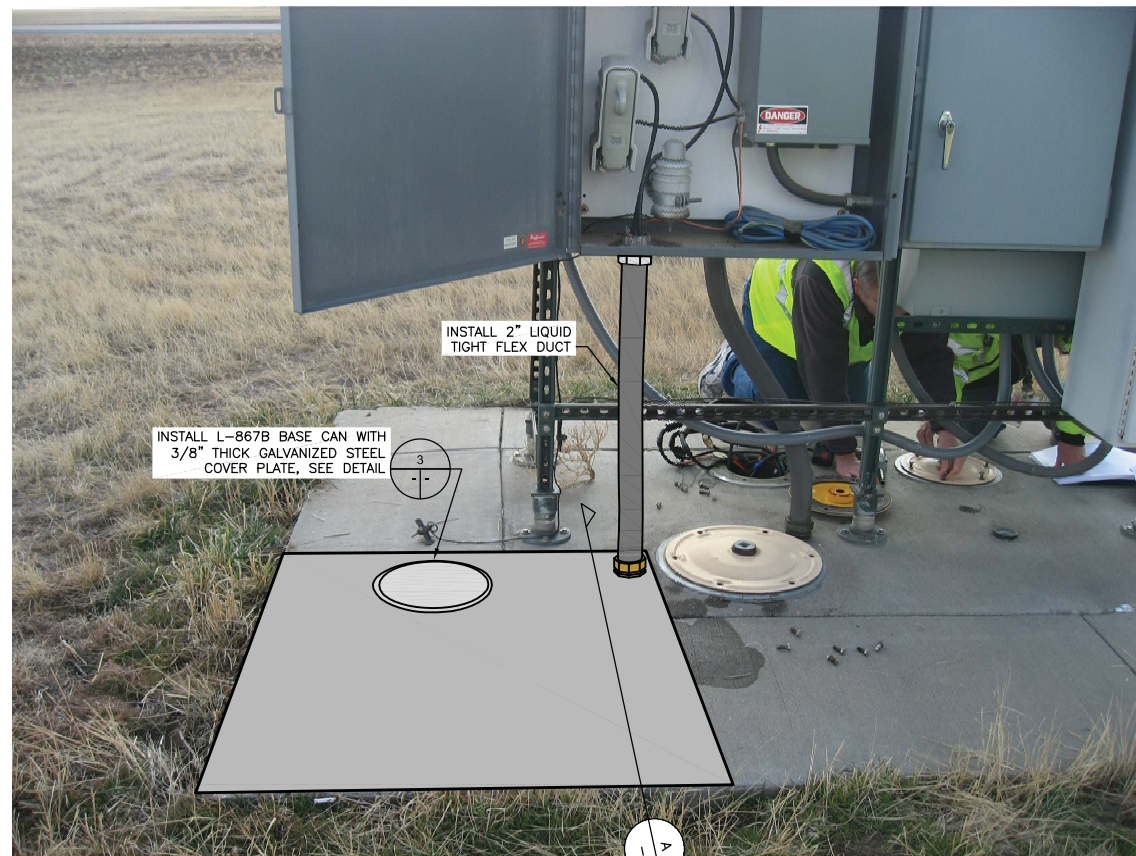
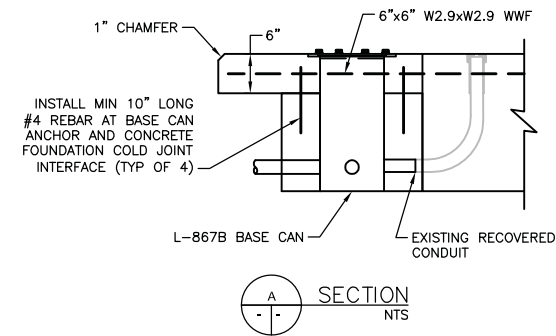


REMOVE 2" FLEX DUCT

DEMOLISH 4" THICK CONCRETE WITH #4 ACROSS JOINT AT 1'-0" SPACING. INCLUDES 6x6 W2.9xW2.9 WWF IN PAD

SAWCUT FOUNDATION AND REMOVE CONTROL POWER CONDUIT BELOW GRADE. SEE NOTE 1

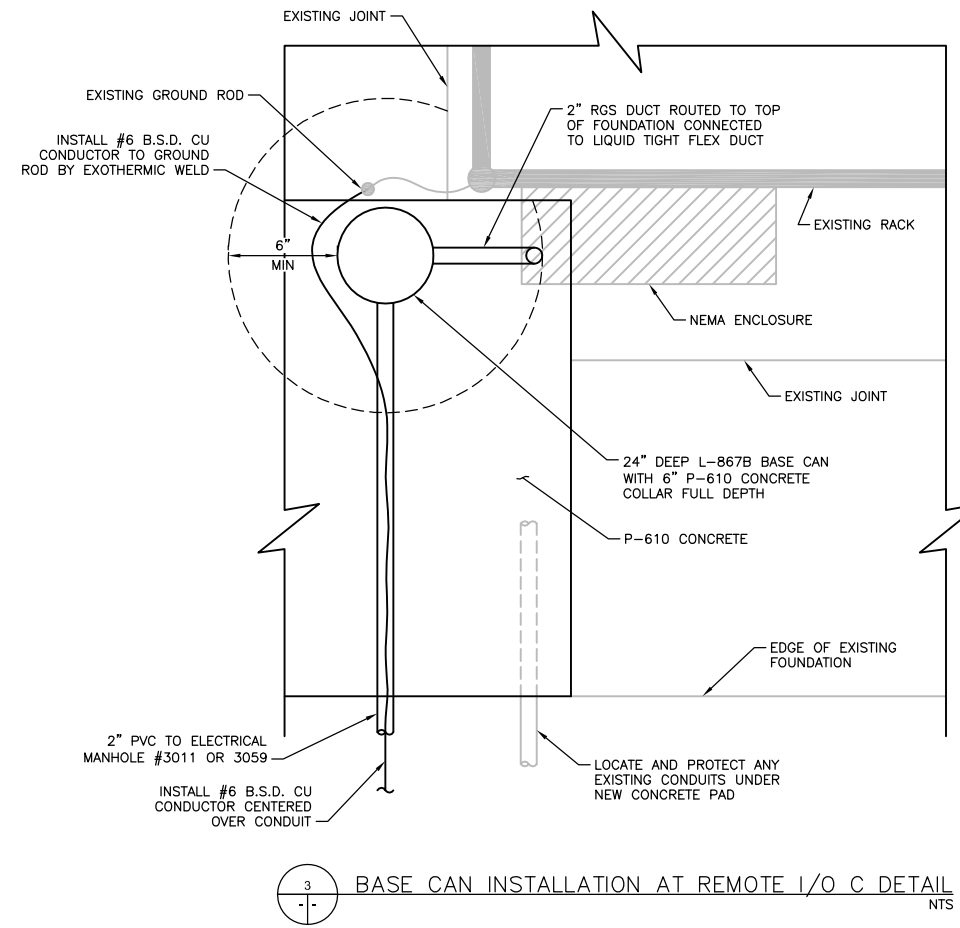
1 RUNWAY 8-26 REMOTE I/O B & C DEMOLITION DETAIL  
NTS



INSTALL 2" LIQUID TIGHT FLEX DUCT

INSTALL L-867B BASE CAN WITH 3/8" THICK GALVANIZED STEEL COVER PLATE, SEE DETAIL

2 RUNWAY 8-26 REMOTE I/O B & C PROPOSED DETAIL  
NTS

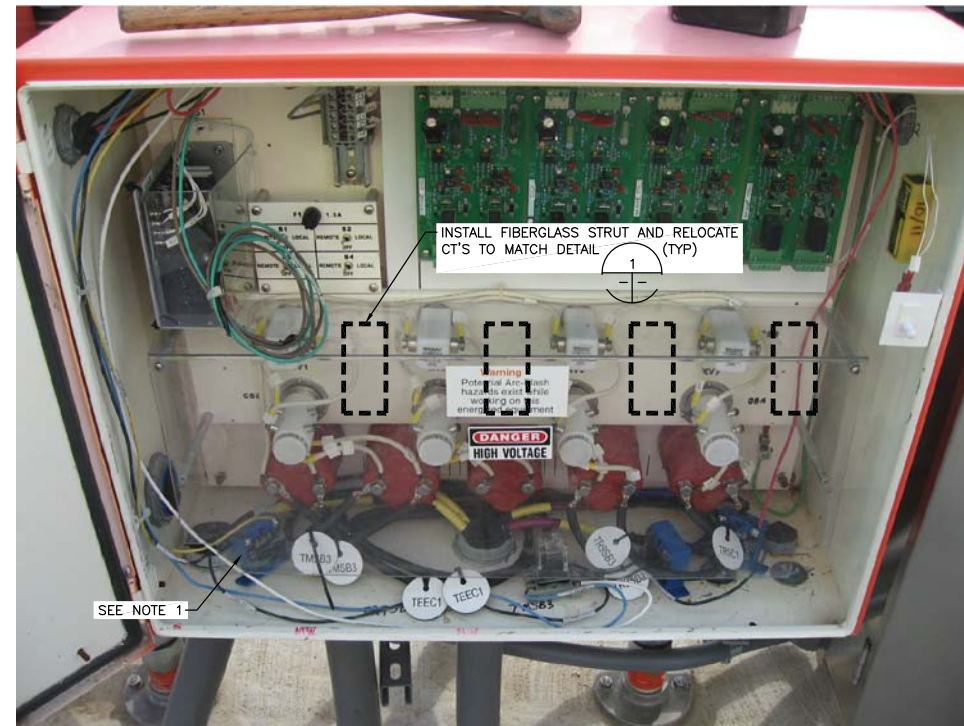


GENERAL NOTES:

1. REMOVE MOUNTING PLATES, INSTALL FIBERGLASS STRUT, AND MOUNT THE CURRENT CT'S TO STRUT USING STAINLESS STEEL BOLTS IN THE CIRCUIT SELECTOR SWITCH ENCLOSURES AS SHOWN IN DETAIL 1 ON THIS SHEET.
2. SEE NOTE 30 ON SHEET ELO01 FOR ADDITIONAL WORK REQUIRED IN THE THREE R/O RACKS.

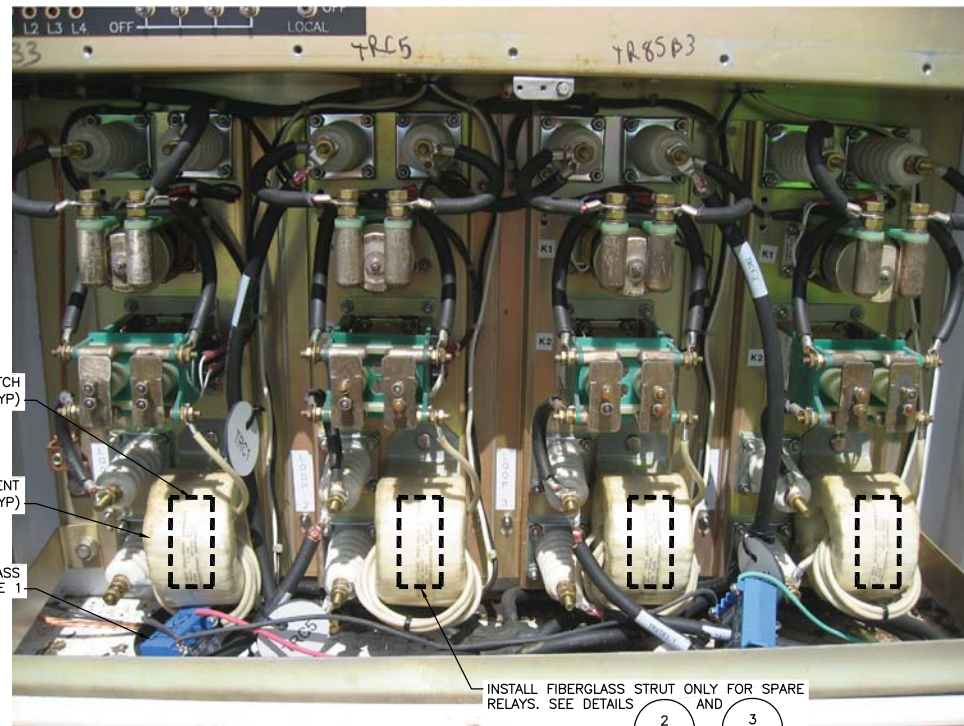


1 PROPOSED CURRENT TRANSFORMER (CT) INSTALLATION  
NTS



NOTE:  
1. ONLY ONE CSS SHOWN. TWO CSS PANELS REQUIRE MODIFICATION.

2 EXISTING CURRENT TRANSFORMER (CT) INSTALLATION - RIO A  
NTS



3 EXISTING CURRENT TRANSFORMER (CT) INSTALLATION - RIO'S B AND C  
NTS

CITY & COUNTY  
of DENVER

DENVER  
INTERNATIONAL  
AIRPORT



DENVER INTERNATIONAL AIRPORT  
MAINT. & ENGS.  
8500 Pena Blvd.  
Denver, CO 80249-6340



RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

CH2MHILL

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | SJ  | CONST | 07JA14  | MS   |      |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

ELECTRICAL  
DETAILS

SHEET NO.

EL510

96 OF 115

CADD FILE NO.  
\_201313528-1EL-510-A

**NOTE:**  
1. REFER TO AIRFIELD ELECTRICAL PLAN SHEETS FOR LOCATION OF RIO RACKS AND CIRCUIT ROUTING.

CITY & COUNTY  
of DENVER

DENVER  
INTERNATIONAL  
AIRPORT



DENVER INTERNATIONAL AIRPORT  
MAINT. & ENG.  
8500 Pena Blvd.  
Denver, CO 80249-6340



**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

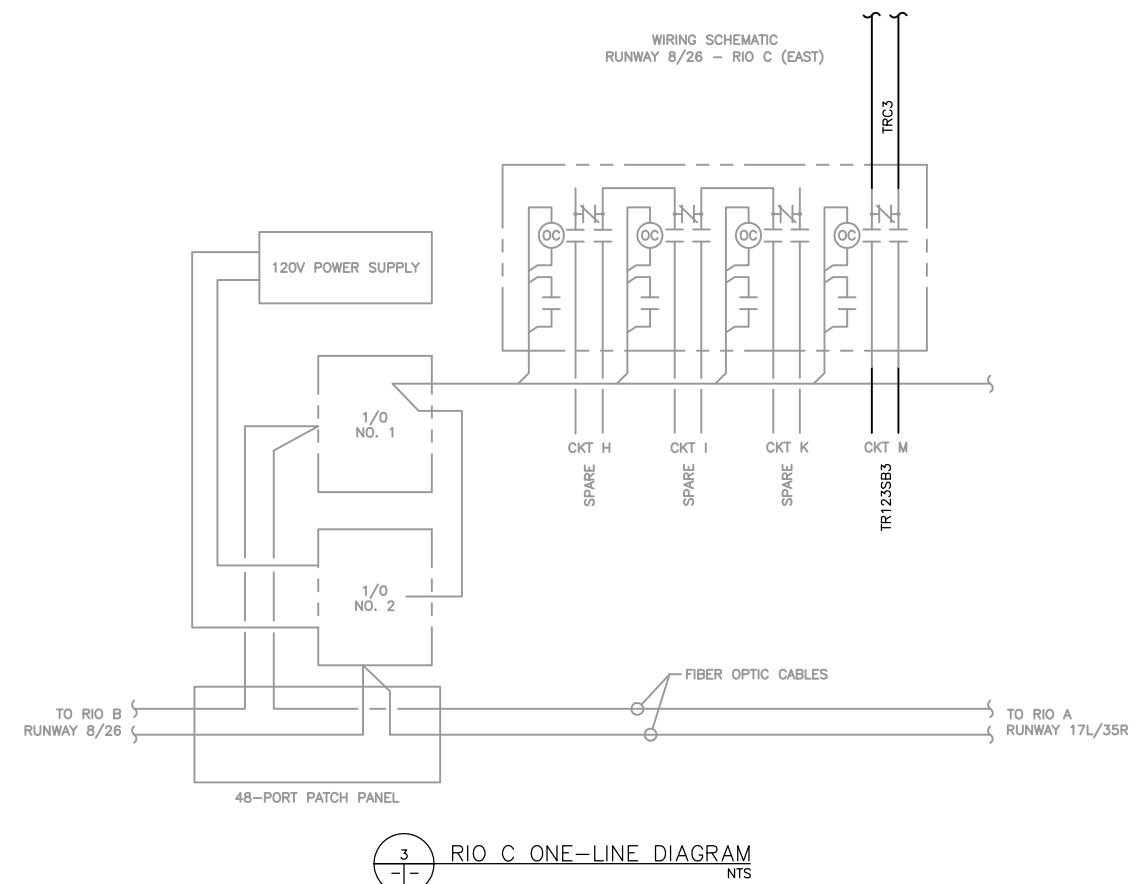
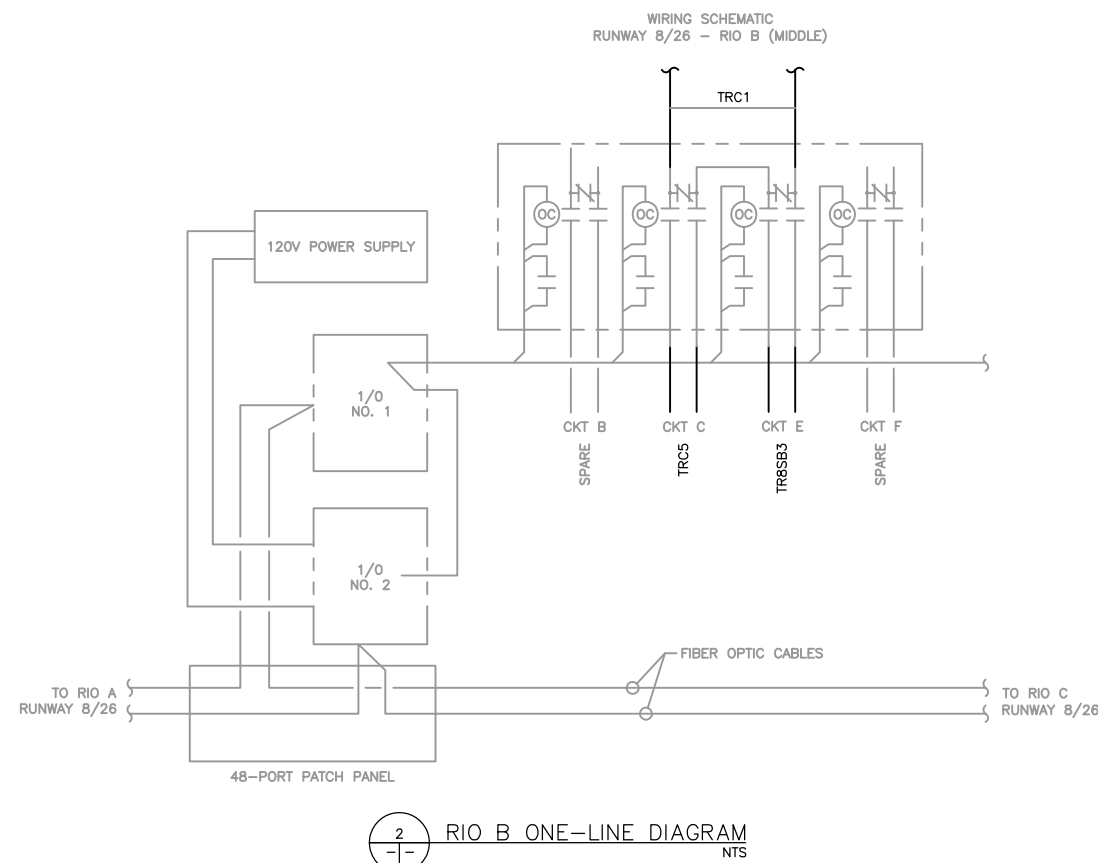
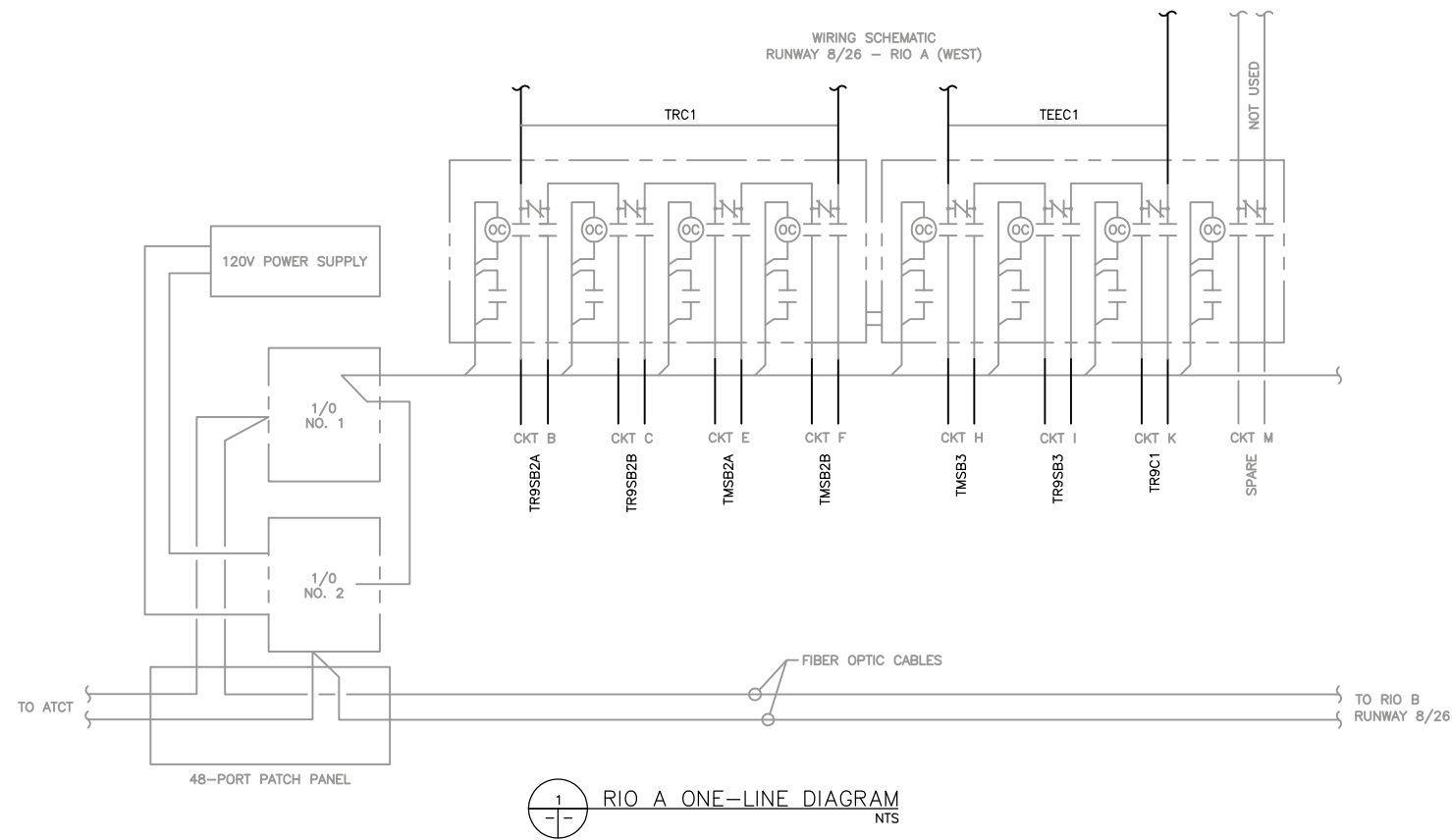
**CH2MHILL**

| ISSUE RECORD | NO. | BY | PURPOSE | DATE   | CHKD |
|--------------|-----|----|---------|--------|------|
|              | 1   | SJ | CONST   | 07JA14 | MS   |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

**ELECTRICAL  
DETAILS**

|               |                      |
|---------------|----------------------|
| SHEET NO.     | EL511                |
|               | 97 OF 115            |
| CADD FILE NO. | _201313528-1EL-511-A |



G:\work\ch2mhill\log\awaziri\201313528-1EL-511.dwg Jan 07, 2014 - 12:58pm awaziri

