

# PROJECT MANUAL



DENVER  
INTERNATIONAL  
AIRPORT

**Trautman &  
Shreve, Inc.**

**Concourse B PCA Replacement  
(RE-BID)**

**CONTRACT NO. 201418277**

## **PART I**

### **PROJECT REQUIREMENTS**

*Issued for Construction July 2015*

CITY & COUNTY OF DENVER  
DEPARTMENT OF AVIATION

**CITY AND COUNTY OF DENVER  
DEPARTMENT OF AVIATION  
DENVER INTERNATIONAL AIRPORT  
CONCOURSE B PCA REPLACEMENT (RE-BID)  
CONTRACT NUMBER 201418277**

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**PART II TECHNICAL PROVISIONS**

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

- |                  |  |
|------------------|--|
| <b>VOLUME 1:</b> | <b>DIVISION 2-16:</b> Technical Specifications (See Index in Technical Specifications) |
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**CITY AND COUNTY OF DENVER  
DEPARTMENT OF AVIATION  
NOTICE OF INVITATION FOR BIDS  
CONCOURSE B PCA REPLACEMENT (RE-BID)  
CONTRACT NO. 201418277**

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> beginning **May 8, 2015**.

**SEALED BIDS** will be due no later than **2:00 PM, Thursday, June 11, 2015**, 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, Thursday, June 11, 2015, 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 Letitia Harper, Room 8810, Airport Office Building (AOB), Denver International Airport, 8500 Peña Blvd., Denver, CO 80249-6340.

**A MANDATORY PRE-BID CONFERENCE** will be held at **1:00 PM, Tuesday, May 19, 2015**, 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).

**GENERAL STATEMENT OF WORK AND COST ESTIMATE:**

The project consists of but is not limited to the following project elements:

1. Removal and replacement of select Pre-Conditioned AIR (PCA) units in 39 locations on Concourse B.
2. Provide for stand-mounted PCA units at fifteen (15) locations. Stands shall be furnished by the PCA manufacturer.
3. Modifications to existing unit support to provide the attachment of the new units the existing Passenger Loading Bridges (PLB).
4. Modifications to the electrical service to the new PCA units at each gate.
5. ADD ALTERNATE #1: Provide lump sum cost for:
  - Deletion of hose trolleys, hose reels and multi-section ductwork (fabric and hard duct) to aircraft.
  - Installation new Boom-Air hose management systems on the discharge side of each new PCA unit, attached to the Passenger Boarding Bridge.
  - Include all costs for addition of all necessary equipment and conduit supports, controls, wiring, conduit, and other appurtenances associated with installing Boom-Air units.
  - Revise the requirements for the PCA Units being purchased and installed to include proper circuit breaker that will power the associated Boom-Air unit.

**PREQUALIFICATION:** Each bidder must be pre-qualified in the category of 2(a) Buildings: General, 2(c) Buildings: Mechanical or 2(d) Buildings: Electrical, at the \$12,000,000.00 level. Prequalification applications are due at least ten (10) calendar days prior to the bid opening date. Prequalification applications must be submitted to the Department of Public Works, Prequalification Section, 201 West Colfax Avenue, Department 506, Denver, Colorado 80202. To view the Rules and Regulations and to obtain a prequalification application, please visit our website at [www.denvergov.org/prequalification](http://www.denvergov.org/prequalification) or call 720-865-2539 for prequalification information ONLY.

**MINORITY/WOMEN BUSINESS ENTERPRISE GOAL:** Pursuant to Article III, Division 1 of Chapter 28 of the Denver Revised Municipal Code, the Project goal of 27% must be met with certified participants, or through the demonstration of a sufficient good faith effort. For compliance with good faith requirements, the M/WBE percentage solicitation level required for this project is 100%.

**As its best interests may appear, the CEO reserves the right to reject any or all bids and to waive informalities in bids.**

Publication Dates: May 8, 2015, May 11, 2015, May 12, 2015  
Published in The Daily Journal

**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 CEO, 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/bids.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 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, of 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 CEO 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 CEO. 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 CEO 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, any reason, including, but not limited to, 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 Base Contract Bid Amount. Alternatives may be accepted in the order listed until the Construction Budget is reached. 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 made available on CD or other electronic means 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 that the Contractor and City will use during construction and that 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 CEO 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 CONTRACTORS' BULLETIN BOARD**

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/bids.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 mandatory 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 writing (letter format) and emailed to the Project Manager; Lee Walinchus at [Lee.Walinchus@flydenver.com](mailto:Lee.Walinchus@flydenver.com). 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 be requested in writing (letter format) and emailed to the Project Manager; Lee Walinchus at [Lee.Walinchus@flydenver.com](mailto:Lee.Walinchus@flydenver.com).

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](mailto:contract.procurement@flydenver.com), must have the words "Request for Clarification" and "Contract No. 201418277" 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 CEO or his authorized representative as to the interpretation or clarification.

If the CEO 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, Aurom Mahobian, Burns & McDonnell Engineering Company, Inc., 9785 Maroon Circle, Suite 400, Centennial, CO 80112; phone 303-474-2267; and Lee Walinchus, Project Manager at [Lee.Walinchus@flydenver.com](mailto:Lee.Walinchus@flydenver.com), not later than ten (10) days prior to the date and time set for opening of bids so that all such approvals will be included in addenda to insure 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 CEO. 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 316, 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 MINORITY/WOMEN BUSINESS ENTERPRISE (MBE/WBE) REQUIREMENTS**

Divisions 1 and 3, Article III of Chapter 28 of the Denver Revised Municipal Code (Sections 28-31 to 28-36 and 28-52 to 28-90, D.R.M.C.) (the "Ordinance") apply to this Project and are incorporated into this Contract by reference. Generally, the Ordinance provides for the adoption of a good faith goals program, to be administered by the Division of Small Business Opportunity (DSBO), devised to provide increased bidding opportunities for Minority/Women Business Enterprises (MBE/WBEs). As such, each bidder must comply with the terms and conditions of the Ordinance in making its bid and, if awarded the Contract, in performing all Work thereunder. A bidder's failure to comply with the Ordinance, any Rules or Regulations promulgated pursuant thereto, or any additional requirement contained herein shall render the bid non-responsive and shall constitute cause for rejection. Failure by the contractor awarded the contract to comply with Ordinance requirements during the performance of the contract is a material breach of the contract, which may result in the termination of this contract, the imposition of sanctions or such other remedy, as deemed appropriate by DSBO. Copies of the Ordinance and its accompanying Rules and Regulations are available for the use and review of bidders from DSBO.

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

1. Under the Ordinance, the Director of DSBO ("Director") is directed to establish project goals for expenditures on construction, reconstruction and remodeling work performed for the City and County of Denver. 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 Minority/Women Business Enterprise Bidders, Subcontractors, Suppliers, Manufacturers, Manufacturers' Representatives or Brokers" the

name, address, work description/supply, committed level of participation and other required information for each MBE/WBE of any tier which the bidder intends to use in performing the work on this Project. **Only the MBE/WBEs identified and the precise levels of participation listed for each on the 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. MBE/WBE bidders may count self-performance or joint venture activity in meeting the MBE/WBE project goal, but only for the scope of work performed as a commercially useful function and at a percentage level the MBE/WBE will be performing itself.**

3. All MBE/WBEs listed on the Bid Form must be properly certified by the City on or before the date bids are opened in order to count towards meeting the designated goal. DSBO maintains an MBE/WBE Construction Directory ("Directory"), which is a current listing of MBE/WBEs that have been certified by the City. A copy of the Directory is available from DSBO, located at 201 W. Colfax, Dept. 907, Denver, Colorado, or on the website located at [www.denvergov.org/DSBO](http://www.denvergov.org/DSBO) and will also be made available at the pre-bid meeting. Bidders are encouraged to use the Directory to assist in locating MBE/WBEs for the work and supplies required on the Project. Bidders are reminded that changes may be made to the Directory at any time in accordance with the City's MBE/WBE Ordinance and procedures established to administer this program, and that a current copy of the Directory must always be used in preparing a bid. MBE/WBE certification or listing in the Directory is not a representation or warranty by the City as to the qualifications of any listed MBE/WBE.
4. In accordance with the provisions of the Ordinance, DSBO will evaluate each bid to determine the responsiveness of the bid to the requirements of the Ordinance. In determining whether a bidder's committed level of participation meets or exceeds the stated MBE/WBE goal, DSBO shall 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 MBE/WBE percentage established for the project to determine the exact dollar amount of required MBE/WBE participation for the Project. This amount will then be compared against the exact dollar amounts for the MBE/WBEs committed for participation by the bidder. If the total dollar amount of participation listed meets or exceeds the established MBE/WBE dollar amount goal listed, then DSBO will determine that the goal has been met.

- b. In addition, DSBO will determine the exact commitment percentage for each listed MBE/WBE by dividing the dollar amount listed for each MBE/WBE by the total base bid dollar amount submitted by the bidder. These individual percentages, when totaled for all listed MBE/WBEs, will establish the total committed percentage level of MBE/WBE participation that the bidder must comply with during the life of the contract. In all cases, the committed percentage level of MBE/WBE participation must equal or exceed the assigned MBE/WBE goal for the Project.
- c. In providing the exact dollar amount of participation for each listed MBE/WBE, 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 dollar amounts and percentages in order for DSBO to determine that the bidder has met or exceeded the applicable MBE/WBE goal.
- d. As previously mentioned, compliance with the MBE/WBE 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 goal. However, should any designated alternate be selected by the City for inclusion in the contract ultimately awarded, the MBE/WBE 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.
- e. On projects where force account or allowance bid items have been included, bidders must meet the MBE/WBE goal percentage based upon the total base bid, including all such items that are submitted to the City. However, when a force account or allowance is designated by the City to be either performed or purchased from a specific company, the bidder may back out the dollar amount of the force account or allowance from the total base bid and meet the MBE/WBE goal on the remaining reduced amount.
- f. On bids that, at the time of bid opening, are equal to or exceed Five Million Dollars (\$5,000,000.00), including any alternates that may be selected, only sixty percent (60%) of the value of the commercially useful function performed by MBE/WBE suppliers shall count toward satisfaction of the Project goal. On Projects under Five Million Dollars (\$5,000,000.00) the value of the commercially useful function of MBE/WBE supplier(s) will count at a one hundred percent (100%)

level. Manufacturers' representatives and packagers shall be counted in the same manner as brokers.

- g. **In utilizing the MBE/WBE participation of a Broker**, only the bona fide commissions earned by such Broker for its performance of a commercially useful function will count toward meeting the Project goals. The bidder must separate the bona fide brokerage 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.
5. On or before the third (3<sup>rd</sup>) working day after bid opening, all of the Bidders are required to submit an executed "MBE/WBE Letter of Intent" for each MBE/WBE listed on the Bid Form as a joint venture member, subcontractor, supplier, manufacturer, manufacturers' representative or broker of any tier. An MBE/WBE Bidder needs to submit a Letter of Intent for any portion of self-performed work to count towards MBE/WBE utilization. , Each Letter of Intent shall be submitted only for the MBE/WBEs listed at the time of bid opening, since this is the only participation that will be counted toward satisfaction of the project goal. A form for the MBE/WBE Letter of Intent is included with the Bid Form. The MBE/WBE 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 MBE/WBE or that its subcontractor(s) and supplier(s), manufacturer(s), manufacturers' representative(s) and broker(s) will do so. Each MBE/WBE Letter of Intent shall be accompanied by a copy of the City and County of Denver's MBE/WBE certification letter for each proposed MBE/WBE identified at 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 the Ordinance:

1. If any Bidder has not met the designated Project 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 goal, that Bidder shall submit, on or before the third (3<sup>rd</sup>) working day after the bid opening a detailed statement, with supporting documentation, setting forth its good faith efforts, made prior to bid opening, attempting to meet the established goal in accordance with Section 28-62 of the Ordinance. This statement shall address each of the items in Subsection (b) of that Section and any additional criteria that the DSBO Director may establish by rule or regulation. A Bidder who fails to meet the Project goal and cannot show that it made a good faith effort to meet the goal shall be considered non-responsive.

2. The statement of good faith efforts shall include a specific response to each of the following as further defined by rule or regulation. 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 items shall render its overall good faith showing insufficient and its bid non-responsive. Items (1) through (10) of Section 28-62, Subsection (b) of the Ordinance are set forth below:
  - (1) The bidder or proposer must solicit through all reasonable and available means, the interest of all MBEs and WBEs certified in the scopes of work of the contract. The bidder or proposer must solicit the interest of such MBEs and WBEs within sufficient time, prior to the bid opening or date of final project-specific proposal in the case of a competitive selection process, to allow such MBEs and WBEs to respond to the solicitation. The bidder or proposer must determine with certainty if the MBEs and WBEs are interested by demonstrating appropriate steps to follow up initial solicitations.
  - (2) The bidder or proposer must select portions of the work of the contract to be performed by MBEs and WBEs in order to increase the likelihood that the project goal will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate MBE and WBE participation as subcontractors or joint venturers, and for bidder or proposer self-performed work, as suppliers, manufacturers, manufacturer's representatives and brokers, all reasonably consistent with industry practice, even when the bidder or proposer would otherwise prefer to perform these work items with its own forces. The bidder or proposer must identify what portions of the contract will be self-performed and what portions of the contract will be opened to solicitation of bids, proposals and quotes from MBE and WBEs. All portions of the contract not self-performed must be solicited for MBE and WBE participation. The ability or desire of a bidder or proposer to perform the work of a contract with its own forces does not relieve the bidder or proposer of the responsibility to meet the project goal or demonstrate good faith efforts to do so.
  - (3) The bidder or proposer, consistent with industry practice, must provide MBEs and WBEs at a clearly stated location with timely, adequate access to and information about the plans, specifications, and requirements of the contract, including bonding and insurance requirements, if any, to assist them in responding to a solicitation.
  - (4) The bidder or proposer must negotiate in good faith with interested MBEs and WBEs and provide written documentation of such negotiation with each such MBE or WBE.



- (5) For each MBE or WBE which contacted the bidder or proposer or which the bidder or proposer contacted or attempted to subcontract or joint venture with, consistent with industry practice, the bidder or proposer must supply a statement giving the reasons why the bidder or proposer and the MBE or WBE did not succeed in negotiating a subcontracting, supplier, manufacturer, manufacturer's representative, broker or joint venture agreement, as applicable.
- (6) The bidder or proposer must provide verification that it rejected each non-utilized MBE and WBE because the MBE or WBE did not submit the lowest bid or it was not qualified. Such verification shall include a verified statement of the amounts of all bids received from potential or utilized subcontractors, suppliers, manufacturers, manufacturer's representatives, brokers or joint venturers on the contract, whether or not they are MBEs or WBEs. In making such a determination of not being qualified, the bidder or proposer shall be guided by the definition of qualified in section 28-54(42), but evidence of lack of qualification must be based on factors other than solely the amount of the MBEs or WBEs bid. For each MBE or WBE found not to be qualified by the bidder or proposer, the verification shall include a statement giving the bidder's or proposer's reasons for its conclusion. A bidder's or proposer's industry standing or group memberships may not be the cause of rejection of an MBE or WBE. A bidder or proposer may not reject an MBE or WBE as being unqualified without sound reasons based on a reasonably thorough investigation and assessment of the MBEs or WBEs capabilities and expertise.
- (7) If requested by a solicited MBE or WBE, the bidder or proposer must make reasonable efforts to assist interested MBEs and WBEs in obtaining bonding, lines of credit, or insurance as required by the City or by the bidder or proposer, provided that the bidder or proposer need not provide financial assistance toward this effort.
- (8) If requested by a solicited MBE or WBE, the bidder or proposer must make reasonable efforts to assist interested MBEs and WBEs in obtaining necessary and competitively priced equipment, supplies, materials, or related assistance or services for performance under the contract, provided that the bidder or proposer need not provide financial assistance toward this effort.
- (9) The bidder or proposer must use the DSBO MBE/WBE directories to identify, recruit, and place MBEs and WBEs.

In accordance with the provisions of the Ordinance, the bidder agrees that it is committed to meeting either the MBE/WBE participation goal or the MBE/WBE participation set forth in its statement of good faith efforts. This commitment must be

expressly indicated on the "Commitment to Minority/Women Business Enterprise Participation" form included with the Bid Form. This commitment includes the following understandings:

1. The bidder understands it must maintain MBE/WBE goals throughout the performance of the Contract pursuant to the requirements set out in D.R.M.C. 28-72.
2. The bidder understands that it must establish and maintain records and submit regular reports, as required, that will allow the City to assess progress in achieving the MBE/WBE participation goal.
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, upon any of the bases discussed in Section 28-73 of the Ordinance, 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 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 an MBE/WBE at the time of contract award, such change orders or contract modification shall be immediately submitted to DSBO for notification purposes. 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 contractor shall be subject to a goal for MBE/WBEs equal to the original goal on the contract which was included in the bid. The contractor shall satisfy such goal with respect to such changed scope of work by soliciting new MBE/WBEs in accordance with Section 28-73 of the Ordinance as applicable, or the contractor must show each element of modified good faith set out in Section 28-75 (c) of the Ordinance. The contractor or consultant shall supply to the director the documentation described in Section 28-75 (c) of the Ordinance with respect to the increased dollar value of the contract.

All bidders are charged with knowledge of and are solely responsible for complying with each and every provision of the Ordinance in making a bid and, if awarded, in performing the work described in the Contract Documents. Failure to comply with these provisions could constitute cause for rejection of a bid or subject the selected contractor to sanctions set forth in the Ordinance. 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 the Ordinance or contact the Project's designated DSBO representative at (303) 342-2180.

## **IB-25 DIVERSITY AND INCLUSIVENESS IN CITY SOLICITATIONS**

The City and County of Denver encourages, but does not require, participation of independent partnerships with SBEs, MBEs, WBEs, and other business enterprises in supply chain activities, prime/subcontractor partnerships, and joint ventures for all contracts and purchase orders. Failure to participate or disclose this information will not impact the award of the contract or purchase order. Voluntary disclosure of such independent partnerships to the City, if any, will be forwarded the DSBO for recording purposes only.

Using the form contained in the Bid Forms, entitled "Diversity and Inclusiveness in City Solicitations Information Request Form", please state whether you have a diversity and inclusiveness program for employment and retention, procurement and supply chain activities, or customer service and provide the additional information requested on the form. The information provided on the Diversity and Inclusiveness in City Solicitations Information Request Form will provide an opportunity for City contractors/consultants to describe their own diversity and inclusiveness practices. Contractors/consultants are not expected to conduct intrusive examinations of its employees, managers, or business partners in order to describe diversity and inclusiveness measures. Rather, the City simply seeks a description of the contractor/consultant's current practices, if any. Diversity and Inclusiveness information provided by City contractors/consultants in response to City solicitations for services or goods will be collated, analyzed, and made available in reports consistent with City Executive Order No. 101. However, no personally identifiable information provided by or obtained from contractors/consultants will be in such reports.

## **IB-26 WAGE RATE REQUIREMENTS**

Pursuant to Section 20-76 of the Revised Municipal Code, the bidder selected to perform this contract shall pay mechanics, laborers and workers employed directly upon the site of the work the full amounts accrued at the time of payment, computed wage rates not less than those shown on the current prevailing wage rate schedule included in the contract bid documents and any addenda thereto. If the City's Career Service Board 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 by the City to all prospective bidders.

The City may, in its sole discretion, determine on a case-by-case basis whether wage rate modifications issued by the Career Service Board ten (10) days or less before the bid opening will be included in an addendum. If they are included in an addendum, the City may, in its sole discretion, elect to postpone the date of bid opening.

If the term of the contract extends for more than one year, the minimum City prevailing wage rates that contractors and subcontractors shall pay during any subsequent yearly period or portion thereof shall be the wage rates in effect on the yearly anniversary date of the contract which begins such subsequent period. In no event shall any increases in prevailing wages after the first anniversary of the contract result in any increased liability on the part of the City and the possibility and risk of any such increase is assumed by all contractors entering into such contract with the City.

#### **IB-27 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-28 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-29 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-30 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 accepted 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 obtain a separate certificate for each subcontractor. 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, via the following email address: ContractDocs@flydenver.com. 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.

City may at its sole option provide an 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 an "add alternate" for additional insurance costs if the City determines not to provide an ROCIP.

## **IB-31 INVOICING**

The contractor recognizes and agrees that it shall be required to use the Textura® Construction Payment Management System (CPM System) for this Project. Bidders are urged, when preparing a 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 prior to billings for any work performed.

## **IB-32 PROJECT CONTROLS REQUIREMENTS**

The Contractor will be required to use the designated Project Management Information System (PMIS) and Primavera P6 compatible to comply with the requirements of DIA's Project Controls System. The PMIS 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 PMIS. The Contractor will be responsible for providing a compatible 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.: 201418277  
 Title: Concourse B PCA Replacement

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:  Lee Walinchus Airport Infrastructure Management Office Denver International Airport 7 <sup>th</sup> Floor, Airport Office Building 8500 Peña Boulevard Denver, CO 80249-6240	Designer of Record:  Aurom Mahobian Burns & McDonnell Engineering Company, Inc. 9785 Maroon Circle, Suite 400, Centennial, CO 80112 303-474-2267
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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]

**SVP-AIM:**

Date:

[Signature]

Bidder(s) Notified By

Addendum No.

Date:

THIS IS PAGE 2 OF 2 PAGES



**EEO QUESTIONNAIRE**  
**Contract No: 201418277**

1. Name of Business:  Trautman & Shreve, Inc.
2. Address:  4406 Race Street
3. City, State, Zip Code:  Denver, CO 80216
4. Telephone Number: (  303 )  295-1414
5. Name and title of your firm's EEO Contact:  Michelle Murdock, HR Director
6. Are you an affiliate or a subsidiary of another business organization (branches, etc.)?  
 Yes  No
7. Type of business you are engaged in:  Construction
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? If yes, complete the following information:

<u>Type of Contract</u>	<u>Contract Number</u>	<u>Total Cost of Each Contract</u>
2C - Buildings Mechanical	2091209030	\$1,000,000
2C - Buildings Mechanical	201414661	\$348,500

(You may use additional sheets if necessary)

(Page 1 of 2 pages)

**PROJECTION OF ANTICIPATED WORKFORCE**  
**Contract No. 201418277**

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
	Not Applicable			

13. What is the anticipated number of employees from the apparent low bidder's current work force to be utilized to perform this contract? 4

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
<u>Mechanical</u>	<u>4</u>	<u>6,000</u>	<u>TBD</u>	
<u>Electrical</u>	<u>2</u>	<u>3,000</u>	<u>TBD</u>	
<u>Structural</u>	<u>2</u>	<u>1,500</u>	<u>TBD</u>	

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 X 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

**Office of Human Resources**  
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](http://www.denvergov.org/csa)

TO: All Users of the City of Denver Prevailing Wage Schedules  
FROM: Seth Duhon-Thornton, Associate Human Resources Professional  
DATE: Friday March 27, 2015  
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 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 Building rates issued by OHR.

The attached Prevailing Wage Schedule is effective as of **Friday March 27, 2015** and applies to the City and County of Denver for **BUILDING CONSTRUCTION PROJECTS** (does not include residential construction consisting of single family homes and apartments up to and including 4 stories) in accordance with the Denver Revised Municipal Code, Section 20-76(c).

General Wage Decision No. CO150004  
Superseded General Decision No. CO20140004  
Modification No.02  
Publication Date: 3/20/2015  
(5 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: CO150004 03/20/2015 CO4

Superseded General Decision Number: CO20140004

State: Colorado

Construction Type: Building

County: Denver County in Colorado.

BUILDING CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

Note: Executive Order (EO) 13658 establishes an hourly minimum wage of \$10.10 for 2015 that applies to all contracts subject to the Davis-Bacon Act for which the solicitation is issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.10 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Modification Number	Publication Date
0	01/02/2015
1	01/09/2015
2	03/20/2015

ASBE0028-001 10/01/2013

	Rates	Fringes
Asbestos Workers/Insulator (Includes application of all insulating materials, protective coverings, coatings and finishings to all types of mechanical systems).....	\$ 28.83	13.18

BRCO0007-001 01/01/2014

	Rates	Fringes
BRICKLAYER.....	\$ 24.03	8.63

BRCO0007-005 05/01/2014

	Rates	Fringes
TILE SETTER.....	\$ 27.15	7.88

CARP0001-004 05/01/2013

	Rates	Fringes
Carpenters:		
Acoustical, Drywall Hanging/Framing and Metal Stud, Form Building/Setting.	\$ 25.00	5.39

-----  
 CARP1607-002 06/01/2012

	Rates	Fringes
MILLWRIGHT.....	\$ 28.95	11.10

-----  
 ELEC0068-002 06/01/2014

	Rates	Fringes
ELECTRICIAN		
(Includes Low Voltage Wiring and Installation of Fire alarms, Security Systems, Telephones, Computers and Temperature Controls).....	\$ 32.65	12.70

-----  
 ELEV0025-002 01/01/2015

	Rates	Fringes
Elevator Constructor.....	\$ 40.68	28.385+a+b

FOOTNOTE:  
 a. Vacation: 6%/under 5 years based on regular hourly rate for all hours worked. 8%/over 5 years based on regular hourly rate for all hours worked.  
 b. PAID HOLIDAYS: New Year's Day; Memorial Day; Independence Day; Labor Day; Veterans' Day; Thanksgiving Day; the Friday after Thanksgiving Day; and Christmas Day.

-----  
 ENGI0009-003 10/23/2013

	Rates	Fringes
Power equipment operator - crane		
141 tons and over.....	\$ 25.97	9.15
50 tons and under.....	\$ 24.88	9.15
51 to 90 tons.....	\$ 25.04	9.15
91 to 140 tons.....	\$ 25.19	9.15

-----  
 IRON0024-001 11/01/2013

	Rates	Fringes
IRONWORKER, STRUCTURAL.....	\$ 24.80	10.14

-----  
LABO0720-003 05/01/2014

	Rates	Fringes
LABORER		
Concrete/Mason Tenders.....	\$ 16.42	6.38

-----  
\* PAIN0079-002 03/01/2015

	Rates	Fringes
Drywall Finisher/Taper		
Hand.....	\$ 20.15	6.91
Tool.....	\$ 20.50	6.91
Painters:.....	\$ 19.45	6.91
PAPERHANGER.....	\$ 20.15	6.91

-----  
PAIN0930-001 07/01/2014

	Rates	Fringes
GLAZIER.....	\$ 29.67	7.52

-----  
PLAS0577-001 05/01/2014

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER...	\$ 24.00	10.23

-----  
PLUM0003-001 07/01/2014

	Rates	Fringes
PLUMBER		
(Excluding HVAC work).....	\$ 31.93	12.34

-----  
PLUM0208-001 07/01/2013

	Rates	Fringes
PIPEFITTER		
(Including HVAC pipe).....	\$ 33.35	12.27

-----  
SFCO0669-001 07/01/2013

	Rates	Fringes
SPRINKLER FITTER.....	\$ 33.09	18.60

-----  
SHEE0009-001 07/01/2014

	Rates	Fringes
Sheet metal worker		
(Includes HVAC duct and installation of HVAC		

systems).....\$ 32.47 13.98

-----  
SUCO2001-011 12/20/2001

	Rates	Fringes
Carpenters:		
All Other Work.....	\$ 16.12	2.84
Ironworkers:		
Reinforcing.....	\$ 18.49	3.87
Laborers:		
Brick Finisher/Tender.....	\$ 12.78	1.41
Common.....	\$ 10.62	2.09
Power equipment operators:		
Mechanic.....	\$ 18.48	

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



**Office of Human Resources**  
**Supplemental to the Davis-Bacon *Building* Construction Project rates**  
**(Specific to the Denver projects)**  
**Supp #100, Date: 03-02-2012**

<b>Classification</b>		<b>Base</b>	<b>Fringe</b>
Boilermakers		\$30.97	\$21.45
Power Equipment Operators (Concrete Mixers):			
	Less than 1 yd	\$23.67	\$10.67
	1 yd and over	\$23.82	\$10.68
	Drillers	\$23.97	\$10.70
	Loaders over 6 cu yd	\$23.82	\$10.68
	Oilers	\$22.97	\$10.70
Soft Floor Layers		\$16.70	\$9.81
Ironworkers (Ornamental)		\$24.80	\$10.03
Plasters		\$24.60	\$12.11
Plaster Tenders		\$10.79	-
Laborers: Concrete Saw		\$13.89	-
Power Equipment Operators:			
	Backhoe	\$23.67	\$10.67
	Loader up to and incl 6 cu yd	\$23.67	\$10.67
	Motor Grader	\$23.97	\$10.70
	Roller	\$23.67	\$10.67
Truck Drivers (Dump Trucks):			
	6 to 14 cu yds	\$19.14	\$10.07
	15 to 29 cu yds	\$19.48	\$10.11
	Flatbed	\$19.14	\$10.07
	Semi	\$19.48	\$10.11

- To determine the Tile Setters-Marble Mason-Terrazzo mechanic rates—Use Davis Bacon-Building rates adopted by the Career Service Board.
- To determine the Tile Finisher-Floor Grinder-Base Grinder—Use current Career Service Prevailing Wage Schedules.
- Caulkers—Receive rate prescribed for craft performing operation to which caulking is incidental .i.e. glazier, painter, brick layer, cement mason.
- Use the “Carpenters—All Other Work” rates published by the federal Davis Bacon rates for batt insulation, pre-stress concrete and tilt up concrete walls, Roofers (including foundation waterproofing).
- Use the “Laborer—Common”, rates published by the federal Davis Bacon rates for General Housekeeping, Final Cleanup and Fence Installer.

**DENVER INTERNATIONAL AIRPORT  
BID FORMS**

**CONTRACT NAME: Concourse B PCA Replacement  
Contract No.: 201418277**

**BID LETTER**

BIDDER     Trautman & Shreve, Inc.    

Chief Executive Officer  
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 May 8, 2015, for Contract No. 201418277, Denver International Airport, Concourse B PCA Replacement.

This contract is for:

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. In accordance with Section 4.4 of Ex. Q, Contractor further 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.

ADD ALTERNATE #1: Provide lump sum cost for:

- Deletion of hose trolleys, hose reels and multi-section ductwork (fabric and hard duct) to aircraft.
- Installation new Boom-Air hose management systems on the discharge side of each new PCA unit, attached to the Passenger Boarding Bridge.
- Include all costs for addition of all necessary equipment and conduit supports, controls, wiring, conduit, and other appurtenances associated with installing Boom-Air units.
- **Revise the requirements for the PCA Units being purchased and installed to include proper circuit breaker that will power the associated Boom-Air unit.**
-

Base Contract Bid Amount: Eight Million, Four Hundred Eighty-four Thousand, Seven Hundred Seventy-four Dollars and 00 Cents (\$ 8,484,774.00).

ADD Alternate 1 Bid Amount: One Million, Seven Hundred Thirty-three Thousand, Six Hundred Forty-one Dollars and 00 Cents (\$ 1,733,641.00).

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

Addenda Nos.: None

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 CEO to do so, mailed and/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 CEO; 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 as 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 11th day of June, 2015.

**BUSINESS ADDRESS OF BIDDER:** 4406 Race Street

City, State, Zip Code: Denver, CO 80216

Telephone Number of Bidder: (303) 295-1414

Fax Number of Bidder: (303) 295-0324

Email Address: fmontoya@trautman-shreve.com

Social Security or Employer Id. No. of Bidder: 13-363-0476

**SIGNATURE OF BIDDER:**

*If a Corporation:*

PRINT NAME OF CORPORATION:

Trautman & Shreve, Inc.

Attest:

(Corporate Seal)

a Colorado Corporation

  
Secretary Frank Montoya

By:  Kevin D. Larington  
President & CEO

*If a Limited Liability Company:*

PRINT NAME OF LIMITED LIABILITY COMPANY:

\_\_\_\_\_

Organized in the State of \_\_\_\_\_

By: \_\_\_\_\_  
Manager

[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:

\_\_\_\_\_  
Corporation ( ) or Partnership ( )

By: \_\_\_\_\_  
Signature

Title: \_\_\_\_\_

*Required for a corporation:*

ATTEST:  
(Corporate Seal)

\_\_\_\_\_  
Secretary

Joint Venture Partner –  
Name of Firm:

\_\_\_\_\_  
Corporation ( ) or Partnership ( )

By: \_\_\_\_\_  
Signature

Title: \_\_\_\_\_

*Required for a corporation:*

ATTEST:  
(Corporate Seal)

\_\_\_\_\_  
Secretary

Joint Venture Partner --  
Name of Firm:

\_\_\_\_\_  
Corporation ( ) or Partnership ( )

By: \_\_\_\_\_  
Signature

Title: \_\_\_\_\_

*Required for a corporation:*

ATTEST:  
(Corporate Seal)

\_\_\_\_\_  
Secretary

Joint Venture Partner –  
Name of Firm:

\_\_\_\_\_  
Corporation ( ) or Partnership ( )

By: \_\_\_\_\_  
Signature

Title: \_\_\_\_\_

*Required for a corporation:*

ATTEST:  
(Corporate Seal)

\_\_\_\_\_  
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.**

**(Not Applicable)**

**DENVER INTERNATIONAL AIRPORT**

**Concourse B PCA Replacement  
Contract No. 201418277**

**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.





Name: Kevin D. Larington

Name: Frank Montoya

Title: President & CEO

Title: Vice President Sheet Metal Division Secretary

Name: Brady Burlison

Name: \_\_\_\_\_

Title: CFO

Title: \_\_\_\_\_

8. Bidder's/Contractor's City and County of Denver Contractor License No.: 242995; 1146; 239158  
License if it has obtained one: Class: A-Plumbing/Refrigeration & A-Heating & Ventilation

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): Colorado

10. Bidder's Surety: Travelers Casualty & Surety Company

11. Surety's State of Incorporation: Connecticut

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

13. Name and address of person to receive payments: Susan Stack

Trautman & Shreve, Inc.

4406 Race Street

Denver, CO 80216

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:

Pipefitters Denver Local #208

Plumbers Denver Local #3

Sheet Metal Colorado Local #9

Bidder     Trautman & Shreve, Inc.    

**DENVER INTERNATIONAL AIRPORT**

**Concourse B PCA Replacement  
Contract No. 201418277**

**Bid Data Forms**

**LIST OF PROPOSED SUBCONTRACTORS**

Bidder shall list below the name, business address, work assignment and dollar value of each 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 Minority/Women 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, 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 SVP-AIM 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, the Contractor agrees not to subcontract any of the work assignment identified for that subcontractor until the Contractor has advised the SVP-AIM in writing of the reasons why a different subcontractor is being used and has obtained approval of the SVP-AIM of the substitution. This requirement does not affect the applicability of General Condition 502.

<b>Subcontractor</b>	<b>Work Assignment</b>	<b>Subcontract Dollar Value</b>
NAME: <u>Ground Engineering</u> ADDRESS: <u>7393 Dahlia Street</u> <u>Commerce City, CO 80022</u> PHONE: <u>303-289-1989</u>	Testing Agency	\$19,750.00

Subcontractor	Work Assignment	Subcontract Dollar Value
NAME: <u>J&amp;J Construction</u> ADDRESS: <u>9200 W. Yale Avenue</u> <u>Denver, CO 80227</u> PHONE: <u>303-523-4735</u>	General Contractor	\$320,750.00
NAME: <u>NM Industrial</u> ADDRESS: <u>1001 W. 42nd Avenue</u> <u>Denver, CO 80011</u> PHONE: _____	Sheet Metal	\$980,335.00
NAME: <u>TAB Services</u> ADDRESS: <u>2065 S. Raritan Street</u> <u>Denver, CO 80223</u> PHONE: <u>303-649-1213</u>	Test & Balance	\$29,901.00
NAME: <u>Precision Industrial Services</u> ADDRESS: <u>10275 E. 106th Avenue</u> <u>Brighton, CO 80601</u> PHONE: <u>303-287-4400</u>	Bollards / Welds	\$261,494.00
NAME: <u>LEI Companies, Inc.</u> ADDRESS: <u>2017 Curtis Street</u> <u>Denver, CO 80205</u> PHONE: <u>303-865-5202</u>	Electrical	\$1,254,307.00
NAME: <u>Aurora Building Company</u> ADDRESS: <u>2221 E. Arapahoe Road, #333</u> <u>Littleton, CO 80161</u> PHONE: <u>303-816-0220</u>	Painting	\$80,540.00
NAME: _____ ADDRESS: _____ PHONE: _____		
NAME: _____ ADDRESS: _____ PHONE: _____		

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

Bidder     Trautman & Shreve, Inc.    

**DENVER INTERNATIONAL AIRPORT**

**Concourse B PCA Replacement  
Contract No. 201418277**

**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:   June 11, 2015  

    Trautman & Shreve, Inc.      
(Name of Bidder)  
By:       
    Kevin D. Larington  
Title:     President & CEO

Bidder Trautman & Shreve, Inc.

**DENVER INTERNATIONAL AIRPORT**

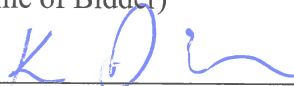
**Concourse B PCA Replacement  
Contract No. 201418277**

**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: June 11, 2015

Trautman & Shreve, Inc.  
(Name of Bidder)  
By:   
Kevin D. Larington  
Title: President & CEO

Bidder Trautman & Shreve, Inc.

**DENVER INTERNATIONAL AIRPORT  
Concourse B PCA Replacement  
Contract No. 201418277**

**BID BOND**

**KNOW ALL MEN BY THESE PRESENTS**

THAT Trautman & Shreve, Inc., as Principal, and \*                     , a corporation organized and existing under and by virtue of the laws of the State of CT, 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 Amount Bid Dollars and                     XX Cents (\$ 5% of Amt. Bid) 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:

\* Travelers Casualty and Surety Company of America

WHEREAS, the said Principal is herewith submitting its Bid, dated on February 12, 2015, for the construction of Contract No. 201418277, Concourse B PCA Replacement, 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.

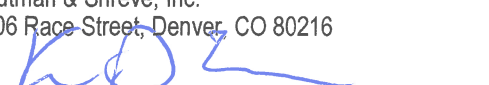
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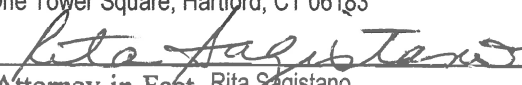


Signed, sealed and delivered this 29th day of January, 2015.

Attest:

  
Secretary Frank Montoya  
[SEAL if bidder a corporation]

**PRINCIPAL**  
Trautman & Shreve, Inc.  
4406 Race Street, Denver, CO 80216  
By:   
President & CEO, Kevin D. Larington

**SURETY**  
Travelers Casualty and Surety Company of America  
One Tower Square, Hartford, CT 06183  
By:   
Attorney-in-Fact Rita Sagistano

(ATTACH POWER OF ATTORNEY)

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



POWER OF ATTORNEY

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company

St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

Attorney-In Fact No. 227925

Certificate No. 006048208

KNOW ALL MEN BY THESE PRESENTS: That Farmington Casualty Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company are corporations duly organized under the laws of the State of Connecticut, that Fidelity and Guaranty Insurance Company is a corporation duly organized under the laws of the State of Iowa, and that Fidelity and Guaranty Insurance Underwriters, Inc., is a corporation duly organized under the laws of the State of Wisconsin (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint

Thomas Bean, Rita Sagistano, Gerard S. Macholz, Susan Lupski, Robert T. Pearson, Camille Maitland, George O. Brewster, Colette R. Chisholm, Virginia M. Lovett, Vincent A. Walsh, Lee Ferrucci, Desiree Cardlin, and Nelly Renchiwich

of the City of Uniondale, State of New York, their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed and their corporate seals to be hereto affixed, this 4th day of September, 2014.

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company

St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company



State of Connecticut
City of Hartford ss.

By: [Signature]
Robert L. Raney, Senior Vice President

On this the 4th day of September, 2014, before me personally appeared Robert L. Raney, who acknowledged himself to be the Senior Vice President of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

In Witness Whereof, I hereunto set my hand and official seal.
My Commission expires the 30th day of June, 2016.



[Signature]
Marie C. Tetreault, Notary Public

**TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA  
HARTFORD, CT. 06183**

**ATTORNEY-IN-FACT JUSTIFICATION  
PRINCIPAL'S ACKNOWLEDGMENT — IF A CORPORATION**

**Colorado**

State of ~~New York~~, County of **Denver** } ss.

On this **2nd** day of **February**, 20 **15**, before me personally appeared **Kevin D. Larington** to me known, who, being by me duly sworn, deposes and says: That he/she resides in the City of **Littleton, Colorado**; that he/she is the **President & CEO** of **Trautman & Shreve, Inc.**, the corporation described in and which executed the within instrument; that he/she knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said corporation, and that he/she signed his/her name thereto by like order.

*Pauline Atkinson*

**PRINCIPAL'S ACKNOWLEDGMENT — IF INDIVIDUAL OR FIRM**

My Commission Expires 04/02/2015

State of New York, County of \_\_\_\_\_ } ss.

On this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, before me personally appeared \_\_\_\_\_ to me known, who, being by me duly sworn, deposes and says: That he/she is the \_\_\_\_\_ (one of the firm of \_\_\_\_\_) described in and who executed the within instrument, and he/she thereupon duly acknowledged to me that he/she executed the same (as the act and deed of said firm).

**SURETY COMPANY'S ACKNOWLEDGMENT**

State of New York, County of **Nassau**

On this **29th** day of **January**, 20 **15**, before me personally appeared **Rita Sagistano** to me known, who, being by me duly sworn, did depose and say: That he/she resides in ~~New York~~ **County of Nassau, NY**; that he/she is Attorney-in-Fact of **TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA**, the corporation described in and which executed the within instrument; that he/she knows the corporate seal of said Company; that the seal affixed to said instrument is such corporate seal; and that he/she signed said instrument as Attorney-in-Fact by authority of the Board of Directors of said Company; and affiant did further depose and say that the Superintendent of Insurance of the State of New York has, pursuant to Chapter 882 of the Laws of the State of New York for the year 1939, constituting chapter 28 of the Consolidating Laws of the State of New York as the Insurance Law as amended, issued to **TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA** his/her certificate that said Company is qualified to become and be accepted as surety or guarantor on all bonds, undertakings, recognizances, guaranties, and other obligations required or permitted by law; and that such certificate has not been revoked.

*Donnamarie A Kissane*  
Notary Public

**TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA  
Hartford, Connecticut 06183**

**DONNAMARIE A KISSANE  
Notary Public, State of New York  
No. 01K16297783  
Qualified in Nassau County  
Commission Expires March 3, 2018**

**FINANCIAL STATEMENT AS OF DECEMBER 31, 2013  
AS FILED WITH THE INSURANCE DEPT. OF THE STATE OF NEW YORK  
CAPITAL STOCK \$ 6,480,000**

<b>ASSETS</b>		<b>LIABILITIES</b>	
CASH AND INVESTED CASH	\$ 67,799,824	UNEARNED PREMIUMS	\$ 808,717,871
BONDS	3,452,214,898	LOSSES	809,863,176
INVESTMENT INCOME DUE AND ACCRUED	47,768,502	LOSS ADJUSTMENT EXPENSES	460,670,453
OTHER INVESTED ASSETS	265,099,810	COMMISSIONS	31,781,138
PREMIUM BALANCES	180,838,482	TAXES, LICENSES AND FEES	12,482,322
NET DEFERRED TAX ASSET	81,575,098	OTHER EXPENSES	38,437,893
REINSURANCE RECOVERABLE	11,381,414	FUNDS HELD UNDER REINSURANCE TREATIES	84,401,484
SECURITIES LENDING REINVESTED COLLATERAL ASSETS	4,910,772	CURRENT FEDERAL AND FOREIGN INCOME TAXES	18,387,407
RECEIVABLES FROM PARENT, SUBSIDIARIES AND AFFILIATES	30,772,481	REMITTANCES AND ITEMS NOT ALLOCATED	13,577,503
STATE SURCHARGES RECEIVABLE	258,771	AMOUNTS WITHHELD / RETAINED BY COMPANY FOR OTHERS	23,616,357
OTHER ASSETS	14,872,822	RETROACTIVE REINSURANCE RESERVE ASSUMED	1,511,874
		POLICYHOLDER DIVIDENDS	8,482,513
		PROVISION FOR REINSURANCE	3,870,484
		ADVANCE PREMIUM	1,078,809
		PAYABLE FOR SECURITIES LENDING	4,910,772
		DERIVATIVES	112,003
		CEDED REINSURANCE NET PREMIUMS PAYABLE	(84,954,254)
		ESCHEAT LIABILITY	471,848
		OTHER ACCRUED EXPENSES AND LIABILITIES	242,236
		<b>TOTAL LIABILITIES</b>	<b>\$ 2,285,740,387</b>
		CAPITAL STOCK	\$ 6,480,000
		PAID IN SURPLUS	433,803,790
		OTHER SURPLUS	1,441,436,327
		<b>TOTAL SURPLUS TO POLICYHOLDERS</b>	<b>\$ 1,881,720,088</b>
<b>TOTAL ASSETS</b>	<b>\$ 4,147,460,454</b>	<b>TOTAL LIABILITIES &amp; SURPLUS</b>	<b>\$ 4,147,460,454</b>

Securitles carried at \$8,174,873 in the above statement are deposited with public authorities, as required by law.

**LIST OF PROPOSED MINORITY/WOMEN BUSINESS ENTERPRISE  
BIDDERS, SUBCONTRACTORS, SUPPLIERS (MANUFACTURERS) OR BROKERS**

**CITY OF DENVER  
DEPARTMENT OF AVIATION  
CONTRACT NO. 201418277**

The undersigned Bidder proposes to utilize the following Minority/Women Business Enterprises (MBE/WBEs) for the project. All listed firms are **CURRENTLY** certified by the City and County of Denver. Only the level of MBE/WBE participation listed at the bid opening will count toward satisfaction of the project goal. Only bona fide commissions may be counted for Brokers. MBE/WBE prime bidders must detail their bid information below. Please copy and attach this page to list additional MBE/WBEs for this project.

The undersigned bidder hereby certifies that the subcontractors and suppliers listed below have full knowledge that their names have been offered as subcontractors and suppliers for the work, and the bidder further certifies that the dollar amount of work to be performed by the MBE/WBE/DBEs was furnished to the bidder prior to the bid opening. The undersigned bidder agrees that after the bid opening, it shall submit to the City executed and completed MBE/WBE/DBE letters of Intent within three working days for an MBE/WBE project, or within five working days for a DBE project, for each of its MBE, WBE and DBE subcontractors. The Letter of Intent form is contained in the Contract Documents.

CHECK BOX IF APPLICABLE:

<input type="checkbox"/>	MBE/WBE Prime Bidder
--------------------------	----------------------

Business Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
Type of Service: \_\_\_\_\_  
Contact Person: \_\_\_\_\_  
Dollar Amount: \$ \_\_\_\_\_ Percent of Project: \_\_\_\_\_ %

CHECK ONE BOX:

<input checked="" type="checkbox"/> Subcontractor	or	<input type="checkbox"/> Supplier	Or	<input type="checkbox"/> Manufacturer	or	<input type="checkbox"/> Broker
---	----	-----------------------------------	----	---------------------------------------	----	---------------------------------

Business Name: LEI Companies, Inc.  
Address: 2017 Curtis Street, Denver, CO 80205  
Type of Service: Electrical  
Contact Person: Terry Haley  
Dollar Amount: \$ 1,254,307.00 Percent of Project: 14.5 %

CHECK ONE BOX:

Subcontractor or  Supplier or  Manufacturer or  Broker

Business Name: NM Industrial Services  
Address: 1001 W. 42nd Avenue, Denver, CO 80011  
Type of Service: Sheet Metal  
Contact Person: Nanette Martinez  
Dollar Amount: \$980,335.00 Percent of Project: 11.5 %

CHECK ONE BOX:

Subcontractor or  Supplier or  Manufacturer or  Broker

Business Name: Aurora Building Company  
Address: 2221 E. Arapahoe Road, #3331, Littleton, CO 80161  
Type of Service: Painting  
Contact Person: Jenny Kachnic  
Dollar Amount: \$ 80,540.00 Percent of Project: 1 %

CHECK ONE BOX:

Subcontractor or  Supplier or  Manufacturer or  Broker

Business Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
Type of Service: \_\_\_\_\_  
Contact Person: \_\_\_\_\_  
Dollar Amount: \$ \_\_\_\_\_ Percent of Project: \_\_\_\_\_ %

CHECK ONE BOX:

Subcontractor or  Supplier or  Manufacturer or  Broker

Business Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
Type of Service: \_\_\_\_\_  
Contact Person: \_\_\_\_\_  
Dollar Amount: \$ \_\_\_\_\_ Percent of Project: \_\_\_\_\_ %

CHECK ONE BOX:

Subcontractor or  Supplier or  Manufacturer or  Broker

Business Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
Type of Service: \_\_\_\_\_  
Contact Person: \_\_\_\_\_  
Dollar Amount: \$ \_\_\_\_\_ Percent of Project: \_\_\_\_\_ %

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.

Business Address of Bidder: 4406 Race Street

City, State, Zip Code: Denver, CO 80216

Telephone Number of Bidder: 303-295-1414 Fax No. 3032-295-0324

Social Security or Federal Employer ID Number of Bidder: 13-363-0476

Name and location of the last work of this kind herein contemplated upon which the Bidder was engaged:

Denver International Airport

For information relative thereto, please refer to:

Name: Lee Walinchus, PE

Title: Manager of MEP Services

Address: 8500 Pena Blvd, Denver, CO

Dated this 11th day of June, 2015 ~~XXXXX~~

**Signature of Bidder:**

If an Individual: \_\_\_\_\_


doing business as \_\_\_\_\_

If a Partnership: \_\_\_\_\_

by: \_\_\_\_\_, General Partner.

If a Corporation: Trautman & Shreve, Inc.

a Colorado, Corporation,

by: , its President.  
Kevin D. Larington

Attest:   
Secretary Frank Montoya (Corporate Seal)

**If a Joint Venture, signature of all Joint Venture participants.**

Firm: \_\_\_\_\_

Corporation ( ), Partnership ( ) or ( ) Limited Liability Company

By: \_\_\_\_\_ (If a Corporation)  
Attest: \_\_\_\_\_  
Title: \_\_\_\_\_ Secretary (Corporate Seal)

Firm: \_\_\_\_\_

Corporation ( ), Partnership ( ) or ( ) Limited Liability Company

By: \_\_\_\_\_ (If a Corporation)  
Attest: \_\_\_\_\_  
Title: \_\_\_\_\_ Secretary (Corporate Seal)

Firm: \_\_\_\_\_

Corporation ( ), Partnership ( ) or ( ) Limited Liability Company

By: \_\_\_\_\_ (If a Corporation)  
Attest: \_\_\_\_\_  
Title: \_\_\_\_\_ Secretary (Corporate Seal)

CITY AND COUNTY OF DENVER  
DEPARTMENT OF AVIATION

COMMITMENT TO MINORITY/WOMEN BUSINESS ENTERPRISE  
PARTICIPATION

CONTRACT NO. 201418277

The undersigned has satisfied the MBE and WBE participant requirements in the following manner: (please check the appropriate space)

The Bidder is committed to a minimum of 27% **MBE and WBE** utilization on the Project, and will submit Letters of Intent for each MBE and WBE listed in the Bid Forms within three (3) working days after the bid opening.

The Bidder is unable to meet the project goal of 27% MBE and WBE participation and is committed to a minimum of \_\_\_\_\_% **MBE and WBE** utilization on this project. The Bidder understands that it must submit a detailed statement of its good faith efforts, which occurred prior to the bid opening, to meet the project goal, and must submit Letters of Intent for each MBE/WBE listed in the Bid Forms within three (3) working days after the bid opening.

Bidder: Trautman & Shreve, Inc.  
Name of Firm

By:  President & CEO  
Signature Kevin D. Larington Title

Address: 4406 Race Street  
Street

Denver, CO 80216  
City / State / Zip Code

Telephone: 303-295-1414 303-295-0324  
Phone Fax

Bid Documents

Contract Number: 201418277  
Bid Forms

Date: June 11, 2015





Office of Economic Development  
 Division of Small Business Opportunity  
 Compliance Unit – DIA  
 E-MAIL: [small.business@flydenver.com](mailto: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.:** 201418277

**Project Name:** DIA Concourse B PCA Replacement

**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: Trautman & Shreve		Phone: 303-295-1414	
Contact Person: Chris Salazar	Email: <a href="mailto:csalazar@trautman-shreve.com">csalazar@trautman-shreve.com</a>	Fax: 303-295-0324	
Address: 4406 Race Street	City: Denver	State: CO	Zip: 80216

**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: LEI Companies, Inc.		Phone: 303.865.5202	
Contact Person: Terry Haley	Email: <a href="mailto:thaley@leicompanies.com">thaley@leicompanies.com</a>	Fax: 303.934.5635	
Address: 2017 Curtis Street	City: Denver	State: CO	Zip: 80205

Please check the designation which applies to the certified firm.	<input checked="" type="checkbox"/> X	MBE/WBE ( x )	<input type="checkbox"/>	SBE ( x )	<input type="checkbox"/>	DBE ( )
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**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: N/A

**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.** Electrical

<input checked="" type="checkbox"/> X	Subcontractor/Subconsultant ( x )	<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:					
\$ 1,254,307				14.5 %	
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 subconsultant M/WBE, SBE or DBE will perform is:					
If the fee amount of the work to be performed is requested, the fee amount, is:				\$ N/A	

Bidder/Consultant's Signature:	Date: 6-11-15
Title: <u>Preconstruction</u>	
M/WBE, SBE or DBE Firm's Signature:	Date: 6.10.15
Title: Senior Account Manager	

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

COMP-FRM-012 Revised 3/10/2010

### 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.*

<b>Completed</b>	
<input checked="" type="checkbox"/>	Project Number & Project Name
<input checked="" type="checkbox"/>	Section A: Name of Bidder/Consultant, Contact Person, Address, City, State, Zip, Phone, Email
<input checked="" type="checkbox"/>	Section B: Name of Certified Firm, Contact Person, Address, City, State, Zip, Phone, Email
<input checked="" type="checkbox"/>	Designation checked for MBE/WBE, SBE or DBE
<input checked="" 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 checked="" type="checkbox"/>	Scope of work performed or item supplied by M/WBE, SBE or DBE
<input checked="" type="checkbox"/>	Line items performed, if line-item bid.
<input checked="" type="checkbox"/>	Copy of M/WBE, SBE or DBE Letter of Certification Attached
<input checked="" type="checkbox"/>	Designation checked for Subcontractor/Subconsultant, Supplier or Broker
<input checked="" type="checkbox"/>	If project is a hard bid...
<input checked="" type="checkbox"/>	Bidder has indicated dollar amount for value of work going to Subcontractor/ Subconsultant, Supplier or Broker
<input checked="" type="checkbox"/>	Bidder has indicated percentage for value of work going to Subcontractor/ Subconsultant, Supplier or Broker
<input type="checkbox"/> N/A	If project is an RFP/RFQ...
<input type="checkbox"/> N/A	Consultant has indicated percentage for value of work going to Subcontractor/ Subconsultant, Supplier or Broker Name & contact name for M/WBE,
<input type="checkbox"/> N/A	Fee amount if fee amount of work to be performed is requested.
<input checked="" type="checkbox"/>	Bidder/Consultant's Signature, Title & Date
<input checked="" 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 28-65. Failure to complete this information on the Letter of Intent (LOI) may automatically deem a bid or proposal non-responsive.



201 W Colfax Ave, Dept 907  
Denver, CO 80202  
p: 720.913.1999  
f: 720.913.1809  
[www.denvergov.org/dsbo](http://www.denvergov.org/dsbo)

Denver International Airport  
Airport Office Building, Suite 7810  
8500 Pena Blvd  
Denver, CO 80249  
p: 303.342-2180  
f: 303.342.2190  
[www.flydenver.com](http://www.flydenver.com)

June 1, 2015

Brandon Berumen  
LEI Companies, Inc.  
2017 Curtis St  
Denver, CO 80205

Dear Brandon Berumen:

The City and County of Denver, Division of Small Business Opportunity (DSBO) is in receipt of your renewal application for LEI Companies, Inc..

We are extending your certification while your application is in process. Therefore, LEI Companies, Inc. will have the following certification(s) until September 1, 2015.

- Airport Concessionaire Disadvantaged Business Enterprise (ACDBE)
- Disadvantaged Business Enterprise (DBE)
- Emerging Business Enterprise (EBE)
- Small Business Enterprise (SBE)
- Minority/Women Business Enterprise (MWBE)
- Small Business Enterprise-Concessions (SBEC)

Review of your documentation will begin in the near future. Please note that at any time during this review, a Certification Analyst may request additional information to complete the review.

Please notify our office immediately, if there are any changes in legal status, management, control, or ownership of your business, contact information, etc, from that provided on the documentation submitted to our office.

If you have any questions, please contact us at (720) 913-1714 or via email at [certificationinfo@denvergov.org](mailto:certificationinfo@denvergov.org). Thank you.

Sincerely,

A handwritten signature in cursive script that reads "S.W. Martinez".

Stephen W. Martinez  
Certification Team  
[certificationinfo@denvergov.org](mailto:certificationinfo@denvergov.org)  
(720) 913-1648



Office of Economic Development  
 Division of Small Business Opportunity  
 Compliance Unit - DIA  
 E-MAIL: small.business@citydenver.com  
 8500 Peete Blvd., AOB, Suite 7810  
 Denver, CO 80248  
 Phone: (303) 342-2188 / Fax: (303) 342-2100

**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.: 201418277 | Project Name: DIA Concourse B PCA Replacement

A. The Following Section Is To Be Completed by the Bidder/Consultant

This Letter of Intent Must be Signed by the Bidder/Consultant and MWBE, SBE or DBE

Name of Bidder/Consultant: Trautman & Shreve		Phone: 303-295-1414	
Contact Person: Chris Salazar	Email: csalazar@trautman-shreve.com	Fax: 303-295-0324	
Address: 4408 Race Street	City: Denver	State: CO	Zip: 80218

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

Name of Certified Firm: NM Industrial Services		Phone: 303-297-0195	
Contact Person: Janelle Martinez	Email: janelle@nmindustrial.com	Fax: 303-297-0197	
Address: 1001 W 42nd Ave	City: Denver	State: CO	Zip: 80211

Please check the designation which applies to the certified firm.

<input checked="" type="checkbox"/>	MBE/WBE (x)	<input checked="" type="checkbox"/>	SBE (x)	<input checked="" type="checkbox"/>	DBE ( )
-------------------------------------	-------------	-------------------------------------	---------	-------------------------------------	---------

Indirect Utilization: If this MWBE, 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: **N/A**

**A Copy of the MWBE, 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 MWBE/SBE/DBE. On unit price bids only, identify which bid line items the MWBE/SBE/DBE's scope of work or supply corresponds to. **Mechanical**

<input checked="" type="checkbox"/>	Subcontractor/Subconsultant (x)	<input type="checkbox"/>	Supplier ( )	<input type="checkbox"/>	Broker ( )
Bidder intends to utilize the aforementioned MWBE, SBE or DBE for the Work/Supply described above. The cost of the work and percentage of the total subcontractor MWBE, SBE or DBE bid amount is:					
\$ 980,335				11.5 %	
Consultant intends to utilize the aforementioned MWBE, SBE or DBE for the Work/Supply described above. The percentage of the work of the total subconsultant MWBE, SBE or DBE will perform is:				N/A %	
If the fee amount of the work to be performed is requested, the fee amount, is:				\$ N/A	

Bidder/Consultant's Signature:	Date: 6-11-2015
Title: PRECONSTRUCTION	
MWBE, SBE or DBE Firm's Signature:	Date: 6/11/2015
Title: President	

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

COMP-FRM-012 Revised 3/10/2010

### 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.*

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



Office of Economic Development  
Division of Small Business Opportunity

201 W. Colfax Avenue, #907  
Denver, CO Zip 80202  
p: 720.913.1999  
f: 720.913.1809  
[www.denvergov.org/dsbo](http://www.denvergov.org/dsbo)

Denver International Airport  
Airport Office Building, Suite 7810  
8500 Peña Boulevard  
Denver, CO Zip 80249  
p: 303.342.2180  
f: 303.342.2190  
[www.flydenver.com](http://www.flydenver.com)

July 25, 2014

Nanette Martinez  
NM Industrial Services, LLC DBA N/A  
1001 W 42nd Ave  
Denver, CO 80011

Dear Nanette Martinez:

The Division of Small Business Opportunity is pleased to inform you that NM Industrial Services, LLC DBA N/A is certified as a Disadvantaged Business Enterprise (DBE) pursuant to the US Department of Transportation's Regulation 49 CFR Part 26. Your firm will be listed on the Colorado Unified Certification Program's (UCP) on-line directory of eligible DBEs at [www.coloradodbe.org](http://www.coloradodbe.org).