ISSUED FOR CONSTRUCTION



**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE     | CHKD |
|--------------|-----|-------|---------|----------|------|
| 1            | SJ  | CONST |         | 07/14/14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

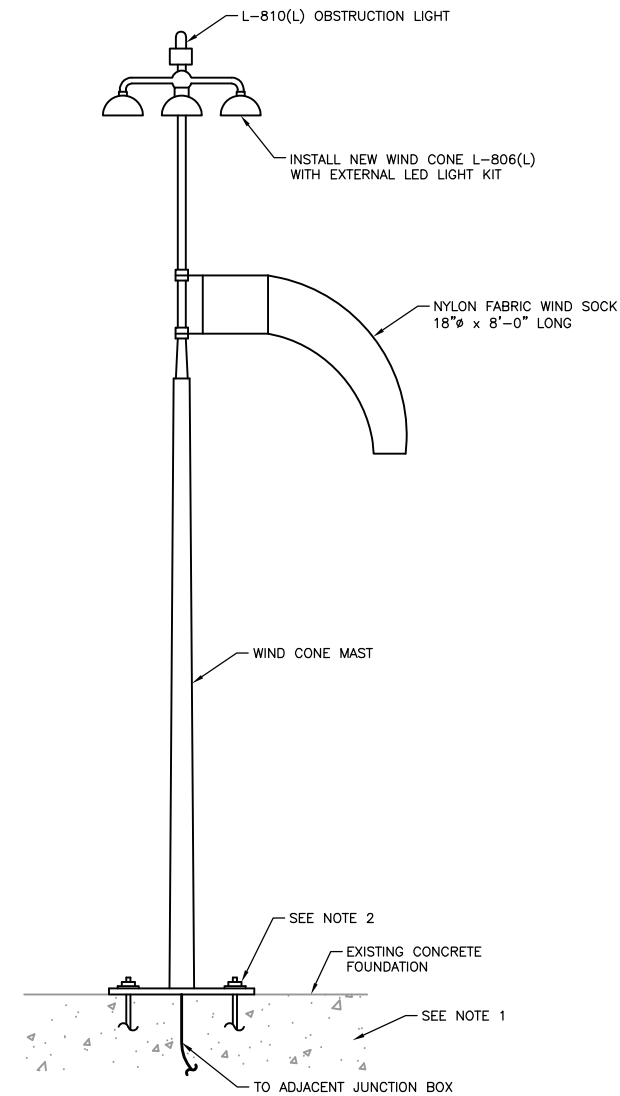
SHEET TITLE

**ELECTRICAL  
DETAILS**

SHEET NO. EL512

98 OF 115  
CADD FILE NO.

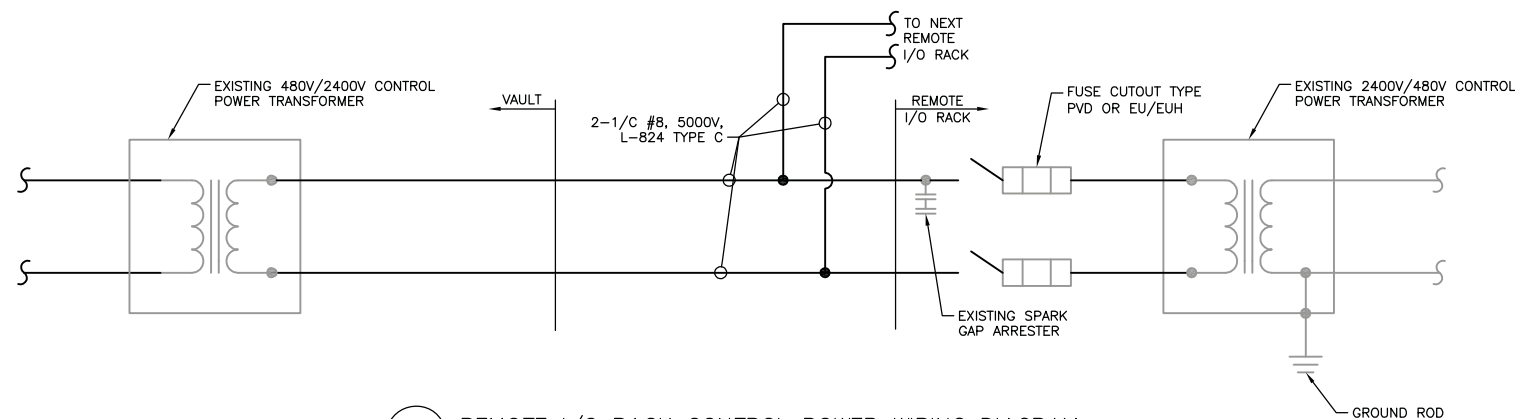
\_201313528-1EL-512-A



**NOTES:**

1. REPLACE EXISTING WIND CONE POWER ADAPTER (6.6A TO 120V) AS REQUIRED PER MANUFACTURER.
2. EXISTING WIND CONE BOLT CIRCLE IS 8". CONTRACTOR SHALL FIELD VERIFY PRIOR TO ORDERING MATERIALS.

1  
L-806 WIND CONE DETAIL  
NTS



2  
REMOTE I/O RACK CONTROL POWER WIRING DIAGRAM  
NTS



RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

CH2MHILL

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | SJ  | CONST | 07JA14  | MS   |      |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

ELECTRICAL  
DETAILS

SHEET NO. EL513

99 OF 115

CADD FILE NO. 201313528-1EL-513-A

SIGN FIXTURE NOTES:

1. ALL MATERIALS AND SIGNS BASE DETAILS SHALL BE SUBMITTED TO THE DIA PROJECT MANAGER FOR APPROVAL.
2. THE CONCRETE SHALL COMPLY WITH (P-610) SPECIFICATION.
3. (P-610) CONCRETE STEEL REINFORCEMENT SHALL BE ASTM A615 GRADE 60. ALL REINFORCEMENT SHALL HAVE A 2" MINIMUM CONCRETE COVER.
4. FOR LOCATION AND ORIENTATION OF SIGN AND FOUNDATIONS SEE PLANS.
5. THE ORIENTATION, INSTALLATION, AND DEPTH OF THE 2" CONDUIT SHALL BE COORDINATED WITH THE PLANS.
6. THE BOLTING PATTERN AND METHOD OF ANCHORING SHALL BE PER SIGN MANUFACTURER'S RECOMMENDATIONS AND SHALL BE SUBMITTED TO THE DIA PROJECT MANAGER FOR APPROVAL. ANCHORS SHALL BE STAINLESS STEEL.
7. ALL CONDUIT SHALL BE 2" SCHEDULE 40 PVC UNLESS NOTED OTHERWISE.
8. SIGNS SHALL BE WELL SEALED AND RESISTANT TO WIND AND DIRT.
9. BOTTOM OF SIGN SHALL BE 6" ABOVE CONCRETE SIGN PAD.
10. CONTRACTOR SHALL INSTALL ISOLATION TRANSFORMERS WITH RATED CURRENT OF 5.5A PRIMARY, 6.2A SECONDARY. EXISTING 1 MODULE, 2 MODULE, AND 3 MODULE SIGNS HAVE 100W, 150W, AND 200W SIZED ISOLATION TRANSFORMERS, RESPECTIVELY.

SIGN TABLE

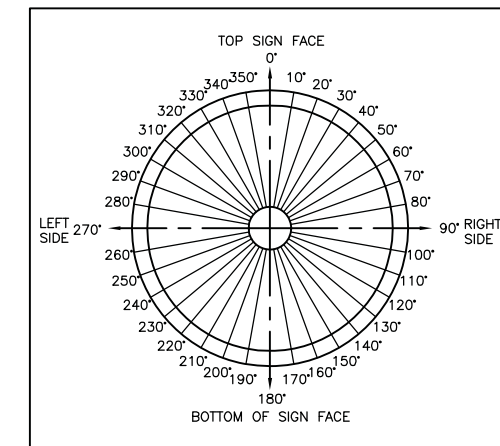
| SIGN ID NUMBER | SIGN MODULE | SIGN LEGEND  |       | TYPE  |      | NORTHING        | EASTING |
|----------------|-------------|--------------|-------|-------|------|-----------------|---------|
|                |             | FRONT        | BACK  | FRONT | BACK |                 |         |
| TLS2-19506     | 2           | 270° ← K   Z | BLANK | Y   L | --   | SEE SHEET EL505 |         |

SIGN TABLE NOTES:

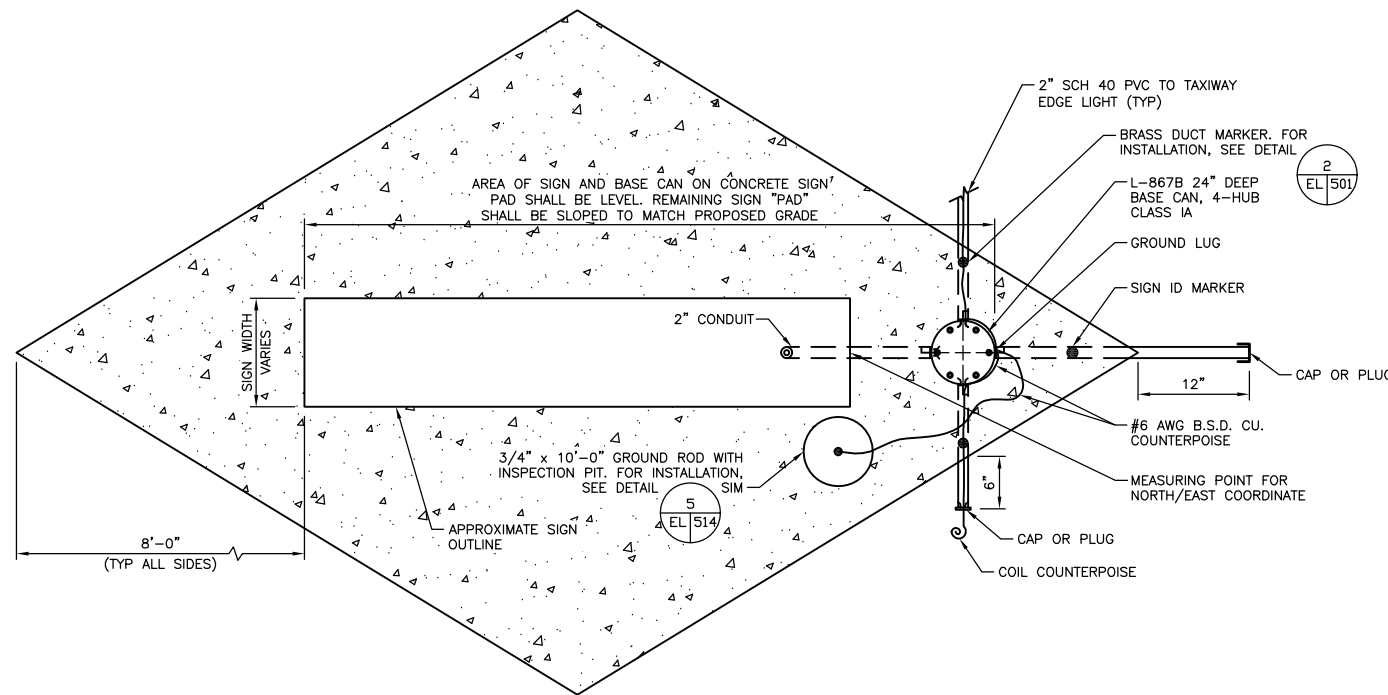
1. MATCH EXISTING LIGHTED SIGNS AT THE AIRPORT, CROUSE HINDS, ADB, OR APPROVED EQUAL. PROVIDE LED SIGNS.
2. THE FRONT SIDE OF A SIGN IS DESIGNATED AS THAT ON THE LEFT SIDE OF PAVEMENT FROM THE PILOT'S PERSPECTIVE.

SIGN TABLE LEGEND:

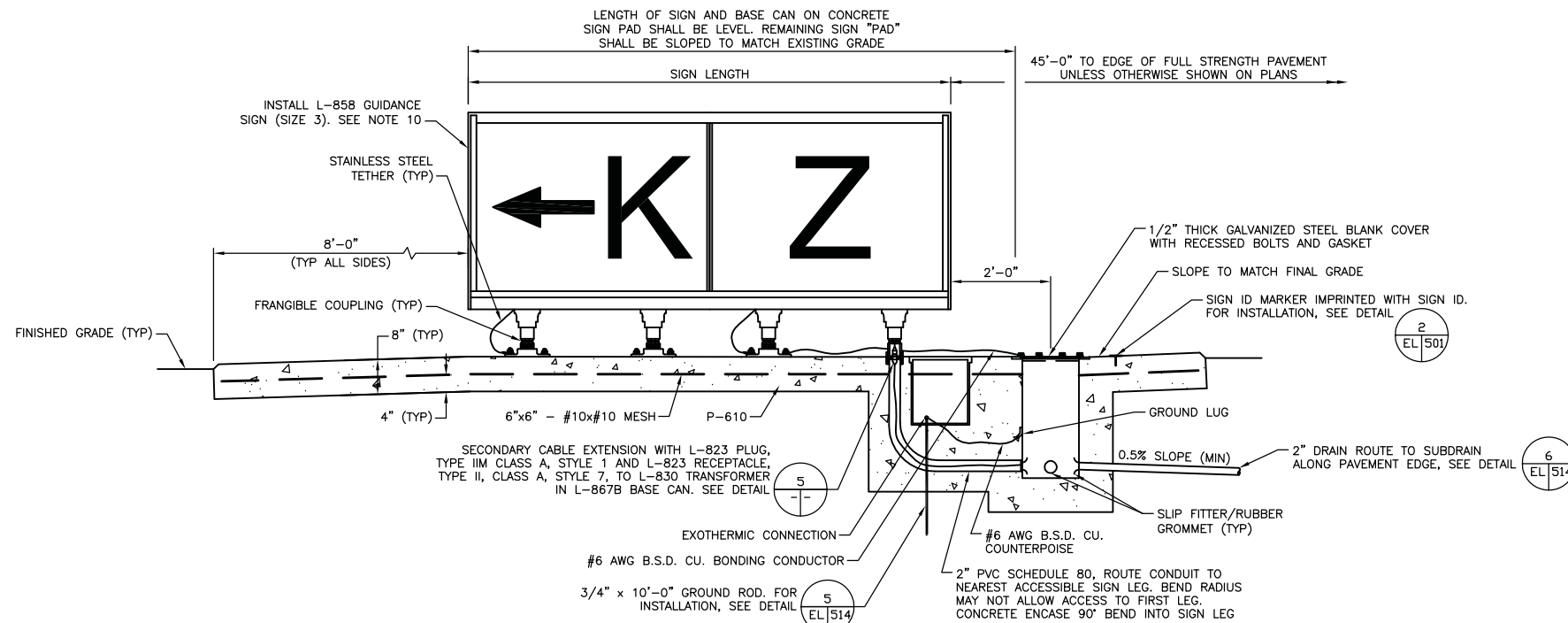
- Y INFORMATION SIGN - BLACK CHARACTERS ON A YELLOW BACKGROUND
- L LOCATION SIGN - YELLOW CHARACTERS AND BORDER ON A BLACK BACKGROUND



ARROW ROTATION ANGLE DATA



1 PLAN VIEW  
NTS



2 INSTALLATION OF SIGN SIZE 3 DETAIL  
NTS

Jan 07, 2014 - 12:58pm swazif  
 C:\pwworkdir\ch2mhill\bg\swazif\00190390\201313528-1EL-513.dwg



**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | SJ  | CONST | 07JA14  | MS   |      |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

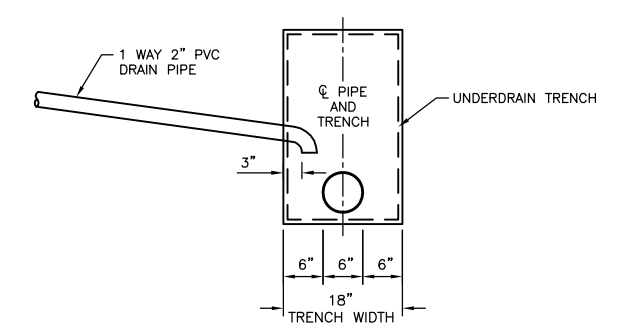
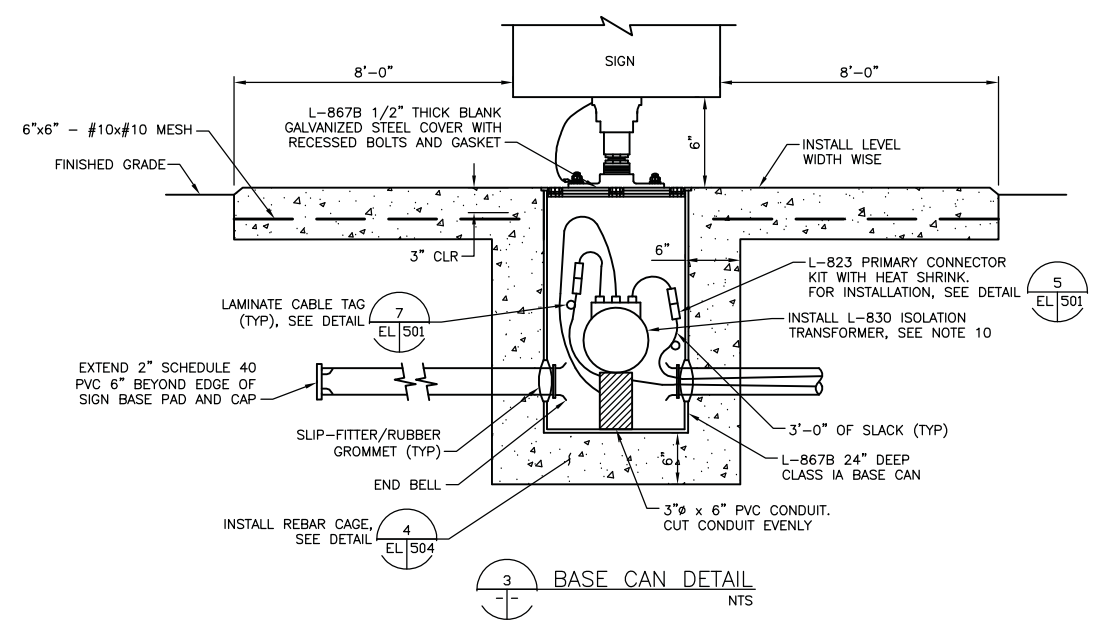
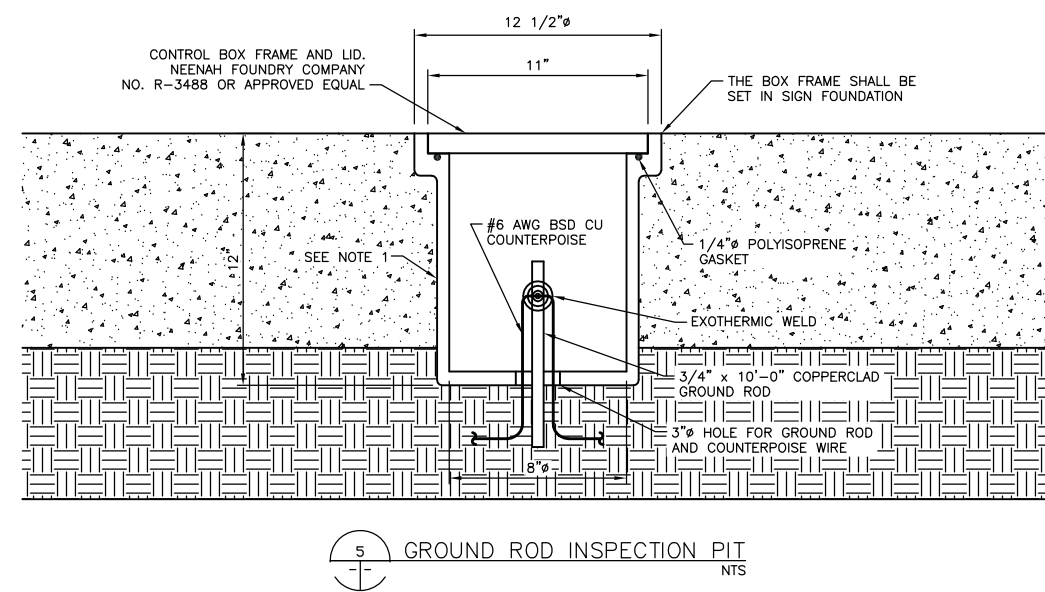
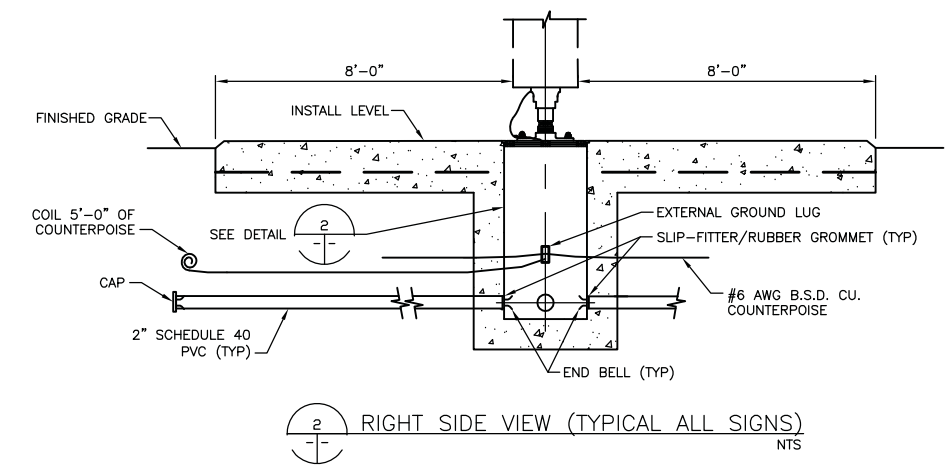
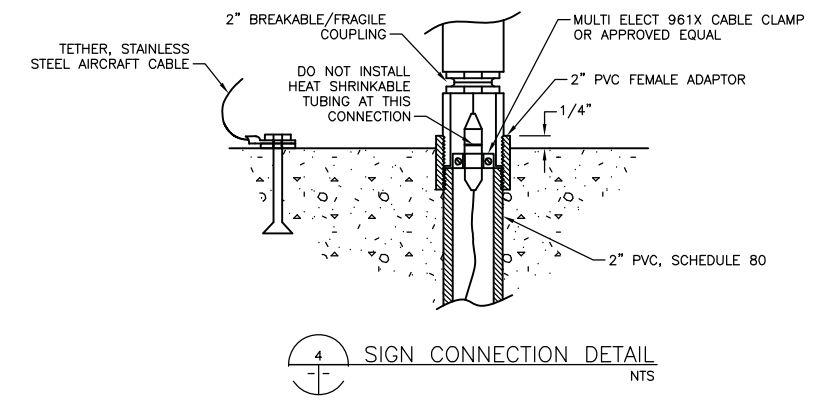
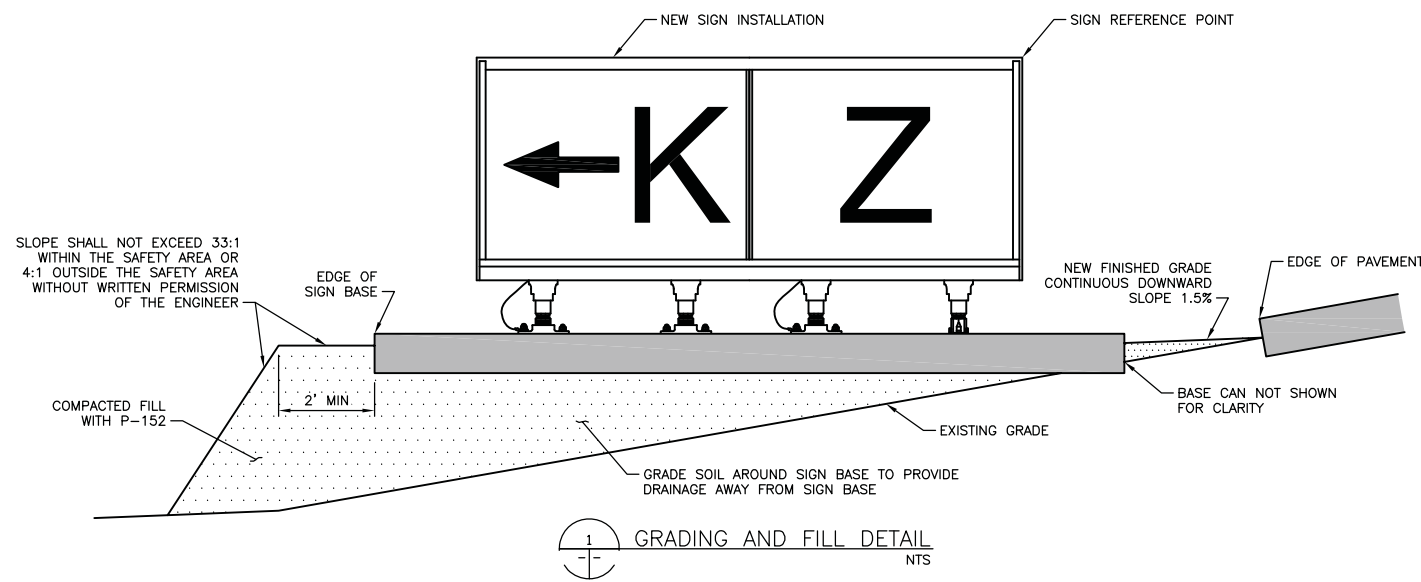
**ELECTRICAL  
DETAILS**

SHEET NO.