NM Industrial Services, LLC DBA N/A is eligible to participate as a DBE on US Department of Transportation financially-assisted projects in Colorado in the work codes appearing as part of your firm's listing on the directory as eligible to be counted toward DBE participation. It is your responsibility to manage your firm's work codes to ensure they are correct.

CO UCP NAICS-238220: HVAC (HEATING, VENTILATION AND AIR-CONDITIONING) CONTRACTORS

The anniversary date of your firm's DBE certification is July 23, 2015. You will be notified prior to the anniversary date that eligibility must be re-evaluated. However, if you do not receive notification from this office, it is your responsibility to contact us. Pursuant to 49 CFR 26.83(i), submittal of this information is required to ensure that there is no interruption of your firm's status as a certified DBE. If any changes occur in the firm's legal structure, ownership, management, control, or work performed, you must notify the division immediately.

Sincerely,

A handwritten signature in cursive script that reads "Chris Martinez".

Chris Martinez  
Director





Office of Economic Development  
Division of Small Business Opportunity

201 W. Colfax Avenue, #907  
Denver, CO Zip 80202  
p: 720.913.1999  
f: 720.913.1809  
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Denver International Airport  
Airport Office Building, Suite 7810  
8500 Peña Boulevard  
Denver, CO Zip 80249  
p: 303.342.2180  
f: 303.342.2190  
[www.flydenver.com](http://www.flydenver.com)

July 25, 2014

Nanette Martinez  
NM Industrial Services, LLC DBA N/A  
1001 W 42nd Ave  
Denver, CO 80011

Dear Nanette Martinez:

**SUBJECT: Minority/Women Business Enterprise (M/WBE) Certification, Pursuant to Article III of Chapter 28, Div. 3 of the D.R.M.C. Construction, Reconstruction, Remodeling and Professional Design, Construction Services and Concessions**

The City and County of Denver's Division of Small Business Opportunity (DSBO) has approved NM Industrial Services, LLC DBA N/A for certification as a **Minority/Women Business Enterprise (M/WBE)**. NM Industrial Services, LLC DBA N/A will be listed in the City and County of Denver's Minority/Women Business Enterprise (M/WBE) Certification Directory. Your firm is certified with the following certification dates:

**July 24, 2014 to July 23, 2015**

Listed below is each NAICS code and Work Specialty for which NM Industrial Services, LLC DBA N/A is certified. Please verify your NAICS codes and work specialties as this letter showing the following codes is required for bidding on City projects:

**NAICS CODES:**

CO UCP NAICS-238220: HVAC (HEATING, VENTILATION AND AIR-CONDITIONING) CONTRACTORS

**WORK SPECIALTY:**

Mechanical, HVAC

This Certification is intended to be used only for participation in city funded projects, and/or certain privately funded projects on city-owned property for contracts with construction, reconstruction, remodeling and professional design and construction services.


Your business enterprise is required to maintain an accurate mailing address, email address and telephone number information with DSBO. If any changes occur in the firm's legal structure, ownership, management, control, or work performed, you must notify DSBO immediately. Failure to report any of these changes may result in removal of your business enterprise from the Certification Directory and possible revocation of certification of your business enterprise as an M/WBE.

Please be aware that your **M/WBE Certification is valid for a period of one (1) year, and must be renewed annually**. It is your responsibility to request and submit a renewal application and all of the documents required

within the renewal application in order for your renewal to be processed. Your application and accompanying documents should be sent electronically to our office at least thirty (30) days prior to the expiration date of your M/WBE Certification.

You may visit [www.work4denver.com](http://www.work4denver.com) to view upcoming Construction/Professional Service bidding opportunities, or [www.denvergov.org/purchasing](http://www.denvergov.org/purchasing) for upcoming Goods & Services bid opportunities. This letter must be attached to your Letter of Intent (LOI) for bidding opportunities in which you may be utilized for goal participation.

Sincerely,



Chris Martinez  
Director





Office of Economic Development  
Division of Small Business Opportunity

201 W. Colfax Avenue, #907  
Denver, CO Zip 80202  
p: 720.913.1999  
f: 720.913.1809  
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p: 303.342.2180  
f: 303.342.2190  
www.flydenver.com

July 25, 2014

Nanette Martinez  
NM Industrial Services, LLC DBA N/A  
1001 W 42nd Ave  
Denver, CO 80011

Dear Nanette Martinez:

**SUBJECT: Small Business Enterprise (SBE) Certification, Pursuant to Article VII of Chapter 28, Div. 1 of the D.R.M.C. Construction, Reconstruction, Remodeling and Professional Design, Construction Services and Concessions**

The City and County of Denver's Division of Small Business Opportunity (DSBO), has approved NM Industrial Services, LLC DBA N/A for certification as a Small Business Enterprise (SBE). NM Industrial Services, LLC DBA N/A will be listed in the City and County of Denver's Small Business Enterprise (SBE) Certification Directory located at [www.denvergov.org/dsbo](http://www.denvergov.org/dsbo). Your firm is certified with the following certification dates:

**July 24, 2014 to July 23, 2015**

Listed below is each NAICS code and Work Specialty for which NM Industrial Services, LLC DBA N/A is certified. Please verify your NAICS codes and work specialties as this letter showing the following codes is required for bidding on City projects:

**NAICS CODES:**

CO UCP NAICS-238220: HVAC (HEATING, VENTILATION AND AIR-CONDITIONING) CONTRACTORS

**WORK SPECIALTY:**

Mechanical, HVAC

This Certification is intended to be used only for participation in city funded projects, and/or certain privately funded projects on city-owned property for contracts with construction, reconstruction, remodeling and professional design and construction services.

Your business enterprise is required to maintain an accurate mailing address, email address and telephone number information with DSBO. If any changes occur in the firm's legal structure, ownership, management, control, or work performed, you must notify DSBO immediately. Failure to report any of these changes may result in removal of your business enterprise from the Certification Directory and possible revocation of certification of your business enterprise as an SBE.

Please be aware that **SBE Certifications are for a period of one (1) year, and must be renewed annually.** It is your responsibility to request and submit a renewal application and all of the documents required within the

renewal application in order for your renewal to be processed. Your application and accompanying documents should be sent electronically to our office at least thirty (30) days prior to the expiration date of your SBE Certification.

You may visit [www.work4denver.com](http://www.work4denver.com) to view upcoming Construction/Professional Service bidding opportunities, or [www.denvergov.org/purchasing](http://www.denvergov.org/purchasing) for upcoming Goods & Services bid opportunities. This letter must be attached to your Letter of Intent (LOI) for bidding opportunities in which you may be utilized for goal participation.

Sincerely,



Chris Martinez  
Director



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.: 201418277

Project Name: DIA Concourse B PCA Replacement

**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: Trautman & Shreve, Inc. Phone: 303-295-1414

Contact Person: Chris Salazar Email: csalazar@trautman-shreve.com Fax: 303-295-0324

Address: 4406 Race Street City: Denver State: CO Zip: 80216

**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: Aurora Building Company Phone: 303-816-0220

Contact Person: **Jenny Kachnic** Email: jenny@aurorabldgco.com Fax: N/A

Address: 2221 E Arapahoe Road #3331 City: Littleton State: CO Zip: 80161

Please check the designation which applies to the certified firm.  
 MBE/WBE (x) SBE (x) 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.** Painting

<input checked="" type="checkbox"/> Subcontractor/Subconsultant (x)	<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:

**\$80,540.00** 1 %

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 subconsultant M/WBE, SBE or DBE will perform is: **N/A** %

If the fee amount of the work to be performed is requested, the fee amount, is: **\$ N/A**

Bidder/Consultant's Signature: *[Signature]* Date: 6/11/2015

M/WBE, SBE or DBE Firm's Signature: *[Signature]* Date: 6/10/2015

Title: *[Signature]*

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

COMP-FRM-012 Revised 3/10/2010

### 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.*

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

## Jennifer Kachnic

---

**From:** City and County of Denver <denver@inwdbae.com>  
**sent:** Monday, April 6, 2015 11:21 AM  
**To:** jenny@aurorabuildingco.com  
**Subject:** City and County of Denver: SBE Approval

Jennifer Kachnic  
Aurora Building Company, Inc. DBA none  
po box 3331  
littleton, CO 80161

Dear Jennifer Kachnic.

**SUBJECT:** Small Business Enterprise (SBE) Certification, Pursuant to Article VII of Chapter 28, Div. 1 of the D.R.M.C. Construction, Reconstruction, Remodeling and Professional Design, Construction Services and Concessions

The City and County of Denver's Division of Small Business Opportunity (DSBO), has approved Aurora Building Company, Inc. DBA none for certification as a Small Business Enterprise (SBE). Aurora Building Company, Inc. DBA none will be listed in the City and County of Denver's Small Business Enterprise (SBE) Certification Directory located at [www.denvergov.org/dsbo](http://www.denvergov.org/dsbo). Your firm is certified with the following certification dates:

April 2, 2015 to April 1, 2016

Listed below is each NAICS code and Work Specialty for which Aurora Building Company, Inc. DBA none is certified. Please verify your NAICS codes and work specialties as this letter showing the following codes is required for bidding on City projects:

### NAICS CODES:

DENVER-238130: FRAMING CONTRACTORS  
DENVER-238310: ACOUSTICAL CEILING TILE AND PANEL INSTALLATION  
DENVER-238310: DROP CEILING INSTALLATION  
DENVER-238310: DRYWALL CONTRACTORS  
DENVER-238310: INSULATION CONTRACTORS  
DENVER-238310: SOUNDPROOFING CONTRACTORS  
DENVER-238320: PAINTING (EXCEPT ROOF) CONTRACTORS  
DENVER-238350: FINISH CARPENTRY

### WORK SPECIALTY:

Drywall and framing contractor.

This Certification is intended to be used only for participation in city funded projects, and/or certain privately funded projects on city-owned property for contracts with construction, reconstruction, remodeling and professional design and construction services.

Your business enterprise is required to maintain an accurate mailing address, email address and telephone number information with DSBO. If any changes occur in the firm's legal structure, ownership, management, control, or work performed, you must notify DSBO immediately. Failure to report any of these changes may result in removal of your

business enterprise from the Certification Directory and possible revocation of certification of your business enterprise as an SBE.

Please be aware that SBE Certifications are for a period of one (1) year, and must be renewed annually. It is your responsibility to request and submit a renewal application and all of the documents required within the renewal application in order for your renewal to be processed. Your application and accompanying documents should be sent electronically to our office at least thirty (30) days prior to the expiration date of your SBE Certification.

You may visit [www.work4denver.com](http://www.work4denver.com) to view upcoming Construction/Professional Service bidding opportunities, or [www.denvergov.org/purchasing](http://www.denvergov.org/purchasing) for upcoming Goods & Services bid opportunities. This letter must be attached to your Letter of Intent (LOI) for bidding opportunities in which you may be utilized for goal participation.

Sincerely,

Chris Martinez  
Director

City and County of Denver  
Office of Economic Development  
<http://www.denvergov.org/oed>  
<http://denver.mwdbe.com>

This message was sent to: [jenny@aurorabuildingco.com](mailto:jenny@aurorabuildingco.com) Sent on: 4/6/2015 12:21:06 PM System ReferenceID: 25444105

## Jennifer Kachnic

---

**From:** City and County of Denver <denver@mwdb.com>  
**Sent:** Monday, April 6, 2015 11:21 AM  
**To:** jenny@aurorabuildingco.com  
**Subject:** City and County of Denver: M/WBE Approval

Jennifer Kachnic  
Aurora Building Company, Inc. DBA none  
po box 3331  
littleton, CO 80161

Dear Jennifer Kachnic:

**SUBJECT:** Minority/Women Business Enterprise (M/WBE) Certification, Pursuant to Article III of Chapter 28, Div. 3 of the D.R.M.C. Construction, Reconstruction, Remodeling and Professional Design, Construction Services and Concessions

The City and County of Denver's Division of Small Business Opportunity (DSBO) has approved Aurora Building Company, Inc. DBA none for certification as a Minority/Women Business Enterprise (M/WBE). Aurora Building Company, Inc. DBA none will be listed in the City and County of Denver's Minority/Women Business Enterprise (M/WBE) Certification Directory. Your firm is certified with the following certification dates:

April 2, 2015 to April 1, 2016

Listed below is each NAICS code and Work Specialty for which Aurora Building Company, Inc. DBA none is certified. Please verify your NAICS codes and work specialties as this letter showing the following codes is required for bidding on city projects:

### NAICS CODES:

DENVER-238130: FRAMING CONTRACTORS  
DENVER-238310: ACOUSTICAL CEILING TILE AND PANEL INSTALLATION  
DENVER-238310: DROP CEILING INSTALLATION  
DENVER-238310: DRYWALL CONTRACTORS  
DENVER-238310: INSULATION CONTRACTORS  
DENVER-238310: SOUNDPROOFING CONTRACTORS  
DENVER-238320: PAINTING (EXCEPT ROOF) CONTRACTORS  
DENVER-238350: FINISH CARPENTRY

### WORK SPECIALTY:

Drywall and framing contractor.

This Certification is intended to be used only for participation in city funded projects, and/or certain privately funded projects on city-owned property for contracts with construction, reconstruction, remodeling and professional design and construction services.

Your business enterprise is required to maintain an accurate mailing address, email address and telephone number information with DSBO. If any changes occur in the firm's legal structure, ownership, management, control, or work performed, you must notify DSBO immediately. Failure to report any of these changes may result in removal of your

business enterprise from the Certification Directory and possible revocation of certification of your business enterprise as an M/WBE.

Please be aware that your M/WBE Certification is valid for a period of one (1) year, and must be renewed annually. It is your responsibility to request and submit a renewal application and all of the documents required within the renewal application in order for your renewal to be processed. Your application and accompanying documents should be sent electronically to our office at least thirty (30) days prior to the expiration date of your M/WBE Certification.

You may visit [www.work4denver.com](http://www.work4denver.com) to view upcoming Construction/Professional Service bidding opportunities, or [www.denvergov.org/purchasing](http://www.denvergov.org/purchasing) for upcoming Goods & Services bid opportunities. This letter must be attached to your Letter of Intent (LOI) for bidding opportunities in which you may be utilized for goal participation.

Sincerely,

Chris Martinez  
Director

City and County of Denver  
Office of Economic Development  
<http://www.denvergov.org/oed>  
<http://denver.mwdb.com>

This message was sent to: [jenny@aurorabuildingco.com](mailto:jenny@aurorabuildingco.com) Sent on: 4/6/2015 12:21:07 PM System ReferenceID: 25444100



**Jennifer Kachnic**

---

**From:** City and County of Denver <denver@miwdbe.com>  
**sent:** Monday, April 6, 2015 11:19 AM  
**To:** jenny@aurorabuildingco.com  
**Subject:** City and County of Denver, EBE Approval Letter

Jennifer Kachnic  
Aurora Building Company, Inc. DBA none  
po box 3331  
littleton, CO 80161

Dear Jennifer Kachnic:

**SUBJECT:** Emerging Business Enterprise (EBE) Certification, Pursuant to Article VII of Chapter 28, Div. 1 of the D.R.M.C. Construction, Reconstruction, Remodeling and Professional Design, Construction Services and Concessions

The City and County of Denver's Division of Small Business Opportunity (DSBO), has approved Aurora Building Company, Inc. DBA none for certification as an Emerging Business Enterprise (EBE). Aurora Building Company, Inc. DBA none will be listed in the City and County of Denver's Emerging Business Enterprise (EBE) Certification Directory. Your firm is certified with the following certification dates:

April 2, 2015 to April 1, 2016

Listed below is each NAICS code and Work Specialty for which Aurora Building Company, Inc. DBA none is certified. Please verify your NAICS codes and work specialties as this letter showing the following codes is required for bidding on City projects:

**NAICS Codes:**

- DENVER-238130: FRAMING CONTRACTORS
- DENVER-238310: ACOUSTICAL CEILING TILE AND PANEL INSTALLATION
- DENVER-238310: DROP CEILING INSTALLATION
- DENVER-238310: DRYWALL CONTRACTORS
- DENVER-238310: INSULATION CONTRACTORS
- DENVER-238310: SOUNDPROOFING CONTRACTORS
- DENVER-238320: PAINTING (EXCEPT ROOF) CONTRACTORS
- DENVER-238350: FINISH CARPENTRY

**WORK SPECIALTY:**

Drywall and framing contractor.

This Certification is intended to be used only for participation in city funded projects, and/or certain privately funded projects on city-owned property for contracts with construction, reconstruction, remodeling and professional design and construction services.

Your business enterprise is required to maintain an accurate mailing address, email address and telephone number information with DSBO. If any changes occur in the firm's legal structure, ownership, management, control, or work performed, you must notify DSBO immediately. Failure to report any of these changes may result in removal of your

business enterprise from the Certification Directory and possible revocation of certification of your business enterprise as an EBE.

Please be aware that your EBE Certification is valid for a period of one (1) year, and must be renewed annually. It is your responsibility to request and submit a renewal and application and all of the documents required within the renewal application in order for your renewal to be processed. Your application and accompanying documents should be sent electronically to our office at least thirty (30) days prior to the expiration date of your EBE Certification.

You may visit [www.work4denver.com](http://www.work4denver.com) to view upcoming bidding opportunities. This letter must be attached to your Letter of Intent (LOI) for bidding opportunities in which you may be utilized for goal participation.

Sincerely,

Chris Martinez  
Director

City and County of Denver  
Office of Economic Development  
<http://www.denvergov.org/oeed>  
<http://denver.mwdbe.com>

This message was sent to: [jenny@aurorabuildingco.com](mailto:jenny@aurorabuildingco.com) Sent on: 4/6/2015 12:19:10 PM System ReferenceID: 25444088

## Jennifer Kachnic

---

**From:** City and County of Denver <denver@mwdbe.com>  
**Content:** Monday, April 6, 2015 11:15 AM  
**To:** jenny@aurorabuildingco.com  
**Subject:** City and County of Denver: DBE Approval

Jennifer Kachnic  
Aurora Building Company, Inc. DBA none  
po box 3331  
littleton, CO 80161

Dear Jennifer Kachnic:

The Division of Small Business Opportunity is pleased to inform you that Aurora Building Company, Inc. DBA none is certified as a Disadvantaged Business Enterprise (DBE) pursuant to the US Department of Transportation's Regulation 49 CFR Part 26. Your firm will be listed on the Colorado Unified Certification Program's (UCP) on-line directory of eligible DBEs at [www.coloradodbe.org](http://www.coloradodbe.org).

Aurora Building Company, Inc. DBA none is eligible to participate as a DBE on US Department of Transportation financially-assisted projects in Colorado in the work codes appearing as part of your firm's listing on the directory as eligible to be counted toward DBE participation. It is your responsibility to manage your firm's work codes to ensure they are correct.

CO UCP NAICS-238130: FRAMING CONTRACTORS CO UCP NAICS-238310: ACOUSTICAL CEILING TILE AND PANEL INSTALLATION CO UCP NAICS-238310: DROP CEILING INSTALLATION CO UCP NAICS-238310: DRYWALL CONTRACTORS CO UCP NAICS-238310: INSULATION CONTRACTORS CO UCP NAICS-238310: SOUNDPROOFING CONTRACTORS CO UCP NAICS-238320: PAINTING (EXCEPT ROOF) CONTRACTORS

The anniversary date of your firm's DBE certification is April 1, 2015. You will be notified prior to the anniversary date that eligibility must be re-evaluated. However, if you do not receive notification from this office, it is your responsibility to contact us. Pursuant to 49 CFR 26.83(i), submittal of this information is required to ensure that there is no interruption of your firm's status as a certified DBE. If any changes occur in the firm's legal structure, ownership, management, control, or work performed, you must notify the division immediately.

Sincerely,

Chris Martinez  
Director

City and County of Denver  
Office of Economic Development  
<http://www.denvergov.org/oed>  
<http://denver.mwdbe.com>

This message was sent to: [jenny@aurorabuildingco.com](mailto:jenny@aurorabuildingco.com) Sent on: 4/6/2015 12:15:08 PM System ReferenceID: 25444058



August 14, 2014

Ms. Jenniter Kachnic  
President  
Aurora Building Company, Inc.  
2221 E. Arapahoe Road, #3331  
Centennial, CO 80161

SUBJECT: SMALL BUSINESS CERTIFICATION APPROVAL

Dear Ms. Kachnic:

Your application for certification as a Small Business Enterprise (SBE) with the Regional Transportation District (RTD) has been approved pursuant to RTD's SBE program policies and procedures. RTD accepts your application and Personal Financial Statement as proof that you meet the criteria for certification as a Category 1 SBE.

Firms approved as Small Business Enterprises are certified to participate in non-federally funded contracting opportunities with SBE participation requirements. Certification does not guarantee contracts with RTD, and certified firms are still required to market RTD and prime contractors for prime and subcontracting opportunities.

Your company will appear in the next update of RTD's SBE Directory. RTD personnel will use this directory as an outreach source for suppliers and contractors as required. Based on the information you have provided, your company will be listed under the following classification code(s):

RTD Bid Code Master List #:

Specialty	
A240	Finishes - Floors, Ceilings & Walls
B404	Maintenance & Repair (Bldg. Construction)
A223	Wall & Ceiling Repair Drywall
A226	Painting - Exterior
B418	Acoustical Ceilings & Walls

This certification is valid until August 14, 2017. However, on an annual basis, at least 30 days prior to the anniversary date of your original certification, you must submit a Change/No Change Affidavit, an updated Personal Financial Statement(s), gross receipts for the applicant business, and any affiliate businesses, number of employees, and any information on recent contracts/projects completed. It is your responsibility to notify RTD when any changes in your business structure occur that affect your qualifications as a Category 1 SBE.

If there are any changes in the ownership, control, mailing address, telephone number of your firm, business size, affiliations with other firms, or your personal net worth exceeds \$1.32M (excluding your interest in your residence or the applicant firm) you must notify this office immediately. All affiliate firms must cooperate with the disclosure of gross receipts or your firm may be denied certification. Presently, the average annual gross receipts for a Category 4 SBE are \$22,400,000.

RTD reserves the right to withdraw this certification if it is determined that this certification was knowingly obtained by false, misleading, or incorrect information. RTD also reserves the right to request additional information and/or to conduct an on-site visit or a more thorough investigation anytime during the tenure of this certification period.

Please visit the Business Center at [www.rtd-denver.com](http://www.rtd-denver.com) for information on doing business with RTD and to find resources available to small businesses.

We welcome your participation in our SBE program and wish you every success. If you have questions, please contact me at (303) 299-2126.

Sincerely,



Zamy Silva  
SBO Manager, Civil Rights Division  
303-299-2126

cc: certification file

# DIVERSITY AND INCLUSIVENESS IN CITY SOLICITATIONS

Using the attached form, entitled "Diversity and Inclusiveness in City Solicitations Information Request Form", please state whether you have a diversity and inclusiveness program for employment and retention, procurement and supply chain activities, or customer service and provide the additional information requested on the form. The information provided on the Diversity and Inclusiveness in City Solicitations Information Request Form will provide an opportunity for City contractors/consultants to describe their own diversity and inclusiveness practices. Contractors/consultants are not expected to conduct intrusive examinations of its employees, managers, or business partners in order to describe diversity and inclusiveness measures. Rather, the City simply seeks a description of the contractor/consultant's current practices, if any. Diversity and Inclusiveness information provided by City contractors/consultants in response to City solicitations for services or goods will be collated, analyzed, and made available in reports consistent with City Executive Order No. 101. However, no personally identifiable information provided by or obtained from contractors/consultants will be in such reports.

**The Diversity and Inclusiveness in City Solicitations Form pages immediately following this page are not included in the page numbering of this contract document.**



## Diversity and Inclusiveness\* in City Solicitations Information Request Form

Type in your response, print out, sign and date; or print out and complete manually. Please print legibly.

Denver Executive Order No. 101 establishes strategies between the City and private industry to use diversity and inclusiveness to promote economic development in the City and County of Denver and to encourage more businesses to compete for City contracts and procurements. The Executive Order requires, among other things, the collection of certain information regarding the practices of the City's contractors and consultants toward diversity and inclusiveness and encourages/requires City agencies to include diversity and inclusiveness policies in selection criteria where legally permitted in solicitations for City services or goods.

Answer each item below. Missing or incomplete responses will be recorded as "no" or "none". **A proposal or response to a solicitation by a contractor/consultant that does not include this completed form shall be deemed non-responsive and rejected.**

**Project Name:**

DIA Concourse B PCA Replacement (Re-bid)

**BID / RFP No.:** 201418277

**Name of Contractor/Consultant:** Trautman & Shreve, Inc.

**Address:**

4406 Race Street

Denver, CO

80216

**Email:** [fmontoya@trautman-shreve.com](mailto:fmontoya@trautman-shreve.com)

**Business Phone No.:** 303-295-1414

**Business Facsimile No.:** 303-295-0324

1. Do you have a Diversity and Inclusiveness Program?  Yes  No

If **No**, and your company size is less than 10 employees continue to question 11. Complete and sign the form.

If **Yes**, does it address:

- 1a. Employment and retention?  Yes  No  
1b. Procurement and supply chain activities?  Yes  No  
1c. Customer service?  Yes  No

2. Provide a detailed narrative of your company's diversity and inclusiveness principles and programs. Attach any written material for your program. (This may include, for example, (i) diversity and inclusiveness employee training programs, equal opportunity policies, and the budget amount spent on an annual basis for workplace diversity; or (ii) diversity and inclusiveness training and information to improve customer service.)

2014 - Diversity and You

Please see attached.

3. How many employees does your company employ?

- 11-50  over 100  
 51-100

3a. How many of your company's employees are:

Full-time 400 Part-Time 0

4. How does your company regularly communicate its diversity and inclusiveness policies to employees?

- Employee Training  
 Pamphlets  
 Public EEO postings  
 Other  
 Not Applicable



5. If you responded that you do not have a diversity and inclusiveness program, describe any plans your company may have to adopt such a program.

6. How often do you provide training in diversity and inclusiveness principles?

- Monthly  Annually
- Quarterly  Not Applicable  Other \_\_\_\_\_

6a. What percentage of the total number of employees generally participate?

- 0 - 25%  50 - 75%
- 23 - 50%  76 - 100%  Not Applicable

7. State how you achieve diversity and inclusiveness in supply and procurement activities. (This may include, for example, narratives of training programs, equal opportunity policies, diversity or inclusiveness partnership programs, mentoring and outreach programs, and the amount and description of budget spent on an annual basis for procurement and supplier diversity and inclusiveness.)

Please refer to the following pages.

8. Do you have a diversity and inclusiveness committee?  Yes  No  
8a. If so, how often does it meet?

- Monthly  Annually  No Committee
- Quarterly  Other \_\_\_\_\_

8b. If you responded that you do not have a diversity and inclusiveness committee, describe any plans your company may have to establish such a committee.

Parent Company, EMCOR Group has a committee that oversees all subsidiary policies.

- 9. Do you have a budget for diversity and inclusiveness efforts?     Yes     No
- 10. Does your company integrate diversity and inclusion competencies into executive/manager performance evaluation plans?     Yes     No
- 11. Would you like information detailing how to implement a Diversity and Inclusiveness program?

If yes, send an email to [X0101@denvergov.org](mailto:X0101@denvergov.org) with your contact information.

Yes                       No

I attest that the information represented herein is true, correct and complete, to the best of my knowledge.



Signature of Person Completing Form

6/11/2015  
Date

Kevin D. Larington  
Printed Name of Person Completing Form

**NOTE: Attach additional sheets or documentation as necessary for a complete response.**

\*“Diversity and inclusiveness program” means a program that invites values, perspectives and contributions of people from diverse backgrounds, and integrates diversity into its hiring and retention policies, training opportunities, and business development methods to provide an equal opportunity for each person to participate, contribute, and succeed within the organization’s workplace. “Diversity” encompasses a wide variety of human differences, including differences such as race, age, gender, gender identity, sexual orientation, ethnicity, physical disabilities, appearance, historically underutilized and disadvantaged persons, as well as social identities such as religion, marital status, socio-economic status, lifestyle, education, parental status, geographic background, language ability, and veteran status.”

## **I. INTRODUCTION**

### **1.1 Notice**

This Handbook applies to employees of Trautman & Shreve, Inc. (the “Company”).

The policies described in this Handbook are in effect and supersede and replace all previous personnel policies, practices and guidelines, and any verbal or written representations that have been previously made by the Company other than those in the Code of Business Conduct and Ethics, which takes precedence over anything in this Handbook. The only exception to the above are different terms, if any, in a written contract between the employee and the Company. To the extent there is any inconsistency between this Handbook and the State Appendices, the applicable State Appendix controls.

Nothing in this Handbook creates or is intended to create a promise or representation of continued employment and this Handbook does not create or form a contract or imply a contractual relationship.

This Handbook also provides a summary of the Company’s employee benefit plans and programs. More detailed information is contained in the official plan documents, which govern in all cases. These benefits may be amended or even terminated at any time.

No one other than authorized officials of EMCOR Group, Inc.’s Human Resources Department may alter, modify, or approve changes to any of the policies set forth in this Handbook and no statement or promise by a supervisor, manager, or department head, past or present, may modify or amend anything in this Handbook.

### **1.2 About This Handbook**

#### **How this Handbook is Organized**

The Company’s policies are grouped according to the following major areas:

- Employment Standards
- Compensation and Benefits
- Time Off and Leave
- Employee Relations
- Work Environment
- Leaving the Company
- Health and Safety

In most areas, topics are addressed with regard to purpose/philosophy, policy and responsibilities.

#### **Keeping the Handbook Up-to-Date**

The emcor.net version of the Handbook will be considered the most up-to-date version. Once logged into emcor.net the Handbook may be found in the Main page of the HR section. Hardcopies of this Handbook should be updated with the version on emcor.net.

#### **Input for Employees**

This Handbook is intended to help employees understand the policies of the Company.

## **Input from You**

This Handbook is intended to help you understand the policies of the Company. Your input can help us ensure that it remains an effective tool and continues to meet your needs. If you have a specific suggestion for improving this Handbook, including ones regarding a policy that you believe should be addressed or a set of procedures that isn't clear, please submit your suggestion to the Human Resources Representative.

### **1.3 Diversity**

The Company encourages diversity in the workplace. The Company is committed to cultivating a diverse work force that represents and respects many backgrounds.

#### **Equal Opportunity Employer**

The Company's policy is to provide equal employment opportunities to all applicants and employees without regard to any protected class in which that applicant or employee may be a member, in accordance with applicable federal and state law.

This policy applies to all aspects of the employment relationship, including recruitment, hiring, placement, promotion, transfer, demotion, advertising, solicitation for employment, treatment during employment, compensation, benefits, selection for training, layoff, and termination.

To ensure equal employment opportunities to qualified individuals with a disability, the Company will make reasonable accommodations for the known disabilities of an otherwise qualified individual, unless an undue hardship on the operation of the business would result.

If you are an employee requiring accommodation to perform the essential functions of your job, please contact the Human Resources Representative to request and discuss the accommodation.

Moreover, if you believe that you have been subject to illegal discrimination, please contact the Human Resources Representative, Payroll Manager, any Vice President or the President/CEO.



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### Diversity on the Job: The Importance of Diversity and the Changing Workplace

ID: pd\_07\_a01\_bs\_enus

Course: 1 Hour

Launch Save

#### Overview

Imagine for a minute that you work in a place where everyone is the same. All of your coworkers are of the same ethnicity, gender, educational background, and socioeconomic standing. Would you be able to easily generate new ideas? Would the group have the ability to understand things from a different point of view? Without diversity in the workplace, organizations run the risk of becoming monocultural and only viewing things from a very limited perspective. The organization provides the structure for operation of the business and often defines the culture, but it's the individuals interacting within the organization who carry out the mission of the organization.

Rather than address the legal underpinnings and requirements related to diversity, this course focuses on how to leverage the diversity that exists within the organization. It defines diversity and dispels some common myths that surround the topic of diversity. The importance of diversity within the ever-changing workplace is described, including the impact of globalization. This course also discusses the barriers and challenges that must be overcome in order to create a diversified working environment. Materials designed to support blended learning activities aligned with this course are available from the Resources Page.

#### Target Audience

Individuals who have an interest in cultivating their understanding of diversity in the workplace

#### Lesson Objectives

##### Course Overview

##### Dispelling the Myths about Diversity in the Workplace

- identify key concepts related to diversity in the workplace

##### How Diversity Benefits Organizations and Employees

- identify the benefits enjoyed by companies that value diversity as a desirable characteristic of their organization

##### Challenges and Barriers to Diversity

- recognize the implications of the principal barriers to diversity in the workplace

#### Diversity and the Changing Workplace

##### Dispelling the Myths about Diversity in the Workplace

- identify key concepts related to diversity in the workplace

Launch Save

##### How Diversity Benefits Organizations and Employees

#### My Notes

#### Training Credits

CPE (NASBA)

#### Job Aids

- Dispelling the Myths About Diversity
- Challenges and Barriers to Diversity

#### SkillBriefs

- The Benefits of Diversity
- Diversity Challenges and Barriers
- Myths about Diversity in the Workplace

# SkillBrief



## The Benefits of Diversity

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Globalization has resulted in modern workplaces being increasingly diverse. Social groups and ethnicities that were traditionally excluded from some types of roles have increasingly entered the labor market or taken on new roles. To respond to these global changes, both managers and employees have to become more aware of the value of embracing diversity in the workplace.

Many companies are starting to realize the benefits of embracing diversity. The ways they address diversity vary greatly from company to company, but they typically fall into four broad categories:

- **welcome aboard** – This is the most common way companies address diversity and is what many people think of when they hear the word. Essentially, it involves inclusion – having employees from a variety of cultures, backgrounds, races, and genders.
- **fit in** – This approach involves denying that differences exist. Companies demonstrate this when they assure employees that differences are meaningless – the only thing that matters is performance. This way of dealing with diversity is based on the belief that, over time, employees in the minority will eventually learn to become more like those who are in the majority.
- **don't rock the boat** – When companies use this approach, they encourage people to suppress their differences. Sometimes they'll isolate with differences – for instance, by creating groups comprised of employees from the same racial group or culture. Other companies may do this at building relationships between different people and groups, but they encourage them to find similarities and minimize their differences. This approach involves tolerating differences – basically allowing them to exist without either valuing or demeaning them.
- **help us achieve our goals** – This approach involves employees working together toward mutual goals. It's the ideal way for companies to embrace diversity, but it's a relatively new concept for many companies. With this approach, the company encourages employees to understand and value differences. This takes some effort on everyone's part, but accommodating diversity in its entirety can go farther than any of the other methods toward helping a company achieve its goals.

## Benefits of developing diversity

Companies may use many different methods to deal with diversity. But no matter which method your company may use, developing diversity should be at the top of your corporate agenda. By effectively leveraging the differences among employees and developing diversity, your company can benefit in four areas:

- **employee retention** – Almost every company has dealt with employee turnover at one time or another. Improved employee retention translates into low turnover and improved performance. When your company develops and practices diversity, employees tend to be more appreciative and respectful of individual differences and similarities. They feel they're given equal opportunities and are valued and treated with respect and appreciation. And they appreciate benefits and initiatives meant to promote diversity. The result is higher morale, more job satisfaction, and increased productivity.
- **creativity** – Your company might be uncertain about whether diversity will actually benefit it because the outcome can't be predicted. However, developing diversity can have several different outcomes. It makes sense that a group of people from a wide range of backgrounds would have increased creativity and problem-solving skills. There's also a greater chance that new markets and products will be identified. And a broad range of talents means fresh perspectives that can help your company succeed.
- **conflict management** – As with creativity, visible diversity tends to cause people to be able to handle conflict better than those in groups where diversity isn't evident. That's because visible differences are a cue to group members that conflict is likely to happen, which means they're prepared to deal with divergences. Over time, the group learns to handle conflict better than a more homogenous group, because people are not surprised when differences of opinion emerge.
- **corporate image** – Companies that work at developing diversity are often known as being employers of choice. Because they have a wide range of talent, they're frequently listed among the top ten or twenty employers. This, in turn, helps them attract even more talent, since people are drawn to companies that are known for being great employers.

Developing diversity can take time and effort, and your company might be unsure if it's worthwhile. However, by putting it in the work and making diversity a priority, your organization can enjoy enormous gains and reap the benefits. But your company isn't the only one that benefits from diversity. You, as an individual, can benefit as well. When your company develops diversity, you'll be exposed to new ideas. This means you'll likely become more open minded and learn how to think outside the box.

To respond to modern global changes, managers have become more aware of the value of embracing diversity in the workplace. Many companies are starting to realize the benefits of embracing diversity. Effectively developing diversity can benefit your company in four areas: employee retention, which includes low turnover, increased productivity, and job satisfaction; creativity, by making the best use of employees' abilities and tapping into a broader range of talents; conflict management, by increasing the ability to handle conflicts productively; and corporate image, with the aim of developing a reputation as a desirable place to work.

# SkillBrief



## Diversity Challenges and Barriers

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Diversity can be a tough issue for organizations to deal with. Although many companies want to foster diversity, they often encounter barriers and challenges along the way to establishing and developing diversity in the workplace. Every company is different, but most encounter a few common barriers to diversity: all types of prejudice and stereotypes, cultural expectations, jealousy and defensiveness, and resistance to change.

### Prejudice and stereotypes

Prejudice and stereotypes can lead to discrimination and unequal opportunities. Prejudices of all types are still the biggest barrier to most companies' efforts to develop diversity. Most people, perhaps yourself included, think they're fair. You don't consciously judge people based on race, age, or gender. But prejudice is often unconscious, which is why it's so difficult to overcome.

Essentially, prejudice is perpetuating negative stereotypes instead of accepting differences. Prejudice within the workplace is especially challenging:

- It's common for some employees and managers to lack certain skills – political or corporate skills, for instance. This can make them feel uncomfortable, which hinders their chances of success.
- It can separate information from the people who need it most and prevent them from obtaining the resources they require to get ahead in the careers. Many employees struggle to get the experience and development opportunities needed to compete for senior positions.
- It can be difficult for some employees to find a balance between their work and personal lives. This is especially true for women and men who are the primary caregivers for their children.
- In general, people are more comfortable dealing with others who are similar to them. A diverse workforce can enhance creativity, but it can create fault lines that split a group into subgroups.

To overcome prejudice and stereotypes, you can become aware of your own biases, assumptions, and social and racial prejudices. By questioning yourself, you can figure out if you're acting on assumptions or facts.

### Cultural expectations

In general, people who come from different cultural backgrounds have different expectations about management styles, work rules, and even appropriate behavior. When expectations among group members differ, it can have a negative impact on the group's cohesion.

It's crucial that a group can communicate effectively about values, objectives, and tasks. But cultural expectations can make it difficult for group members to come to any sort of agreement about these issues, and this can eventually destroy the team. If your company wants to avoid these negative consequences, it must figure out a way to manage cultural differences. This is where the challenge lies. Often, some employees find their ideas and opinions dismissed in favor of the more dominant point of view.

To be successful, your company needs to determine how to create a model of success that incorporates diversity instead of forcing all employees to fit into traditional ideas and visions. Even though many employees tend to accept the dominant culture, it's important that your company find a way to incorporate the cultural differences.

As an individual, you can take actions to overcome cultural expectations. You can improve your intercultural literacy by getting to know your colleagues' cultures and differences. By talking about expectations openly, you replace judgments with curiosity. This will help you connect with your coworkers and better understand their behavior.

### Jealousy and defensiveness

People often feel threatened when they think their advantages will be taken away. If your company doesn't encourage and embrace diversity properly, employees who have traditionally been advantaged might feel that these advantages are being threatened.

Employees who have traditionally been handed promotions might feel resentful that they now have to compete for those jobs. This can lead to jealousy and defensiveness – both of which can negatively impact your team's productivity.

Jealousy and defensiveness are most likely to become issues when diversity is forced. If employees are made to work with

people they normally wouldn't socialize with, they may feel they need to change their behavior – which, over time, leads to resentment.

It can be difficult for you, as an individual, to overcome this barrier. It's natural to be jealous or defensive when you feel threatened. But by becoming a "diversity advocate," you can get past these negative feelings. Try bridging differences and building understanding, or discussing diversity openly. Instead of viewing diversity as negative, try to find the positive aspects.

## Resistance

No matter how much enthusiasm your company has for diversity and how much effort it puts into developing diversity, it might still encounter resistance. Resistance can happen for two reasons:

- some people feel there's no need to change – It's common for some employees, especially executives, to feel that there's no need to change because the company is successful just the way it is. They believe the culture should stay the same, even if the current structure might not be working. It can be difficult to overcome this resistance, but it's worthwhile to put in the effort. Those in opposition need to be convinced that the traditional way of doing things isn't going to help the company get ahead – even if things seem to be going along just fine.
- others just can't understand the benefits of developing diversity – Some executives have a difficult time understanding the benefits of diversity. They tend to think in terms of profit versus social responsibility – and profit wins out. It's not that they don't believe in social and ethical responsibility; it's just that they can't see how diversity can offer measurable financial gain. This means resistance to investing in diversity initiatives because the benefits of doing so are vague. Overcoming this obstacle is possible, but only when the organization has clearly defined its objectives with diversity. The company must show executives how the expected payoffs of developing diversity are worth achieving.

Overcoming resistance might seem like an impossible task for you as an individual. But think about how you learn to accept any change – you focus on the benefits. If you focus on the benefits of diversity instead of thinking of all the reasons it might not work, you'll probably find the resistance becomes less of an issue over time.

Diversity is a tough issue for many organizations to deal with. Companies want to foster diversity, but they often encounter barriers and challenges along the way to establishing and developing diversity in the workplace. The most common barriers to diversity are prejudice and stereotypes, cultural expectations, jealousy and defensiveness, and resistance to change. Overcoming these barriers will help your organization become a leader in its industry.

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**Course:** Diversity on the Job: The Importance of Diversity and the Changing Workplace

**Topic:** Challenges and Barriers to Diversity

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# SkillBrief



## Myths about Diversity in the Workplace

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Diversity is a concept that's constantly evolving. It's not easy to define, and everyone has a different idea of what diversity actually means. Because people have such different ideas about diversity, many myths and misunderstandings about it still exist. Three of the most common myths are that diversity is all about differences of race and gender, that diversity is all about equal opportunities, and that diversity is an HR issue.

### Diversity: not just race and gender

The first myth – that diversity is all about race and gender – is perhaps the most pervasive. There's no question that any definition of diversity must include race and gender. But, you should keep in mind that not all diversities are visible.

People can be diverse even in terms of invisible attributes. In any group, you'll find different thoughts, values, social backgrounds, and levels of education. Other invisible attributes contributing to diversity can include your generation, sexual orientation, marital status, political or religious beliefs, physical abilities, and life experience.

When you consider the fact that there's more to people than just the way they look on the outside, it becomes clear why diversity means more than race and gender. Those invisible attributes contribute a great deal to the mix of ideas and perspectives in the workplace.

### Diversity: not just equal opportunity

Another myth about diversity is that it's all about equal opportunities. Providing employment equity is indeed one aspect of diversity in the workplace, but diversity encompasses more than just that.

In companies that have developed diversity far beyond just equal opportunities, you'll notice three things:

- people from different backgrounds are helped and encouraged to work together – Diversity in the workplace entails finding ways to help people from different backgrounds – social or economic, for instance – be productive as a team.
- the contribution of a workforce made of diverse individuals is valued – Workplaces must focus on creating a culture that values everyone's contribution, not just the contributions of a few people or groups.
- monoculture is avoided and differences among individuals are understood, recognized, and accepted – Avoiding monoculture – which is characterized by homogeneity – is a huge part of diversity in the workplace. Very few companies could be successful without the different perspectives their diverse workforces provide.

The key thing to remember is that diversity is about focusing on the big picture, not just pieces of it. Each person, as an individual, doesn't represent diversity. Instead, the entire mixture of individuals – with their unique ideas and experiences – is the real diversity in an organization.

### Diversity: not just an HR issue

The final myth about diversity is that it's an HR issue. Many people, perhaps yourself included, think of HR when they hear the word diversity. However, the reality is that diversity isn't just an organizational issue created by the HR Department. It actually starts with you, as an individual. Being exposed to diversity broadens your perspectives and might even enhance your creativity and problem-solving abilities.

When people have different views and backgrounds, they often observe a problem from different perspectives. This can help broaden their views and the way they approach problems.

Some companies bypass the HR Department altogether by including diversity in their strategic vision. By emphasizing and encouraging differences instead of suppressing them, a company allows fresh ideas to emerge. Instead of forcing everyone to think along the same lines, the focus is on the varied perspectives that emerge when differences are celebrated. This approach provides a company with business advantages not enjoyed by its peers who don't foster diversity.

Because people have such different ideas about diversity, many myths and misunderstandings about it still exist: that diversity is all about race and gender, that diversity is all about equal opportunities, and that diversity is an HR issue. By clearing away the myths about diversity in the workplace, you'll be able to focus on the ways diversity can benefit your organization and you as an individual.

# Job Aid



## Principles for Demonstrating Respect

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**Purpose:** Use this job aid to help you support a respectful workplace.

Make yourself familiar with these guidelines on treating your coworkers with respect.

### Principles of Respectful Behavior

Principles	Explanations
Avoid stereotyping	Resist any tendencies you may have to stereotype fellow employees, whether on the basis of race, nationality, gender, or age.
Be supportive	When a colleague asks you for feedback, acknowledge what is well done, even if you have to make some criticism. You should be both encouraging and honest.
Be courteous	Under all circumstances, avoid shouting, name-calling, eye-rolling, sarcasm, and other forms of discourteous behavior.
Value each individual	Accept coworkers' different styles, personalities, and values, and avoid making personal criticisms. Never exclude or shun a coworker from team activities just because you don't like them.
Show empathy	If a coworker is having difficulties, whether with work or at home, be as sensitive and supportive as you can be.

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**Course:** Preventing Harassment in the Global Workplace – Employee Edition

**Topic:** Demonstrating Respect

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# Job Aid



## Dispelling the Myths about Diversity

**Purpose:** *Use this job aid to dispel the myths and misconceptions about diversity.*

Because people have such different ideas about diversity, many myths and misunderstandings about it still exist. These are the three most common myths:

### Common diversity myths

Myth	Reality
Diversity is all about race and gender.	<p>Not all diversities are visible.</p> <p>People can be diverse even in terms of invisible attributes such as different thoughts, values, social backgrounds, and levels of education.</p> <p>Other invisible attributes contributing to diversity can include your generation, sexual orientation, marital status, political or religious beliefs, physical abilities, and life experience.</p> <p>Invisible attributes contribute a great deal to the mix of ideas and perspectives in the workplace.</p>
Diversity is all about equal opportunities.	<p>In companies that have developed diversity far beyond just equal opportunities, you'll notice these things:</p> <p>People from different backgrounds are helped and encouraged to work together.</p> <p>The contribution of a workforce made of diverse individuals is value.</p> <p>Monoculture is avoided and differences among individuals are understood, recognized, and accepted.</p> <p>Diversity is about focusing on the big picture, not just pieces of it.</p>
Diversity is an HR issue.	<p>Diversity isn't just an organizational issue created by the HR Department.</p> <p>Diversity actually starts with the individual.</p> <p>Being exposed to diversity broadens your perspectives and might even enhance your creativity and problem-solving abilities.</p> <p>Some companies bypass the HR Department altogether by including diversity in their strategic vision.</p>

# Job Aid



## Challenges and Barriers to Diversity

**Purpose:** Use this job aid as a guide to the challenges and barriers companies encounter when trying to develop diversity.

Diversity can be a tough issue for organizations to deal with. Although many companies want to foster diversity, they often encounter barriers and challenges along the way to establishing and developing diversity in the workplace.

Barrier	Attributes	How to overcome this barrier
Prejudice and stereotypes	<p>Prejudice and stereotypes can lead to discrimination and unequal opportunities.</p> <p>Prejudice is the biggest barrier to diversity.</p> <p>Prejudice is often unconscious, which is why it's so difficult to overcome.</p> <p>Prejudice can lead to even more barriers for some employees who belong to minority groups.</p>	<p>Become aware of your own biases, assumptions, and prejudices.</p> <p>Question yourself to figure out if you're acting on assumptions or facts.</p>
Cultural expectations	<p>People from different cultural backgrounds have different expectations about management styles, work rules, and even appropriate behavior.</p> <p>When expectations among group members differ, it can have a negative impact on the group's cohesion.</p>	<p>Improve your intercultural literacy by getting to know your colleagues' cultures and differences.</p> <p>Talk about expectations openly – this replaces judgments with curiosity.</p> <p>Connect with your coworkers to better understand their behavior.</p>
Jealousy and defensiveness	<p>If your company doesn't encourage and embrace diversity properly, employees who have traditionally been advantaged might feel that these advantages are being threatened.</p> <p>Jealousy and defensiveness can negatively impact your team's productivity.</p> <p>Jealousy and defensiveness are most likely to become issues when diversity is forced.</p>	<p>Become a "diversity advocate" – this can help you get past negative feelings.</p> <p>Try bridging differences and building understanding, or discussing diversity openly.</p> <p>Instead of viewing diversity as negative, try to find the positive aspects.</p>
Resistance	<p>Some people feel there's no need to change.</p> <p>Others just can't understand the benefits of developing diversity.</p>	<p>Focus on the benefits of diversity instead of thinking of all the reasons it might not work, and you'll probably find the resistance becomes less of an issue over time.</p>

**Course:** Diversity on the Job: The Importance of Diversity and the Changing Workplace

**Topic:** Challenges and Barriers to Diversity



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You searched: diversity

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#### Handbook of Research on Workforce Diversity in a Global Society: Technologies and Concepts

By: Chaunda L. Scott, Marilyn Y. Byrd (eds)  
IGI Global © 2012 ISBN: 9781466618121  
Book: 650 Pages

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#### The Diversity Code: Unlock the Secrets to Making Differences Work in the Real World

By: Michelle T. Johnson  
AMACOM © 2011 ISBN: 9780814416327  
Book: 257 Pages

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#### Building on the Promise of Diversity: How We Can Move to the Next Level in Our Workplaces, Our Communities, and Our Society

By: R. Roosevelt Thomas, Jr.  
AMACOM © 2006 ISBN: 9780814408629  
Book: 256 Pages

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### Courses (74)

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### Diversity on the Job: The Importance of Diversity and the Changing Workplace

Course: 1 Hour

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[View relevant topics \(3\)](#)



### Diversity on the Job: Diversity and You

Course: 1 Hour

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[View relevant topics \(2\)](#)



### Key Aspects of the American Work Environment

Course: 1 Hour

[Details](#) [Launch](#) [More Actions](#) ▼

[View relevant topics \(1\)](#)

## Resources (78)

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### Managing Diversity

Challenge: 12 Minutes

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### Understanding Workplace Diversity

Business Impact: 6 Minutes

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### Communicating with a Cross-cultural Audience

Business Impact: 6 Minutes

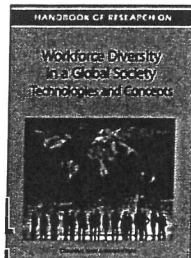
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## Handbook of Research on Workforce Diversity in a Global Society: Technologies and Concepts

By : Chaunda L. Scott, Marilyn Y. Byrd (eds)

IGI Global © 2012 ISBN: 9781466618121

ID : 59252

Book : 650 pages

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### Overview

For those who want to enhance their understanding of leveraging diversity in the workforce, this cutting-edge resource highlights innovative research, theoretical frameworks, and perspectives that are currently being used to guide the practice of leveraging diversity in multiple organizational settings.

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**Chapter 2: Examining the Diversity Curriculum of Leading Executive MBA Programs in the United States**

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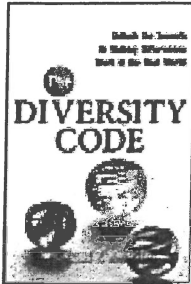
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## The Diversity Code: Unlock the Secrets to Making Differences Work in the Real World

By : Michelle T. Johnson  
AMACOM © 2011 ISBN: 9780814416327  
ID : 36884  
Book : 257 pages

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### Overview

The most diligent compliance with laws and regulations can't foster true workplace diversity. This insightful book promotes understanding by answering many of the toughest questions that professionals and their employers are often afraid to ask.

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**“I can't manage  
all these people  
with different  
values.”**

**We value all  
kinds of people.**

The face of industry has changed. As the workforce becomes more diverse, our competitive challenge is clear: create a workplace that enables everyone from every background to contribute to the company's success. Employees expect it. Customers expect it. EMCOR expects it.

Online diversity training is available and strongly recommended across the company.

Log on to [emcor.net](http://emcor.net), select the HR tab, and click on workplace learning.





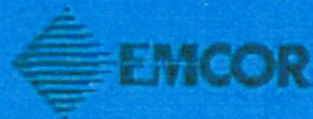
**“This industry  
is very slow to  
change.”**

**The workforce  
already has.**

The face of industry has changed. As the workforce becomes more diverse, our competitive challenge is clear: create a workplace that enables everyone from every background to contribute to the company's success. Employees expect it. Customers expect it. EMCOR expects it.

Online diversity training is available and strongly recommended across the company.

Log on to [emcor.net](http://emcor.net), select the HR tab, and click on workplace learning.





**“Hire more women? That’s not the nature of this business.”**

**Time to adapt.**

The face of industry has changed. As the workforce becomes more diverse, our competitive challenge is clear: create a workplace that enables everyone from every background to contribute to the company’s success. Employees expect it. Customers expect it. EMCOR expects it.

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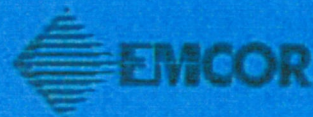
**“What does it  
take to succeed  
around here?”**

**It takes all  
kinds.**

The face of industry has changed. As the workforce becomes more diverse, our competitive challenge is clear: create a workplace that enables everyone from every background to contribute to the company's success. Employees expect it. Customers expect it. EMCOR expects it.

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**Division of Small Business Opportunity**

**JOINT VENTURE AFFIDAVIT**

"The Undersigned swear that the foregoing statements are correct and include all material information necessary to identify and explain the terms and operation of our joint venture and the intended participation by each joint venturer in the undertaking. Further, the Undersigned covenant and agree to provide the City current, complete, and accurate information regarding actual joint venture work and the payment thereof and any proposed changes in any of the joint venture arrangements and to permit the audit and examination of the books, records, and files of the joint venture, by authorized representatives of the City or Federal funding agency, if applicable. Any material misrepresentation will be grounds for terminating any contract which may be awarded and for initiating action under Federal or State laws concerning false statements."

_____ Name of Firm	
_____ Signature	_____ Date
_____ Name	_____ Title

(Name) \_\_\_\_\_ appeared to me personally known, who, being first duly sworn, did execute the foregoing affidavit, and subscribe and swear to such affidavit before me, and did state that he or she was properly authorized by (Name of Firm) \_\_\_\_\_ to execute the affidavit and did so as his or her free act and deed.

Date: \_\_\_\_\_ Notary Public \_\_\_\_\_  
State of \_\_\_\_\_ Commission Expires \_\_\_\_\_  
County of \_\_\_\_\_ (Seal)  
On this \_\_\_\_\_ day of \_\_\_\_\_ before me

Name of Firm	
Signature	Date
Name	Title

(Name) \_\_\_\_\_ appeared to me personally known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by (Name of Firm)

\_\_\_\_\_ to execute the affidavit and did so at his or her free act and deed.

Date: \_\_\_\_\_ Notary Public \_\_\_\_\_  
 State of \_\_\_\_\_ Commission Expires \_\_\_\_\_  
 County of \_\_\_\_\_ (Seal)  
 On this \_\_\_\_\_ day of \_\_\_\_\_ before me

Rev 8/2000



2) Briefly describe the experience and business qualifications of each non-MBE/WBE Joint Venture.

---

---

---

(Attach additional information if necessary)

5. Name of the Joint Venture's Business: \_\_\_\_\_

6. Provide a copy of the signed Joint Venture Agreement

7. What is the claimed percentage of MBE/WBE ownership? \_\_\_\_\_%

8. Ownership of Joint Venture: (This need not be filled in if described in the joint venture agreement provided in question 6.)

(a) Profit and loss sharing: \_\_\_\_\_  
\_\_\_\_\_

(b) Capital contributions, including equipment: \_\_\_\_\_  
\_\_\_\_\_

Other applicable ownership interests: \_\_\_\_\_  
\_\_\_\_\_

Duration of the joint venture:

From: \_\_\_\_\_ To: \_\_\_\_\_

9. Control of and participation in this contract. Identify which firm and those individuals (and their titles) who are responsible for the day-to-day management and policy decision making, including but not limited to those with prime responsibility for:

(a) Financial Decisions:

Firm: _____
Name: _____
Title: _____

(b) Management Decisions:

(1) Estimating
Firm: _____
Name: _____
Title: _____
(2) Marketing and Sales
Firm: _____
Name: _____
Title: _____
(3) Hiring and firing of management personnel
Firm: _____
Name: _____
Title: _____
(4) Purchasing of major items or supplies
Firm: _____
Name: _____
Title: _____

**Note:** (1) An MBE/WBE performs a commercially useful function when it is responsible for execution of a distinct element of the work of the contract and carrying out its responsibilities by actually performing, managing, and supervising the work involved. To determine whether an MBE/WBE is performing a commercially useful function, the amount of work subcontracted, industry practices, and other relevant factors shall be evaluated.

(2) An MBE/WBE does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction, contract, or project through which funds are passed in order to obtain the appearance of MBE/WBE participation or the MBE/WBE subcontracts a greater portion of the work of a contract than would be expected on the basis of normal industry practice for the type of work involved.

(3) A joint venture which includes one (1) or more MBE/WBEs is subject to the review and

approval by the Director of DSBO and the participation will count toward satisfaction of the MBE/WBE goal upon confirmation of the utilization in the joint venture of joint management and full integration of work forces by the joint venture partners.

If there are any significant changes in this submittal, the joint venture members must immediately notify the Division of Small Business Opportunity.



Department of Aviation  
Airport Office Building, Room 8810  
8500 Peña Boulevard  
Denver, Colorado

(303) 342-2200  
www.flydenver.com



## **N O T I C E   T O   A P P A R E N T** **L O W   B I D D E R**

July 16, 2015

Trautman & Shreve, Inc.

The Chief Executive Officer, having considered the Bids submitted for the construction of Contract No. 201418277, CONCOURSE B PCA REPLACEMENT RE-BID, 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, for the Total Contract Bid Amount of EIGHT MILLION FOUR HUNDRED EIGHTY-FOUR THOUSAND SEVEN HUNDRED SEVENTY-FOUR AND 00/100 Dollars (\$8,484,774.00) 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 by returning the signed contract signature page, as well as furnishing the required Performance Bond, Payment Bond and insurance certificate. In addition, you are required to submit the EEO information described in IB-27. These requirements must be satisfied 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



---

Kim Day, Chief Executive Officer

**J. Somer Shindler**

Digitally signed by J. Somer Shindler  
DN: cn=J. Somer Shindler, o=DIA, ou=AIM  
Development,  
email=somer.shindler@flydenver.com, c=US  
Date: 2015.07.16 12:42:11 -06'00'

---

Somer Shindler, Interim Senior Vice President  
Airport Infrastructure Management (AIM)

cc: Steve Campbell, BMS  
Kate Tremblay, BMS  
Emmanuel Hangar, BMS  
Lisa Torres, BMS  
Shala Sandoval, BMS  
Mary Connors, Safety  
Glenn Frieler, AIM  
Max Taylor, Airport Legal Services  
Chris Lines, Division of Small Business Opportunity  
Rob Merritt, Prevailing Wage  
Candace Brown, Airport Security  
Doug Schellinger, Treasury  
File



## **C O N T R A C T**

**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 Trautman & Shreve, Inc., a corporation organized and existing under and by virtue of the laws of the State of Colorado, hereinafter referred to as the "CONTRACTOR", Party of the Second Part;

### **W I T N E S S E T H**

**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. 201418277, Concourse B PCA Replacement, Denver International Airport;

**WHEREAS**, bids to said advertisement have been received by the CEO, 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
  - Commitment to Minority/Women Business Enterprise Participation
- 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  
Technical Specifications  
Contract Drawings  
Approved Shop Drawings  
Change 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 Senior Vice President – Airport Infrastructure Management and agrees to fully complete the Work in its entirety within three hundred sixty-five (365) 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 Eight Million, Four Hundred Eighty-Four Thousand, Seven Hundred Seventy-Four and 00/100 Dollars (\$8,484,774.00).