EL514

100 OF 115

CADD FILE NO. 201313528-1EL-514-A



- DRAINAGE NOTES:**
1. THE CONTRACTOR SHALL ENSURE THE ELECTRICAL DRAINAGE PIPE IS INSTALLED TO PROVIDE POSITIVE DRAINAGE AWAY FROM THE FIXTURES AND COMPLETELY OUTFALL IN THE UNDERDRAIN TRENCH.
  2. THE CONTRACTOR SHALL MINIMIZE THE CUT TO THE GEOTEXTILE FABRIC WHEN CONNECTING THE 1 WAY 2" DUCT BANK TO THE UNDERDRAIN TRENCH. CARE SHALL BE TAKEN NOT TO DAMAGE THE GEOTEXTILE FABRIC WHEN INSTALLING THE 2" PVC.
  3. STOP ENCASUREMENT OF THE 2" PVC PIPE AT THE EDGE OF THE UNDERDRAIN TRENCH.

Jan 07, 2014 12:58pm swazif  
 C:\work\ch2mhill\log\swazif\0130390\201313528-1EL-514.dwg  
 REUSE OF DOCUMENTS: THIS DOCUMENT AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF CH2M HILL AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF CH2M HILL. © CH2M HILL

ISSUED FOR CONSTRUCTION





**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/14/14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**MANHOLE BUTTERFLIES**

SHEET NO. EL701

101 OF 115

CADD FILE NO. \_201313528-1EL-701-A

**NOTE:**

1. A NUMBER (1) OR (3) SHOWN BEHIND A CIRCUIT DESIGNATION SIGNIFIES THE NUMBER OF CONDUCTORS. WHERE THERE IS NO NUMBER, 2 CONDUCTORS SHALL BE ASSUMED.

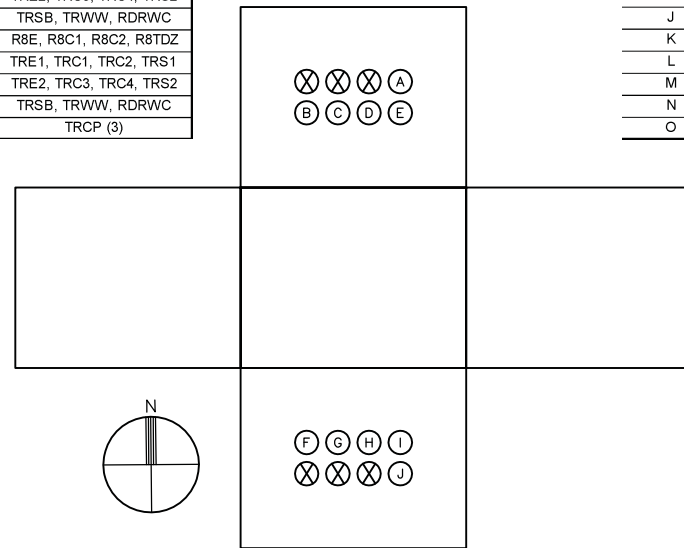
**LEGEND:**

- 2" CONDUIT
- ⊙ 4" CONDUIT
- ⊗ EMPTY 4" CONDUIT

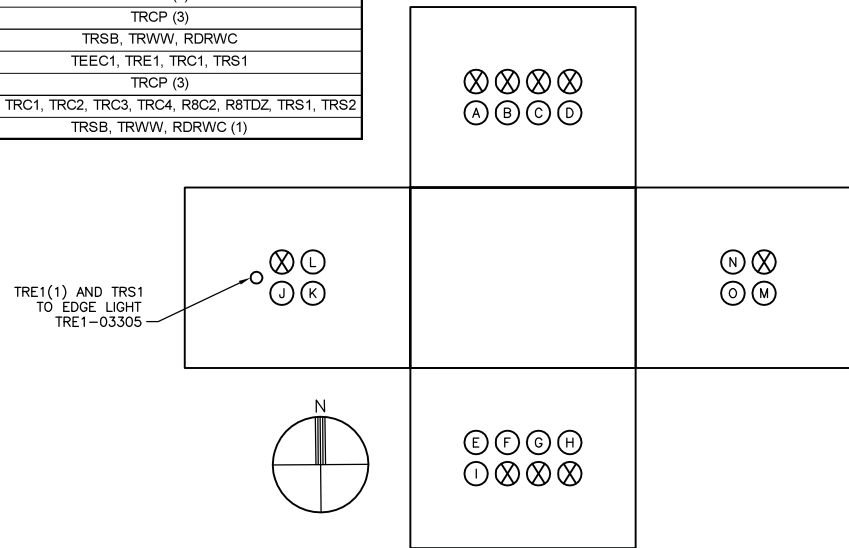
| CALLOUT | CIRCUIT DESIGNATION    |
|---------|------------------------|
| A       | TRCP (3)               |
| B       | R8E, R8C1, R8C2, R8TDZ |
| C       | TRE1, TRC1, TRC2, TRS1 |
| D       | TRE2, TRC3, TRC4, TRS2 |
| E       | TRSB, TRWW, RDRWC      |
| F       | R8E, R8C1, R8C2, R8TDZ |
| G       | TRE1, TRC1, TRC2, TRS1 |
| H       | TRE2, TRC3, TRC4, TRS2 |
| I       | TRSB, TRWW, RDRWC      |
| J       | TRCP (3)               |

| CALLOUT | CIRCUIT DESIGNATION                                   |
|---------|-------------------------------------------------------|
| A       | TRCP (3)                                              |
| B       | R8E, R8C1                                             |
| C       | TRE1 (1), TRC1, TRS1                                  |
| D       | TRSB, TRWW, RDRWC (1)                                 |
| E       | R8E, R8C1, R8C2, R8TDZ                                |
| F       | TRE1, TRC1, TRC2, TRS1, TEEC1                         |
| G       | TRE2, TRC3, TRC4, TRS2                                |
| H       | TRSB, TRWW, RDRWC                                     |
| I       | TRCP (3)                                              |
| J       | TRCP (3)                                              |
| K       | TRSB, TRWW, RDRWC                                     |
| L       | TEEC1, TRE1, TRC1, TRS1                               |
| M       | TRCP (3)                                              |
| N       | TRE2, TRC1, TRC2, TRC3, TRC4, R8C2, R8TDZ, TRS1, TRS2 |
| O       | TRSB, TRWW, RDRWC (1)                                 |

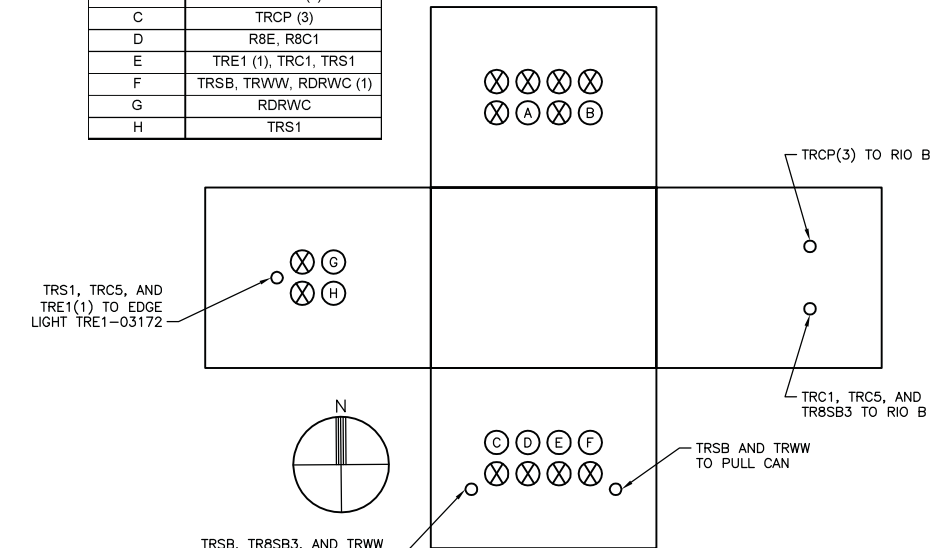
| CALLOUT | CIRCUIT DESIGNATION   |
|---------|-----------------------|
| A       | R8E, R8C1             |
| B       | RDRWC (1)             |
| C       | TRCP (3)              |
| D       | R8E, R8C1             |
| E       | TRE1 (1), TRC1, TRS1  |
| F       | TRSB, TRWW, RDRWC (1) |
| G       | RDRWC                 |
| H       | TRS1                  |



MANHOLES EMH-03006 THROUGH EMH-03009



MANHOLE EMH-03010

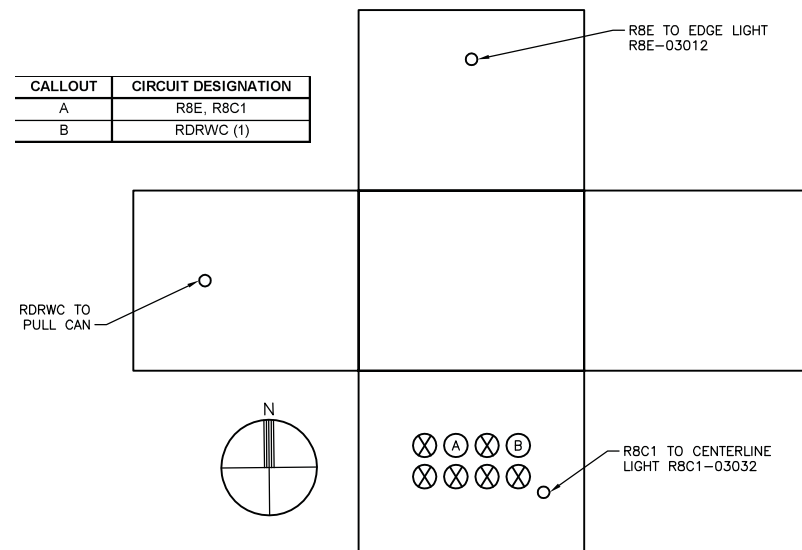


MANHOLE EMH-03011

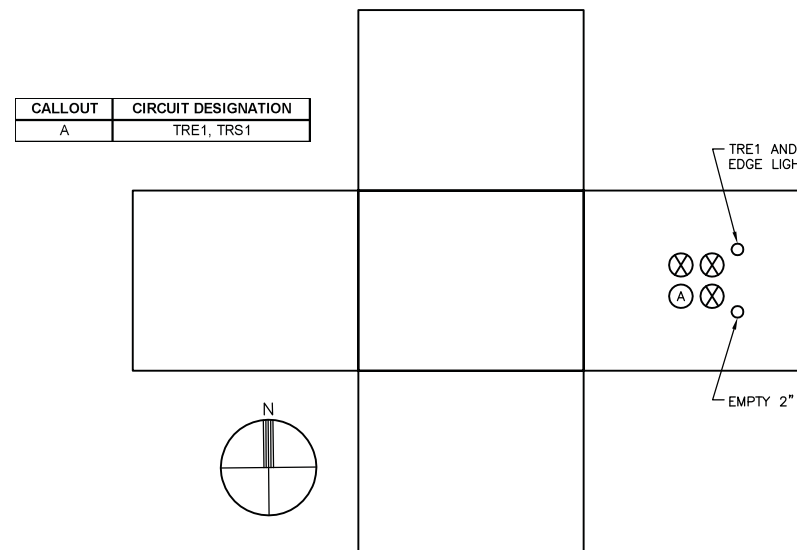
| CALLOUT | CIRCUIT DESIGNATION |
|---------|---------------------|
| A       | R8E, R8C1           |
| B       | RDRWC (1)           |

| CALLOUT | CIRCUIT DESIGNATION |
|---------|---------------------|
| A       | TRE1, TRS1          |

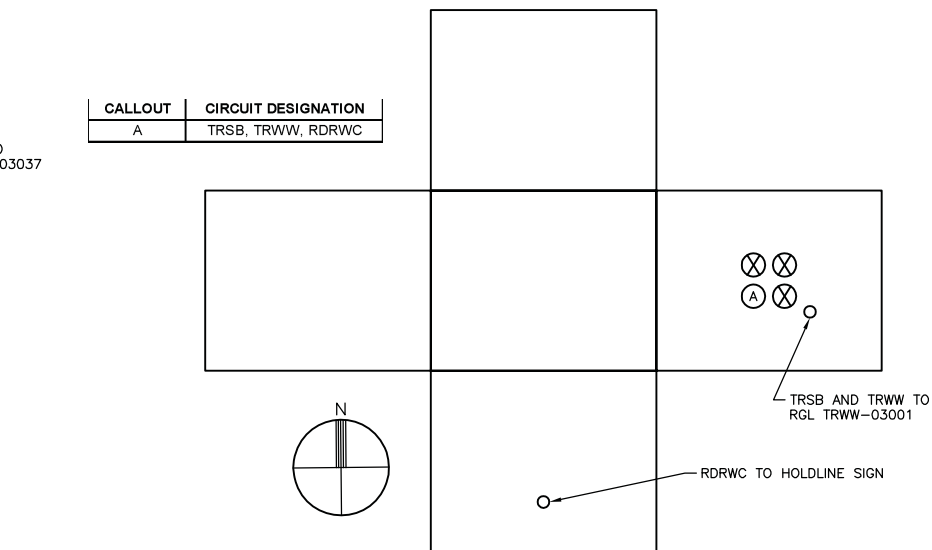
| CALLOUT | CIRCUIT DESIGNATION |
|---------|---------------------|
| A       | TRSB, TRWW, RDRWC   |



MANHOLE EMH-03012



MANHOLE EMH-03014



MANHOLE EMH-03015



RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

**CH2MHILL**

| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/14/14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

MANHOLE BUTTERFLIES

SHEET NO. EL702

102 OF 115

CADD FILE NO. \_201313528-1E1-702-A

ISSUED FOR CONSTRUCTION

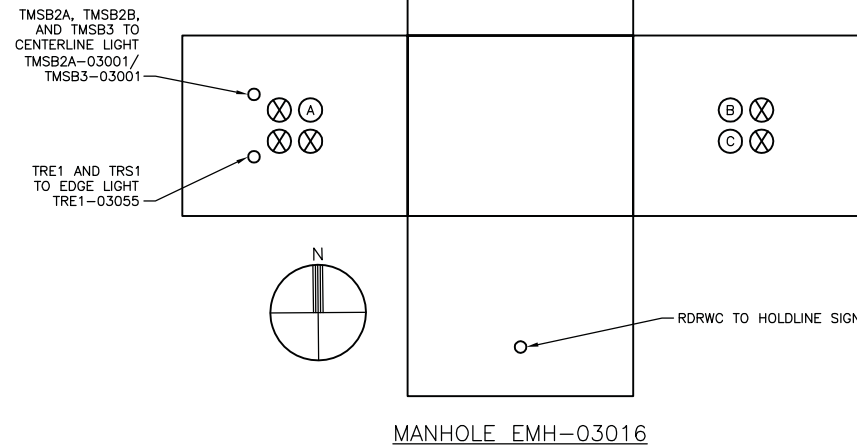
**NOTE:**

1. A NUMBER (1) OR (3) SHOWN BEHIND A CIRCUIT DESIGNATION SIGNIFIES THE NUMBER OF CONDUCTORS. WHERE THERE IS NO NUMBER, 2 CONDUCTORS SHALL BE ASSUMED.

**LEGEND:**

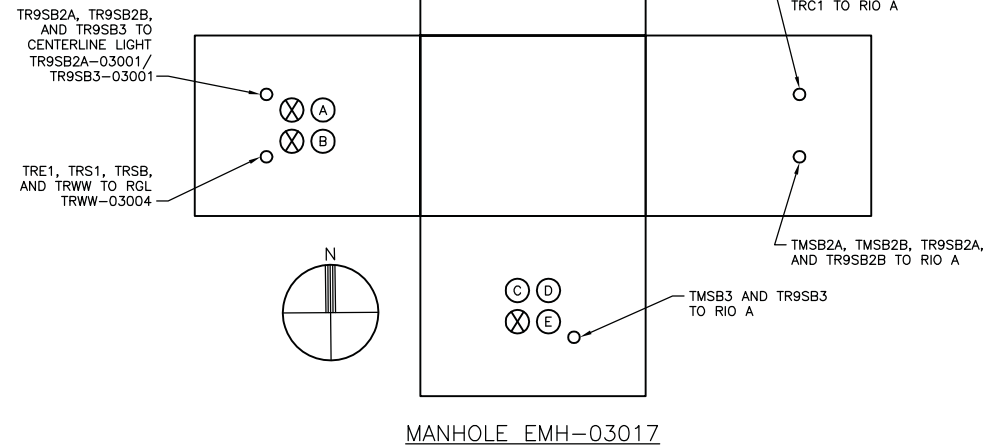
- 2" CONDUIT
- 4" CONDUIT
- ⊗ EMPTY 4" CONDUIT

| CALLOUT | CIRCUIT DESIGNATION               |
|---------|-----------------------------------|
| A       | TRSB, TRWW, RDRWC                 |
| B       | TRSB, TRWW, RDRWC                 |
| C       | TMSB2A, TMSBSB, TMSB3, TRE1, TRS1 |



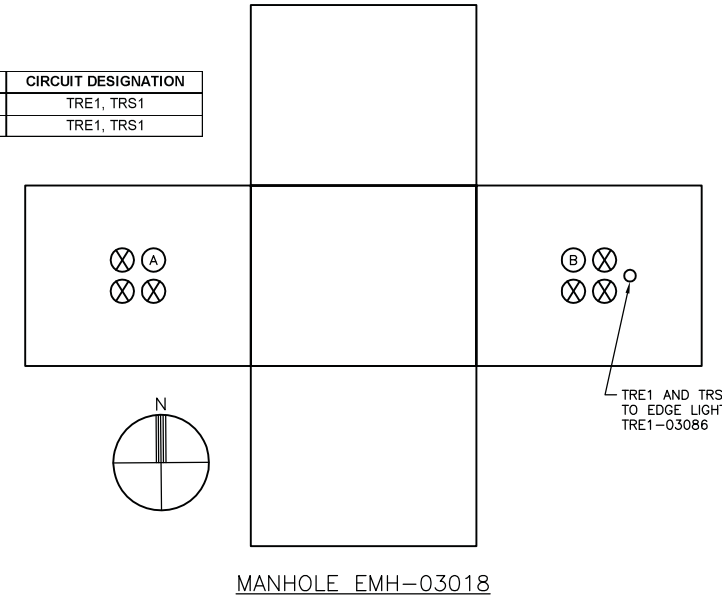
MANHOLE EMH-03016

| CALLOUT | CIRCUIT DESIGNATION               |
|---------|-----------------------------------|
| A       | TRSB, TRWW, RDRWC                 |
| B       | TMSB2A, TMSBSB, TMSB3, TRE1, TRS1 |
| C       | TRSB, TRWW, RDRWC                 |
| D       | TRC1, TEEC1, TRE1, TRS1           |
| E       | TRCP (3)                          |



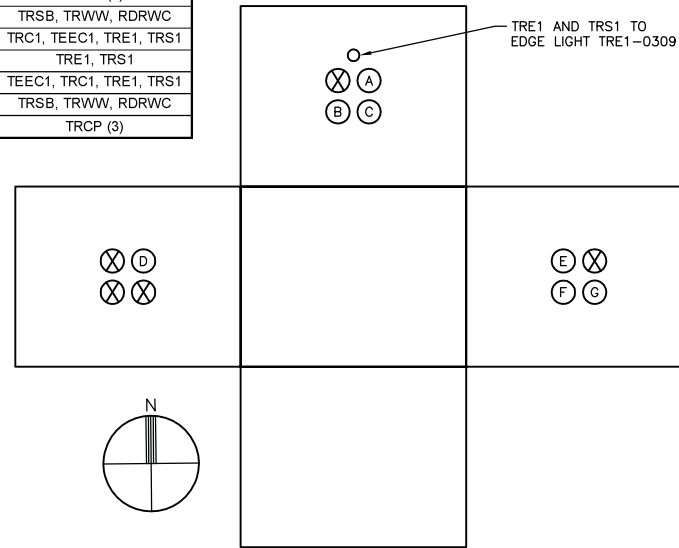
MANHOLE EMH-03017

| CALLOUT | CIRCUIT DESIGNATION |
|---------|---------------------|
| A       | TRE1, TRS1          |
| B       | TRE1, TRS1          |



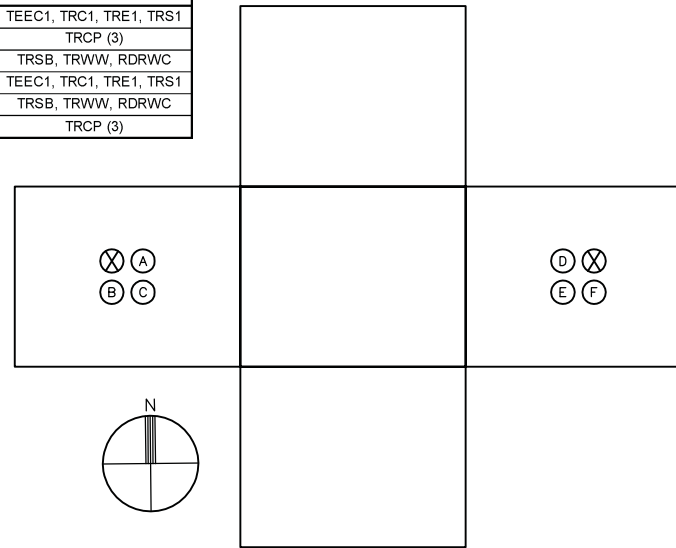
MANHOLE EMH-03018

| CALLOUT | CIRCUIT DESIGNATION     |
|---------|-------------------------|
| A       | TRCP (3)                |
| B       | TRSB, TRWW, RDRWC       |
| C       | TRC1, TEEC1, TRE1, TRS1 |
| D       | TRE1, TRS1              |
| E       | TEEC1, TRC1, TRE1, TRS1 |
| F       | TRSB, TRWW, RDRWC       |
| G       | TRCP (3)                |



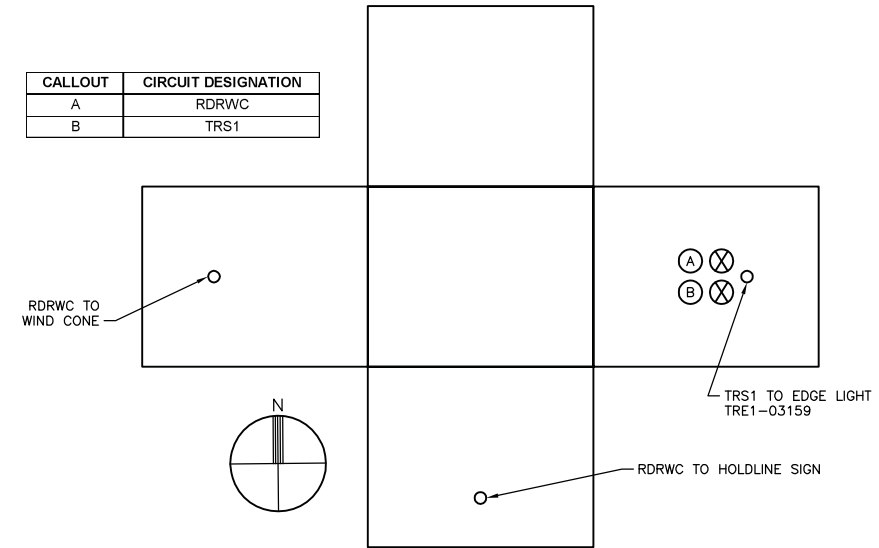
MANHOLE EMH-03019

| CALLOUT | CIRCUIT DESIGNATION     |
|---------|-------------------------|
| A       | TEEC1, TRC1, TRE1, TRS1 |
| B       | TRCP (3)                |
| C       | TRSB, TRWW, RDRWC       |
| D       | TEEC1, TRC1, TRE1, TRS1 |
| E       | TRSB, TRWW, RDRWC       |
| F       | TRCP (3)                |



MANHOLES EMH-03020 AND EMH-03021

| CALLOUT | CIRCUIT DESIGNATION |
|---------|---------------------|
| A       | RDRWC               |
| B       | TRS1                |



MANHOLE EMH-03022



RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

**CH2MHILL**

| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/14/14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

MANHOLE BUTTERFLIES

SHEET NO.