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 CEO.

**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 XVIII – 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.

[END OF PAGE]

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed at Denver, Colorado as of the date indicated on the City signature page.

Contract Control Number: 201418277

Vendor Name: Trautman & Shreve, Inc.

By: Frank Montoya

Name: Frank Montoya

(please print)

Title: V.P.

(please print)

ATTEST: (if required)

By: Beth Hanna

Name: Beth Hanna

(please print)

Title: Project Coordinator

(please print)



**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 \_\_\_\_\_



## PAYMENT BOND

**KNOW ALL MEN BY THESE PRESENTS**, that we, the undersigned Trautman & Shreve, Inc., a corporation organized under the laws of the State of Colorado, hereinafter referred to as the "Contractor" and Travelers Casualty and Surety Company of America, <sup>Federal Insurance Company</sup> a corporation organized under the laws of the State of Connecticut, <sup>\*\* Indiana</sup> 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 Eight Million, Four Hundred Eighty-Four Thousand, Seven Hundred Seventy-Four and 00/100 Dollars (\$8,484,774.00), 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. 201418277, Concourse B PCA Replacement, 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 10th day of August, 2015.

TRAUTMAN & SHREVE, INC.  
CONTRACTOR  
4406 Race Street, Denver, CO 80216

By:   
President **Kevin D. Larington**


Travelers Casualty and Surety Company of America  
One Tower Square, Hartford, CT 06183 &  
Federal Insurance Company  
15 Mountain View Road, Warren, NJ 07059  
SURETY

By:   
Attorney-in-Fact  
Rita Sagistano

(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:   
Chief Executive Officer  
**DENVER INT AIRPORT**

APPROVED AS TO FORM:

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

By:   
Assistant City Attorney





POWER OF ATTORNEY

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company

St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

Attorney-In Fact No. 229701

Certificate No. 006418657

KNOW ALL MEN BY THESE PRESENTS: That Farmington Casualty Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company are corporations duly organized under the laws of the State of Connecticut, that Fidelity and Guaranty Insurance Company is a corporation duly organized under the laws of the State of Iowa, and that Fidelity and Guaranty Insurance Underwriters, Inc., is a corporation duly organized under the laws of the State of Wisconsin (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint

Thomas Bean, Rita Sagistano, Gerard S. Macholz, Susan Lupski, Robert T. Pearson, Camille Maitland, George O. Brewster, Colette R. Chisholm, Vincent A. Walsh, Lee Ferrucci, Desiree Cardlin, Nelly Renchiwich, and Mia Woo-Warren

of the City of Uniondale, State of New York, their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed and their corporate seals to be hereto affixed, this 27th day of July, 2015.

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company

St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company



State of Connecticut
City of Hartford ss.

By: [Signature]
Robert L. Raney, Senior Vice President

On this the 27th day of July, 2015, before me personally appeared Robert L. Raney, who acknowledged himself to be the Senior Vice President of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

In Witness Whereof, I hereunto set my hand and official seal.
My Commission expires the 30th day of June, 2016.



[Signature]
Marie C. Tetreault, Notary Public

**TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA  
HARTFORD, CT. 06183**

**ATTORNEY-IN-FACT JUSTIFICATION  
PRINCIPAL'S ACKNOWLEDGMENT — IF A CORPORATION**

**Colorado**

State of ~~New York~~, County of **Denver** } ss.

On this **12th** day of **August**, 20 **15**, before me personally appeared **Kevin D. Larington** to me known, who, being by me duly sworn, deposes and says: That he/she resides in the City of **Littleton, Colorado**; that he/she is the **President & CEO** of **Trautman & Shreve, Inc.**, the corporation described in and which executed the within instrument; that he/she knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said corporation, and that he/she signed his/her name thereto by like order.

*Pauline Atkinson*

**PRINCIPAL'S ACKNOWLEDGMENT — IF INDIVIDUAL OR FIRM**

**My Commission Expires 04/02/2019**

State of New York, County of \_\_\_\_\_ } ss.

On this \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_\_, before me personally appeared \_\_\_\_\_ to me known to be (the individual) (one of the firm of \_\_\_\_\_) described in and who executed the within instrument, and he/she thereupon duly acknowledged to me that he/she executed the same (as the act and deed of said firm).

**SURETY COMPANY'S ACKNOWLEDGMENT**

State of New York, County of **Nassau** } ss.

On this **10th** day of **August**, 20 **15**, before me personally appeared **Rita Sagistano** to me known, who, being by me duly sworn, did depose and say: That he/she resides in the City of ~~New York~~ County of **Nassau, NY**; that he/she is Attorney-in-Fact of **TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA**, the corporation described in and which executed the within instrument; that he/she knows the corporate seal of said Company; that the seal affixed to said instrument is such corporate seal; and that he/she signed said instrument as Attorney-in-Fact by authority of the Board of Directors of said Company; and affiant did further depose and say that the Superintendent of Insurance of the State of New York has, pursuant to Chapter 882 of the Laws of the State of New York for the year 1939, constituting chapter 28 of the Consolidating Laws of the State of New York as the Insurance Law as amended, issued to **TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA** his/her certificate that said Company is qualified to become and be accepted as surety or guarantor on all bonds, undertakings, recognizances, guaranties, and other obligations required or permitted by law; and that such certificate has not been revoked.

*Donnamarie A. Kissane*  
Notary Public

**TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA  
Hartford, Connecticut 06183**

**DONNAMARIE A KISSANE  
Notary Public, State of New York  
No. 01K16297783  
Qualified in Nassau County  
Commission Expires March 3, 2018**

**FINANCIAL STATEMENT AS OF DECEMBER 31, 2014  
AS FILED WITH THE INSURANCE DEPT. OF THE STATE OF NEW YORK  
CAPITAL STOCK \$ 6,480,000**

<b>ASSETS</b>		<b>LIABILITIES</b>	
CASH AND INVESTED CASH	\$ 127,187,283	UNEARNED PREMIUMS	\$ 855,349,712
BONDS	3,411,436,937	LOSSES	880,168,443
STOCKS	328,931,879	LOSS ADJUSTMENT EXPENSES	358,911,923
INVESTMENT INCOME DUE AND ACCRUED	45,277,103	COMMISSIONS	34,142,046
OTHER INVESTED ASSETS	4,019,416	TAXES, LICENSES AND FEES	11,534,866
PREMIUM BALANCES	209,982,904	OTHER EXPENSES	40,097,405
NET DEFERRED TAX ASSET	62,639,844	CURRENT FEDERAL AND FOREIGN INCOME TAXES	24,133,580
REINSURANCE RECOVERABLE	17,397,751	REMITTANCES AND ITEMS NOT ALLOCATED	11,062,682
SECURITIES LENDING REINVESTED COLLATERAL ASSETS	8,224,694	AMOUNTS WITHHELD / RETAINED BY COMPANY FOR OTHERS	41,744,996
RECEIVABLES FROM PARENT, SUBSIDIARIES AND AFFILIATES	9,057,189	RETROACTIVE REINSURANCE RESERVE ASSUMED	853,430
OTHER ASSETS	3,078,655	POLICYHOLDER DIVIDENDS	7,376,699
		PROVISION FOR REINSURANCE	3,416,505
		ADVANCE PREMIUM	1,327,118
		PAYABLE FOR SECURITIES	4,590,766
		PAYABLE FOR SECURITIES LENDING	8,224,694
		CEDED REINSURANCE NET PREMIUMS PAYABLE	28,084,142
		ESCHEAT LIABILITY	1,136,046
		OTHER ACCRUED EXPENSES AND LIABILITIES	421,157
		<b>TOTAL LIABILITIES</b>	<b>\$ 2,110,576,190</b>
		CAPITAL STOCK	\$ 6,480,000
		PAID IN SURPLUS	433,803,780
		OTHER SURPLUS	1,674,373,715
		<b>TOTAL SURPLUS TO POLICYHOLDERS</b>	<b>\$ 2,114,657,475</b>
<b>TOTAL ASSETS</b>	<b>\$ 4,225,233,665</b>	<b>TOTAL LIABILITIES &amp; SURPLUS</b>	<b>\$ 4,225,233,665</b>

Securities carried at \$8,170,697 in the above statement are deposited with public authorities, as required by law.



**Chubb  
Surety**

**POWER  
OF  
ATTORNEY**

**Federal Insurance Company  
Vigilant Insurance Company  
Pacific Indemnity Company**

**Attn: Surety Department  
15 Mountain View Road  
Warren, NJ 07059**

Know All by These Presents, That FEDERAL INSURANCE COMPANY, an Indiana corporation, VIGILANT INSURANCE COMPANY, a New York corporation, and PACIFIC INDEMNITY COMPANY, a Wisconsin corporation, do each hereby constitute and appoint Thomas Bean, George O. Brewster, Desiree Cardlin, Colette R. Chisholm, Susan Lupski, Gerard S. Macholz, Camille Maitland, Robert T. Pearson, Nelly Renchiwich, Rita Sagistano, Vincent Walsh and Mia Woo-Warren of Uniondale, New York

each as their true and lawful Attorney- in- Fact to execute under such designation in their names and to affix their corporate seals to and deliver for and on their behalf as surety thereon or otherwise, bonds and undertakings and other writings obligatory in the nature thereof (other than bail bonds) given or executed in the course of business, and any instruments amending or altering the same, and consents to the modification or alteration of any instrument referred to in said bonds or obligations.

In Witness Whereof, said FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, and PACIFIC INDEMNITY COMPANY have each executed and attested these presents and affixed their corporate seals on this 20<sup>th</sup> day of July, 2015.

Dawn M. Chloros, Assistant Secretary

David B. Norris, Jr., Vice President



STATE OF NEW JERSEY

ss.

County of Somerset

On this 20<sup>th</sup> day of July, 2015 before me, a Notary Public of New Jersey, personally came Dawn M. Chloros, to me known to be Assistant Secretary of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, and PACIFIC INDEMNITY COMPANY, the companies which executed the foregoing Power of Attorney, and the said Dawn M. Chloros, being by me duly sworn, did depose and say that she is Assistant Secretary of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, and PACIFIC INDEMNITY COMPANY and knows the corporate seals thereof, that the seals affixed to the foregoing Power of Attorney are such corporate seals and were thereto affixed by authority of the By- Laws of said Companies; and that she signed said Power of Attorney as Assistant Secretary of said Companies by like authority; and that she is acquainted with David B. Norris, Jr., and knows him to be Vice President of said Companies; and that the signature of David B. Norris, Jr., subscribed to said Power of Attorney is in the genuine handwriting of David B. Norris, Jr., and was thereto subscribed by authority of said By- Laws and in deponent's presence.

Notarial Seal



**KATHERINE J. ADELAAR  
NOTARY PUBLIC OF NEW JERSEY  
No. 2316685  
Commission Expires July 16, 2019**

Notary Public

**CERTIFICATION**

Extract from the By- Laws of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, and PACIFIC INDEMNITY COMPANY:

"Except as otherwise provided in these By-Laws or by law or as otherwise directed by the Board of Directors, the President or any Vice President shall be authorized to execute and deliver, in the name and on behalf of the Corporation, all agreements, bonds, contracts, deeds, mortgages, and other instruments, either for the Corporation's own account or in a fiduciary or other capacity, and the seal of the Corporation, if appropriate, shall be affixed thereto by any of such officers or the Secretary or an Assistant Secretary. The Board of Directors, the President or any Vice President designated by the Board of Directors may authorize any other officer, employee or agent to execute and deliver, in the name and on behalf of the Corporation, agreements, bonds, contracts, deeds, mortgages, and other instruments, either for the Corporation's own account or in a fiduciary or other capacity, and, if appropriate, to affix the seal of the Corporation thereto. The grant of such authority by the Board or any such officer may be general or confined to specific instances."

I, Dawn M. Chloros, Assistant Secretary of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, and PACIFIC INDEMNITY COMPANY (the "Companies") do hereby certify that

- (i) the foregoing extract of the By- Laws of the Companies is true and correct,
- (ii) the Companies are duly licensed and authorized to transact surety business in all 50 of the United States of America and the District of Columbia and are authorized by the U.S. Treasury Department; further, Federal and Vigilant are licensed in the U.S. Virgin Islands, and Federal is licensed in Guam, Puerto Rico, and each of the Provinces of Canada except Prince Edward Island; and
- (iii) the foregoing Power of Attorney is true, correct and in full force and effect.

Given under my hand and seals of said Companies at Warren, NJ this August 10, 2015



Dawn M. Chloros, Assistant Secretary

IN THE EVENT YOU WISH TO NOTIFY US OF A CLAIM, VERIFY THE AUTHENTICITY OF THIS BOND OR NOTIFY US OF ANY OTHER MATTER, PLEASE CONTACT US AT ADDRESS LISTED ABOVE, OR BY Telephone (908) 903- 3493 Fax (908) 903- 3656 e-mail: surety@chubb.com

ACKNOWLEDGMENT OF SURETY COMPANY

STATE OF ..New York..... }  
COUNTY OF ...Nassau..... } ss

On this August 10, 2015, before me personally came Rita Sagistano  
to me known, who, being by me duty sworn, did depose and say; that he/she resides in  
Nassau County, State of NY, that he/she is the Attorney-in-Fact of the  
Federal Insurance Company the corporation described in which executed the

above instrument; that he/she knows the seal of said corporation; that the seal affixed to said instrument is  
such corporate seal; that it was so affixed by the Board of Directors of said corporation; and that he/she signed  
his/her name thereto by like order; and the affiant did further depose and say that the Superintendent of  
Insurance of the State of New York, has, pursuant to Section 1111 of the Insurance Law of the State of New  
York, issued to Federal Insurance Company (Surety) his/her certificate of  
qualification evidencing the qualification of said Company and its sufficiency under any law of the State of New  
York as surety and guarantor, and the propriety of accepting and approving it as such; and that such certificate  
has not been revoked.

*Donnamarie A. Kissane*  
Notary Public

NY acknowledgment

DONNAMARIE A KISSANE  
Notary Public, State of New York  
No. 01K16297783  
Qualified in Nassau County  
Commission Expires March 3, 2018

# FEDERAL INSURANCE COMPANY

## STATEMENT OF ASSETS, LIABILITIES AND SURPLUS TO POLICYHOLDERS

Statutory Basis

**DECEMBER 31, 2014**

(in thousands of dollars)

ASSETS	LIABILITIES AND SURPLUS TO POLICYHOLDERS		
Cash and Short Term Investments.....	\$ 110,484	Outstanding Losses and Loss Expenses .....	\$ 12,181,139
United States Government, State and Municipal Bonds .....	10,245,402	Unearned Premiums.....	3,654,861
Other Bonds.....	4,927,443	Ceded Reinsurance Premiums Payable.....	339,466
Stocks .....	1,066,355	Provision for Reinsurance .....	46,470
Other Invested Assets.....	1,365,367	Other Liabilities.....	1,434,018
<b>TOTAL INVESTMENTS .....</b>	<b>17,715,051</b>	<b>TOTAL LIABILITIES .....</b>	<b>17,655,954</b>
Investments in Affiliates:		Capital Stock.....	20,980
Chubb Investment Holdings, Inc. ....	3,565,038	Paid-In Surplus.....	3,106,809
Pacific Indemnity Company.....	2,922,214	Unassigned Funds .....	11,700,594
Executive Risk Indemnity Inc.....	1,258,019		
Chubb Insurance Investment Holdings Ltd....	1,162,709	 	
CC Canada Holdings Ltd.....	652,880	<b>SURPLUS TO POLICYHOLDERS.....</b>	<b>14,828,383</b>
Chubb Insurance Company of Australia Ltd.	480,068		
Great Northern Insurance Company .....	476,969		
Vigilant Insurance Company .....	292,313		
Chubb European Investment Holdings SLP ..	287,633		
Other Affiliates .....	517,330		
Premiums Receivable .....	1,679,148		
Other Assets .....	1,474,965		
<b>TOTAL ADMITTED ASSETS .....</b>	<b>\$ 32,484,337</b>	<b>TOTAL LIABILITIES AND SURPLUS TO POLICYHOLDERS.....</b>	<b>\$ 32,484,337</b>

Investments are valued in accordance with requirements of the National Association of Insurance Commissioners.  
At December 31, 2014, investments with a carrying value of \$518,199,884 were deposited with government authorities  
as required by law.

State, County & City of New York, — ss:

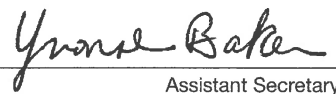
Yvonne Baker, Assistant Secretary \_\_\_\_\_ of the Federal Insurance Company

being duly sworn, deposes and says that the foregoing Statement of Assets, Liabilities and Surplus to Policyholders of said Federal Insurance Company on December 31, 2014 is true and correct and is a true abstract of the Annual Statement of said Company as filed with the Secretary of the Treasury of the United States for the 12 months ending December 31, 2014.

Subscribed and sworn to before me  
this March 11, 2015.

  
\_\_\_\_\_  
Notary Public

JEANETTE SHIPSEY  
Notary Public, State of New York  
No. 02SH5074142  
Qualified in Nassau County  
Commission Expires March 10, 2019

  
\_\_\_\_\_  
Assistant Secretary

# FEDERAL INSURANCE COMPANY

## STATEMENT OF ASSETS, LIABILITIES AND SURPLUS TO POLICYHOLDERS

Statutory Basis

DECEMBER 31, 2014

(in thousands of dollars)

ASSETS		LIABILITIES AND SURPLUS TO POLICYHOLDERS	
Cash and Short Term Investments.....	\$ 110,484	Outstanding Losses and Loss Expenses.....	\$ 12,181,139
United States Government, State and Municipal Bonds .....	10,245,402	Unearned Premiums.....	3,654,861
Other Bonds.....	4,927,443	Ceded Reinsurance Premiums Payable.....	339,466
Stocks.....	1,066,355	Provision for Reinsurance .....	46,470
Other Invested Assets.....	<u>1,365,367</u>	Other Liabilities.....	<u>1,434,018</u>
TOTAL INVESTMENTS .....	<u>17,715,051</u>	TOTAL LIABILITIES .....	<u>17,655,954</u>
Investments in Affiliates:		Capital Stock.....	20,980
Chubb Investment Holdings, Inc. ....	3,565,038	Paid-In Surplus.....	3,106,809
Pacific Indemnity Company.....	2,922,214	Unassigned Funds .....	<u>11,700,594</u>
Executive Risk Indemnity Inc.....	1,258,019		
Chubb Insurance Investment Holdings Ltd....	1,162,709		
CC Canada Holdings Ltd.....	652,880	SURPLUS TO POLICYHOLDERS.....	<u>14,828,383</u>
Chubb Insurance Company of Australia Ltd.	480,068		
Great Northern Insurance Company .....	476,969		
Vigilant Insurance Company.....	292,313		
Chubb European Investment Holdings SLP ..	287,633		
Other Affiliates .....	517,330		
Premiums Receivable .....	1,679,148		
Other Assets .....	<u>1,474,965</u>		
TOTAL ADMITTED ASSETS .....	<u>\$ 32,484,337</u>	TOTAL LIABILITIES AND SURPLUS TO POLICYHOLDERS.....	<u>\$ 32,484,337</u>

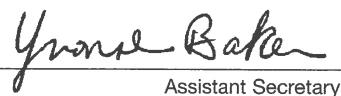
Investments are valued in accordance with requirements of the National Association of Insurance Commissioners. At December 31, 2014, investments with a carrying value of \$518,199,884 were deposited with government authorities as required by law.

State, County & City of New York, — ss:

Yvonne Baker, Assistant Secretary \_\_\_\_\_ of the Federal Insurance Company  
being duly sworn, deposes and says that the foregoing Statement of Assets, Liabilities and Surplus to Policyholders of said Federal Insurance Company on December 31, 2014 is true and correct and is a true abstract of the Annual Statement of said Company as filed with the Secretary of the Treasury of the United States for the 12 months ending December 31, 2014.  
Subscribed and sworn to before me  
this March 11, 2015.

  
\_\_\_\_\_  
Notary Public

JEANETTE SHIPSEY  
Notary Public, State of New York  
No. 02SH5074142  
Qualified in Nassau County  
Commission Expires March 10, 2019

  
\_\_\_\_\_  
Assistant Secretary

## PERFORMANCE BOND

**KNOW ALL MEN BY THESE PRESENTS**, that we, the undersigned Trautman & Shreve, Inc., a corporation organized under the laws of the State of Colorado, hereinafter referred to as the "Contractor" and Travelers Casualty and Surety Company of America, <sup>\* & Federal Insurance Company</sup> a corporation organized under the laws of the State of Connecticut, <sup>\*\*</sup> and <sup>Indiana</sup> 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 Eight Million, Four Hundred Eighty-Four Thousand, Seven Hundred Seventy-Four and 00/100 Dollars (\$8,484,774.00), 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. 201418277, Concourse B PCA Replacement, 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 10th day of August, 2015.

TRAUTMAN & SHREVE, INC.  
CONTRACTOR  
4406 Race Street, Denver, CO 80216

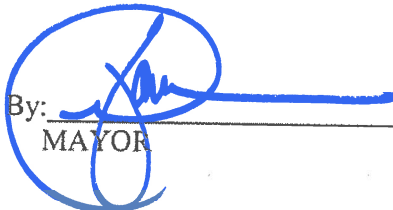
By:   
President **Kevin D. Larington**

Travelers Casualty and Surety Company of America,  
One Tower Square, Hartford, CT 06183 &  
Federal Insurance Company, 15 Mountain View Road, Warren, NJ 07059  
SURETY

By:   
Attorney-in-Fact  
Rita Sagistano

(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:   
Chief Executive Officer  
**DENVER INT. AIRPORT**

APPROVED AS TO FORM:

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

By:   
Assistant City Attorney





POWER OF ATTORNEY

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company

St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

Attorney-In Fact No. 229701

Certificate No. 006418656

KNOW ALL MEN BY THESE PRESENTS: That Farmington Casualty Company, St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company are corporations duly organized under the laws of the State of Connecticut, that Fidelity and Guaranty Insurance Company is a corporation duly organized under the laws of the State of Wisconsin (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint

Thomas Bean, Rita Sagistano, Gerard S. Macholz, Susan Lupski, Robert T. Pearson, Camille Maitland, George O. Brewster, Colette R. Chisholm, Vincent A. Walsh, Lee Ferrucci, Desiree Cardlin, Nelly Renchiwich, and Mia Woo-Warren

of the City of Uniondale, State of New York, their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed and their corporate seals to be hereto affixed, this 27th day of July, 2015.

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company

St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company



State of Connecticut
City of Hartford ss.

By: [Signature]
Robert L. Raney, Senior Vice President

On this the 27th day of July, 2015, before me personally appeared Robert L. Raney, who acknowledged himself to be the Senior Vice President of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

In Witness Whereof, I hereunto set my hand and official seal.
My Commission expires the 30th day of June, 2016.



[Signature: Marie C. Tetreault]
Marie C. Tetreault, Notary Public

**TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA  
HARTFORD, CT. 06183**

**ATTORNEY-IN-FACT JUSTIFICATION  
PRINCIPAL'S ACKNOWLEDGMENT — IF A CORPORATION**

State of ~~New York~~ **Colorado**, County of **Denver** } ss.

On this **12th** day of **August**, 20 **15**, before me personally appeared **Kevin D. Larington** to me known, who, being by me duly sworn, deposes and says: That he/she resides in the City of **Littleton, Colorado** that he/she is the **President & CEO** of **Trautman & Shreve, Inc.**, the corporation described in and which executed the within instrument; that he/she knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said corporation, and that he/she signed his/her name thereto by like order.

*Pauline Atkinson*  
\_\_\_\_\_  
Notary Public

**PRINCIPAL'S ACKNOWLEDGMENT — IF INDIVIDUAL OR FIRM** My Commission Expires **04/02/2019**

State of New York, County of \_\_\_\_\_ } ss.

On this \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_\_, before me personally appeared \_\_\_\_\_ to me known to be (the individual) (one of the firm of \_\_\_\_\_) described in and who executed the within instrument, and he/she thereupon duly acknowledged to me that he/she executed the same (as the act and deed of said firm).

**SURETY COMPANY'S ACKNOWLEDGMENT**

State of New York, County of **Nassau** } ss.

On this **10th** day of **August**, 20 **15**, before me personally appeared **Rita Sagistano** to me known, who, being by me duly sworn, did depose and say: That he/she resides in the ~~City of Nassau~~ County of **Nassau, NY** that he/she is Attorney-in-Fact of **TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA**, the corporation described in and which executed the within instrument; that he/she knows the corporate seal of said Company; that the seal affixed to said instrument is such corporate seal; and that he/she signed said instrument as Attorney-in-Fact by authority of the Board of Directors of said Company; and affiant did further depose and say that the Superintendent of Insurance of the State of New York has, pursuant to Chapter 882 of the Laws of the State of New York for the year 1939, constituting chapter 28 of the Consolidating Laws of the State of New York as the Insurance Law as amended, issued to **TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA** his/her certificate that said Company is qualified to become and be accepted as surety or guarantor on all bonds, undertakings, recognizances, guaranties, and other obligations required or permitted by law; and that such certificate has not been revoked.

*Donnamarie A. Kissane*  
\_\_\_\_\_  
Notary Public

**TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA**  
Hartford, Connecticut 06183

**DONNAMARIE A KISSANE**  
Notary Public, State of New York  
No. 01K16297783  
Qualified in Nassau County  
Commission Expires March 3, 2018

FINANCIAL STATEMENT AS OF DECEMBER 31, 2014  
AS FILED WITH THE INSURANCE DEPT. OF THE STATE OF NEW YORK  
CAPITAL STOCK \$ 6,480,000

ASSETS		LIABILITIES	
CASH AND INVESTED CASH	\$ 127,187,283	UNEARNED PREMIUMS	\$ 855,349,712
BONDS	3,411,436,937	LOSSES	680,168,443
STOCKS	326,931,879	LOSS ADJUSTMENT EXPENSES	356,911,923
INVESTMENT INCOME DUE AND ACCRUED	45,277,103	COMMISSIONS	34,142,046
OTHER INVESTED ASSETS	4,019,416	TAXES, LICENSES AND FEES	11,534,866
PREMIUM BALANCES	209,982,904	OTHER EXPENSES	40,097,405
NET DEFERRED TAX ASSET	62,639,844	CURRENT FEDERAL AND FOREIGN INCOME TAXES	24,133,580
REINSURANCE RECOVERABLE	17,397,751	REMITTANCES AND ITEMS NOT ALLOCATED	11,062,682
SECURITIES LENDING REINVESTED COLLATERAL ASSETS	8,224,694	AMOUNTS WITHHELD / RETAINED BY COMPANY FOR OTHERS	41,744,996
RECEIVABLES FROM PARENT, SUBSIDIARIES AND AFFILIATES	9,057,199	RETROACTIVE REINSURANCE RESERVE ASSUMED	853,430
OTHER ASSETS	3,078,655	POLICYHOLDER DIVIDENDS	7,376,699
		PROVISION FOR REINSURANCE	3,416,605
		ADVANCE PREMIUM	1,327,118
		PAYABLE FOR SECURITIES	4,590,766
		PAYABLE FOR SECURITIES LENDING	8,224,694
		CEDED REINSURANCE NET PREMIUMS PAYABLE	28,084,142
		ESCHEAT LIABILITY	1,136,046
		OTHER ACCRUED EXPENSES AND LIABILITIES	421,157
		<b>TOTAL LIABILITIES</b>	<b>\$ 2,110,576,190</b>
		CAPITAL STOCK	\$ 6,480,000
		PAID IN SURPLUS	433,803,760
		OTHER SURPLUS	1,674,373,715
		<b>TOTAL SURPLUS TO POLICYHOLDERS</b>	<b>\$ 2,114,657,475</b>
<b>TOTAL ASSETS</b>	<b>\$ 4,225,233,665</b>	<b>TOTAL LIABILITIES &amp; SURPLUS</b>	<b>\$ 4,225,233,665</b>

Securities carried at \$8,170,697 in the above statement are deposited with public authorities, as required by law.



**Chubb  
Surety**

**POWER  
OF  
ATTORNEY**

**Federal Insurance Company  
Vigilant Insurance Company  
Pacific Indemnity Company**

**Attn: Surety Department  
15 Mountain View Road  
Warren, NJ 07059**

Know All by These Presents, That **FEDERAL INSURANCE COMPANY**, an Indiana corporation, **VIGILANT INSURANCE COMPANY**, a New York corporation, and **PACIFIC INDEMNITY COMPANY**, a Wisconsin corporation, do each hereby constitute and appoint Thomas Bean, George O. Brewster, Desiree Cardlin, Colette R. Chisholm, Susan Lupski, Gerard S. Macholz, Camille Maitland, Robert T. Pearson, Nelly Renchiwich, Rita Sagistano, Vincent Walsh and Mia Woo-Warren of Uniondale, New York

each as their true and lawful Attorney-in-Fact to execute under such designation in their names and to affix their corporate seals to and deliver for and on their behalf as surety thereon or otherwise, bonds and undertakings and other writings obligatory in the nature thereof (other than bail bonds) given or executed in the course of business, and any instruments amending or altering the same, and consents to the modification or alteration of any instrument referred to in said bonds or obligations.

In Witness Whereof, said **FEDERAL INSURANCE COMPANY**, **VIGILANT INSURANCE COMPANY**, and **PACIFIC INDEMNITY COMPANY** have each executed and attested these presents and affixed their corporate seals on this 20<sup>th</sup> day of **July, 2015**.

Dawn M. Chloros, Assistant Secretary

David B. Norris, Jr., Vice President



STATE OF NEW JERSEY

ss.

County of Somerset

On this 20<sup>th</sup> day of **July, 2015** before me, a Notary Public of New Jersey, personally came Dawn M. Chloros, to me known to be Assistant Secretary of **FEDERAL INSURANCE COMPANY**, **VIGILANT INSURANCE COMPANY**, and **PACIFIC INDEMNITY COMPANY**, the companies which executed the foregoing Power of Attorney, and the said Dawn M. Chloros, being by me duly sworn, did depose and say that she is Assistant Secretary of **FEDERAL INSURANCE COMPANY**, **VIGILANT INSURANCE COMPANY**, and **PACIFIC INDEMNITY COMPANY** and knows the corporate seals thereof, that the seals affixed to the foregoing Power of Attorney are such corporate seals and were thereto affixed by authority of the By-Laws of said Companies; and that she signed said Power of Attorney as Assistant Secretary of said Companies by like authority; and that she is acquainted with David B. Norris, Jr., and knows him to be Vice President of said Companies; and that the signature of David B. Norris, Jr., subscribed to said Power of Attorney is in the genuine handwriting of David B. Norris, Jr., and was thereto subscribed by authority of said By-Laws and in dependent's presence.

Notarial Seal



**KATHERINE J. ADELAAR**  
NOTARY PUBLIC OF NEW JERSEY  
No. 2316685  
Commission Expires July 16, 2019

Notary Public

**CERTIFICATION**

Extract from the By-Laws of **FEDERAL INSURANCE COMPANY**, **VIGILANT INSURANCE COMPANY**, and **PACIFIC INDEMNITY COMPANY**:

"Except as otherwise provided in these By-Laws or by law or as otherwise directed by the Board of Directors, the President or any Vice President shall be authorized to execute and deliver, in the name and on behalf of the Corporation, all agreements, bonds, contracts, deeds, mortgages, and other instruments, either for the Corporation's own account or in a fiduciary or other capacity, and the seal of the Corporation, if appropriate, shall be affixed thereto by any of such officers or the Secretary or an Assistant Secretary. The Board of Directors, the President or any Vice President designated by the Board of Directors may authorize any other officer, employee or agent to execute and deliver, in the name and on behalf of the Corporation, agreements, bonds, contracts, deeds, mortgages, and other instruments, either for the Corporation's own account or in a fiduciary or other capacity, and, if appropriate, to affix the seal of the Corporation thereto. The grant of such authority by the Board or any such officer may be general or confined to specific instances."

I, Dawn M. Chloros, Assistant Secretary of **FEDERAL INSURANCE COMPANY**, **VIGILANT INSURANCE COMPANY**, and **PACIFIC INDEMNITY COMPANY** (the "Companies") do hereby certify that

- (i) the foregoing extract of the By-Laws of the Companies is true and correct,
- (ii) the Companies are duly licensed and authorized to transact surety business in all 50 of the United States of America and the District of Columbia and are authorized by the U.S. Treasury Department; further, Federal and Vigilant are licensed in the U.S. Virgin Islands, and Federal is licensed in Guam, Puerto Rico, and each of the Provinces of Canada except Prince Edward Island; and
- (iii) the foregoing Power of Attorney is true, correct and in full force and effect.

Given under my hand and seals of said Companies at Warren, NJ this **August 10, 2015**



Dawn M. Chloros, Assistant Secretary

IN THE EVENT YOU WISH TO NOTIFY US OF A CLAIM, VERIFY THE AUTHENTICITY OF THIS BOND OR NOTIFY US OF ANY OTHER MATTER, PLEASE CONTACT US AT ADDRESS LISTED ABOVE, OR BY Telephone (908) 903- 3493 Fax (908) 903- 3656 e-mail: surety@chubb.com

ACKNOWLEDGMENT OF SURETY COMPANY

STATE OF ..New York..... }  
COUNTY OF ...Nassau..... } ss

On this August 10, 2015 before me personally came Rita Sagistano  
to me known, who, being by me duly sworn, did depose and say; that he/she resides in  
Nassau County State of NY that he/she is the Attorney-in-Fact of the  
Federal Insurance Company the corporation described in which executed the  
above instrument; that he/she knows the seal of said corporation; that the seal affixed to said instrument is  
such corporate seal; that it was so affixed by the Board of Directors of said corporation; and that he/she signed  
his/her name thereto by like order; and the affiant did further depose and say that the Superintendent of  
Insurance of the State of New York has, pursuant to Section 1111 of the Insurance Law of the State of New  
York, issued to Federal Insurance Company (Surety) his/her certificate of  
qualification evidencing the qualification of said Company and its sufficiency under any law of the State of New  
York as surety and guarantor, and the propriety of accepting and approving it as such; and that such certificate  
has not been revoked.

*Donnamarie A. Kissane*  
Notary Public

NY acknowledgment

DONNAMARIE A KISSANE  
Notary Public, State of New York  
No. 01K18297783  
Qualified in Nassau County  
Commission Expires March 3, 2018

**CITY AND COUNTY OF DENVER**

**DEPARTMENT OF AVIATION**

\*\*\*\*\*

**NOTICE TO PROCEED**

Date:

TO: Trautman & Shreve, Inc.  
4406 Race Street  
Denver, CO 80216

You are hereby authorized and directed to proceed on this date with the work of constructing Contract No. 201418277, Concourse B PCA Replacement, 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 \_\_\_\_\_  
Senior Vice President  
Airport Infrastructure Management

By \_\_\_\_\_  
Chief Executive Officer

**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. 201418277, Concourse B PCA Replacement, Denver International Airport, Denver, Colorado, provided for in the foregoing Contract, [Payment amount] 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**  
**Contract No. 201418277**

**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:

<https://www.denvergov.org/dpw/DepartmentofPublicWorks/Newsroom/tabid/438508/newsid500663/6124/City-and-County-of-Denver-update-to-General-Contract-Conditions/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 1 & 2 (See the Master Table of Contents, page TOC-3, for the content of these volumes)

Volume 3

Contract Drawings

Change Orders and Change 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 SVP-AIM.”

### **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:

Chief Executive Officer (CEO). Executive Office, 9<sup>th</sup> Floor, Airport Office Building, 8500 Peña Boulevard, Denver, CO 80249.

Senior Vice President - Airport Infrastructure Management (SVP-AIM) who reports to the CEO. Airport Infrastructure Management office, 7<sup>th</sup> Floor, Airport Office Building, 8500 Peña Boulevard, Denver, CO 80249.

Director of Infrastructure and Quality Assurance, reports to the SVP-AIM. The Project Manager reports to the Director of Infrastructure and Quality Assurance. Airport Infrastructure Management Division, 7<sup>th</sup> 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 SVP-AIM. 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: Lee Walinchus, Airport Infrastructure Management Office, 7<sup>th</sup> Floor, Airport Office Building, 8500 Peña Boulevard, Denver, CO 80249, phone 303-342-2200.

The CEO may from time to time substitute a different City official as the designated “SVP-AIM” hereunder, and any such change will be effective upon the issuance of written notice to the Contractor which identifies the successor SVP-AIM. The SVP-AIM 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 80% 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>201419021</u>	<u>Concourse B Gate Pavement Rehabilitation</u>
<u>201414664</u>	<u>HVAC Controls Systems Upgrade Phase 4- Concourse B</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 three hundred sixty-five (365) consecutive calendar days from Notice to Proceed.

**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 \$1,000.00 per day until substantial completion is achieved.

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 Concourse B. The Contractor shall have access to the work site via Gate 5.

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 TO BE PROVIDED BY THE CONTRACTOR**

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 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 Directive” in all its occurrences in such G.C. with the phrase “Change 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 the designated Project Management Information System (PMIS) and Primavera P6 compatible to comply with the requirements of DIA's Project Controls System. The PMIS 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 PMIS. The Contractor will be responsible for providing a compatible 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, 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/safetyManualOCIPAttach3.pdf>

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



**EXHIBIT Q**  
**OWNER CONTROLLED INSURANCE PROGRAM (ROCIP)**

**1.0 Definitions**

<b>Certificate of Insurance:</b>	Evidence of the insurance coverage afforded under the ROCIP. Also, evidence of insurance coverage provided by Enrolled Parties for automobile liability and offsite exposures.
<b>Contract:</b>	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.
<b>Contractor:</b>	Prime Contractor, subcontractors of any tier.
<b>Contractor insurance cost</b>	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.
<b>City (Sponsor):</b>	City of Denver
<b>Owner Controlled Insurance Program (ROCIP):</b>	A coordinated insurance program providing certain coverage, as defined herein, for the City, Contractor and Enrolled Subcontractors, along with their Eligible Employees, performing Work at the Project Site.
<b>Eligible Employees:</b>	Employees of Enrolled Subcontractors who are not excluded from the ROCIP under the "Excluded Parties" definition.
<b>Enrolled Parties:</b>	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.
<b>Excluded Parties:</b>	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 following:  <ol style="list-style-type: none"><li>(1) Any person or organization that fabricates or manufactures products, materials or supplies away from the Project Site(s);</li><li>(2) Hazardous materials remediation, removal, or transportation companies and their consultants;</li><li>(3) Any architect, engineer or surveyor and their consultants except when approved by City;</li></ol>

- (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 subconsultants 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 Contactors 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 INSURED

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.

**DENVER INTERNATIONAL AIRPORT  
PARTIAL RELEASE**

**DEPARTMENT OF AVIATION**

**FINAL/PARTIAL RELEASE AND CERTIFICATE OF PAYMENT  
(SUBCONTRACTOR/SUPPLIER)**

201418277, Concourse B PCA Replacement	Date: _____, 20__ .
(NAME OF CONTRACTOR)	Subcontract #: _____ .
	Subcontract Value: \$ _____ .
(NAME OF SUBCONTRACTOR/SUPPLIER)	Last Progress Payment: \$ _____ .
	Date: _____ .
Check Applicable Box: <input type="checkbox"/> DBE <input type="checkbox"/> MBE/WBE	Total Paid to Date: \$ _____ .
	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 \_\_\_\_\_, 20\_\_, 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. CITY OF _____)	_____ (Name of Subcontractor)
Signed and sworn before me this day of _____, 20 .	By:
Notary Public/Commissioner of Oaths My Commission Expires	Title:

**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 supersede 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 To 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.

**CITY AND COUNTY OF DENVER  
DEPARTMENT OF PUBLIC WORKS  
DESIGN AND CONSTRUCTION MANAGEMENT DIVISION**

**APPENDIX A  
CITY AND COUNTY OF DENVER EQUAL OPPORTUNITY CLAUSE  
ALL CONTRACTS**

1. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, sex, age, national origin, religion, marital status, political opinion or affiliation, or mental or physical handicap. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, creed, color, sex, age, national origin, religion, marital status, political opinion or affiliation, or mental or physical handicap. 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 consideration for employment without regard to race, creed, color, sex, age, national origin, religion, marital status, political opinion or affiliation, or mental or physical handicap.
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. Each Contractor will comply with all provisions of Article, Division 2 of Chapter 28 of the Denver Revised Municipal Code, and the rules, regulations, and relevant orders of the Manager of Public Works and the Director of the Division of Small Business Opportunity.
5. The Contractor will furnish all information and reports required by Article m, Division 2 of Chapter 28 of the Denver Revised Municipal Code, and by rules, regulations and orders of the Manager and Director or pursuant thereto, and will permit access to the Contractors books, records, and accounts by the Manager, Director, or their designee 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 City contracts in accordance with procedures authorized in Article m, Division 2 of Chapter 28 of the Denver Revised Municipal Code, or by rules, regulations, or order of the Manager of Public Works.
7. The Contractor will include Regulation 12, Paragraph 2 and the provisions of paragraphs (1) through (6) in every subcontract of purchase order unless exempted by rules, regulations, or orders of the Manager issued pursuant to Article III, Division 2 of Chapter 28 of the Denver Revised Municipal Code, so that such provisions will take such action with respect to any subcontractor or supplies. 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 provisions, including sanctions for noncompliance.

The applicant further agrees to be bound by the above equal opportunity clauses with respect to its own employment practices when it participates in City contracts. The Contractor agrees to assist and cooperate actively with the Manager of Public Works and the Director of Contract Compliance in obtaining compliance of subcontractors and suppliers with the equal opportunity clause and the rules, regulations and relevant orders of the Manager of Public Works, and will furnish the Manager of Public Works and the Director of Contract Compliance such information as they may require for the supervision of compliance, and will otherwise assist the Manager and Director in the discharge of the City's primary responsibility for securing compliance. The Contractor further agrees to refrain from entering into any contract or contract modification subject to Article III, Division 2 of Chapter 28 of the Denver Revised Municipal Code with a contractor debarred from, or who has not demonstrated eligibility for, City contracts.

The Contractor will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the Manager of Public Works and Director of Contract Compliance. In addition, the Contractor agrees that failure or refusal to comply with these undertakings the Manager of Public Works may take any or all of the following actions:

- A. Cancellation, termination, or suspension in whole or in part of this contract.
- B. Refrain from extending any further assistance to the applicant under the program with respect to which the failure occurred until satisfactory assurance of future compliance has been received from such applicant.
- C. Refer the case to the City Attorney for appropriate legal proceedings.

**SUBCONTRACTS** - Each prime Contractor or Subcontractor shall include the equal opportunity clause in each of its subcontracts.

**APPENDIX F:  
AFFIRMATIVE ACTION REQUIREMENTS  
EQUAL EMPLOYMENT OPPORTUNITY**

**For all Non-Exempt Construction Contracts to be awarded  
by the City and County of Denver, Department of Public Works**

**NOTICE**

EACH BIDDER, CONTRACTOR OR SUBCONTRACTOR (HEREINAFTER THE CONTRACTOR) MUST FULLY COMPLY WITH THE REQUIREMENTS OF THESE BID CONDITIONS AS TO EACH CONSTRUCTION TRADE IT INTENDS TO USE ON THIS CONSTRUCTION CONTRACT, AND ALL OTHER CONSTRUCTION WORK (BOTH CITY AND NON-CITY) IN THE DENVER AREA DURING THE PERFORMANCE OF THIS CONTRACT OR SUBCONTRACT. THE CONTRACTOR COMMITS ITSELF TO THE GOALS FOR MINORITY MANPOWER UTILIZATION, AS APPLICABLE, AND ALL OTHER REQUIREMENTS, TERMS AND CONDITION OF THESE BID CONDITIONS BY SUBMITTING A PROPERLY SIGNED BID. THE CONTRACTOR SHALL APPOINT A COMPANY EXECUTIVE TO ASSUME THE RESPONSIBILITY FOR THE IMPLEMENTATION OF THE REQUIREMENTS, TERMS AND CONDITIONS OF THESE BID CONDITIONS.

Manager of Public Works  
City and County of Denver



A. REQUIREMENTS - AN AFFIRMATIVE ACTION PLAN:

Contractors shall be subject to the provisions and requirements of these bid conditions including the goals and timetables for minority\* and female utilization, and specific affirmative action steps set forth by the Division of Small Business Opportunity. The contractor's commitment to the goals for minority, and female utilization as required constitutes a commitment that it will make every good faith effort to meet such goals.

1. GOALS AND TIMETABLES:

The goals and timetables for minority and female participation, expressed in percentage terms for the contractor's aggregate workforce in each trade are as follows:

GOALS FOR MINORITY PARTICIPATION FOR EACH TRADE	GOALS FOR FEMALE PARTICIPATION FOR EACH TRADE
From January 1, 1982 to Until Further Notice	From January 1, 1982 to Until Further Notice
21.7% - 23.5%	6.9%

The goals for minority and female utilization above are expressed in terms of hours of training and employment as a proportion of the total number of hours to be worked by the contractor's aggregate workforce, which includes all supervisory personnel, in each trade, on all projects for the City and County of Denver during the performance of its contract (i.e., The period beginning with the first day of work on the City and County of Denver funded construction contract and ending with the last day of work).

The hours of minority and female employment and training must be substantially uniform throughout the length of the contract in each trade and minorities and females must be employed evenly on each of a contractor's projects. Therefore, the transfer of minority or female employees from contractor to contractor or from project to project for the purpose of meeting the contractor's goals shall be a violation of these Bid Conditions.

If the Contractor counts the nonworking hours of apprentices they must be employed by the Contractor during the training period; the Contractor must have made a commitment to employ apprentices at the completion of their training subject to the availability of employment opportunities; and the apprentices must be trained pursuant to training programs approved by the Bureau of Apprenticeship and Training.

\* "Minority" is defined as including, Blacks, Spanish Surname Americans, Asian Americans, and American Indians, and includes both minority men and women.

## 2. SPECIFIC AFFIRMATIVE ACTION STEPS:

If contractor shall be found to be in noncompliance solely on account of its failure to meet its goals, but will be given an opportunity to demonstrate that the contractor has instituted all the specific affirmative action steps specified and has made every good faith effort to make these steps work toward the attainment of its goals within the timetables, all to the purpose of expanding minority and female utilization in its aggregate workforce A contractor, who fails to comply with its obligation under the Equal Opportunity Clause of its contract and fails to achieve its commitments to the goals for minority and female utilization has the burden of proving that it has engaged in an Affirmative Action Program directed at increasing minority and female utilization and that such efforts were at least as extensive and as specific as the following:

- a. The Contractor should have notified minority and female organizations when employment opportunities were available and should have maintained records of the organization's response.
- b. The Contractor should have maintained a file of the names and addresses of each minority and female referred to it by any individual or organization and what action was taken with respect to each such referred individual, and if the individual was not employed by the Contractor, the reasons. If such individual was sent to the union hiring hall for referral and not referred back by the union or if referred, not employed by the Contractor, the file should have documented this and their reasons.
- c. The Contractor should have promptly notified the Department of Public Works, and the Division of Small Business Opportunity when the union or unions with which the Contractor has collective bargaining agreements did not refer to the contractor a minority or female sent by the contractor, or when the Contractor has other information that the union referral process has impeded efforts to meet its goals.
- d. The Contractor should have disseminated its EEO policy within its organization by including it in any employee handbook or policy manual; by publicizing it in company newspapers and annual reports and by advertising such policy as reasonable intervals in union publications. The EEO policy should be further disseminated by conducting staff meetings to explain and discuss the policy; by posting of the policy; and by review of the policy with minority and female employees.
- e. The Contractor should have disseminated its EEO policy externally by informing and discussing it with all recruitment sources; by advertising in news media, specifically including minority and female news media; and by notifying and discussing it with all subcontractors.
- f. The Contractor should have made both specific and reasonably recurrent written and oral recruitment efforts. Such efforts should have been directed at minority and female organizations, schools with substantial minority and female enrollment, and minority and female recruitment and training organizations within the Contractor's recruitment area.

- g. The Contractor should have evidence available for inspection that all tests and other selection techniques used to select from among candidates for hire, transfer, promotion, training, or retention are being used in a manner that does not violate the OFCCP Testing Guidelines in 41 CFR Part 60-3.
- h. The Contractor should have made sure that seniority practices and job classifications do not have a discriminatory effect.
- i. The Contractor should have made certain that all facilities are not segregated by race.
- j. The Contractor should have continually monitored all personnel activities to ensure that its EEO policy was being carried out including the evaluation of minority and female employees for promotional opportunities on a quarterly basis and the encouragement of such employees to seek those opportunities.
- k. The Contractor should have solicited bids for subcontracts from available minority and female subcontractors engaged in the trades covered by these Bid Conditions, including circulation of minority and female contractor associations. NOTE: The Director and the Division of Small Business Opportunity will provide technical assistance on questions pertaining to minority and female recruitment sources, minority and female community organizations, and minority and female news media upon receipt of a request for assistance from a contractor.

3. NONDISCRIMINATION:

In no event may a contractor utilize the goals and affirmative action steps required in such a manner as to cause or result in discrimination against any person on account of race, color, religion, sex, marital status, national origin, age, mental or physical handicap, political opinion or affiliation.

4. COMPLIANCE AND ENFORCEMENT:

In all cases, the compliance of a contractor will be determined in accordance with its obligations under the terms of these Bid Conditions. All contractors performing or to perform work on projects subject to these Bid Conditions hereby agree to inform their subcontractors in writing of their respective obligations under the terms and requirements of these Bid Conditions, including the provisions relating to goals of minority and female employment and training.

A. CONTRACTORS SUBJECT TO THESE BID CONDITIONS:

In regard to these Bid Conditions, if the Contractor meets the goals set forth therein or can demonstrate that it has made every good faith effort to meet these goals, the Contractor shall be presumed to be in compliance with Article m, Division 2 of Chapter 28 of the Denver Revised Municipal Code, the implementing regulations and its obligations under these Bid Conditions. In the event, no formal sanctions or proceedings leading toward sanctions shall be instituted unless

the contracting or administering agency otherwise determines that the contractor is violating the Equal Opportunity Clause.

1. Where the Division of Small Business Opportunity finds that a contractor failed to comply with the requirements of Article III, Division 2 of Chapter 28 of the Denver Revised Municipal Code or the implementing regulations and the obligations under these Bid Conditions, and so informs the Manager, the Manager shall take such action and impose such sanctions, which include suspension, termination, cancellation, and debarment, as may be appropriate under the Ordinance and its regulations. When the Manager proceeds with such formal action it has the burden of proving that the Contractor has not met the goals contained in these Bid Conditions. The Contractor's failure to meet its goals shall shift to it the requirement to come forward with evidence to show that it has met the good faith requirements of these Bid Conditions.
2. The pendency of such proceedings shall be taken into consideration by the Department of Public Works in determining whether such contractor can comply with the requirements of Article III, Division 2 of Chapter 28 of the Denver Revised Municipal Code, and is therefore a "responsible prospective contractor".
3. The Division of Small Business Opportunity shall review the Contractor's employment practices during the performance of the contract, If the Division of Small Business Opportunity determines that the Contractor's Affirmative Action Plan is no longer an acceptable program, the Director shall notify the Manager.

**B. OBLIGATIONS APPLICABLE TO CONTRACTORS:**

It shall be no excuse that the union with which the Contractor has a collective bargaining agreement providing for exclusive referral failed to refer minority or female employees, Discrimination in referral for employment, even if pursuant to provisions of a collective bargaining agreement, is prohibited by the National Labor Relations Act, as amended, Title VI of the Civil Rights Act of 1964, as amended, and Article Division 2 of Chapter 28 of the Denver Revised Municipal Code. It is the policy of the Department of Public Works that contractors have a responsibility to provide equal employment opportunity, if they wish to participate in City and County of Denver contracts. To the extent they have delegated the responsibility for some of their employment practices to a labor organization and, as a result, are prevented from meeting their obligations pursuant to Article m, Division 2 of Chapter 28 of the Denver Revised Municipal Code, such Contractors cannot be considered to be in compliance with Article m, Division 2 of Chapter 28 of the Denver Revised Municipal Code, or its implementing rules and regulations.

**C. GENERAL REQUIREMENTS:**

Contractors are responsible for informing their subcontractors in writing regardless of tier, as to their respective obligations. Whenever a Contractor subcontracts a portion of work in any trade covered by these Bid Conditions, it shall include these Bid Conditions in such subcontractors and each subcontractor shall be bound by these Bid Conditions to the full extent as if it were the

prime contractor. The Contractor shall not, however, be held accountable for the failure of its subcontractors to fulfill their obligations under these Bid Conditions. However, the prime contractor shall give notice to the Director of any refusal or failure of any subcontractor to fulfill the obligations under these Bid Conditions. A subcontractor's failure to comply will be treated in the same manner as such failure by a prime contractor.

1. Contractors hereby agree to refrain from entering into any contractor contract modification subject to Article III, Division 2 of Chapter 28 of the Denver Revised Municipal Code with a contractor debarred from, or who is determined not to be a "responsive" bidder for the City and County of Denver contracts pursuant to the Ordinance.
2. The Contractor shall carry out such sanctions and penalties for violation of these Bid Conditions and the Equal Opportunity Clause including suspension, termination and cancellation of existing subcontracts and debarment from future contracts as may be ordered by the Manager pursuant to Article III, Division 2 of Chapter 28 of the Denver Revised Municipal Code and its implementing regulations.
3. Nothing herein is intended to relieve any contractor during the term of its contract from compliance with Article M, Division 2 of Chapter 28 of the Denver Revised Municipal Code, and the Equal Opportunity Clause of its contract with respect to matters not covered in these Bid Conditions.
4. Contractors must keep such records and file such reports relating to provisions of these Bid Conditions as shall be required by the Division of Small Business Opportunity.
5. Requests for exemptions from these Bid Conditions must be made in writing, with justification, to the Manager of Public Works, City and County Building, Room 379, Denver, Colorado 80202, and shall be forwarded through and with the endorsement of the Director of the Division of Small Business Opportunity.

## 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.

# PROJECT MANUAL



DENVER  
INTERNATIONAL  
AIRPORT

Trautman & Shreve, Inc.

**Concourse B PCA Replacement  
(RE-BID)**

**CONTRACT NO. 201418277**

## **Volume I**

### **Technical Specifications**

*Issued for Construction July 2015*

CITY & COUNTY OF DENVER  
DEPARTMENT OF AVIATION

**CONCOURSE B PCA EQUIPMENT REPLACEMENT**

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**CONCOURSE B PCA EQUIPMENT REPLACEMENT**

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## DIVISION 1 – GENERAL REQUIREMENTS

### SECTION 01010

#### SUMMARY OF WORK

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

###### A. General

1. 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.
2. 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.

###### B. The project consists of but is not limited to the following project elements

1. Removal and replacement of select Pre-Conditioned Air (PCA) units on Concourse B.
2. Provide for ramp mounted PCA units at select locations
3. Modify unit supports that provide for the attachment of the new units to the existing Passenger Loading Bridges (PLB).
4. Modify the electrical service to the new PCA units
5. Work will only be allowed on one PLB at a time and be coordinated with the CCD Project Manager.

##### 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. 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**

## 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 DIA Project Manager, Josh Spoon, telephone (303) 342-4477, 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. Environmental Impact Statement (EIS)
  2. Geotechnical Reports
    - a. Borings, other field and laboratory explorations and investigations have been made to indicate subsurface materials at particular locations. Explorations and investigations conducted by designers and their subconsultants are solely for the purpose of study and design.
    - b. The subsurface exploration and investigation information is presented or made available to indicate some of the conditions that may be encountered during construction and is offered as supplementary information only. Geotechnical information presented in the referenced material represents the opinion of soils consultants as to the character of the materials encountered. Subsurface information was directly obtained only at the specified location and necessarily indicates subsurface conditions only at the respective plan location, depths penetrated and only at the time of the exploration.
    - c. Neither the City nor the Designers assume any responsibility whatever in respect to the sufficiency or accuracy of borings made, or of the logs of test borings, or of other investigations, or of the interpretations made thereof, and there is no warranty or guarantee, either expressed or implied, that the conditions indicated by such investigations are representative of those existing throughout such area, or any part thereof, or that unforeseen developments may not occur. It is expressly understood that the making of deductions, interpretations and conclusions from all of the accessible factual information, including the nature of the materials to be excavated, the difficulties of doing other work affected by the geology, groundwater elevations and other subsurface conditions at the site of the Work are the Contractor's sole responsibility.
    - d. Information derived from inspection of logs of borings, topographic maps, technical memorandum, reports or plans showing information of the subsurface of site conditions will not relieve the Contractor from any risk or from properly examining the site and making such additional investigations as he may elect or from properly fulfilling all the terms of the contract documents.
  3. Available Geotechnical Reports:
    - Geotechnical Engineering Study
    - Pikes Peak Remote Parking Expansion
    - Denver International Airport
    - Denver, Colorado
    - January 24, 2000

Prepared by Goodson & Associates, Inc.  
Available at HDR Engineering, Inc.

**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**

## 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.
7. Due to impacts of other DIA Projects on Concourse B, Work on each passenger loading bridge is limited to night time hours only (approximately 11:00pm – 5:00am as directed by the Project Manager and coordinated with the Airlines). The contractor shall ensure that the passenger loading bridge is operational at the start of daytime operations.

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. Interruptions or system shut down shall be limited to between the hours of 11:00 p.m. and 5:30 a.m. 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 AC150/5370-2C, "Operational Safety on Airports During Construction", FAR Part 139 and FAR Part 107 except as herein modified.

F. 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.

G. 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.

H. 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).

I. 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.

J. 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 -**

### **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 AC150/5370-2E, "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 AC150/5370-2E. 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 AC150/5370-2E, "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 AC150/5370-2E. 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 datum. 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's 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:
- |                                 |                    |              |
|---------------------------------|--------------------|--------------|
| Qwest 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                 | Catherine Rafferty | 303-342-4461 |
| DIA Sanitary Sewer              | Catherine Rafferty | 303-342-4461 |
| Denver Water Department         | John Bambei        | 303-628-6669 |
| Inland Technologies             | Brian Stierman     | 303-342-6811 |
| Fuel System (ASII)              | Gil Patron         | 303-342-3552 |
| Premise Wiring System           | Kelan Pape         | 303-342-2200 |
| FAA Duct Bank                   | Rick Silva         | 303-342-1405 |
| 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 (303) 534-6700 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:

<u>Overweight (pounds)</u>	<u>Price Reduction (dollars)</u>
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 lbs., or fraction thereof, or 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, whichever 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 an IBM compatible computer with a 286, 386, 486 or Pentium processor. 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**

## 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 METHOD OF PAYMENT

- A. 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.
- B. When and where required, the Contractor shall develop appropriate coordination drawings for use by interfacing adjacent parties using the Denver International Airport site.
- C. DIA project manager and Contractor shall coordinate who will be working in the area of the project limits.

#### PART 2 - PRODUCTS (NOT USED)

#### PART 3 - EXECUTION (NOT USED)

#### PART 4 - MEASUREMENT

- A. No separate measurement shall be made for work under this Section.