EL703

103 OF 115

CADD FILE NO.

\_201313528-11EL-703-A

**NOTE:**

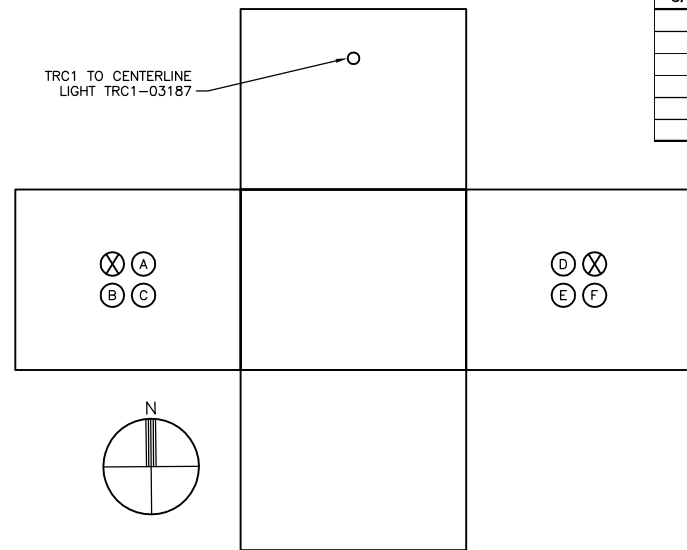
1. A NUMBER (1) OR (3) SHOWN BEHIND A CIRCUIT DESIGNATION SIGNIFIES THE NUMBER OF CONDUCTORS. WHERE THERE IS NO NUMBER, 2 CONDUCTORS SHALL BE ASSUMED.

**LEGEND:**

- 2" CONDUIT
- ⊗ 4" CONDUIT
- ⊗ 4" CONDUIT
- ⊗ 4" CONDUIT

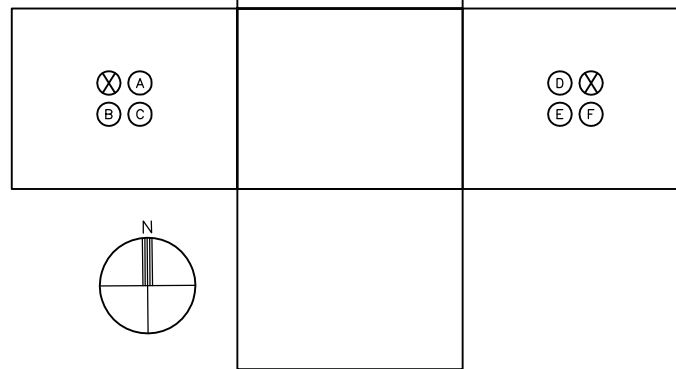
| CALLOUT | CIRCUIT DESIGNATION                                   |
|---------|-------------------------------------------------------|
| A       | TRE2, TRC1, TRC2, TRC3, TRC4, R8C2, R8TDZ, TRS1, TRS2 |
| B       | TRCP (3)                                              |
| C       | TRSB, TRWW, RDRWC (1)                                 |
| D       | TRE2, TRC2, TRC3, TRC4, R8C2, R8TDZ, TRS1, TRS2       |
| E       | TRSB, TRWW, RDRWC (1)                                 |
| F       | TRCP (3)                                              |

TRC1 TO CENTERLINE LIGHT TRC1-03187



MANHOLE EMH-03023

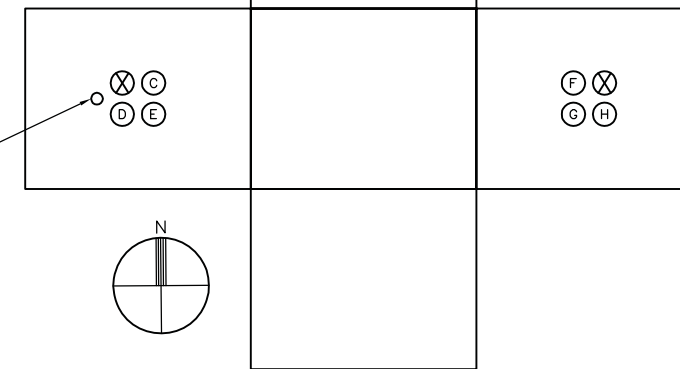
| CALLOUT | CIRCUIT DESIGNATION                             |
|---------|-------------------------------------------------|
| A       | TRE2, TRC2, TRC3, TRC4, R8C2, R8TDZ, TRS1, TRS2 |
| B       | TRCP (3)                                        |
| C       | TRSB, TRWW, RDRWC (1)                           |
| D       | TRE2, TRC2, TRC3, TRC4, R8C2, R8TDZ, TRS1, TRS2 |
| E       | TRSB, TRWW, RDRWC (1)                           |
| F       | TRCP (3)                                        |



MANHOLE EMH-03024

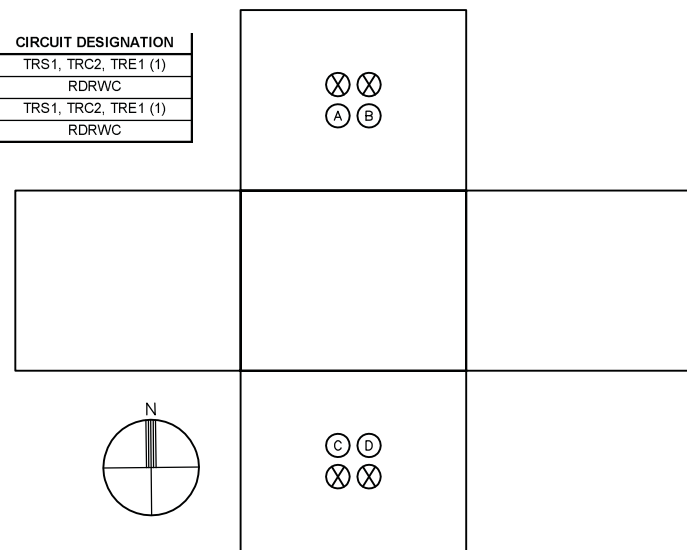
| CALLOUT | CIRCUIT DESIGNATION                             |
|---------|-------------------------------------------------|
| A       | TRS1, TRC2, TRE1 (1)                            |
| B       | RDRWC                                           |
| C       | TRE2, TRC2, TRC3, TRC4, R8C2, R8TDZ, TRS1, TRS2 |
| D       | TRCP (3)                                        |
| E       | TRSB, TRWW, RDRWC (1)                           |
| F       | TRE2, TRC2, TRC3, TRC4, R8C2, R8TDZ, TRS1, TRS2 |
| G       | TRSB, TRWW, RDRWC (1)                           |
| H       | TRCP (3)                                        |

TRC3 AND TRE1(1) TO EDGE LIGHT TRE1-03287



MANHOLE EMH-03025

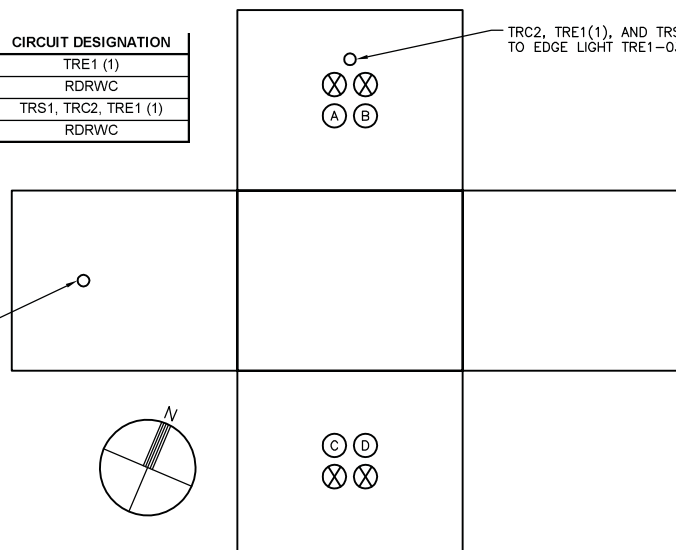
| CALLOUT | CIRCUIT DESIGNATION  |
|---------|----------------------|
| A       | TRS1, TRC2, TRE1 (1) |
| B       | RDRWC                |
| C       | TRS1, TRC2, TRE1 (1) |
| D       | RDRWC                |



MANHOLE EMH-03026

| CALLOUT | CIRCUIT DESIGNATION  |
|---------|----------------------|
| A       | TRE1 (1)             |
| B       | RDRWC                |
| C       | TRS1, TRC2, TRE1 (1) |
| D       | RDRWC                |

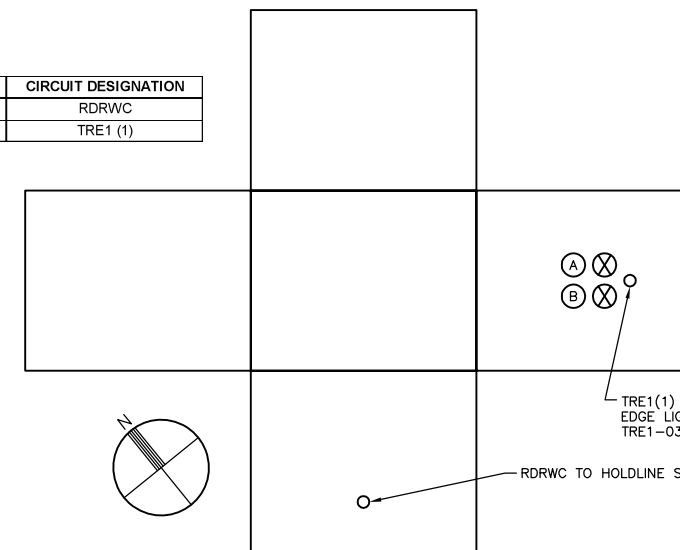
RDRWC TO HOLDLINE SIGN



MANHOLE EMH-03027

TRC2, TRE1(1), AND TRS1 TO EDGE LIGHT TRE1-03219

| CALLOUT | CIRCUIT DESIGNATION |
|---------|---------------------|
| A       | RDRWC               |
| B       | TRE1 (1)            |



MANHOLE EMH-03028

TRE1(1) TO EDGE LIGHT TRE1-03196

RDRWC TO HOLDLINE SIGN



**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| ISSUE RECORD NO. | BY | PURPOSE | DATE     | CHKD |
|------------------|----|---------|----------|------|
| 1                | SJ | CONST   | 07/14/14 | MS   |

SCALE: AS SHOWN

DATE: 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**MANHOLE BUTTERFLIES**

SHEET NO.

EL704

104 OF 115

CADD FILE NO. 201313528-1EL-704-A

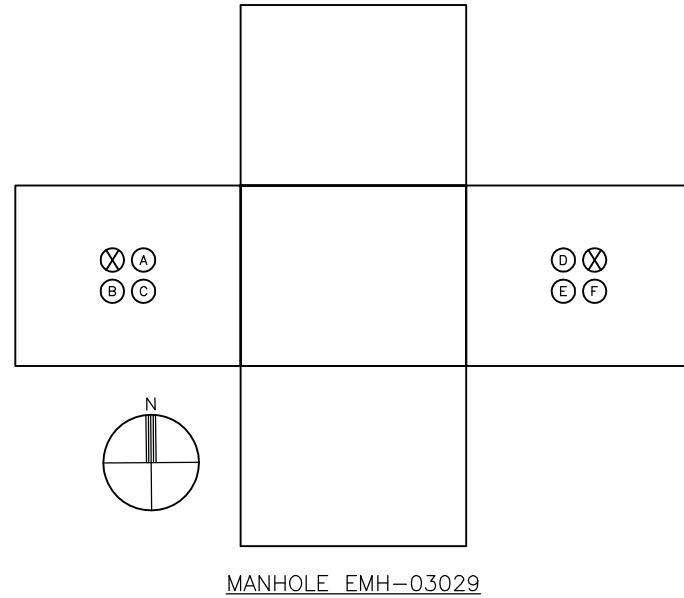
**NOTE:**

1. A NUMBER (1) OR (3) SHOWN BEHIND A CIRCUIT DESIGNATION SIGNIFIES THE NUMBER OF CONDUCTORS. WHERE THERE IS NO NUMBER, 2 CONDUCTORS SHALL BE ASSUMED.

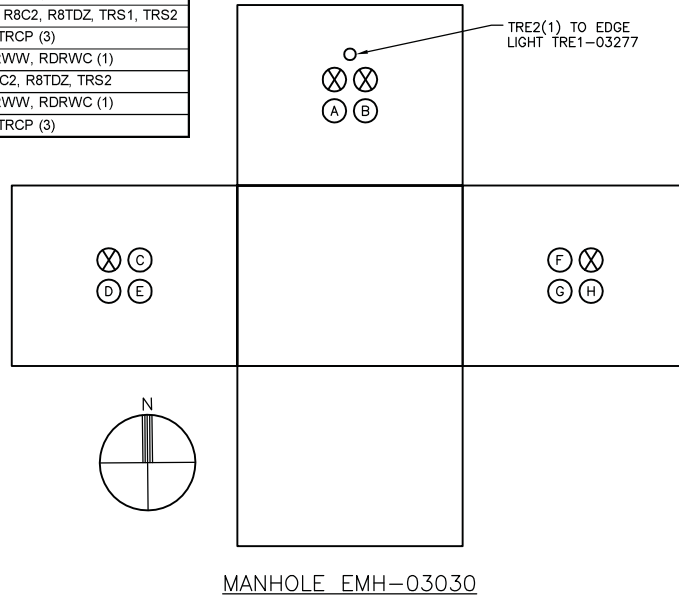
**LEGEND:**

- 2" CONDUIT
- ⊗ 4" CONDUIT
- ⊗ (with X) EMPTY 4" CONDUIT

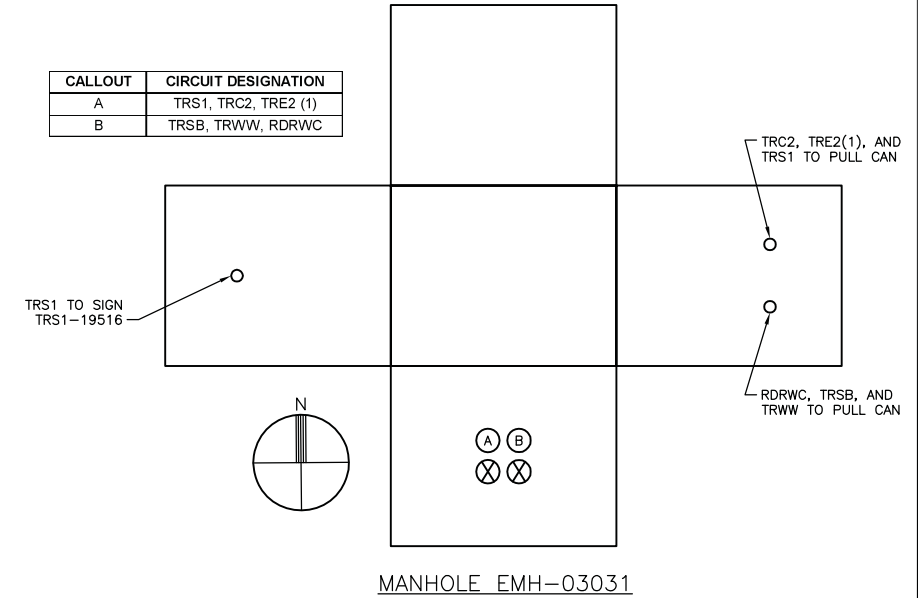
| CALLOUT | CIRCUIT DESIGNATION                       |
|---------|-------------------------------------------|
| A       | TRE2, TRC2, TRC4, R8C2, R8TDZ, TRS1, TRS2 |
| B       | TRCP (3)                                  |
| C       | TRSB, TRWW, RDRWC (1)                     |
| D       | TRE2, TRC2, TRC4, R8C2, R8TDZ, TRS1, TRS2 |
| E       | TRSB, TRWW, RDRWC (1)                     |
| F       | TRCP (3)                                  |



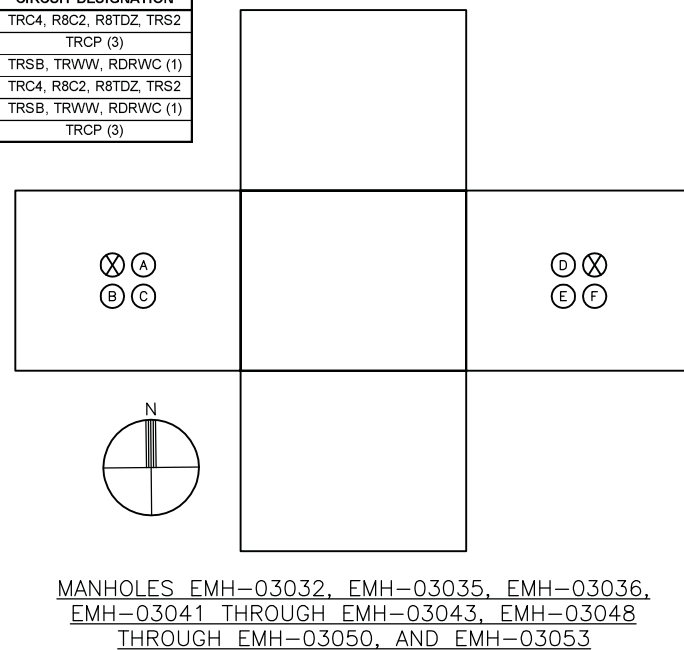
| CALLOUT | CIRCUIT DESIGNATION                       |
|---------|-------------------------------------------|
| A       | TRS1, TRC2, TRE2 (1)                      |
| B       | TRSB, TRWW, RDRWC                         |
| C       | TRE2, TRC2, TRC4, R8C2, R8TDZ, TRS1, TRS2 |
| D       | TRCP (3)                                  |
| E       | TRSB, TRWW, RDRWC (1)                     |
| F       | TRC4, R8C2, R8TDZ, TRS2                   |
| G       | TRSB, TRWW, RDRWC (1)                     |
| H       | TRCP (3)                                  |



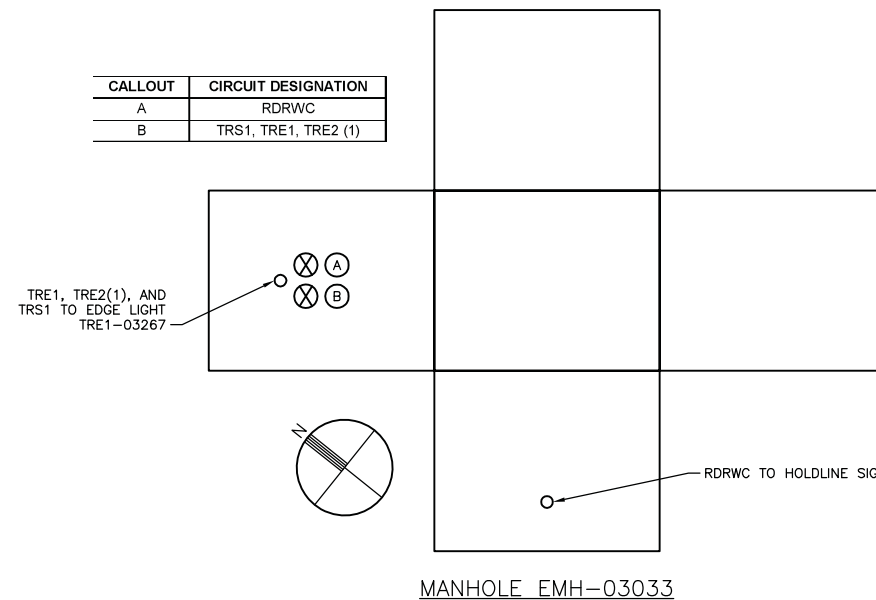
| CALLOUT | CIRCUIT DESIGNATION  |
|---------|----------------------|
| A       | TRS1, TRC2, TRE2 (1) |
| B       | TRSB, TRWW, RDRWC    |



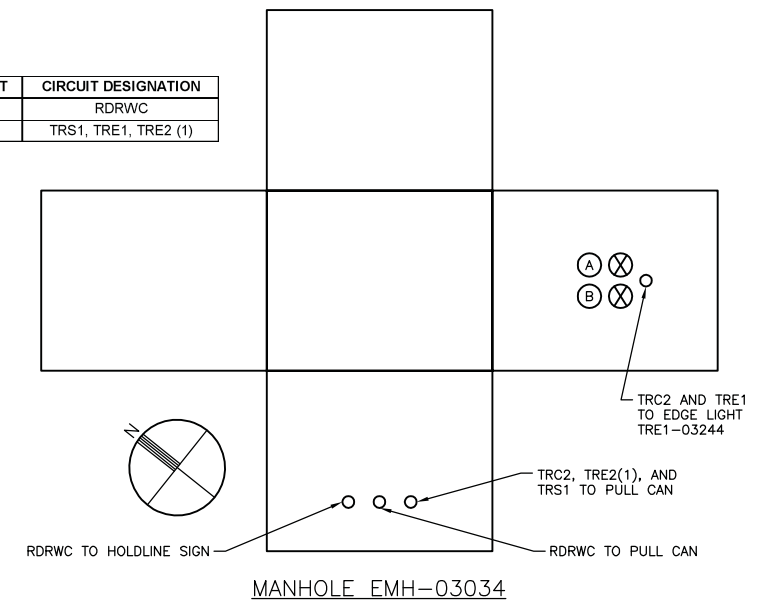
| CALLOUT | CIRCUIT DESIGNATION     |
|---------|-------------------------|
| A       | TRC4, R8C2, R8TDZ, TRS2 |
| B       | TRCP (3)                |
| C       | TRSB, TRWW, RDRWC (1)   |
| D       | TRC4, R8C2, R8TDZ, TRS2 |
| E       | TRSB, TRWW, RDRWC (1)   |
| F       | TRCP (3)                |



| CALLOUT | CIRCUIT DESIGNATION  |
|---------|----------------------|
| A       | RDRWC                |
| B       | TRS1, TRE1, TRE2 (1) |



| CALLOUT | CIRCUIT DESIGNATION  |
|---------|----------------------|
| A       | RDRWC                |
| B       | TRS1, TRE1, TRE2 (1) |





**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/14/14 | MS   |

SCALE: AS SHOWN

DATE: 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

MANHOLE BUTTERFLIES

SHEET NO. EL705

105 OF 115

CADD FILE NO. \_201313528-1E1-705-A

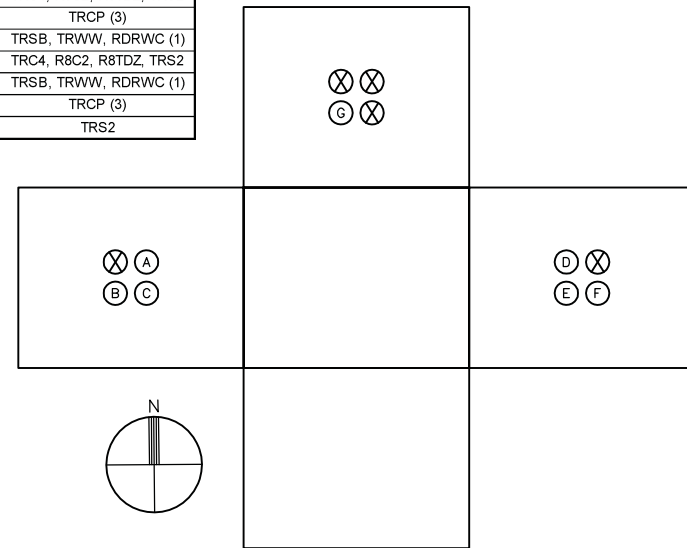
**NOTE:**

1. A NUMBER (1) OR (3) SHOWN BEHIND A CIRCUIT DESIGNATION SIGNIFIES THE NUMBER OF CONDUCTORS. WHERE THERE IS NO NUMBER, 2 CONDUCTORS SHALL BE ASSUMED.

**LEGEND:**

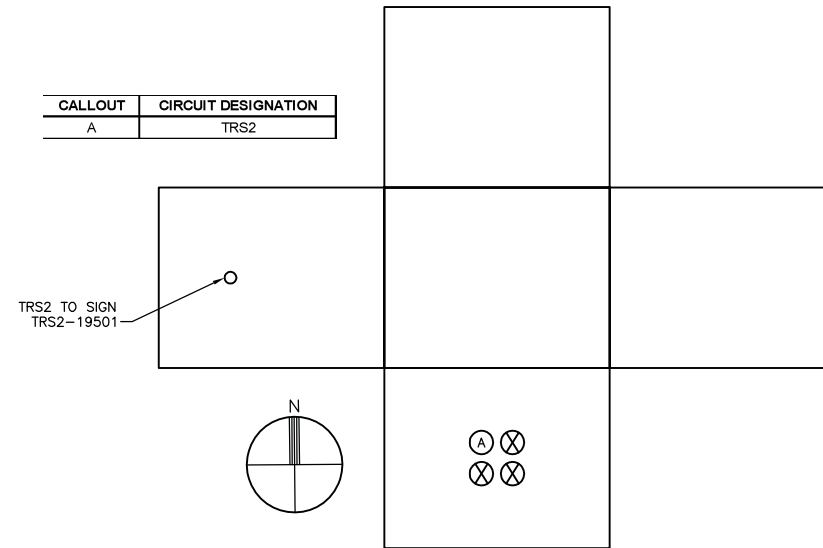
- 2" CONDUIT
- 4" CONDUIT
- ⊗ EMPTY 4" CONDUIT

| CALLOUT | CIRCUIT DESIGNATION     |
|---------|-------------------------|
| A       | TRC4, R8C2, R8TDZ, TRS2 |
| B       | TRCP (3)                |
| C       | TRSB, TRWW, RDRWC (1)   |
| D       | TRC4, R8C2, R8TDZ, TRS2 |
| E       | TRSB, TRWW, RDRWC (1)   |
| F       | TRCP (3)                |
| G       | TRS2                    |



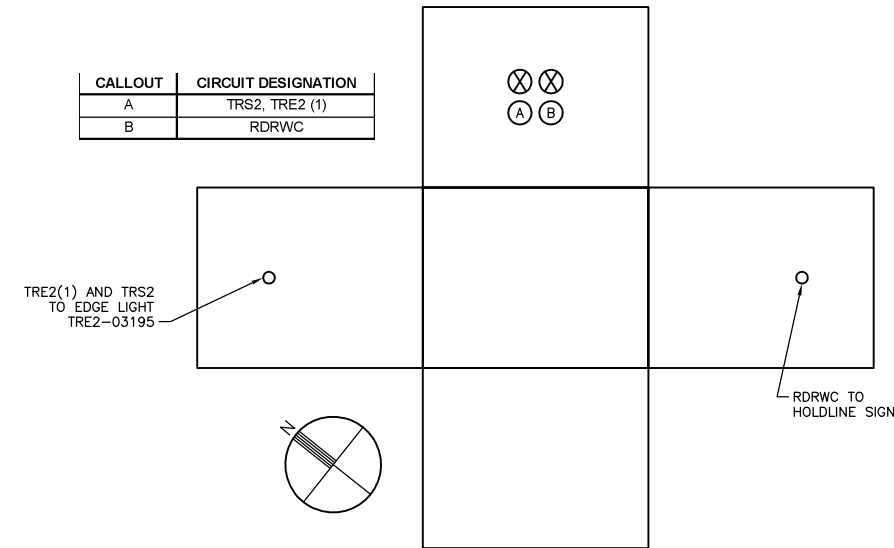
MANHOLE EMH-03044

| CALLOUT | CIRCUIT DESIGNATION |
|---------|---------------------|
| A       | TRS2                |



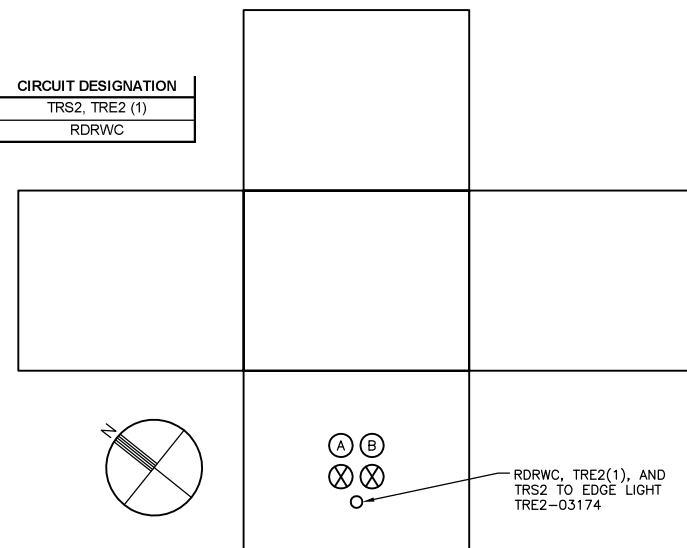
MANHOLE EMH-03045

| CALLOUT | CIRCUIT DESIGNATION |
|---------|---------------------|
| A       | TRS2, TRE2 (1)      |
| B       | RDRWC               |



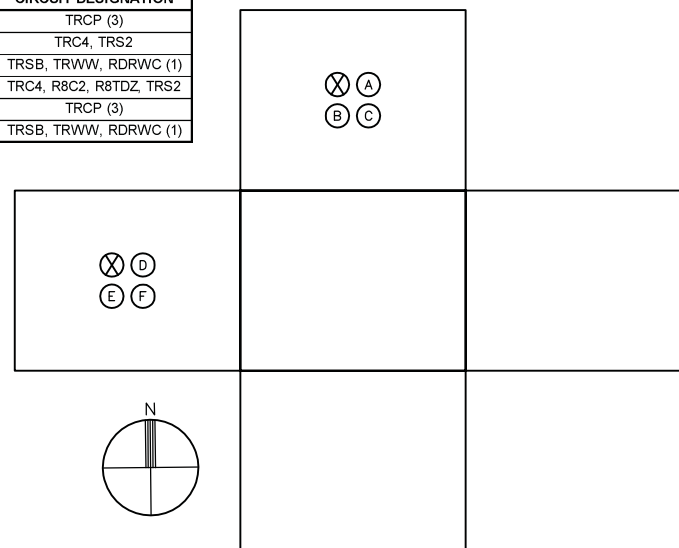
MANHOLE EMH-03051

| CALLOUT | CIRCUIT DESIGNATION |
|---------|---------------------|
| A       | TRS2, TRE2 (1)      |
| B       | RDRWC               |



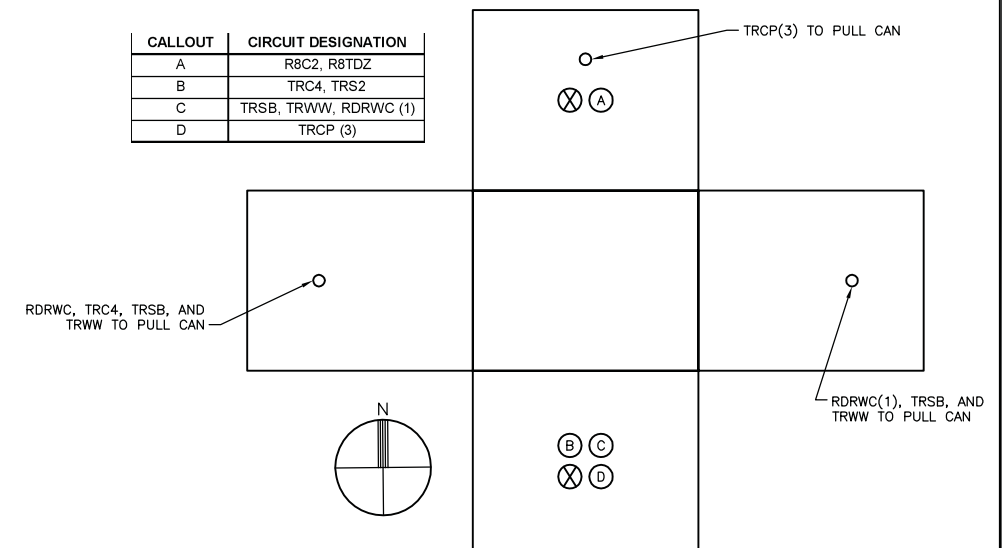
MANHOLE EMH-03052

| CALLOUT | CIRCUIT DESIGNATION     |
|---------|-------------------------|
| A       | TRCP (3)                |
| B       | TRC4, TRS2              |
| C       | TRSB, TRWW, RDRWC (1)   |
| D       | TRC4, R8C2, R8TDZ, TRS2 |
| E       | TRCP (3)                |
| F       | TRSB, TRWW, RDRWC (1)   |



MANHOLE EMH-03054

| CALLOUT | CIRCUIT DESIGNATION   |
|---------|-----------------------|
| A       | R8C2, R8TDZ           |
| B       | TRC4, TRS2            |
| C       | TRSB, TRWW, RDRWC (1) |
| D       | TRCP (3)              |



MANHOLE EMH-03055



**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/14/14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

**MANHOLE  
BUTTERFLIES**

SHEET NO.

EL706

106 OF 115

CADD FILE NO.

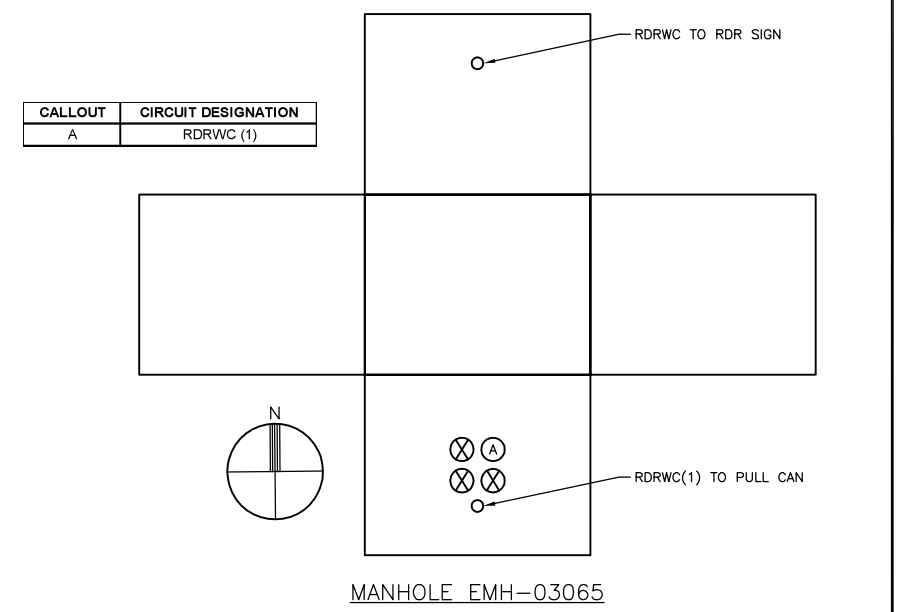
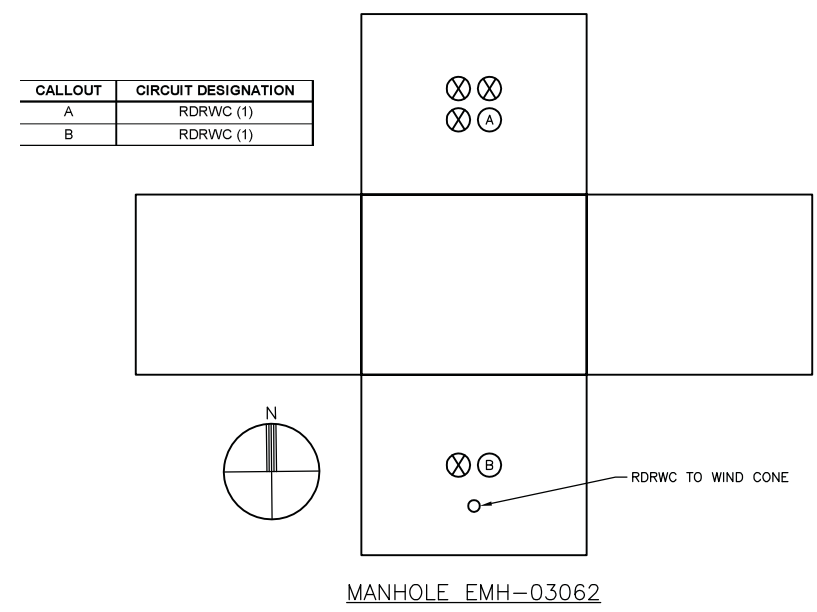
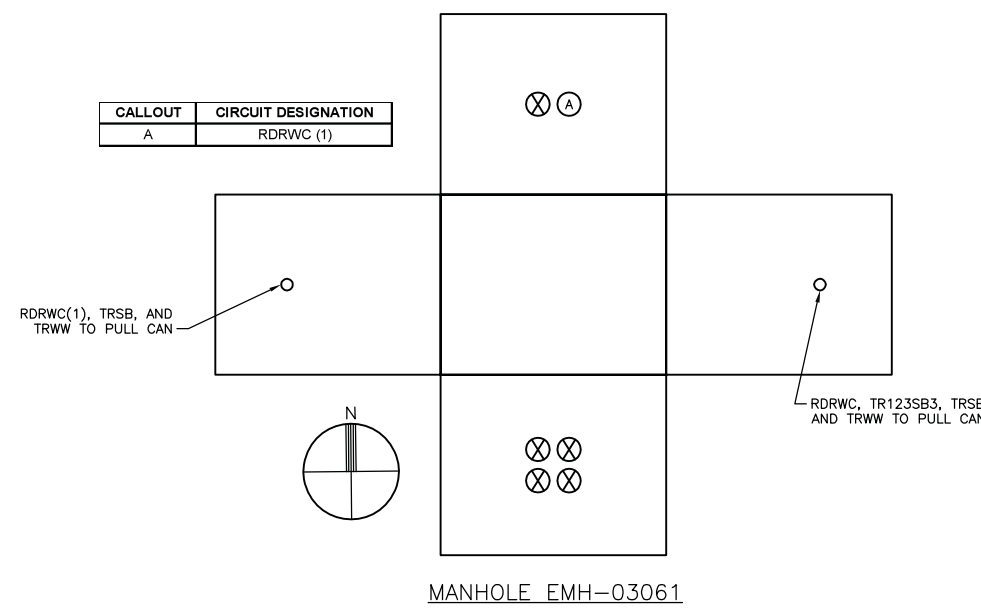
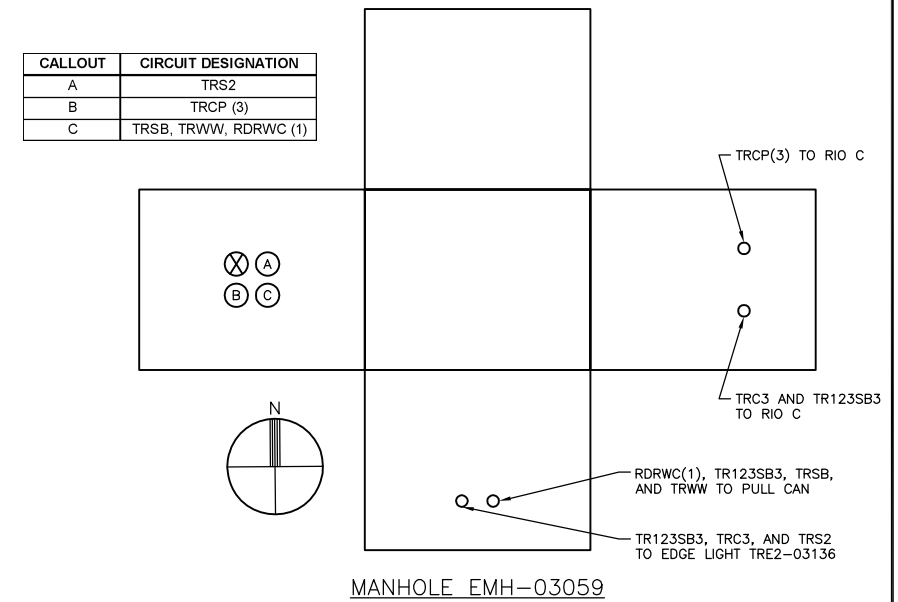
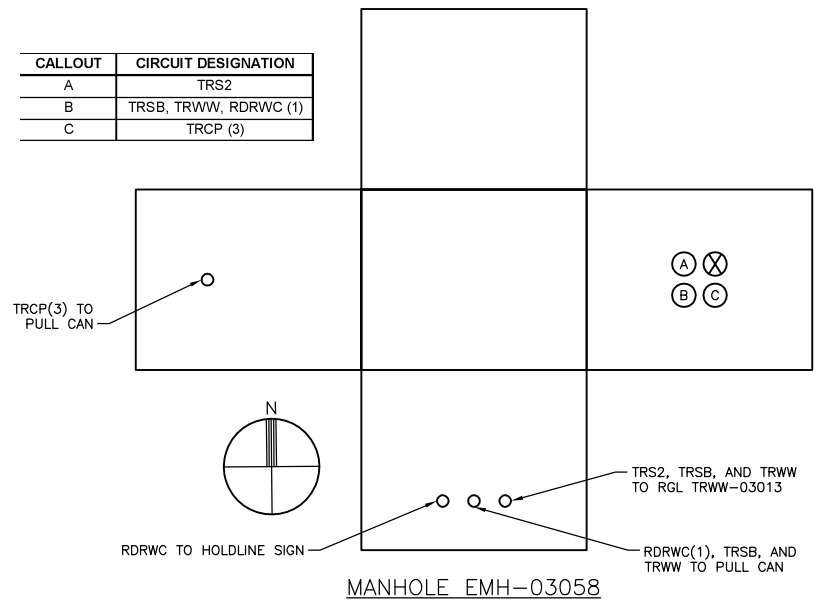
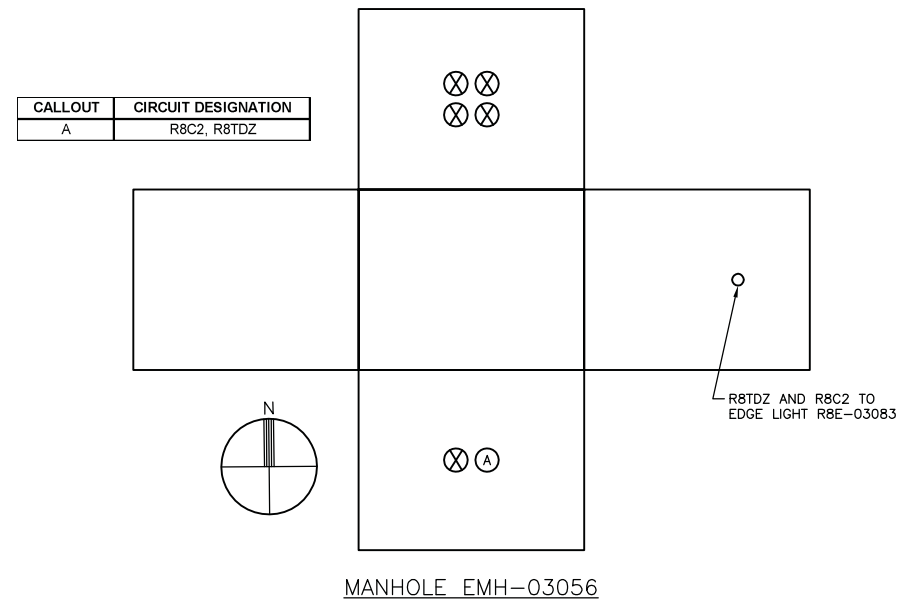
\_201313528-1EL-706-A

**NOTE:**

1. A NUMBER (1) OR (3) SHOWN BEHIND A CIRCUIT DESIGNATION SIGNIFIES THE NUMBER OF CONDUCTORS. WHERE THERE IS NO NUMBER, 2 CONDUCTORS SHALL BE ASSUMED.

**LEGEND:**

- 2" CONDUIT
- 4" CONDUIT
- ⊗ EMPTY 4" CONDUIT



G:\\_work\ch2mhill\log\swazif\0113528-1EL-706.dwg Jan 07, 2014 - 12:59pm swazif

ISSUED FOR CONSTRUCTION



RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

CH2MHILL

| NO. | BY | PURPOSE | DATE   | CHKD |
|-----|----|---------|--------|------|
| 1   | SJ | CONST   | 07JA14 | MS   |

SCALE: AS SHOWN

DATE: 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

MANHOLE BUTTERFLIES

SHEET NO. EL707

107 OF 115

CADD FILE NO. 201313528-11EL-707-A

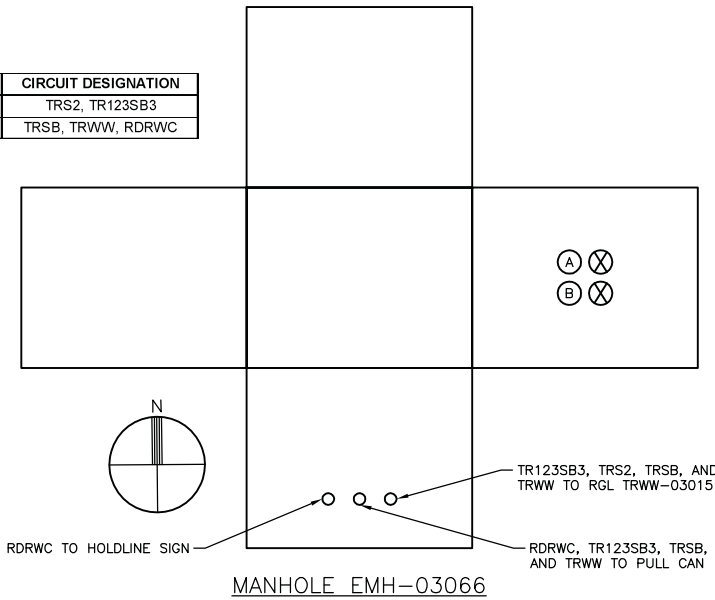
NOTE:

1. A NUMBER (1) OR (3) SHOWN BEHIND A CIRCUIT DESIGNATION SIGNIFIES THE NUMBER OF CONDUCTORS. WHERE THERE IS NO NUMBER, 2 CONDUCTORS SHALL BE ASSUMED.