**PART 5 - 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 addresses 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**

## 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:

ALA	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
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
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**

## 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 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 Elastomerics 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**

## 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 fire fighting 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 paper 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

##### 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 CONSTRUCTION OPERATIONAL SAFETY PLAN

- A. Scope: The Contractor's Operational Safety Plan covers 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 250 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 paper 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 fire fighting 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 paper 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**

## 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**

## 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.

##### 2.02 ELECTRONIC SUBMITTALS

- A. All submittals shall be delivered to the DIA Project Manager in electronic format.
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: CEXXXXX-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.
  - 1. Contact Brendan Dillon at [Brendan.Dillon@flydenver.com](mailto:Brendan.Dillon@flydenver.com) (Ph: 303.342.2676) to coordinate all BIM submittal requirements.

### 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 either 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.

## **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**

## 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 be 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 listed below:
1. Products:
    - a. Equipment Name #1
    - b. Equipment Name #2
  2. 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**

## 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 for submittal procedures.
- B. Submit digital photographs of such quality that when printed in 8x10 inch 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 01400

### CONTRACTOR QUALITY CONTROL

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. This Section identifies the Quality Control activities to be performed during all phases of the contract by the Contractor.
- B. The Contractor shall have in place his Quality Control Program as necessary to ensure that all materials and work are completed in compliance with contract documents. The Contractor is solely responsible for Quality Control and shall provide the necessary quality control personnel to assure that all materials, workmanship, and tests are in conformance with the project documents with the exception of those tests and/or audits that may be conducted by the City as defined in the contract documents.
- C. Test schedules and/or testing requirements for materials used on this project are included in the technical specifications. Laboratory and field testing identified in the technical specifications shall be conducted by an Independent Testing Agency (ITA) retained by the Contractor.

##### 1.02 SUBMITTALS

- A. Refer to Technical Specification Section 01300 and Technical Specifications Section 01340, for submittal requirements.
- B. Quality Control Plan: Within 10 days after Notice to Proceed, the Contractor shall submit a Quality Control Plan for review and acceptance. The Quality Control Plan shall be accepted by the DIA Project Manager prior to any work or materials remaining in place. Acceptance by the DIA Project Manager does not relieve the Contractor of compliance with the contract requirements. The Contractor Quality Control Plan shall address the following as a minimum:
  - 1. A general description of Quality Control monitoring to be performed until final acceptance by DIA. Include monitoring activities of Work and the worksite during times that no construction activity is scheduled to take place.
  - 2. An individual designated by the Contractor whose sole responsibility is Quality Control Management. This individual shall be highly qualified in all phases of construction as it relates to this project and shall have the authority to direct work changes required to bring the Work into conformance with contract requirements, including stopping non-conforming work in progress. This individual cannot be Contractor's Project Manager or Project Superintendent. A resume of the proposed Quality Control Manager including applicable education, experience and certifications shall be included in the Quality Control Plan.
  - 3. Quality Control inspection staff as needed to assist the Quality Control Manager with implementation of the Quality Control Program. Duties of the Quality Control Inspectors shall be limited strictly to inspection of the ongoing work. Sampling and testing of materials shall be performed by Quality Control personnel other than Quality Control Inspectors. Quality Control Inspectors shall inspect only those work elements for which they are qualified. Resumes of the proposed Quality Control Inspectors including applicable education, experience and certifications shall be included in the Quality

Control Plan.

4. An Organization Chart identifying all Quality Control staff by name and function. The chart shall indicate the total staff required to implement all elements of the Quality Control Program, including inspection and testing for each item of work. If necessary, different Quality Control staff can be utilized for specific inspection and testing functions for different items of work. The chart shall show that the Quality Control Manager, Quality Control Inspectors, and Quality Control testing personnel are outside of the production staff with clear lines of authority for Quality Control.
  5. Each technical specification division's requirements for quality control identifying each item requiring submittal and approval/acceptance prior to installation of work, all inspections to be performed during work and prior to acceptance of work, each item of work requiring testing by the independent testing agency, and the testing frequency.
  6. Establish controls and documentation format to ensure that items or materials that have been accepted through receiving inspection are used or installed. Identification and traceability shall be provided throughout all inspections, test activities and records. For stored items, provisions shall be made for the control of item/material identification, consistent with the expected duration and type of storage.
  7. A methodology of monitoring, testing and exercising of all equipment, valves and/or assemblies to ensure the Work installed is in proper working order.
  8. A list of suppliers and subcontractors. This list shall include items to be supplied by each supplier and/or subcontractor and shall identify work to be performed by each subcontractor. The list shall be updated and resubmitted as required.
  9. Emergency contact information including name, company, title, work phone number, home phone number and other means of contact. The Emergency Contact list shall include at least four individuals. The Emergency Contact list shall be maintained on a daily basis. In the event there is any change in any of the information, the Contractor shall forward the updated list to the Project Manager and to DIA Maintenance Control (303-342-2800). The Emergency Contact list shall include the project number, project title and date of issue.
- C. Contractor's Daily Quality Control Inspection Report:
1. Contractor's Daily Quality Control Inspection Reports shall be completed on the form included in Technical Specifications Section 01999. The reports shall be written by the Quality Control Manager and all Inspectors. The Quality Control Manager and Inspectors may add sheets of information to this form as required. The report shall address as a minimum the following: the work requiring inspection identified by the technical item number and description, results of the inspections, material compliance with approved submittals, proper storage of materials and equipment, adherence to plans and technical specifications, review and description of quality control tests, compliance of testing frequencies, location and nature of defects or deviations found, causes for rejection, and corrections required to bring the Work into conformance with the contract.
  2. Contractor's Daily Quality Control Inspection Reports shall be computerized or typed and may contain an electronic signature of the author. Reports shall be transmitted to the DIA Project Manager electronically on the following work day.
- D. Corrective Action Report (CAR)
1. Conditions adverse to quality will be reviewed by the Contractor to determine the cause and to recommend a corrective action that will preclude recurrence. The condition, its

cause and the corrective action planned shall be reported to the Project Manager prior to implementation. Follow-up action shall be taken to verify implementation of the corrective action. The Contractor will document the corrective action and a copy of the Corrective Action Report (CAR) will be transmitted to the DIA Project Manager.

### 1.03 DOCUMENTATION

- A. The Contractor shall not change or alter approved submittals, procedures, specifications, drawings or other pertinent documentation without the Project Manager's written authorization.
- B. All records and documents that are quality related shall be prepared, identified and maintained by the Contractor and shall be made available to DIA upon request. Records shall be protected from damage, deterioration or loss. A copy of the records and documents shall be maintained at the Work site at all times unless the Project Manager has approved other locations in writing. Retention time for all quality records shall be not less than three years from date of Final Acceptance of the contract.
- C. The Contractor shall maintain records at the actual worksite and at Contractor's office to show the inspection status of materials and items installed in order to ensure that the required inspections and tests have been performed in a timely and correct manner.

### 1.04 INSPECTIONS AND TESTS

- A. Inspections, tests and system shut down requests, 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. The Contractor's designated Quality Control Representative shall inspect the work and shall ensure the work complies with the contract requirements prior to any requests for inspection or testing.
- B. When the specifications, laws, ordinances, rules, regulations or orders of any public agency having jurisdiction require the Project Manager's surveillance of inspections or tests, the Contractor shall notify the Project Manager of the place, date and time 48 hours prior to the inspection and/or test. The Contractor shall be responsible for notifying and requesting inspection by other agencies including but not limited to the Denver Building Inspection Division, Denver Fire Department and Denver Water Department. Prior to request for other agency inspections, the Contractor shall meet and plan inspection times with the Project Manager and or the Project Manager's designated representative.
- C. Special inspections or tests may be required by the technical specifications, City, State and/or Federal Agencies in addition to those tests already performed. The Contractor shall notify the Project Manager at least 48 hours in advance of the additional inspections or tests.
- D. Quantities will be verified as defined in the Pre-Work Meetings.

### 1.05 INSPECTION PLAN

- A. The Contractor shall utilize the following six-point inspection plan to ensure the conformance of the Work performed by the Contractor meets the requirements of the contract drawings and specifications, the referenced codes and standards and the approved submittals:
  - 1. Prework Coordination: Prior to the start of construction work on the contract and prior to the start of work under each separate specification section and prior to the start of work where a change in a construction operation is contemplated by the Contractor and prior to a new subcontractor starting work, a coordination meeting will be held with the

- Contractor's superintendent, Quality Control and Safety representative(s), the ITA representative, the DIA Project Manager and DIA inspectors. Supervisory, Safety and Quality Control, representatives of all applicable subcontractors will also attend. Prior to the meeting, the Contractor's Quality Control Manager shall provide the DIA Project Manager with a meeting agenda for review. The Contractor's Quality Control Manager shall conduct the meeting and distribute the approved agenda. The Quality Control Manager shall develop and electronically distribute finalized meeting minutes within 24 hours upon completion of the meeting.
2. The purpose of the meeting is to ensure that the Contractor's personnel have no misunderstandings regarding their safety and quality procedures as well as the technical requirements of the contract. The following items shall be presented and reviewed by the Contractor:
    - a. Contract requirements and specifications
    - b. Shop drawings, certifications, submittals and as-built drawings
    - c. Testing and inspection program and procedures
    - d. Contractor's Quality Control program
    - e. Familiarity and proficiency of the Contractor's and subcontractor's workforce to perform the operation to required workmanship standards including certifications of installers
    - f. Safety, security and environmental precautions to be observed
    - g. Any other preparatory steps dependent upon the particular operation
    - h. The Contractor's means and methods for performing the Work.
  3. Initial Inspection: Upon completion of a representative sample of a given feature of the Work and no later than two weeks after the start of a new or changed operation, the Project Manager and/or the Project Manager's designated representatives will meet with the Contractor's Quality Control representative and applicable subcontractor's supervisor and their Quality Control representatives to check the following items, as a minimum:
    - a. Workmanship to established quality standards
    - b. Conformance to contract drawings, specifications and the accepted shop drawings
    - c. Adequacy of materials and articles utilized
    - d. Results of inspection and testing methods
    - e. Adequacy of as-built drawings maintained daily.
  4. Once accepted, the representative sample will become the physical baseline by which ongoing work is compared for quality and acceptability. To the maximum practical extent, approved representative samples of work elements shall remain visible until all work in the appropriate category is complete. Acceptance of a sample does not waive or alter any contract requirements or show acceptance of any deviation from the contract not approved in writing by the Project Manager.
  5. Follow-up Inspection: The Contractor's Quality Control representative will monitor the work to review the continuing conformance of the work to the workmanship standards established during the preparatory and initial inspections.
  6. Completion Inspection: Forty-eight hours prior to the completion of an item or segment of work and prior to covering up any work, the Contractor will notify the Project Manager who will verify that the segment of work is substantially complete, all inspections and tests have been completed and the results are acceptable. The purpose of this inspection is to allow further corrective work upon, or integral to, the completed segment of work. THIS IS NOT AN ACCEPTANCE INSPECTION. If any items are determined

to be deficient, need correction or are non-conforming, a Deficiency List will be prepared and issued to the respective Contractor for correction, repair or replacement of any deficient or non-conforming items. The Project Manager and Contractor's Quality Control representative will verify the correction of the deficient and/or non-conforming items prior to the start of the next operation.

7. Pre-Final Acceptance Inspection: Prior to requesting a Pre-Final Acceptance Inspection by DIA, all work and operational systems to be inspected shall be satisfactorily completed and tested by the Contractor. The Contractor's written request for this inspection shall be made 72 hours in advance. With the request shall come a list of any known deficiencies and when they will be corrected. If the list is too large or contains too many significant items, in the opinion of the Project Manager, no inspection will be held because of the incompleteness of the work.
8. The Project Manager will schedule the Pre-Final Acceptance Inspection and will prepare a list of deficient items (punch list) discovered during the inspection. If during the inspection the list becomes too large or too many significant items are on the list, the inspection will be canceled. After the inspection is completed, the Deficiency List will be transmitted to the Contractor for correction of the deficient items.
9. Final Acceptance Inspection: After the Contractor has completed all items on the Deficiency List (generated from the Pre-Final Acceptance Inspection) he shall request a Final Acceptance Inspection. The request shall be made in writing at least 72 hours in advance of the inspection. All areas must be cleaned and ready for turnover prior to this inspection. The Project Manager, the design consultant, a representative of the funding agency (if applicable) and other interested parties will inspect the subject Work to ensure that all deficiencies have been satisfactorily attended to and that no new deficiencies have appeared and that all systems are completely functional. Any outstanding or additional deficient items will be noted and handled per the requirements of the Pre-Final Acceptance Inspection noted above until the Work is acceptable to the Project Manager.

#### **1.06 SAMPLES**

- A. The Contractor shall maintain at the worksite a copy of all samples submitted and accepted by DIA. Samples shall be made available to the designer or the Project Manager's designated representatives for review and comparison in the field. The Project Manager prior to use on the project must accept all items and materials.
- B. The installed work will be compared to the samples and if any of the work is not of the same quality, material, finish, color, texture or appearance as the sample, that portion that is not the same will be considered defective and in nonconformance.
- C. Contractor selection of samples will only be considered if taken at random. The Contractor shall permit representatives of DIA 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.
- D. The Contractor is obligated to correct any item deemed deficient.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 - EXECUTION**

#### **3.01 REQUIREMENTS**

- A. All materials required for the contract shall be new except where specified otherwise. The Project Manager may elect to perform additional inspections and/or tests at the place of the manufacture, the shipping point or at the destination to verify conformance to applicable specifications. Inspections and tests performed by DIA shall not relieve the Contractor from the responsibility to meet the specifications, nor shall such inspections/tests be considered a guarantee for acceptance of materials that will be delivered at a later time.
- B. The Contractor is obligated to correct or remove non-conforming 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, removal and/or replacement of defective materials by others, in which case the Contractor shall bear all costs incurred by such actions.
- C. Materials accepted on the basis of a Certificate of Compliance may be sampled and inspected/tested by DIA or its designer 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 that conform to the specifications.
- D. The Contractor shall impose upon his suppliers the same quality control requirements, including inspection and test procedures, as imposed upon him by the specifications and referenced standards. The Contractor shall apply appropriate controls, designed to ensure that all materials supplied meet the requirements and specifications.

#### **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. If the City is required to re-inspect work or conduct a special test because a previous inspection, requested by the Contractor, 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 01400**

## 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. 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**

## SECTION 01402

### DIA QUALITY ASSURANCE

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. This Section identifies DIA Inspection activities to be performed by inspectors employed by DIA 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 DIA. Technical specifications may contain requirements more stringent than Building Inspection Division or other code agency requirements.

##### 1.02 RELATED DOCUMENTS

- A. Technical Specifications Section 01400 – “Contractor Quality Control”
- B. General Conditions Title 17, Section 1701 – “Construction Inspection by the City”
- C. General Conditions Title 17, Section 1702 – “Authority of Inspectors”
- D. General Conditions Title 17, Section 1703 – “Observable Defects”
- E. General Conditions Title 17, Section 1704 – “Defects – Uncovering Work”
- F. General Conditions Title 17, Section 1705 – “Latent Defects”
- G. General Conditions Title 17, Section 1706 – “Removal of Defective Materials and Work”.

#### 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 the manufacture, the shipping point or at the destination to verify conformance to applicable specifications. Inspections and tests performed by DIA 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.
- C. Should the Project Manager conduct plant inspections the following conditions shall exist:

1. The Project Manager shall have the cooperation and assistance of the Contractor and the producer with whom the Contractor has contracted for materials.
  2. 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.
  3. 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.
- D. It is understood and agreed that DIA shall have the right to re-test at DIA's expense any materials that have been tested and accepted at the source of supply after it has been delivered to the site.

### 3.02 INSPECTIONS AND TESTS

- A. It is understood and agreed that DIA shall have the right to take samples and perform 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 DIA tests fail.
- B. Materials accepted on the basis of a certificate of compliance may be sampled and inspected/tested by DIA or its designer 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 that conform to the specifications.
- C. DIA 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 01400.

### 3.03 NONCONFORMING WORK AND MATERIALS

- A. Remedial Action Request (RAR)
1. The Project Manager will request the Contractor to take remedial action when nonconforming work is discovered and/or when test results indicate nonconforming work.
  2. 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.
  3. 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.
  4. 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. Nonconformance Report (NCR)
1. The Project Manager will issue a Nonconformance Report to the Contractor whenever there are violations of the terms of the contract that cannot be immediately brought back into conformance, including materials received and/or items of the work found not to be in conformance 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'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 Project Manager will make the disposition of nonconforming items/materials.
- C. The Contractor is obligated to correct any item deemed deficient.

#### **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 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 \$75.00 per man-hour.

**END OF SECTION 01402**

## SECTION 01403

### CONTRACTOR QUALITY CONTROL PROGRAM

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. The Contractor shall establish, provide and maintain an effective Quality Control Program that details the methods and procedures that will be taken to ensure that all materials and completed construction required by this contract conform to contract plans, technical specifications and any other requirements, whether manufactured by the Contractor or procured from subcontractors or vendors. Although guidelines are established and certain minimum requirements are specified herein and elsewhere in the contract technical specifications, the Contractor shall assume full responsibility for accomplishing the stated purpose.

##### 1.02 LEVEL OF CONTROL

- A. The intent of this section is to enable the Contractor to establish a necessary level of control that will:
1. Adequately provide for the production of acceptable quality materials
  2. Provide sufficient information to ensure both the Contractor and the DIA Project Manager that the specification requirements are being met
  3. Allow the Contractor as much latitude as possible to develop his or her own standards of control.

##### 1.03 REQUIREMENTS

- A. The Contractor shall be prepared to discuss and present, at the Preconstruction Conference, his/her understanding of the quality control requirements. The Contractor shall not begin any construction or production of materials to be incorporated into the completed work until the Quality Control Program has been reviewed and approved by the DIA Project Manager. No partial payment will be made for materials subject to specific quality control requirements until the Quality Control Program has been reviewed and approved by the DIA Project Manager.
- B. The quality control requirements contained in this section and elsewhere in the contract technical specifications are in addition to and separate from the acceptance testing requirements. Acceptance testing requirements are also the responsibility of the Contractor.

#### PART 2 - PRODUCTS (NOT USED)

#### PART 3 - EXECUTION

##### 3.01 QUALITY CONTROL PROGRAM

- A. GENERAL DESCRIPTION. The Contractor shall establish a Quality Control Program to perform inspection and testing of all items of work required by the technical specifications, including those performed by subcontractors. This Quality Control Program shall ensure conformance to applicable specifications and plans with respect to materials, workmanship, construction, finish, and functional performance. The Quality Control Program shall be effective for control of all construction work performed under this contract and shall

specifically include surveillance and tests required by the technical specifications in addition to other requirements of this section and any other activities deemed necessary by the Contractor to establish an effective level of quality control.

- B. **QUALITY CONTROL PROGRAM.** The Contractor shall describe the Quality Control Program in a written document which shall be reviewed by the DIA Project Manager prior to the start of any production, construction or off-site fabrication. The written Quality Control Program shall be submitted to the DIA Project Manager for review and approval at least five (5) calendar days before the Preconstruction Conference.
- C. The Quality Control Program shall be organized to address, as a minimum, the following items:
  - 1. Quality control organization
  - 2. Project progress schedule
  - 3. Submittals schedule
  - 4. Inspection requirements
  - 5. Quality control testing plan
  - 6. Documentation of quality control activities
  - 7. Requirements for corrective action when quality control and/or acceptance criteria are not met.
- D. The Contractor is encouraged to add any additional elements to the Quality Control Program that he/she deems necessary to adequately control all production and/or construction processes required by this contract.

### **3.02 QUALITY CONTROL ORGANIZATION**

- A. The Contractor's Quality Control Program shall be implemented by the establishment of a separate quality control organization. An organizational chart shall be developed to show all quality control personnel and how these personnel integrate with other management/production and construction functions and personnel.
  - 1. The organizational chart shall identify all quality control staff by name and function and shall indicate the total staff required to implement all elements of the Quality Control Program, including inspection and testing for each item or work. If necessary, different technicians can be utilized for specific inspection and testing functions for different items of work. All personnel used for implementation of all or part of the Quality Control Program shall be subject to the qualification requirements of paragraph 3.02 A and 3.02 B. The organizational chart shall indicate which personnel are Contractor employees and which are provided by an outside organization.
- B. The quality control organization shall consist of the following minimum personnel:
  - 1. **QUALITY CONTROL MANAGER.** The Quality Control Manager shall be a full-time employee of the Contractor or a consultant engaged by the Contractor. The Quality Control Manager shall have a minimum of 10 years of experience in airport and/or highway construction and shall have had prior quality control experience on a project of comparable size and scope as this contract.
  - 2. **QUALITY CONTROL TECHNICIANS.** A sufficient number of Quality Control Technicians necessary to adequately implement the Quality Control Program shall be



provided.

- C. **STAFFING LEVELS.** The Contractor shall provide sufficient qualified quality control personnel to monitor each work activity at all times. Where material is being produced in a plant for incorporation into the work, separate plant and field technicians shall be provided at each plant and field placement location. The scheduling and coordinating of all inspection and testing must match the type and pace of work activity. The Quality Control Program shall state where different technicians will be required for different work elements.

### **3.03 PROJECT PROGRESS SCHEDULE.**

- A. The Contractor shall submit a coordinated construction schedule for all work activities. The schedule shall be prepared as a network diagram in Critical Path Method (CPM), PERT, or other format, or as otherwise specified in the contract. As a minimum, it shall provide information on the sequence of work activities, milestone dates and activity duration.
- B. The Contractor shall maintain the work schedule and provide an update and analysis of the progress schedule on a twice-monthly basis, or as otherwise specified in the contract. Submission of the work schedule shall not relieve the Contractor of overall responsibility for scheduling, sequencing and coordinating all work to comply with the requirements of the contract.

### **3.04 SUBMITTALS SCHEDULE.**

- A. The Contractor shall submit a detailed listing of all submittals (e.g., mix designs, material certifications, etc.) and shop drawings required by the technical specifications. The listing can be developed in a spreadsheet format and shall include:
  - 1. Specification item number
  - 2. Item description
  - 3. Description of submittal
  - 4. Specification paragraph requiring submittal
  - 5. Scheduled date of submittal.

### **3.05 INSPECTION REQUIREMENTS**

- A. The Contractor shall utilize the following six-point inspection plan to ensure the conformance of the Work performed by the Contractor meets the requirements of the contract drawings and specifications, the referenced codes and standards and the approved submittals:
  - 1. **PREWORK COORDINATION.** Prior to the start of construction work on the contract and prior to the start of work under each separate specification section and prior to the start of work where a change in a construction operation is contemplated by the Contractor and prior to a new subcontractor starting work, a coordination meeting will be held with the Contractor's Quality Control Manager, Quality Control and Safety representative(s), the Testing Agency (TA) representative, the DIA Project Manager and DIA inspectors. Supervisory, safety and quality control representatives of all applicable subcontractors will also attend. The DIA Project Manager will chair the meeting. The purpose of the meeting is to ensure the Contractor's personnel have no misunderstandings regarding their safety and quality procedures as well as the technical requirements of the contract. The following items shall be presented and reviewed by the Contractor at the meeting:

- a. Contract requirements and specifications
  - b. Shop drawings, certifications, submittals and as-built drawings that apply
  - c. Testing and inspection program and procedures
  - d. Contractor's Quality Control Program
  - e. Familiarity and proficiency of the Contractor's and subcontractor's workforce to perform the operation to required workmanship standards including certifications of installers
  - f. Safety and environmental precautions to be observed
  - g. Any other preparatory steps dependent upon the particular operation
  - h. The Contractor's means and methods for performing the Work.
2. INITIAL INSPECTION. Upon completion of a representative sample of a given feature of the Work and no later than two weeks after the start of a new or changed operation, the DIA Project Manager or his/hers designated representative will meet with the Contractor's Quality Control representative and applicable subcontractor's supervisor and their Quality Control representatives to check the following items, as a minimum:
- a. Workmanship to established quality standards
  - b. Conformance to contract drawings, specifications and the accepted shop drawings
  - c. Adequacy of materials and articles utilized
  - d. Results of inspection and testing methods
  - e. Adequacy of as-built drawings maintained daily.
  - f. Once accepted, the representative sample will become the physical baseline by which ongoing work is compared for quality and acceptability. To the maximum practical extent, approved representative samples of work elements shall remain visible until all work in the appropriate category is complete. Acceptance of a sample does not waive or alter any contract requirements or show acceptance of any deviation from the contract not approved in writing by the DIA Project Manager. The Contractor's Quality Control representative shall chair, prepare and distribute minutes of Quality Control meetings. Meeting minutes shall be distributed within 24 hours of the meeting.
3. FOLLOW-UP INSPECTION. The Contractor's Quality Control representative will monitor the work to review the continuing conformance of the work to the workmanship standards established during the preparatory and initial inspections.
4. COMPLETION INSPECTION. Forty-eight hours prior to the completion of an item or segment of work and prior to covering up any work, the Contractor will notify the DIA Project Manager who will verify that the segment of work is substantially complete, all inspections and tests have been completed and the results are acceptable. The purpose of this inspection is to allow further corrective work upon, or integral to, the completed segment of work. THIS IS NOT AN ACCEPTANCE INSPECTION. If any items are determined to be deficient, need correction or are non-conforming, a deficiency list will be prepared and issued to the respective Contractor for correction, repair or replacement of any deficient or non-conforming items. The DIA Project Manager and Contractor's Quality Control representative will verify the correction of the deficient and/or non-conforming items prior to the start of the next operation.
5. PRE-FINAL ACCEPTANCE INSPECTION. Prior to requesting a Pre-final Acceptance Inspection by DIA, all work and operational systems to be inspected shall be satisfactorily completed and tested by the Contractor. The Contractor's written request for this inspection shall be made 72 hours in advance. With the request shall come a list of any known deficiencies and when they will be corrected. If the list is too large or contains too many significant items, in the opinion of the DIA Project Manager, no

inspection will be held due to the incompleteness of the work.

- a. The DIA Project Manager will schedule the Pre-final Acceptance Inspection and will prepare a list of deficient items (punch list) discovered during the inspection. If during the inspection the list becomes too large or too many significant items are on the list, the inspection will be canceled. After the inspection is completed, the deficiency list will be transmitted to the Contractor for correction of the deficient items.
6. FINAL ACCEPTANCE INSPECTION. After the Contractor has completed all items on the deficiency list (generated from the Pre-final Acceptance Inspection) he shall request a Final Acceptance Inspection. The request shall be made in writing at least 72 hours in advance of the inspection. All areas must be cleaned and ready for turnover prior to this inspection. The DIA Project Manager, the design consultant, a representative of the funding agency (if applicable) and other interested parties will inspect the subject Work to ensure that all deficiencies have been satisfactorily attended to and that no new deficiencies have appeared and that all systems are completely functional. Any outstanding or additional deficient items will be noted and handled per the requirements of the Pre-final Acceptance Inspection noted above until the Work is acceptable to the DIA Project Manager.

### 3.06 QUALITY CONTROL TESTING PLAN.

- A. As a part of the overall Quality Control Program, the Contractor shall implement a quality control testing plan as required by the technical specifications. The testing plan shall include the minimum tests and test frequencies required by each technical specification Item as well as any additional quality control tests that the Contractor deems necessary to adequately control production and/or construction processes.
- B. The testing plan can be developed in a spreadsheet fashion and shall, as a minimum, include the following:
  1. Specification item number (e.g., P-401)
  2. Item description (e.g., Plan Mix Bituminous Pavements)
  3. Test type (e.g., gradation, grade, asphalt content)
  4. Test standard (e.g., ASTM or AASHTO test number, as applicable)
  5. Test frequency (e.g., as required by technical specifications or minimum frequency when requirements are not stated)
  6. Responsibility (e.g., plant technician)
  7. Control requirements (e.g., target, permissible deviations).
- C. The testing plan shall contain a statistically based procedure of random sampling for acquiring test samples in accordance with ASTM D 3665. The DIA Project Manager shall be provided the opportunity to witness quality control sampling and testing.
- D. All quality control test results shall be documented by the Contractor as required by paragraph 3.07 below.

### 3.07 DOCUMENTATION.

- A. The Contractor shall maintain current quality control records of all inspections and tests performed. These records shall include factual evidence that the required inspections or tests

have been performed, including type and number of inspections or tests involved; results of inspections or tests; nature of defects, deviations, causes for rejection, etc.; proposed remedial action; and corrective actions taken.

- B. These records must cover both conforming and defective or deficient features and must include a statement that all supplies and materials incorporated in the work are in full compliance with the terms of the contract. Legible copies of these records shall be furnished to the DIA Project Manager daily. The records shall cover all work placed subsequent to the previously furnished records and shall be verified and signed by the Contractor's Quality Control Manager.
- C. Specific Contractor quality control records required for the contract shall include, but are not necessarily limited to, the following records:
  - D. Daily Inspection Reports. Each Contractor quality control technician shall maintain a daily log of all inspections performed for both Contractor and subcontractor operations on a form acceptable to the DIA Project Manager. These technician's daily reports shall provide factual evidence that continuous quality control inspections have been performed and shall, as a minimum, include the following:
    - 1. Technical specification item number and description
    - 2. Compliance with approved submittals
    - 3. Proper storage of materials and equipment
    - 4. Proper operation of all equipment
    - 5. Adherence to plans and technical specifications
    - 6. Review of quality control tests
    - 7. Safety inspection.
    - 8. The daily inspection reports shall identify inspections conducted, results of inspections, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed.
    - 9. The daily inspection reports shall be signed by the responsible quality control technician and the Quality Control Manager. The DIA Project Manager shall be provided a minimum of one copy of each daily inspection report on the workday following the day of record.
- E. Daily Test Reports. The Contractor shall be responsible for establishing a system which will record all quality control test results. Daily test reports shall document the following information:
  - 1. Technical specification item number and description
  - 2. Test designation
  - 3. Location
  - 4. Date of test
  - 5. Control requirements
  - 6. Quality Control Charts
  - 7. Test results
  - 8. Causes for rejection

9. Recommended remedial actions
  10. Retests.
  11. Test results from each day's work period shall be submitted to the DIA Project Manager prior to the start of the next day's work period. Any failing test shall be reported separately to a DIA Inspector or the DIA Project Manager within two hours after discovery of the failure. The Contractor shall maintain quality control charts. The daily test reports shall be signed by the responsible quality control technician and the Quality Control Manager. A typed weekly summary shall be submitted to the DIA Project Manager. The number of copies to be provided shall be as directed by the DIA Project Manager.
  12. Field testing/inspection, field density and moisture tests shall be reported in legible draft form immediately at the test site and attached to the daily test report with a summary of test results provided weekly to the DIA Project Manager. If the DIA Inspector is not present for the actual test, the draft results shall be given to the DIA Project Manager at the end of the shift.
  13. Test reports shall include worksheets showing all calculations used to obtain the test results. Certificates of compliance shall be submitted 30 days prior to the product's incorporation into the work. 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.
- F. Contractor Daily Reports. The Contractor shall report daily construction activities using the Daily Construction Report form as included in Specification Section 01999. These daily reports shall include the following:
1. Daily activities
  2. Quantities of material placed
  3. Weather
  4. Equipment on site with time used
  5. Work delays
  6. Possible delays
  7. Materials delivered.
  8. The daily construction reports shall be signed by the responsible foreman. The DIA Project Manager shall be provided a minimum of one copy of each daily construction report on the work day following the day of record.