LEGEND:

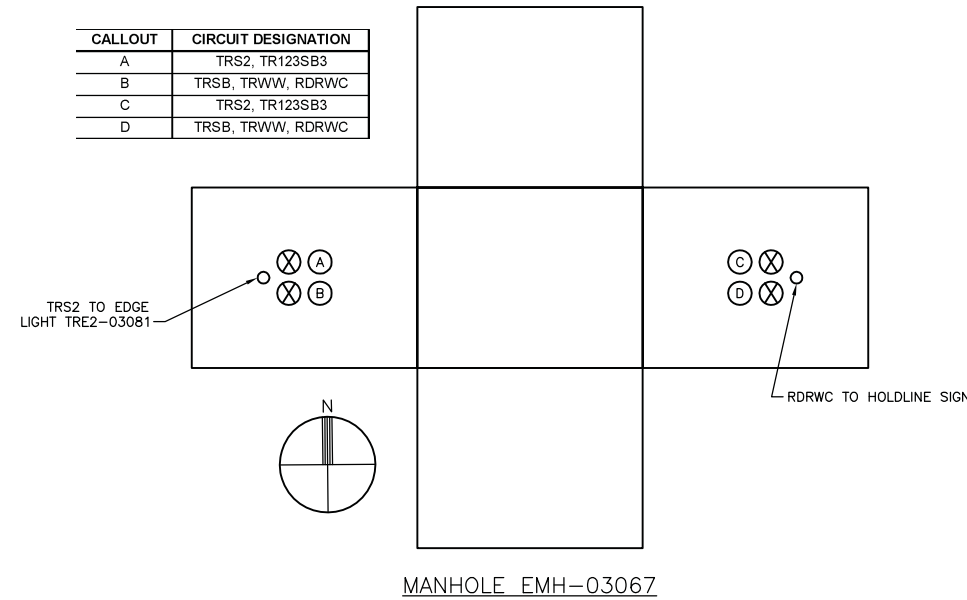
- 2" CONDUIT
- 4" CONDUIT
- ⊗ EMPTY 4" CONDUIT

| CALLOUT | CIRCUIT DESIGNATION |
|---------|---------------------|
| A       | TRS2, TR123SB3      |
| B       | TRSB, TRWW, RDRWC   |



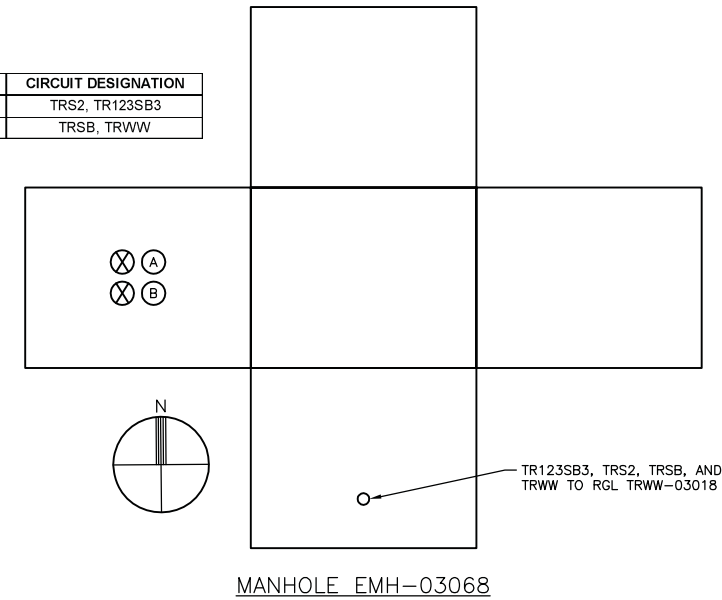
MANHOLE EMH-03066

| CALLOUT | CIRCUIT DESIGNATION |
|---------|---------------------|
| A       | TRS2, TR123SB3      |
| B       | TRSB, TRWW, RDRWC   |
| C       | TRS2, TR123SB3      |
| D       | TRSB, TRWW, RDRWC   |



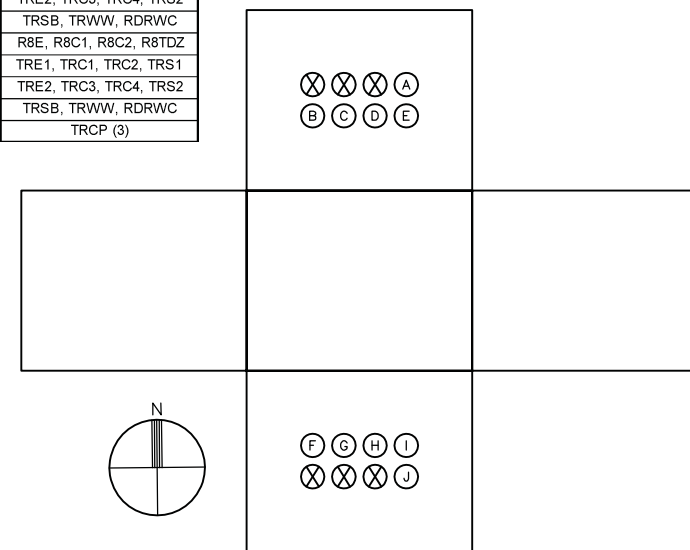
MANHOLE EMH-03067

| CALLOUT | CIRCUIT DESIGNATION |
|---------|---------------------|
| A       | TRS2, TR123SB3      |
| B       | TRSB, TRWW          |



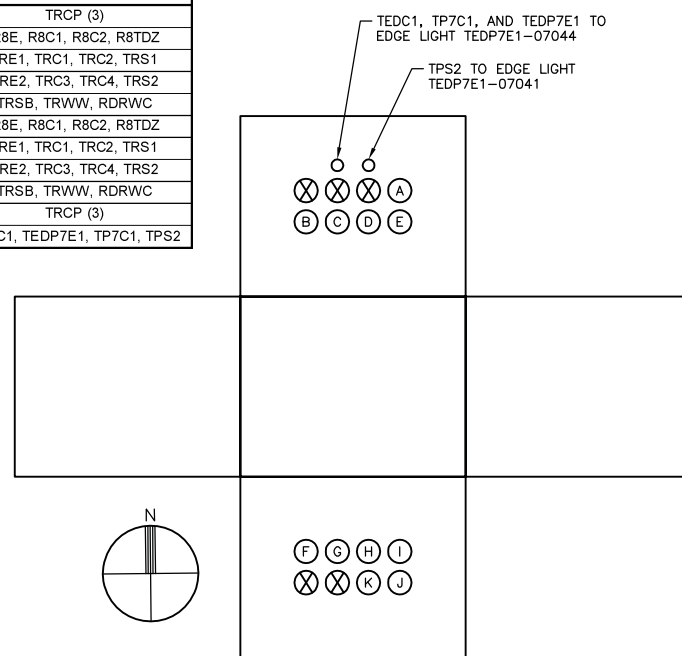
MANHOLE EMH-03068

| CALLOUT | CIRCUIT DESIGNATION    |
|---------|------------------------|
| A       | TRCP (3)               |
| B       | R8E, R8C1, R8C2, R8TDZ |
| C       | TRE1, TRC1, TRC2, TRS1 |
| D       | TRE2, TRC3, TRC4, TRS2 |
| E       | TRSB, TRWW, RDRWC      |
| F       | R8E, R8C1, R8C2, R8TDZ |
| G       | TRE1, TRC1, TRC2, TRS1 |
| H       | TRE2, TRC3, TRC4, TRS2 |
| I       | TRSB, TRWW, RDRWC      |
| J       | TRCP (3)               |



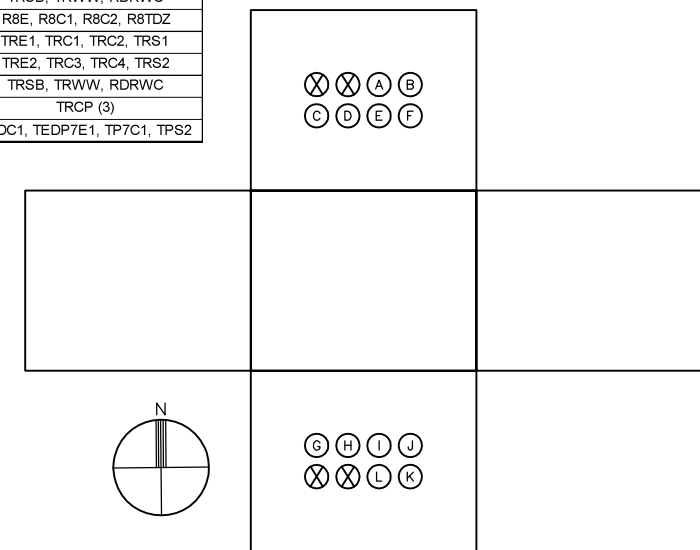
MANHOLES EMH-03001 THROUGH EMH-03005  
AND EMH-03101 THROUGH EMH-03103

| CALLOUT | CIRCUIT DESIGNATION         |
|---------|-----------------------------|
| A       | TRCP (3)                    |
| B       | R8E, R8C1, R8C2, R8TDZ      |
| C       | TRE1, TRC1, TRC2, TRS1      |
| D       | TRE2, TRC3, TRC4, TRS2      |
| E       | TRSB, TRWW, RDRWC           |
| F       | R8E, R8C1, R8C2, R8TDZ      |
| G       | TRE1, TRC1, TRC2, TRS1      |
| H       | TRE2, TRC3, TRC4, TRS2      |
| I       | TRSB, TRWW, RDRWC           |
| J       | TRCP (3)                    |
| K       | TEDC1, TEDP7E1, TP7C1, TPS2 |



MANHOLE EMH-03104

| CALLOUT | CIRCUIT DESIGNATION         |
|---------|-----------------------------|
| A       | TEDC1, TEDP7E1, TP7C1, TPS2 |
| B       | TRCP (3)                    |
| C       | R8E, R8C1, R8C2, R8TDZ      |
| D       | TRE1, TRC1, TRC2, TRS1      |
| E       | TRE2, TRC3, TRC4, TRS2      |
| F       | TRSB, TRWW, RDRWC           |
| G       | R8E, R8C1, R8C2, R8TDZ      |
| H       | TRE1, TRC1, TRC2, TRS1      |
| I       | TRE2, TRC3, TRC4, TRS2      |
| J       | TRSB, TRWW, RDRWC           |
| K       | TRCP (3)                    |
| L       | TEDC1, TEDP7E1, TP7C1, TPS2 |



MANHOLES EMH-03105 THROUGH EMH-03110



RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

**CH2MHILL**

| ISSUE RECORD |    |         |        |      |
|--------------|----|---------|--------|------|
| NO.          | BY | PURPOSE | DATE   | CHKD |
| 1            | SJ | CONST   | 07JA14 | MS   |

|                     |              |
|---------------------|--------------|
| SCALE               | AS SHOWN     |
| DATE                | 01/07/2014   |
| DRAWN BY:           | S. JACOBS    |
| CHECKED BY:         | M. SOUTHWICK |
| FAA AIP NO:         |              |
| WORK BREAKDOWN NO.  |              |
| DESIGN CONTRACT NO. | CE84021      |
| CONST. CONTRACT NO. | 201313528    |
| VOLUME NO.          | 1            |
| SHEET TITLE         |              |

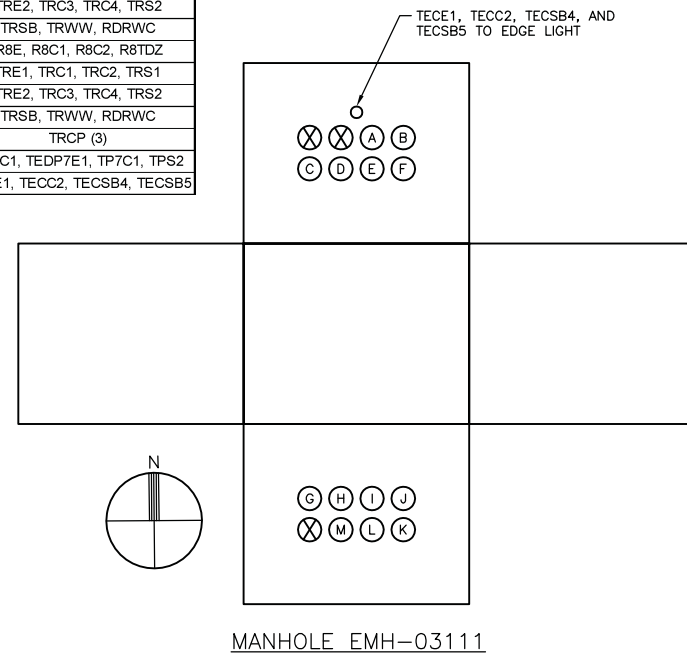
MANHOLE  
BUTTERFLIES

SHEET NO.  
EL708

108 OF 115

CADD FILE NO.  
\_201313528-11EL-708-A

| CALLOUT | CIRCUIT DESIGNATION          |
|---------|------------------------------|
| A       | TEDC1, TEDP7E1, TP7C1, TPS2  |
| B       | TRCP (3)                     |
| C       | R8E, R8C1, R8C2, R8TDZ       |
| D       | TRE1, TRC1, TRC2, TRS1       |
| E       | TRE2, TRC3, TRC4, TRS2       |
| F       | TRSB, TRWW, RDRWC            |
| G       | R8E, R8C1, R8C2, R8TDZ       |
| H       | TRE1, TRC1, TRC2, TRS1       |
| I       | TRE2, TRC3, TRC4, TRS2       |
| J       | TRSB, TRWW, RDRWC            |
| K       | TRCP (3)                     |
| L       | TEDC1, TEDP7E1, TP7C1, TPS2  |
| M       | TECE1, TECC2, TECSB4, TECSB5 |







RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

**CH2MHILL**

| ISSUE RECORD | NO. | BY | PURPOSE | DATE     | CHKD |
|--------------|-----|----|---------|----------|------|
|              | 1   | SJ | CONST   | 07/14/14 | MS   |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

EAST VAULT  
DEMOLITION

SHEET NO.

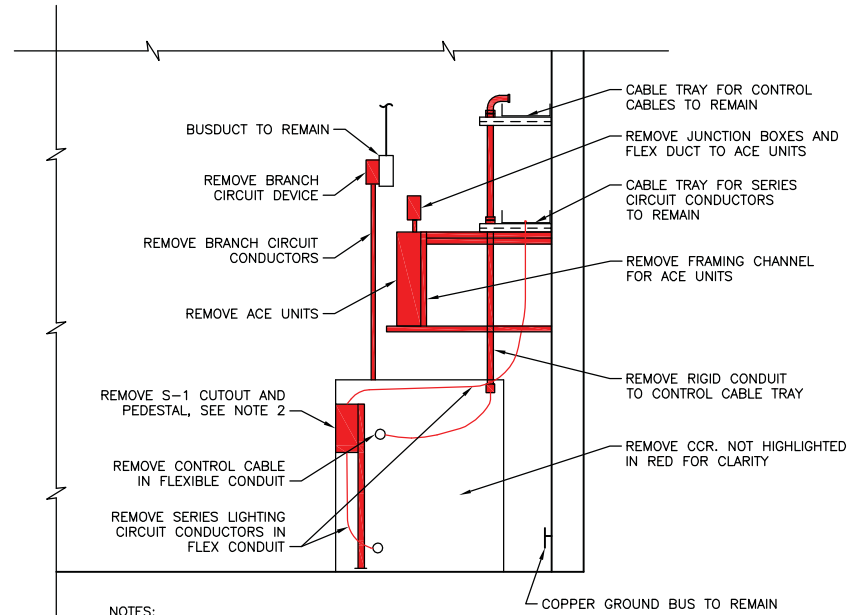
EL801

109 OF 115

CADD FILE NO.  
\_201313528-11EL-801-A



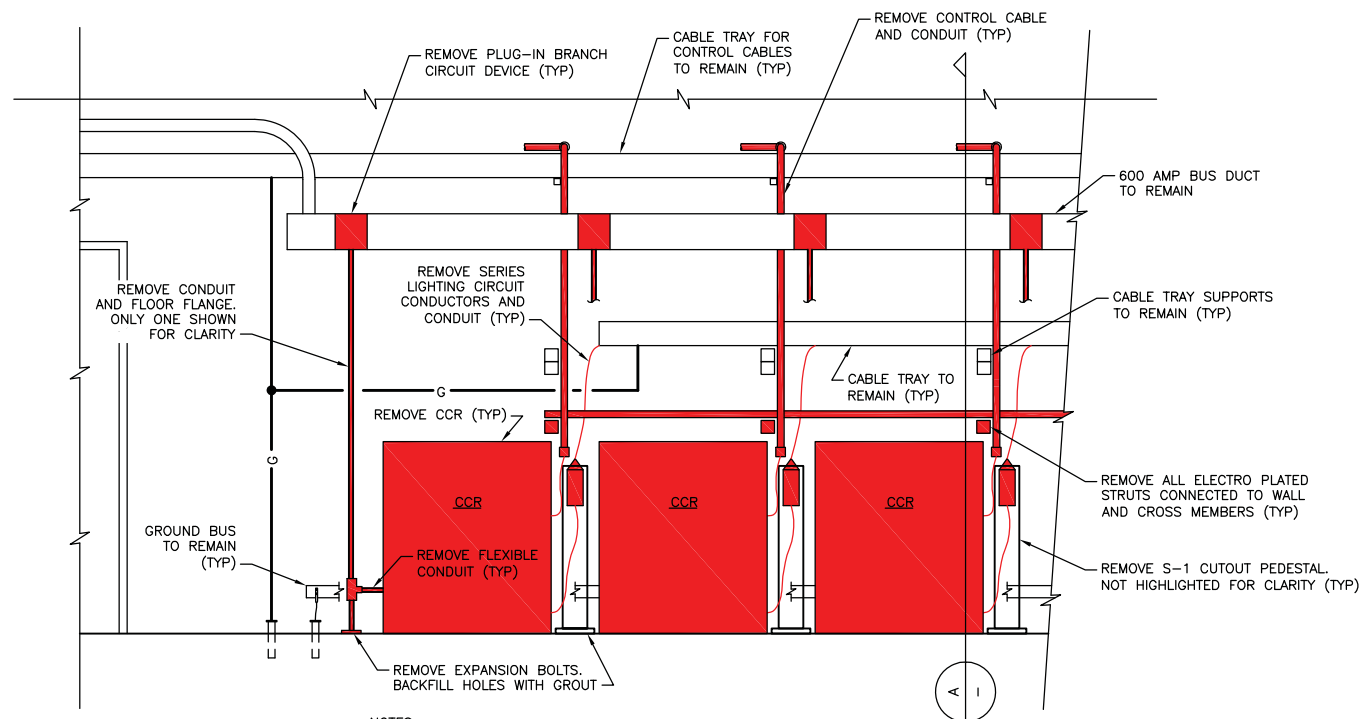
2 EXISTING CCR INSTALLATION  
NTS



NOTES:

- EQUIPMENT, STRUT, CONDUIT, CABLE, ETC. HIGHLIGHTED IN RED SHALL BE REMOVED COMPLETELY.
- SOME S-1 CUTOUTS ARE MOUNTED ON STRUT ADJACENT TO THE ACE UNITS. THEY SHALL BE REMOVED INCLUDING THE ELECTRO PLATED STRUT.

A SECTION  
NTS



NOTES:

- EQUIPMENT, STRUT, CONDUIT, CABLE, ETC. HIGHLIGHTED IN RED SHALL BE REMOVED COMPLETELY.
- ACE UNITS AND CONTROL CONDUIT NOT SHOWN FOR CLARITY. SEE SECTION A.

1 CCR LINEUP DEMOLITION  
NTS

GENERAL NOTE:

- REFER TO EAST VAULT AND ALCMS MODIFICATION PLAN FOR CCR LAYOUT.



RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

CH2MHILL

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | SJ  | CONST | 07JA14  | MS   |      |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

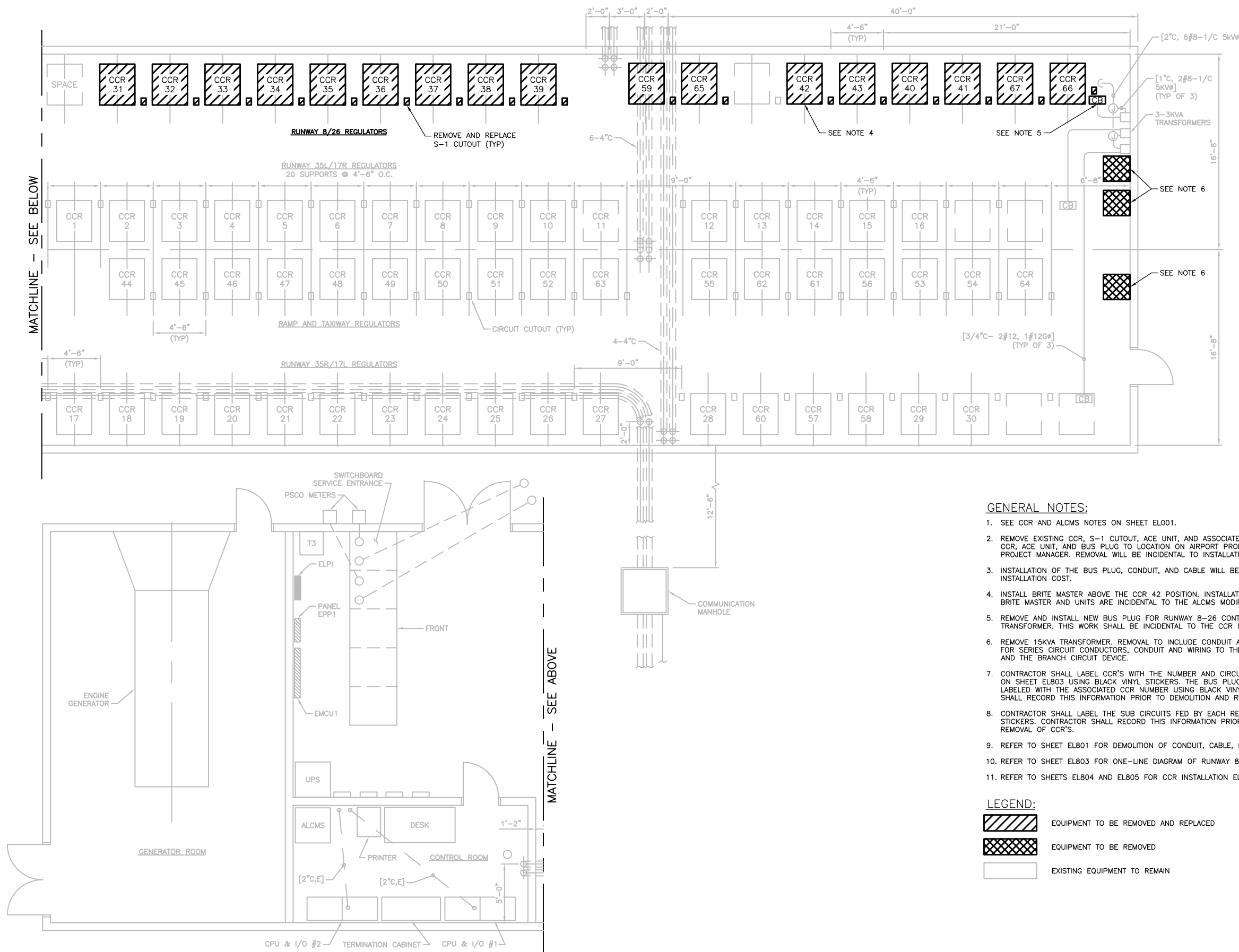
VOLUME NO. 1

SHEET TITLE  
EAST VAULT  
AND ALCMS  
MODIFICATION PLAN

SHEET NO. EL802

110 OF 115

CADD FILE NO. \_201313528-1EL-802-A



GENERAL NOTES:

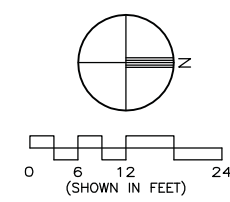
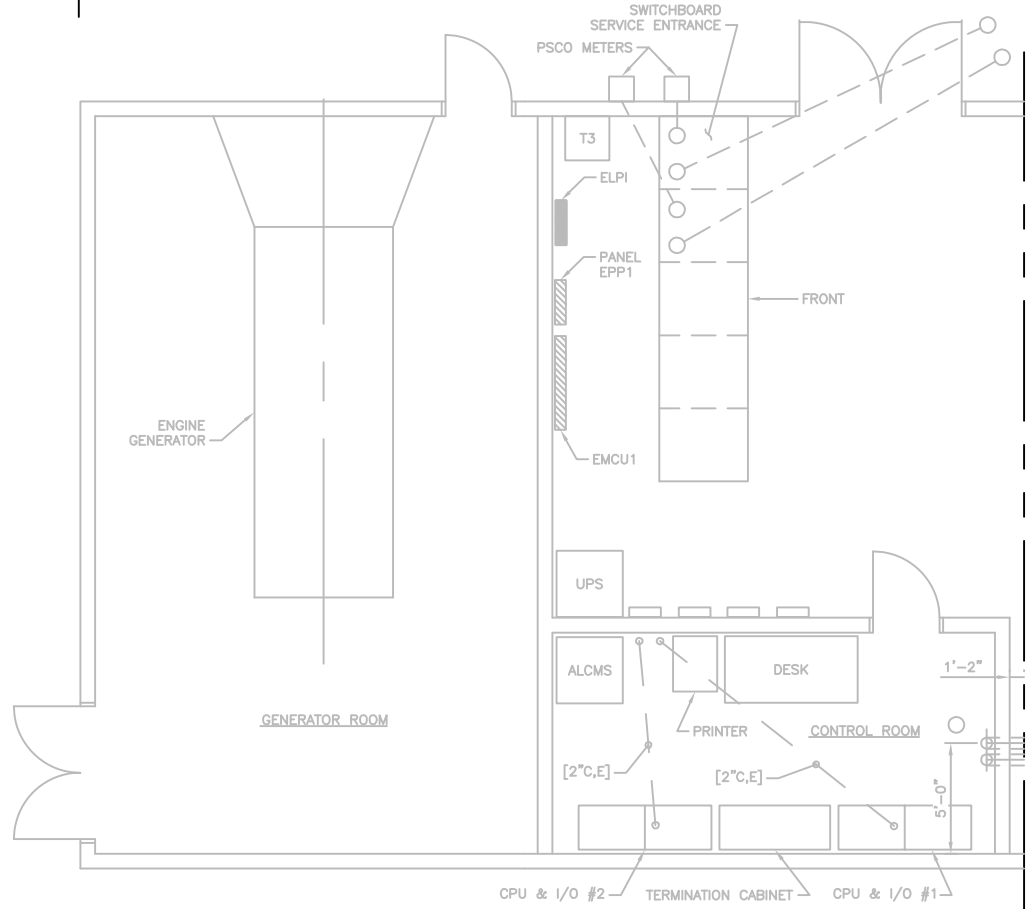
- SEE CCR AND ALCMS NOTES ON SHEET EL001.
- REMOVE EXISTING CCR, S-1 CUTOUT, ACE UNIT, AND ASSOCIATED BUS PLUG. DELIVER CCR, ACE UNIT, AND BUS PLUG TO LOCATION ON AIRPORT PROPERTY AS DIRECTED BY DIA PROJECT MANAGER. REMOVAL WILL BE INCIDENTAL TO INSTALLATION OF CCR.
- INSTALLATION OF THE BUS PLUG, CONDUIT, AND CABLE WILL BE INCIDENTAL TO THE CCR INSTALLATION COST.
- INSTALL BRITE MASTER ABOVE THE CCR 42 POSITION. INSTALLATION AND MODIFICATION OF BRITE MASTER AND UNITS ARE INCIDENTAL TO THE ALCMS MODIFICATION BID ITEM.
- REMOVE AND INSTALL NEW BUS PLUG FOR RUNWAY 8-26 CONTROL POWER 3KVA TRANSFORMER. THIS WORK SHALL BE INCIDENTAL TO THE CCR INSTALLATION COST.
- REMOVE 15KVA TRANSFORMER. REMOVAL TO INCLUDE CONDUIT AND WIRING TO CABLE TRAY FOR SERIES CIRCUIT CONDUCTORS, CONDUIT AND WIRING TO THE BRANCH CIRCUIT DEVICE, AND THE BRANCH CIRCUIT DEVICE.
- CONTRACTOR SHALL LABEL CCR'S WITH THE NUMBER AND CIRCUIT PER ONE-LINE DIAGRAM ON SHEET EL803 USING BLACK VINYL STICKERS. THE BUS PLUG DISCONNECT SHALL BE LABELED WITH THE ASSOCIATED CCR NUMBER USING BLACK VINYL STICKERS. CONTRACTOR SHALL RECORD THIS INFORMATION PRIOR TO DEMOLITION AND REMOVAL OF CCR'S.
- CONTRACTOR SHALL LABEL THE SUB CIRCUITS FED BY EACH REGULATOR USING RED VINYL STICKERS. CONTRACTOR SHALL RECORD THIS INFORMATION PRIOR TO DEMOLITION AND REMOVAL OF CCR'S.
- REFER TO SHEET EL801 FOR DEMOLITION OF CONDUIT, CABLE, BUS PLUGS, AND CCR'S.
- REFER TO SHEET EL803 FOR ONE-LINE DIAGRAM OF RUNWAY 8-26 CCR'S.
- REFER TO SHEETS EL804 AND EL805 FOR CCR INSTALLATION ELEVATION DETAILS.

LEGEND:

- EQUIPMENT TO BE REMOVED AND REPLACED
- EQUIPMENT TO BE REMOVED
- EXISTING EQUIPMENT TO REMAIN

MATCHLINE - SEE BELOW

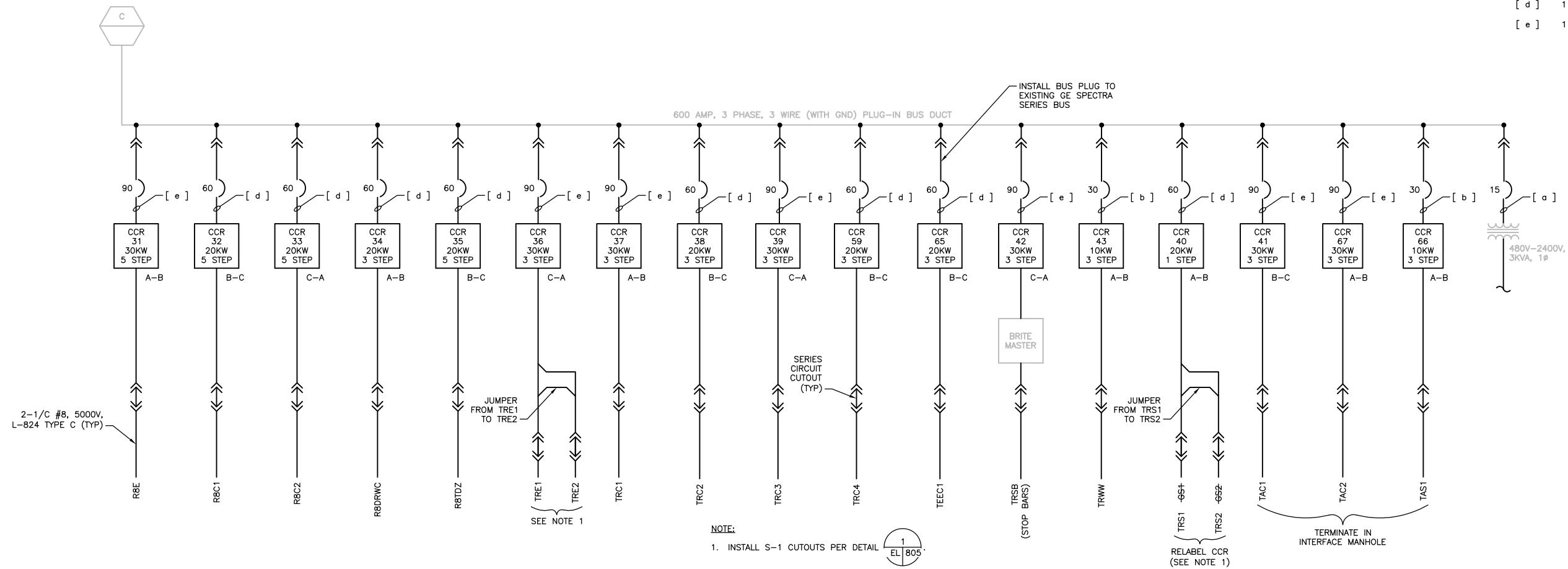
MATCHLINE - SEE ABOVE



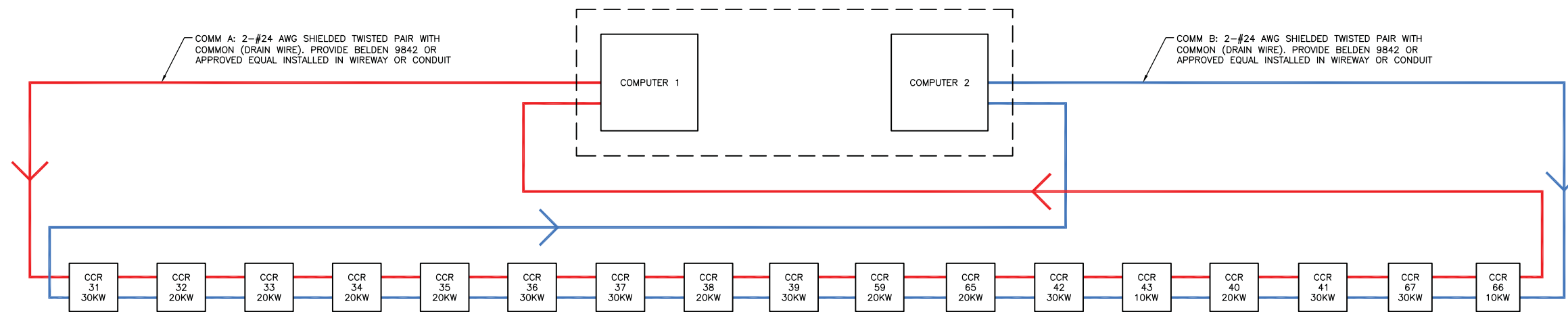
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ISSUED FOR CONSTRUCTION

- CIRCUIT CALLOUTS:**
- [ a ] 1 1/2" C-2#12,1#12G
  - [ b ] 1 1/2" C-2#10,1#10G
  - [ c ] NOT USED
  - [ d ] 1 1/2" C-2#4,1#8G
  - [ e ] 1 1/2" C-2#2,1#8G



1 RUNWAY 8-26 CONSTANT CURRENT REGULATORS  
NTS



- NOTES:**
1. TERMINATE CONTROL WIRES TO ACE PRINTED CIRCUIT BOARD USING 6 DUAL CONTACT SCREW TERMINATION PHOENIX CONNECTORS OR APPROVED EQUAL.
  2. CONTRACTOR SHALL APPLY COLORED TAPE (RED AND BLUE SHALL NOT BE USED) TO THE COMM A IN/OUT AND COMM B IN/OUT CONTROL CONDUCTORS.

2 COMMUNICATION NETWORK  
NTS



**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| NO. | BY | PURPOSE | DATE     | CHKD |
|-----|----|---------|----------|------|
| 1   | SJ | CONST   | 07/14/14 | MS   |

SCALE: AS SHOWN

DATE: 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

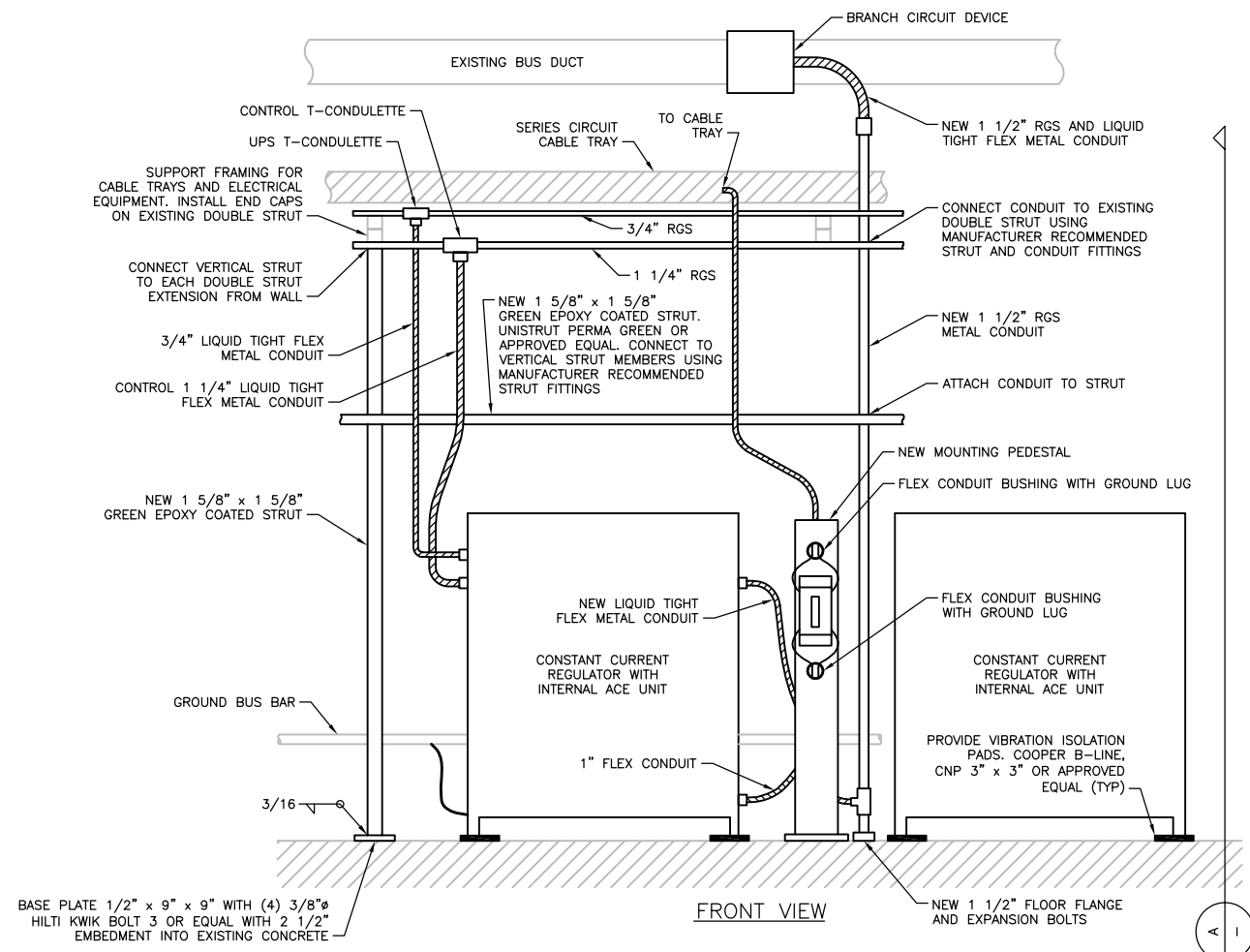
VOLUME NO. 1

SHEET TITLE: EAST VAULT AND ALCMS MODIFICATION PLAN

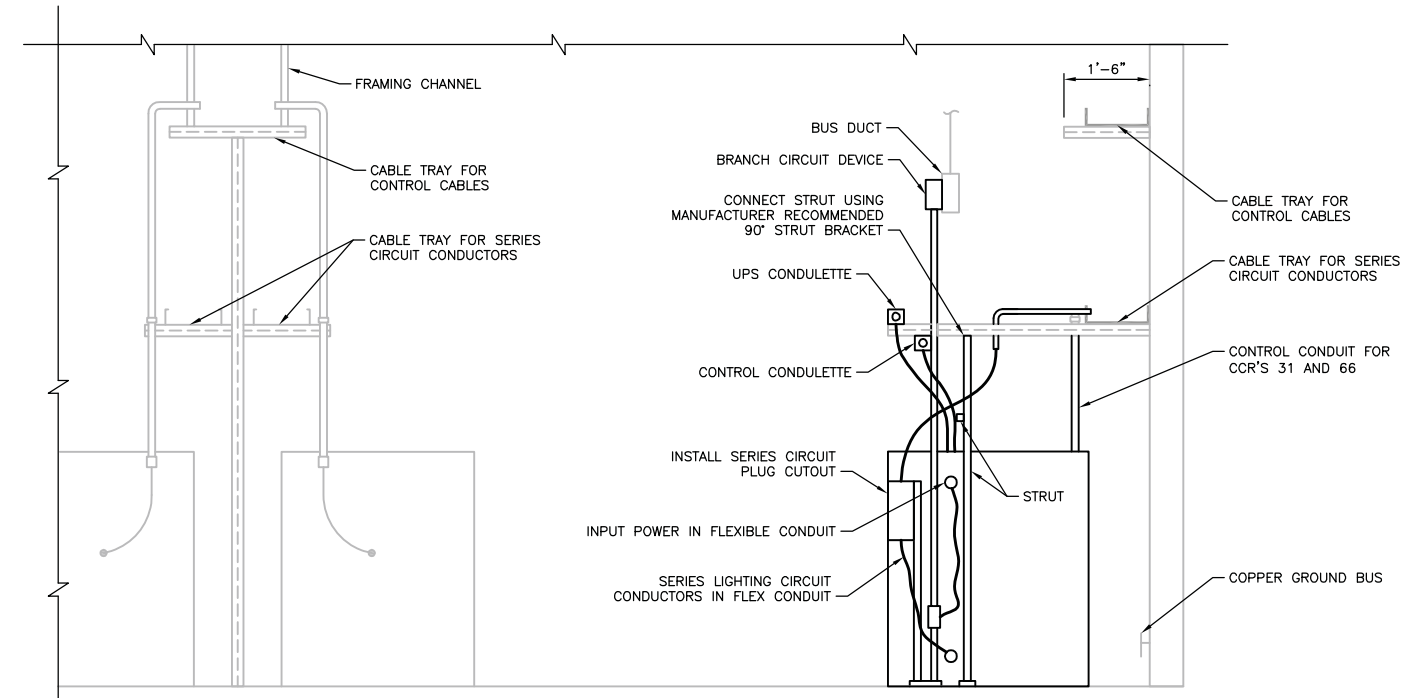
SHEET NO. EL803

111 OF 115

CADD FILE NO. \_201313528-11EL-803-A



1  
-1- CCR WITH INTEGRAL CONTROL INSTALLATION  
NTS



A  
-1- SECTION  
NTS

NOTE:

1. THE MOUNTING PEDESTAL TO BE SUPPLIED SHALL BE MADE OF A-36 STEEL, 1/8" THICK. THE PEDESTAL SHALL FORM A "C", 5.25" WIDE x 2.5" DEEP TOP AND BOTTOM. THE BRACKET SHALL BE CONTINUOUSLY WELDED TO A 1/8" THICK, 8" x 8" STEEL PLATE. HOT DIP GALVANIZE AFTER FABRICATION.

CITY & COUNTY  
of DENVER

DENVER  
INTERNATIONAL  
AIRPORT



DENVER INTERNATIONAL AIRPORT  
MAINT. & ENGR.  
8500 Pena Blvd.  
Denver, CO 80249-6340



RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

CH2MHILL

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | SJ  | CONST | 07JA14  | MS   |      |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE  
EAST VAULT  
SECTIONS AND  
DETAILS

SHEET NO. EL804

112 OF 115

CADD FILE NO. \_201313528-1EL-804-A

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ISSUED FOR CONSTRUCTION



RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | SJ  | CONST | 07JA14  | MS   |      |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

EAST VAULT  
SECTIONS AND  
DETAILS

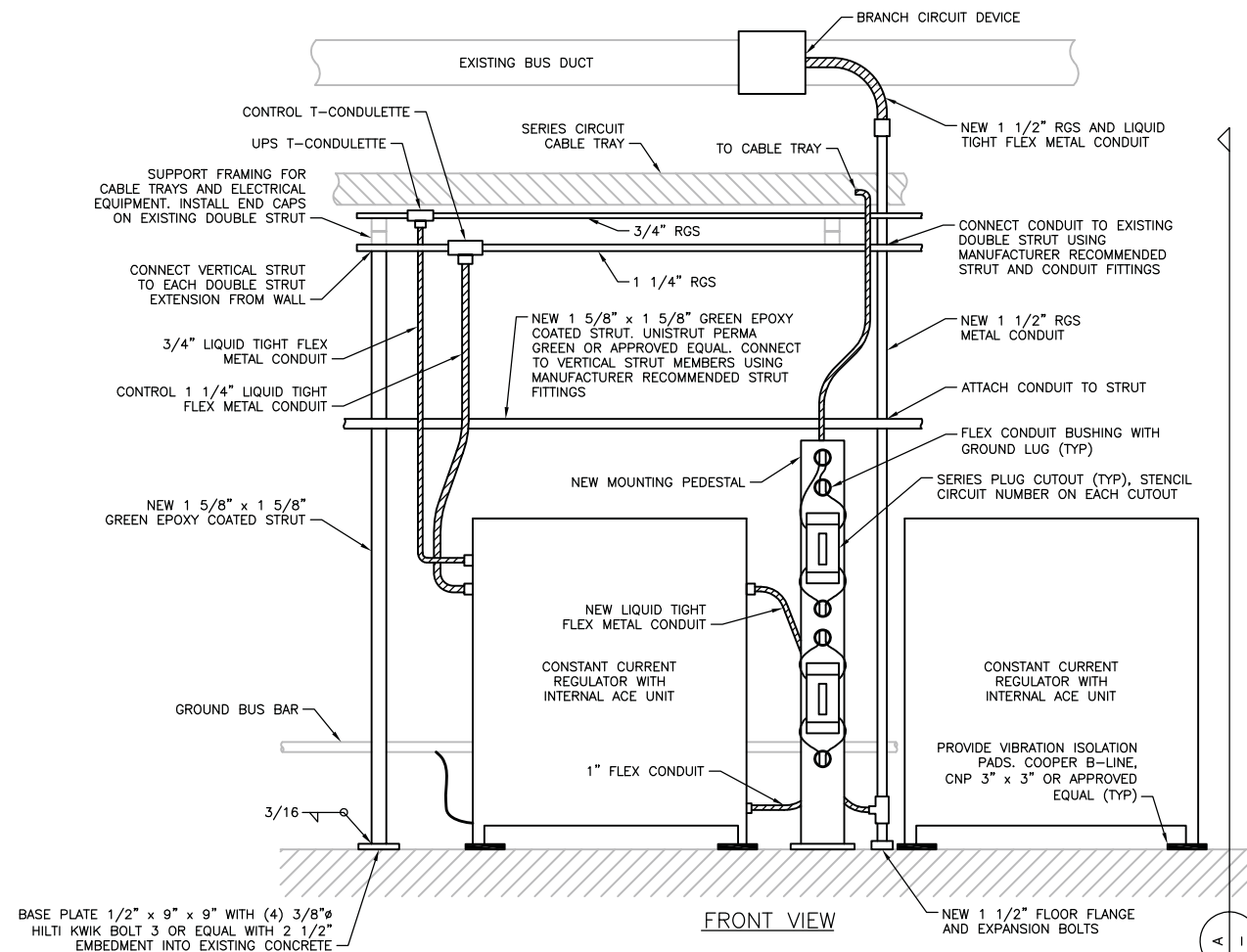
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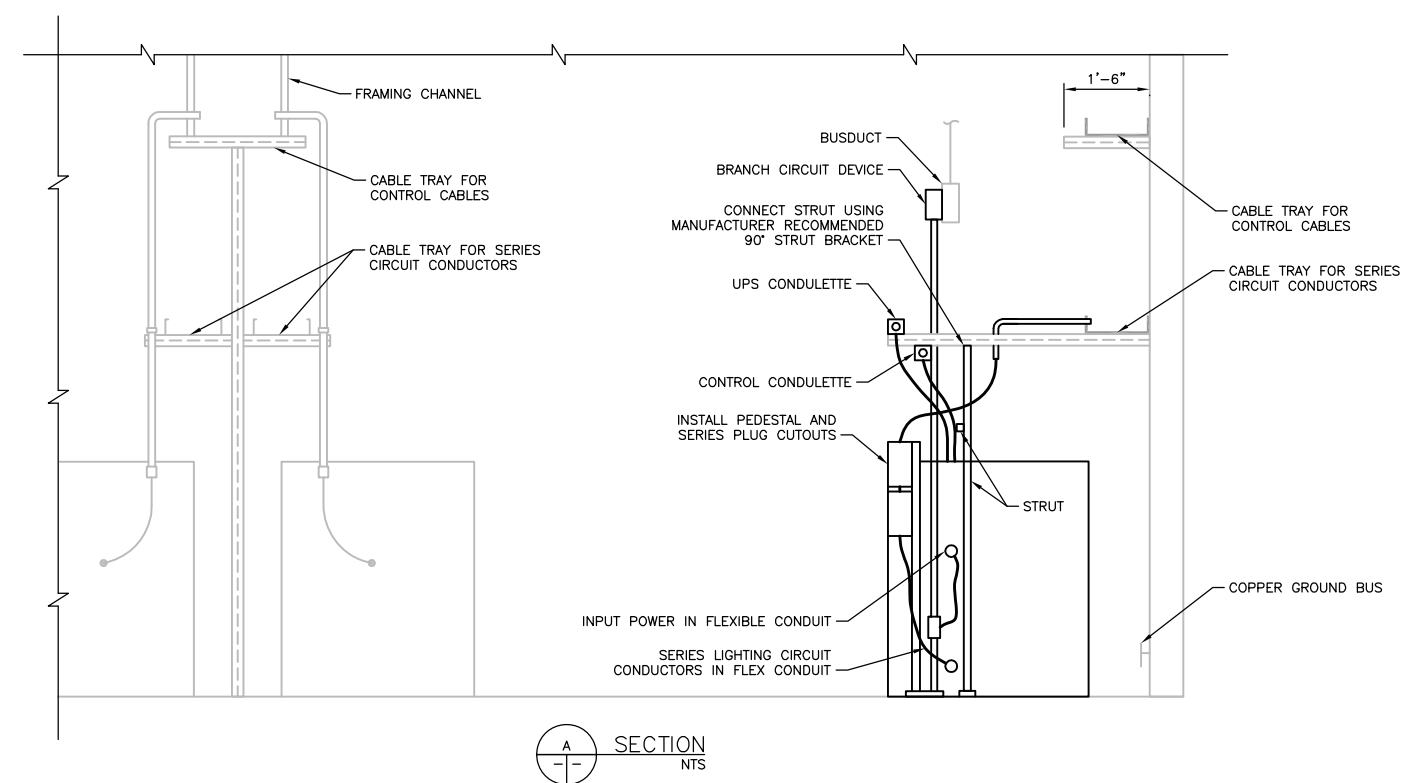
113 OF 115

CADD FILE NO.

\_201313528-1EL-805-A



1 CCR WITH INTEGRAL CONTROL AND DUAL CUTOUTS FOR CCR 36 AND 40  
NTS



A SECTION  
NTS

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ISSUED FOR CONSTRUCTION



RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | SJ  | CONST | 07JA14  | MS   |      |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

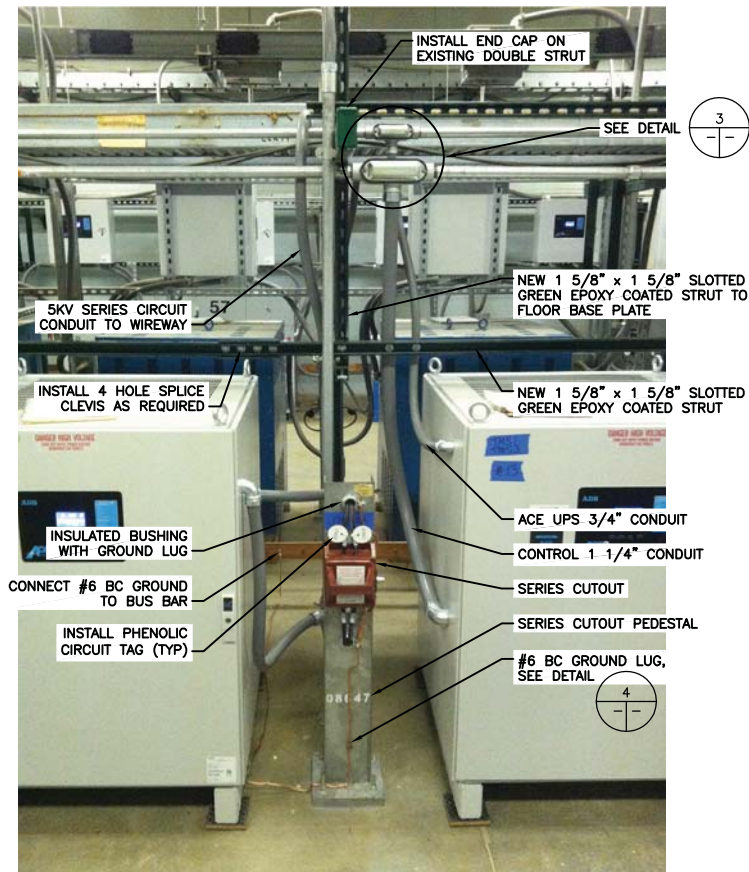
SHEET TITLE EAST VAULT DETAILS

SHEET NO. EL806

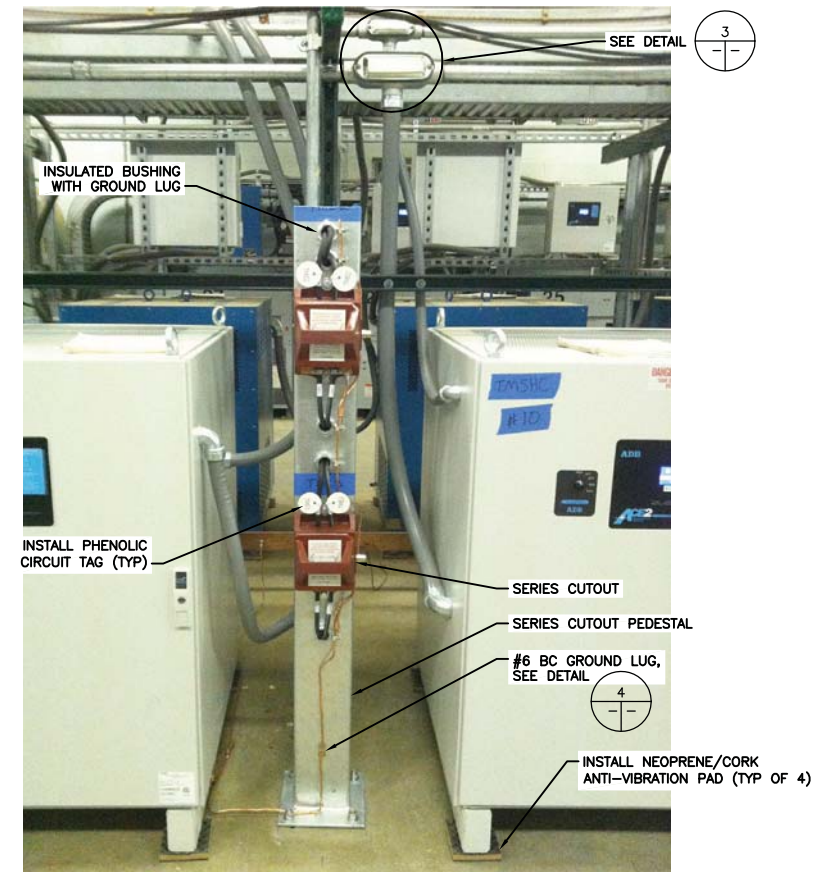
114 OF 115

CADD FILE NO. \_201313528-11EL-806-A

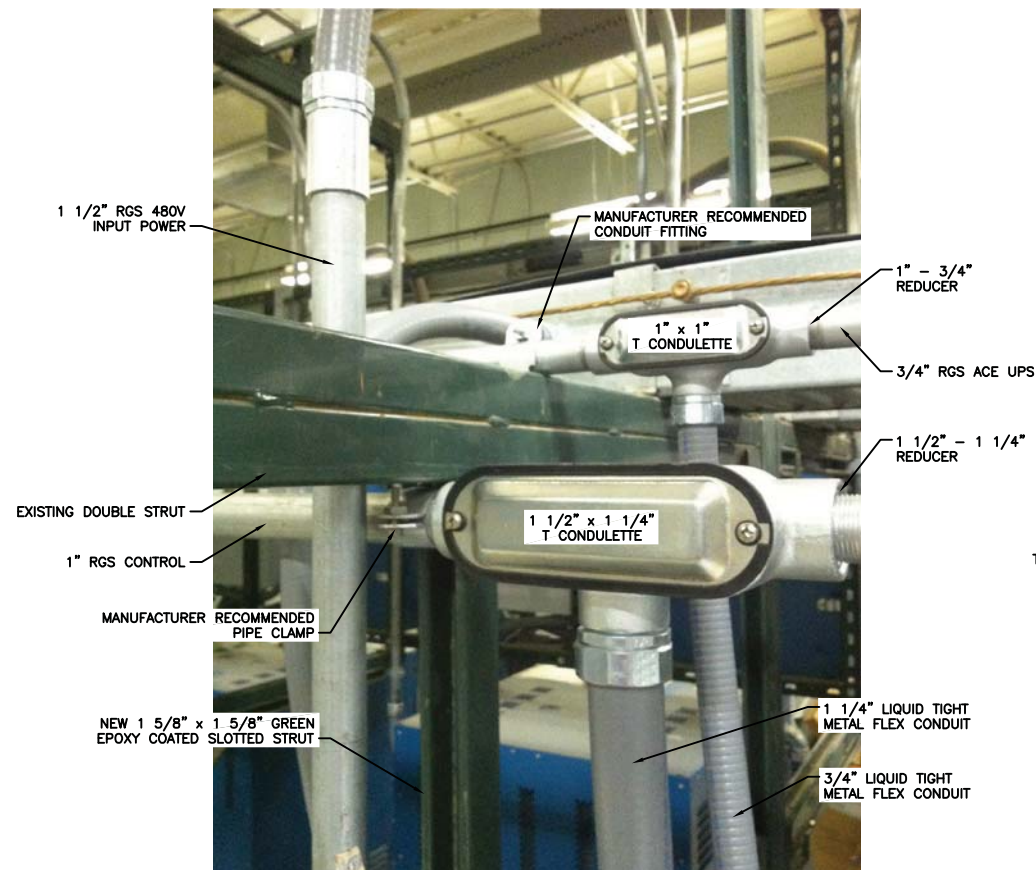
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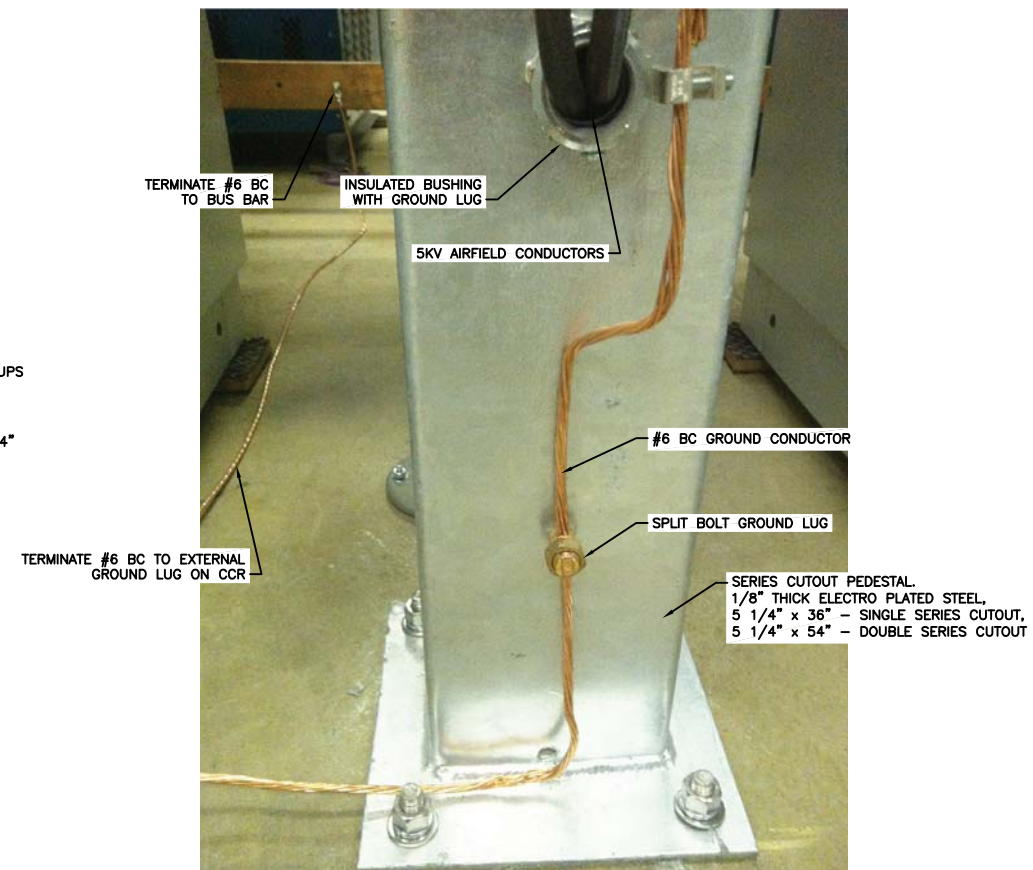
1 CCR TYPICAL INSTALLATION DETAIL  
NTS



2 CCR INSTALLATION WITH DUAL CUTOUTS DETAIL  
NTS



3 CONDULETTE INSTALLATION DETAIL  
NTS



4 GROUNDING INSTALLATION DETAIL  
NTS

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**RUNWAY 8-26  
COMPLEX LIGHTING  
REHABILITATION**

**CH2MHILL**

| ISSUE RECORD | NO. | BY    | PURPOSE | DATE | CHKD |
|--------------|-----|-------|---------|------|------|
| 1            | SJ  | CONST | 07JA14  | MS   |      |

SCALE AS SHOWN

DATE 01/07/2014

DRAWN BY: S. JACOBS

CHECKED BY: M. SOUTHWICK

FAA AIP NO:

WORK BREAKDOWN NO.

DESIGN CONTRACT NO. CE84021

CONST. CONTRACT NO. 201313528

VOLUME NO. 1

SHEET TITLE

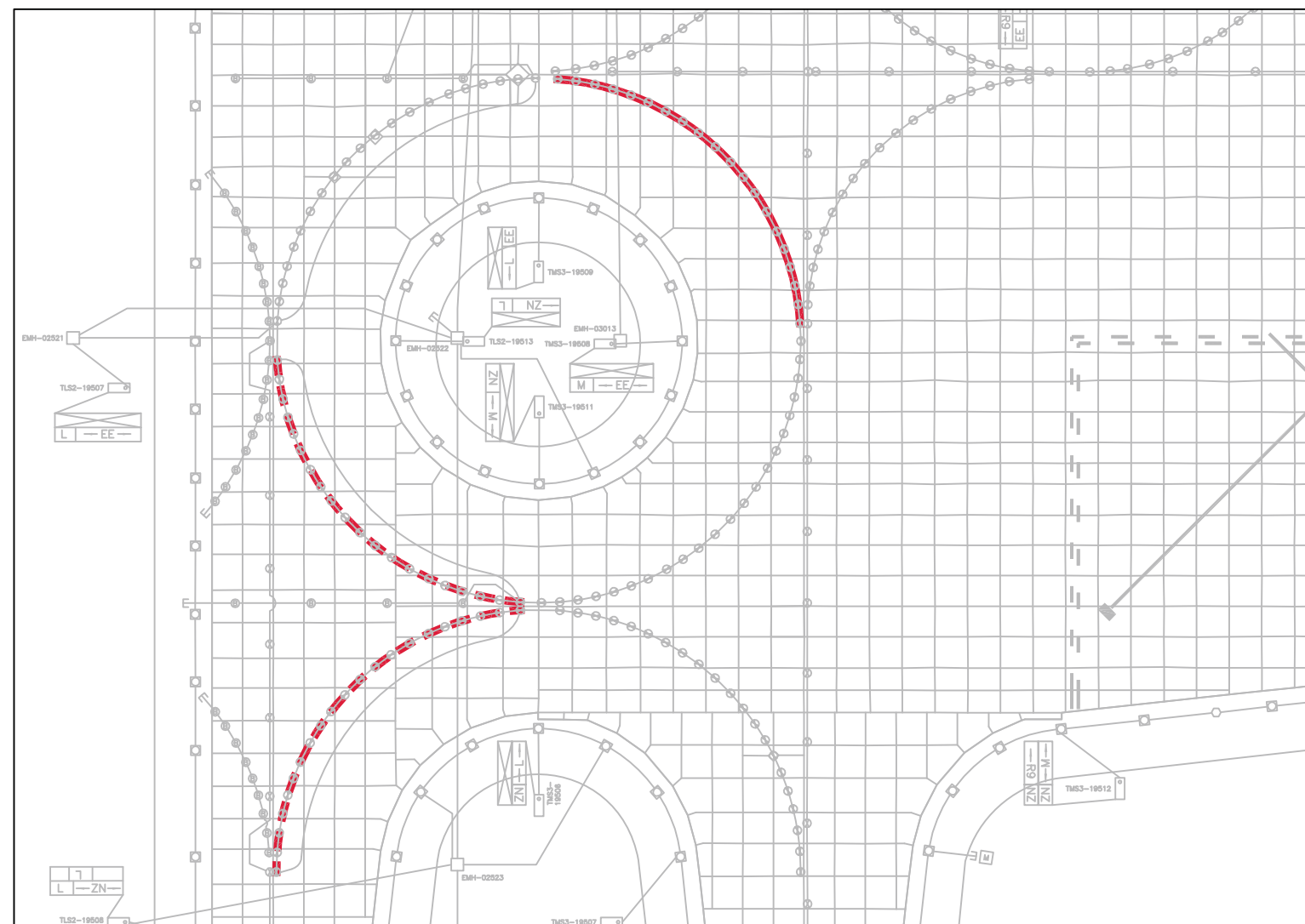
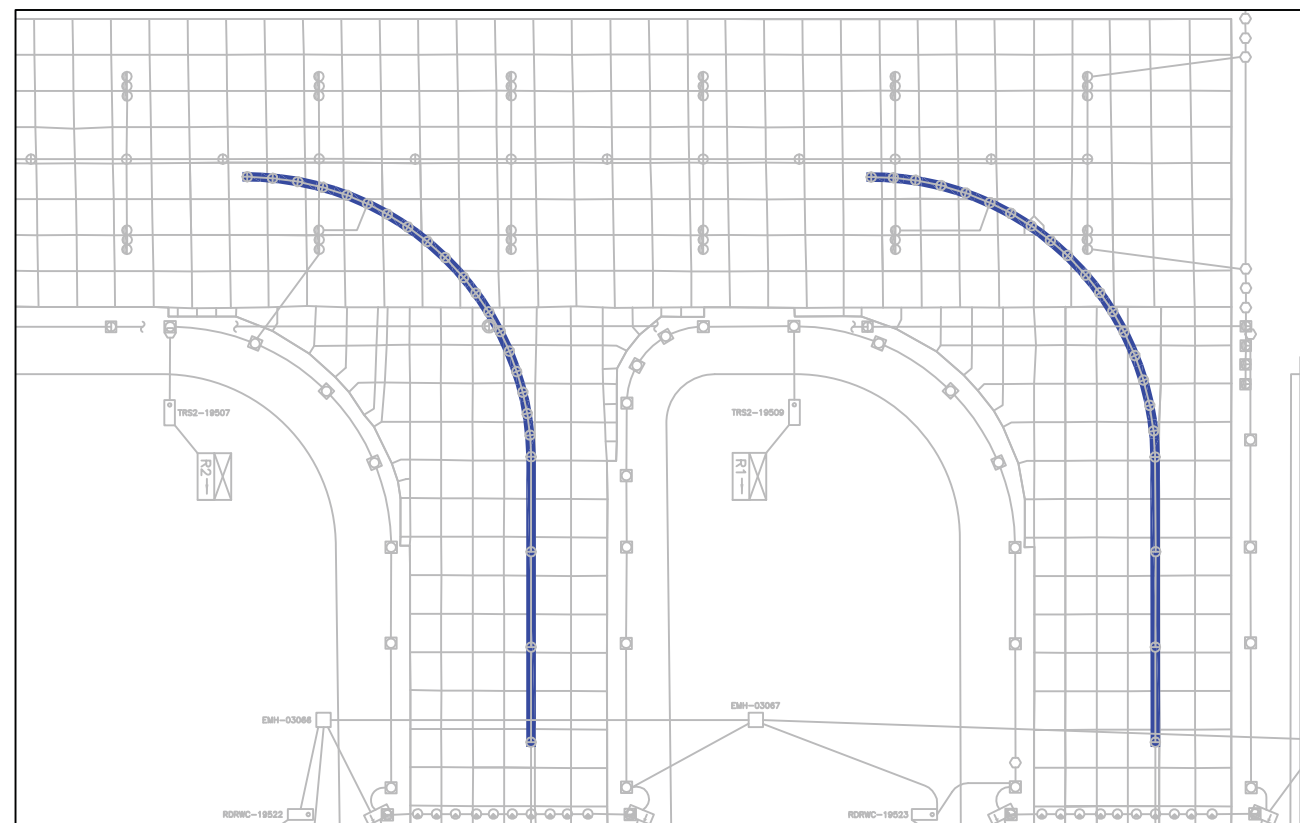
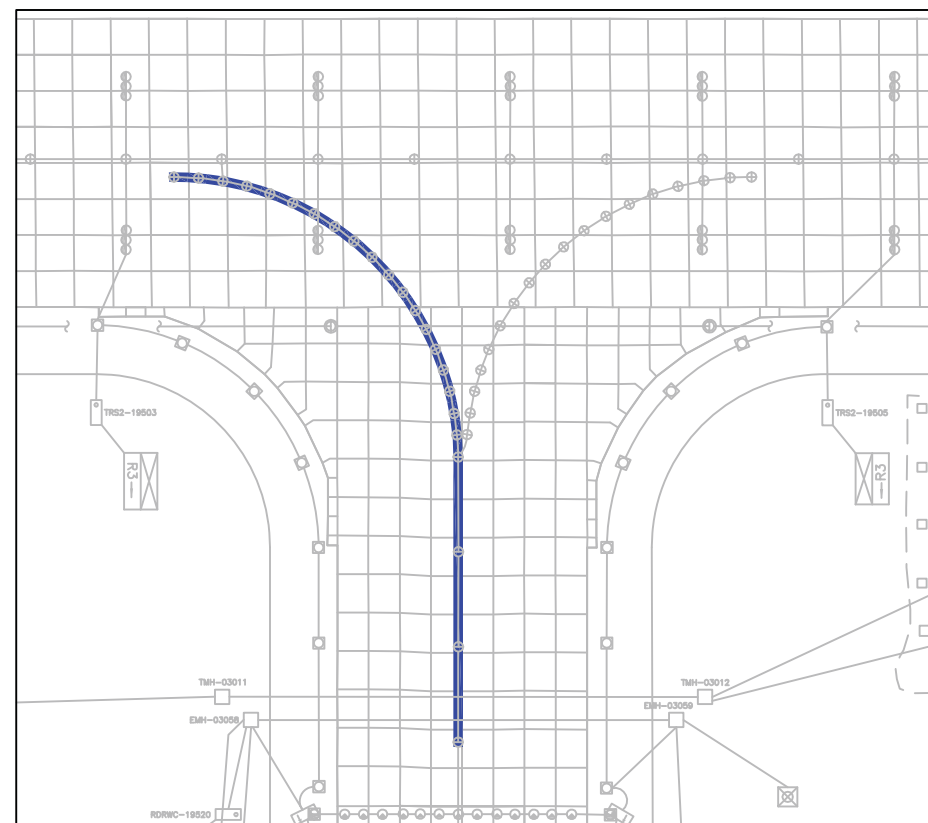
**ALCMS  
CONTROL SCREEN  
MODIFICATION PLAN**

SHEET NO.

EL807

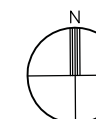
115 OF 115

CADD FILE NO. 201313528-11EL-807-A



**LEGEND:**

- MODIFY ALCMS CONTROL SCREENS TO SHOW TAXIWAY CENTERLINE RADIUS MOVED FROM CIRCUIT TMC6 TO CIRCUIT TR9C1
- - - - - MODIFY ALCMS CONTROL SCREENS TO SHOW TAXIWAY CENTERLINE RADII MOVED FROM CIRCUIT TLC4 TO CIRCUIT TR9C1
- MODIFY ALCMS CONTROL SCREENS TO SHOW TAXIWAY CENTERLINES MOVED FROM CIRCUITS TR15B3, TR25B3, AND TR35B3 TO CIRCUIT TR1235B3



0 25 50 100  
(SHOWN IN FEET)