### **3.08 CORRECTIVE ACTION REQUIREMENTS**

- A. The Quality Control Program shall indicate the appropriate action to be taken when a process is deemed, or believed, to be out of control (out of tolerance) and detail what action will be taken to bring the process under control. The requirements for corrective action shall include both general requirements for operation of the Quality Control Program as a whole, and for individual items of work contained in the technical specifications.
- B. The Quality Control Program shall detail how the results of quality control inspections and tests will be used for determining the need for corrective action and shall contain clear sets of

rules to gauge when a process is out of control and the type of correction to be taken to regain process control.

- C. When applicable or required by the technical specifications, the Contractor shall establish and utilize statistical quality control charts for individual quality control tests. The requirements for corrective action shall be linked to the control charts.

### **3.09 SURVEILLANCE BY THE DIA PROJECT MANAGER**

- A. All items of material and equipment shall be subject to surveillance by the DIA Project Manager at the point of production, manufacture or shipment to determine if the Contractor, producer, manufacturer or shipper maintains an adequate quality control system in conformance with the requirements detailed herein and the applicable technical specifications and plans. In addition, all items of materials, equipment and work in place shall be subject to surveillance by the DIA Project Manager at the site for the same purpose.
- B. Surveillance by the DIA Project Manager does not relieve the Contractor of performing quality control inspections of either on-site or off-site Contractor's or subcontractor's work.

### **3.10 NONCOMPLIANCE**

- A. The DIA Project Manager will notify the Contractor of any noncompliance with any of the foregoing requirements. The Contractor shall, after receipt of such notice, immediately take corrective action. Any notice, when delivered by the DIA Project Manager or his/her authorized representative to the Contractor or his/her authorized representative at the site of the work, shall be considered sufficient notice.
- B. In cases where quality control activities do not comply with either the Contractor's Quality Control Program or the contract provisions, or where the Contractor fails to properly operate and maintain an effective Quality Control Program, as determined by the DIA Project Manager, the DIA Project Manager may:
  - 1. Order the Contractor to replace ineffective or unqualified quality control personnel or subcontractors
  - 2. Order the Contractor to stop operations until appropriate corrective actions are taken.

## **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 01403**

## 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 01411

### SELECTIVE DEMOLITION

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Technical Specifications Section 01566 Environmental Controls

##### 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Demolition and removal of selected portions of a building or structure.
  - 2. Repair procedures for selective demolition operations.

##### 1.03 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction, wrap and label and deliver them to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

##### 1.04 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain DIA's property, demolished materials shall become the Contractor's property and shall be removed from the project site.

##### 1.05 SUBMITTALS

- A. Refer to Technical Specifications Section 01300 and 01340 for submittal procedures.
- B. Qualification Data: For firms and persons specified in Technical Specifications Section 01400 Contractor Quality Control to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Proposed Dust Control and Noise Control Measures: Submit 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.

- D. Submit a Schedule of Selective Demolition Activities that indicates the following:
1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure that DIA's and other tenants' on-site operations are uninterrupted.
  2. Interruption of utility services.
  3. Coordination for shutoff, capping, and continuation of utility services.
  4. Coordination of DIA's continuing occupancy of portions of existing building and of DIA's partial occupancy of completed Work..

#### 1.06 QUALITY CONTROL

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI A10.6 and NFPA 241.
- C. Predemolition Conference: Conduct conference at the Project site with all parties involved with demolition. Review methods and procedures related to selective demolition including, but not limited to, the following:
1. Inspect and discuss condition of construction to be selectively demolished.
  2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

#### 1.07 PROJECT CONDITIONS

- A. Painting: Comply with manufacturer's recommendations for application conditions.
- B. When there are occupied portions of buildings immediately adjacent to selective demolition area, conduct selective demolition so DIA's or tenant's operations will not be disrupted. Provide not less than 72 hours' notice to Project Manager of activities that will affect DIA's or tenant's operations.
- C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.
- D. DIA assumes no responsibility for condition of areas to be selectively demolished. DIA will maintain conditions existing at time of inspection for bidding purpose as far as practical.
- E. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Project Manager.
- F. Storage or sale of removed items or materials on-site will not be permitted.
- G. Utility Service: Maintain existing utilities indicated to remain in service and protect them

against damage during selective demolition operations.

- H. Maintain fire-protection facilities in service during selective demolition operations.

### 1.08 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition by methods and with materials so as not to void existing warranties.
1. If possible, retain 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.
    - a. Ornamental metal
    - b. Preformed metal panels
    - c. Firestopping
    - d. Wall covering
    - e. ProCoat paint finishes
    - f. HVAC enclosures, cabinets or covers.

## PART 2 - PRODUCTS

### 2.01 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that, when installed, will match the visual and functional performance of existing materials, as approved by DIA.
  2. Use materials whose installed performance equal or surpass that of existing materials.
- B. Comply with material and installation requirements specified in individual specification sections.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- B. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- C. When unanticipated mechanical, electrical or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to Project Manager.
- D. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

### 3.02 UTILITY SERVICES

- A. Existing Utilities: Maintain services indicated to remain and protect them against damage

during selective demolition operations.

1. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by the Project Manager and authorities having jurisdiction.

### 3.03 PREPARATION

- A. Site Access and Temporary controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct roads, streets, walks, walkways, or other adjacent occupied or used facilities without written authorization from the Project Manager and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
  2. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
  3. Protect existing site improvements, appurtenances and landscaping.
  4. Erect a plainly visible fence around drip lines of individual trees or around perimeter drip lines of groups of trees.
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities.
1. Provide protection to ensure safe passage of people around selective demolition area, and to and from occupied portions of buildings.
  2. Provide temporary weather protection during intervals between selective demolition operations of existing construction on exterior surfaces and new construction to prevent water leakage and damage to structure and interior areas.
  3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  4. Cover and protect furniture, furnishings and equipment that have not been removed.
- C. Temporary Enclosures: Provide temporary enclosures for protection of existing buildings and construction projects, both in progress and completed, from exposure, foul weather and other construction operations. Provide temporary weather tight enclosures for building exteriors.
1. Where heating or cooling is needed and permanent enclosures are not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
- D. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

### 3.04 SELECTIVE DEMOLITION

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.



2. Neatly cut openings and holes plumb, square and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings that are to remain.
  3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  4. Dispose of demolished items and materials promptly.
  5. Return elements of construction and surfaces that are to remain to the same condition existing before selective demolition operations begin.
- B. Existing Facilities: Comply with DIA's requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.
- C. Removed and Salvaged Items: Comply with the following:
1. Clean all removed and salvaged items.
  2. Pack or crate items after cleaning. Identify contents of containers.
  3. Store items in a secure area until turned over to DIA.
  4. Transport items to DIA's storage area as designated by the Project Manager.
  5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items: Comply with the following:
1. Clean and repair items to a functional condition adequate for the intended reuse. Paint equipment to match new equipment.
  2. Pack or crate items after cleaning. Identify contents of containers
  3. Protect items from damage during transport and storage.
  4. Reinstall items in locations indicated in message schedule. Comply with installation requirements for new materials and equipment. Provide connections, supports and miscellaneous materials necessary to make the items functional for the use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Project Manager, items may be removed to a suitable protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

### 3.05 PATCHING AND REPAIRS

- A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.
- B. Patching: Comply with Technical Specification Section 01410, Cutting and Patching.
- C. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written

recommendations.

- D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.
- E. Floors and Walls: Where walls or partitions that are demolished 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.
  - 1. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements as specified in other sections of these specifications.
  - 2. Where patching occurs on a painted surface, apply primer and intermediate paint coats over the patch and apply a final paint coat over the entire unbroken surface containing the patch. Provide additional coats until the patch blends with adjacent surfaces.
  - 3. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
- F. Ceilings: Patch, repair or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

### **3.06 DISPOSAL OF DEMOLISHED MATERIALS**

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Shall be in accordance with Technical Specifications Section 01566.

## **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 01411**

## 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. A construction office is at the Contractor's option (Project Manager's option).
- 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 levels 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 Qwest 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. 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.

## **PART 5 - PAYMENT**

### **5.01 MOBILIZATION**

- 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.
- 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 City, 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

**END OF SECTION 01505**

## 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://www.flydenver.com/diabiz/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://www.flydenver.com/diabiz/community/enviro/index.asp>. 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 Manager 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. No separate measurement shall be made for work under this Section.

## **PART 5 - PAYMENT**

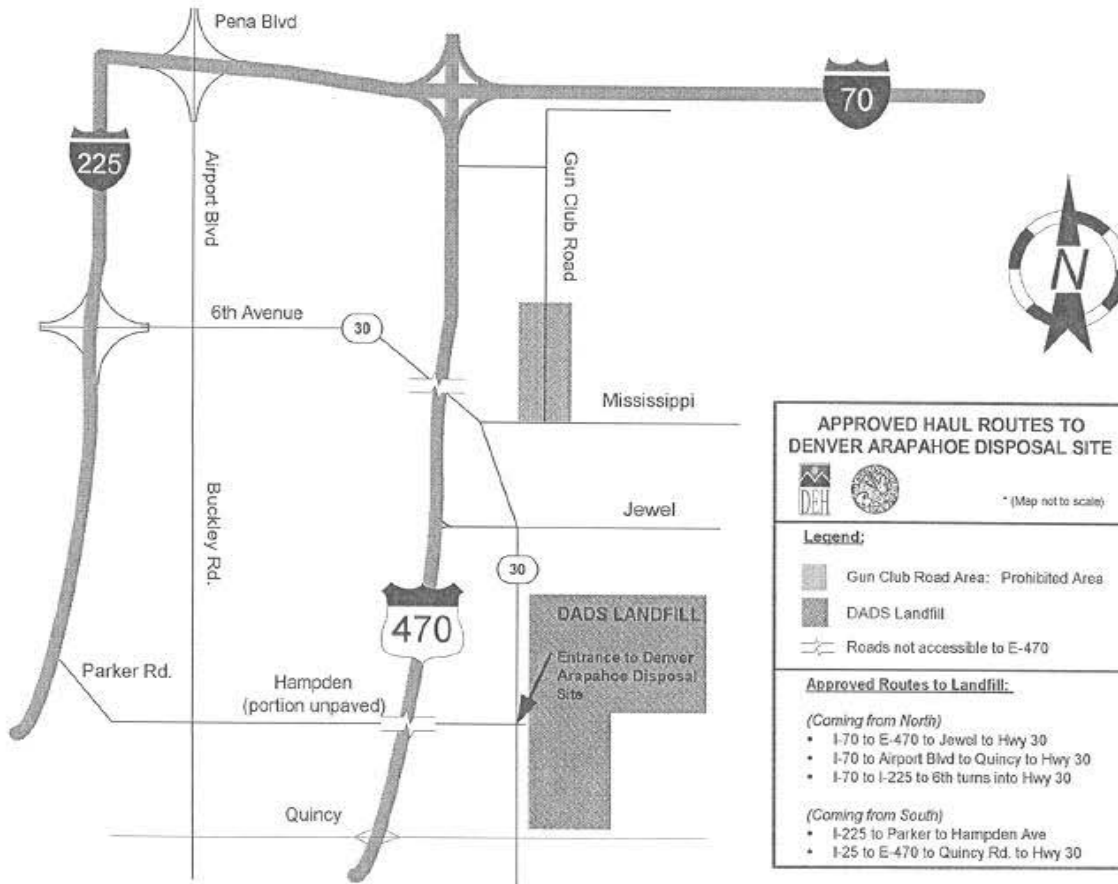
### **5.01 METHOD OF PAYMENT**

- 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

items. The Contractor shall be responsible for payment of all fees associated with review of environmental permit applications and processing of environmental permits.

**EXHIBIT A**

**MAP OF ROUTE TO DADS LANDFILL**



**END OF SECTION 01566**

## 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. No separate measurement shall be made for work under this Section.

#### **PART 5 - PAYMENT**

##### **5.01 METHOD OF PAYMENT**

- A. Payment for Traffic Control under these schedules will be for work performed under the applicable work request lump sum bid item.

**END OF SECTION 01576**

## 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**

## 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**

## 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**

## 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 \$75.00 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 reinspection 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**

## 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.

### **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**

## 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 BUILDING INFORMATION MANAGEMENT (REVIT)

- A. Contact Mark Hughes at [Mark.Hughes@flydenver.com](mailto:Mark.Hughes@flydenver.com) (Ph: 303.214.5620) to coordinate all BIM "Project Record" requirements.

### 3.05 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.
- E. Contact Brendan Dillon at [Brendan.Dillon@flydenver.com](mailto:Brendan.Dillon@flydenver.com) (Ph: 303.214.2676) to coordinate all Building Information Management (BIM) submittal requirements.

##### 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**

**SECTION 01999**  
**STANDARD FORMS**

**PART 1 - GENERAL**

**1.01 FORMS**

- A. The forms listed below and appended to this Section 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.

**1.02 APPENDICES**

- A. Attached to this Technical Specifications Section are the following forms:
1. Daily Quality Control Inspection 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 03 - CONCRETE

### SECTION 03301

#### CAST-IN-PLACE CONCRETE (LIMITED APPLICATIONS)

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.02 SUMMARY

- A. This Section specifies cast-in-place concrete, including reinforcement, concrete materials, mix design, placement procedures, and finishes.

##### 1.03 SUBMITTALS

- A. General: In addition to the following, comply with submittal requirements in ACI 301.
- B. Product Data: For each type of manufactured material and product indicated.
- C. Design Mixes: For each concrete mix.

##### 1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Source Limitations: Obtain each type of cement of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- D. Comply with ACI 301, "Specification for Structural Concrete," including the following, unless modified by the requirements of the Contract Documents.
  - 1. General requirements, including submittals, quality assurance, acceptance of structure, and protection of in-place concrete.
  - 2. Formwork and form accessories.
  - 3. Steel reinforcement and supports.
  - 4. Concrete mixtures.
  - 5. Handling, placing, and constructing concrete.

#### PART 2 - PRODUCTS

## 2.01 FORMWORK

- A. Furnish formwork and form accessories according to ACI 301.

## 2.02 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

## 2.03 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type II.
- B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, not exceeding 1-1/2-inch nominal size.
- C. Water: Potable and complying with ASTM C 94.

## 2.04 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures. Do not use admixtures containing calcium chloride.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

## 2.05 RELATED MATERIALS

- A. Vapor Retarder: Multi-ply reinforced polyethylene sheet, ASTM E 1745, Class C, not less than 7.8 mils thick; or polyethylene sheet, ASTM D 4397, not less than 10 mils thick.
- B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a No. 4 sieve and 10 to 30 percent passing a No. 100 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.
- C. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.

## 2.06 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene

sheet.

- D. Water: Potable.
- E. Clear, Solvent-Borne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- G. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

## 2.07 CONCRETE MIXES

- A. Comply with ACI 301 requirements for concrete mixtures.
- B. Prepare design mixes, proportioned according to ACI 301, for normal-weight concrete determined by either laboratory trial mix or field test data bases, as follows:
  - 1. Compressive Strength (28 Days): 4000 psi.
  - 2. Slump: 4 inches.
    - a. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: Not more than 8 inches after adding admixture to plant- or site-verified, 2- to 3-inch slump.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 6.0 percent within a tolerance of plus 1.0 or minus 1.5 percent.
  - 1. Air content of trowel-finished interior concrete floors shall not exceed 3.0 percent.

## 2.08 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with ASTM C 94.
  - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.
  - 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least one and one-half minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
  - 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
  - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

## PART 3 - EXECUTION



### 3.01 FORMWORK

- A. Design, construct, erect, shore, brace, and maintain formwork according to ACI 301.

### 3.02 VAPOR RETARDER

- A. Install, protect, and repair vapor-retarder sheets according to ASTM E 1643; place sheets in position with longest dimension parallel with direction of pour.
- B. Lap joints 6 inches and seal with manufacturer's recommended tape.
  - 1. Cover vapor retarder with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.

### 3.03 STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
  - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

### 3.04 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Locate and install so as not to impair strength or appearance of concrete, at locations indicated or as approved by Architect.
- C. Isolation Joints: Install joint-filler strips at junctions with slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
  - 1. Extend joint fillers full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
- D. Contraction (Control) Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
  - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
  - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

### 3.05 CONCRETE PLACEMENT

- A. Comply with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- B. Do not add water to concrete during delivery, at Project site, or during placement.

- C. Consolidate concrete with mechanical vibrating equipment.

### 3.06 FINISHING FORMED SURFACES

- A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Completely remove fins and other projections.
  - 1. Apply the following rubbed finish, defined in ACI 301, to smooth-formed finished concrete.
    - a. Smooth-rubbed finish.

### 3.07 FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on the surface.
  - 1. Do not further disturb surfaces before starting finishing operations.
- C. Nonslip Broom Finish: Apply a nonslip broom finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

### 3.08 TOLERANCES

- A. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

### 3.09 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection, and follow recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure formed and unformed concrete for at least seven days by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

### 3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article. Perform tests according to ACI 301.
- B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Tests will be performed according to ACI 301.
  1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

### 3.11 REPAIRS

- A. Remove and replace concrete that does not comply with requirements in this Section.

## 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. The cost of the work described in this Section shall be included in the lump sum contract price.

**END OF SECTION 03301**

**DIVISION 5 – METALS**

**SECTION 05120**

**STRUCTURAL STEEL**

**PART 1 -GENERAL**

**1.01 SUMMARY**

- A. Extent of structural steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.
- B. Structural steel is that work defined in American Institute of Steel Construction (AISC) "Code of Standard Practice" and as otherwise shown on drawings.
- C. Members in a structure that carries an imposed load in addition to their own weight.

**1.02 RELATED DOCUMENTS**

- A. Drawings, general and special conditions, general requirements and other applicable technical specifications apply to work of this Section.

**1.03 RELATED SECTIONS**

- A. Division 5 Section 05999 "Welding". Contractor shall comply with requirements of 05999 Welding in addition to requirements of this section. In the case of a conflict between Section 05999 and this section, the more stringent shall apply.

**1.04 REFERENCE STANDARDS**

- A. Comply with the requirements of the reference standards noted herein, except where more stringent requirements are listed herein or otherwise required by the Contract Documents.

**1.05 SUBMITTALS**

- A. Product Data: Submit producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
  - 1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
  - 2. High-strength bolts (each type), including nuts and washers.
  - 3. Structural steel primer paint.
  - 4. Shrinkage-resistant grout.
  - 5. Welding Electrodes: per Section 05999 Welding
  - 6. Provide fully traceable certificates of compliance with ASTM.
- B. Submit shop drawings as specified under Section 01300 for all work specified herein, including complete details and schedules for fabrication and assembly of structural steel

members, procedures and diagrams. Submit design calculations and drawings prepared under the supervision and sealed by a professional engineer registered in Colorado for all standard shear connections moment connections, and fabricated truss member connections as shown on drawings. Submit non-standard connections for design review. Design construction drawings shall not be re-used as bases for submitted shop drawings. Shop drawings that use reproductions of design plans or details may not be reviewed. Erection and piece drawings shall be submitted in complete units. Do not submit partial sets. Calculations shall be submitted only with relevant erection plans with clear references between each.

1. Shop drawings shall clearly indicate profiles, sizes, and locations of structural members, connections, attachments, anchorage's, framed openings, size and type of fasteners, and clearances. Indicate welded connections using standard AWS welding symbols. Clearly indicate net weld lengths and sizes, root openings, bevel angles and other information required to satisfactorily complete welding operations.
  2. Calculations shall show all pertinent members and pieces. Calculations shall be submitted prior to, or with, relevant shop drawing submittals. It is contractor's responsibility to insure that field construction uses connection design as submitted and reviewed.
- C. Test Reports: Submit copies of all test reports conducted on shop and field bolted and welded connections. Include data on type(s) of tests conducted and test results. Reports must be sequentially numbered and submitted to the Project Manager within 48 hours of completion.
- D. Surveys: Submit certified copies of each survey conducted by a registered professional engineer, showing elevations and locations of all base plates and anchor bolts to receive structural steel, and final elevations and locations for major members. Indicate discrepancies between actual installation and contract documents.
- E. Submit WPS (Welding Procedure Specifications) and WPQR (Welder performance Qualification Records) in accordance with Specification 05999 Welding.
- F. Submit Quality Control Plan for approval by DIA Project Manager and Designer of Record.

## 1.06 QUALITY CONTROL

- A. Codes and Standards: Comply with provisions of following, except as otherwise indicated:
1. AISC "Code of Standard Practice for Steel Buildings and Bridges", 1986 except as modified by the below comments:
    - 1.2 Definitions: Owner - as pertains to this Code shall be interpreted as the Contractor.
    - 2.2 Delete.
    - 3.2 Delete "provided all requirements for the structural steel are noted on the structural plans."
    - 3.3 Delete "in case of discrepancies between the structural steel plans and plans for other trades, the structural steel plans govern."
    - 4.2 In the second sentence, change "fourteen (14) calendar days" to "thirty (30) calendar days from receipt of complete shop drawings by the owner."

- Delete the last two sentences, beginning with "Return of shop drawings..."  
Delete this sentence from 4.2.1, "This approval constitutes the owner's acceptance of all responsibility for the design adequacy of any connections designed by the fabricator as a part of his preparation of these shop drawings."
- 7.3 Delete.
- 7.5.4 Delete.
- 7.6 Add to the end of this section, "The survey notes from the checking of lines and grades shall be furnished to the owner in an acceptable form at least 48 hours prior to grouting."
- 7.8 Delete.
- 7.9.1 Delete from the last sentence, "but not the loads resulting from the performance of work by or the acts of others."
- 7.9.6 Delete.
- 7.11.1 Add to the end of this section, "The variances allowed shall be the lesser of the values specified below or those required by the standards of the industry whose work is attaching to the steel."
- 7.11.3.3 Add after the first sentence, "For purposes of bidding, the contractor should assume that adjustable connections should be supplied where needed to accommodate other trades." Delete the second sentence, which begins "When adjustable connections."
- 7.11.4 Delete.
- 7.12 All cutting by heat must be approved by the Project Manager.
- 8.5.4 Delete the last sentence, which begins "However, this provision..."
- 8.5.5 Delete.
- 9.2.2 (c, d & e) Delete.
- 9.3 Delete whole section.
- 9.4 Delete whole section.
- 9.5 Delete whole section.
2. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", including "Commentary" and Supplements thereto as issued.
  3. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.
  4. American Welding Society (AWS) D1.1 "Structural Welding Code Steel" and all other applicable A.W.S codes (latest editions).

5. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".
  6. Specification Section 05999 Welding.
- B. The erection sequence indicated on the drawing is the basis for bidding the work. The contractor may submit alternate method(s) for the erection sequence. The alternate method(s) shall be priced as a separate line item and shall be inclusive of cost of the work complete including:
- C. All engineering required for the alternate design.
- D. Design of connections: Standard shear connections moment connections, and fabricated truss member connections shall be designed by the fabricator for loads indicated in drawings. Calculations shall be prepared by or under the direct supervision of a Colorado registered engineer and submitted to the Project Manager for review prior to fabrication.
- E. An allowance of \$15,000.00 for the Engineer of Record to review the alternate proposal, fabricator-designed connections, and related engineering calculations.
- F. Qualifications for welding work shall be in accordance with Specification Section 05999 Welding and applicable welding and inspection codes.
1. The Contractor shall periodically review each welder's work quality and take any steps required to endure high quality work. This is in addition to Quality Control requirements.
- G. Fabricator Qualifications: Minimum of three years experience specializing in fabrication of structural steel for similar projects and be an AISC Class III shop.
- H. Fabricator shall provide full traceability of all steel used in the fabrication of this project. Procedures for providing traceability shall be included in the Quality Control Plan.
- I. Source Quality Control: Materials and fabrication procedures are subject to inspection and tests in mill, shop, and field, conducted by a qualified independent inspection agency furnished and paid for by contractor.
1. Promptly remove and replace materials or fabricated components which do not comply.
- J. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.
1. Promptly notify Project Manager whenever design of members and connections for any portion of structure are not clearly indicated.
- K. Paint testing: Provide certification that factory applied paint complies with specified requirements. Submit copy to Project Manager prior to steel erection.
- L. Independent Testing Agency or Project Manager's Quality Control Inspector will have authority to reject weldments. Such rejection may be based on visual inspection where, in his opinion, weldment would not pass more detailed investigation.

## 1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to site at such intervals to insure uninterrupted progress of work. All material shall bear easily readable identification mark numbers as noted on shop drawings. Deliveries to the jobsite shall be made in the order that material is being erected. The direction of camber shall be clearly shown.
- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not to delay work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
  - 1. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Metal Surfaces, General: For fabrication of exposed to view steel, use only materials which are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness.
- B. Structural Steel Shapes, Plates and Bars: ASTM A 36, ASTM A 572 grade 50, as shown on drawings.
  - 1. Finish: galvanized.
- C. Cold-Formed Steel Tubing: ASTM A 500, Grade B.
  - 1. Finish: galvanized.
- D. Hot-Formed Steel Tubing: ASTM A 501.
  - 1. Finish: galvanized.
- E. Steel Pipe: ASTM A 53, Type E or S, Grade B; or ASTM A 501.
  - 1. Finish: galvanized.
- F. Steel Castings: ASTM A 27, Grade 65-35, medium-strength carbon steel.
  - 1. Finish: galvanized.
- G. Headed Stud-Type Shear Connectors: ASTM A 108, Grade 1015 or 1020, cold finished carbon steel; with dimensions complying with AISC Specifications.
  - 1. Finish: galvanized.
- H. Anchor Bolts: ASTM A 307, nonheaded type unless otherwise indicated.
  - 1. Finish: galvanized.
- I. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular low-carbon steel bolts and nuts.
  - 1. Provide hexagonal heads and nuts for all connections.



2. Finish: galvanized.
  3. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as followFinish: galvanized.
  4. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A 325.
  5. Quenched and tempered alloy steel bolts, nuts and washers, complying with ASTM A 490.
  6. High strength bolted connections will use one of the following tension control systems.
    - a. Direct tension indicator washers for A325 and A490 bolts. Washers and installation shall comply with ASTM F959-89.
    - b. Torque control bolt assembly using splined bolt shank for A325 and A490 bolts. Fastener shall be ICBO approved and shown to result in uniform clamping and tension forces not less than AISC specifications.
- J. Electrodes for Welding: Comply with Specifications Section 05999 Welding and applicable welding codes and specifications.
- K. Cement Grout: Portland cement (ASTM C 150, Type I or Type III) and clean, uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum water required for placement and hydration.
- L. Non-metallic Shrinkage-Resistant Grout: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents.
1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
    - a. Euco N.S.; Euclid Chemical Co.
    - b. Crystex; L&M Construction Chemicals
    - c. Masterflow 713; Master Builders
    - d. Five Star Grout; U.S. Grout Corp.
    - e. Upcon; Upco Chem. Div., USM Corp.
    - f. Propak; Protex Industries, Inc.
    - g. Sure Grip High Performance; Dayton Superior Corp.

## 2.02 FABRICATION

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.
1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.
  2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
- B. Connections: Weld or bolt shop connections, as indicated.
1. Bolt field connections, except where welded connections or other connections are

indicated.

- a. Provide high-strength threaded fasteners for all bolted connections, except where unfinished bolts are indicated.
  - b. Provide unfinished threaded fasteners for only bolted connections of secondary framing members to primary members (including girts, small angle bracing) and for temporary bracing to facilitate erection.
- C. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts", including direction tension indicator tightening procedures.
- D. Welding: Comply with AISC Specifications and applicable welding codes per Specification Section 05999 Welding.
- E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Shop weld shear connectors, spaced as shown, to beams and girders in composite construction. Use automatic end welding of headed stud shear connectors in accordance with manufacturer's printed instructions, Specification Section 05999 Welding, and AWS D1.1.
- F. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.
1. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.
  2. Cut, drill, or punch holes perpendicular to metal surfaces. Any enlarging of holes by flame cutting shall be approved by the Project Manager. Drill holes in bearing plates.
- G. Expansion Joints: Provide expansion joints in steel shelf angles to match locations of expansion joints in structural steel frame.
- H. Reference Specification Section 01401 and Section 05120 4.01 for Independent Testing Agency Requirements.

### **2.03 SHOP CLEANING AND PAINTING**

- A. Steel to be primed is as shown on the drawings.
1. Do not paint surfaces that are to be welded or high strength bolted with friction type connections. Touch up paint.
- B. Surface Preparation: After inspection and before shipping, clean all steelwork, including steelwork to be painted or not to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:
1. SP-3, Power Tool Cleaning.

## **PART 3 -EXECUTION**

### **3.01 ERECTION**

- A. Surveys: Employ a registered professional engineer or land surveyor for accurate erection

- of structural steel. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Project Manager along with a suggested plan on how to correct the discrepancy. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Project Manager.
- B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and all final connections are made. Provide temporary guide lines to achieve proper alignment of structures as erection proceeds. Temporary shoring and bracing shall be designed by a Licensed Colorado Professional Engineer. The Engineer shall inspect finished shoring and bracing and document compliance with the design plans.
- C. Temporary Planking: Provide temporary planking handrails, nets, anchorages and working platforms as necessary to effectively and safely complete work.
- D. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
1. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
- E. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
- F. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
1. For proprietary grout materials, comply with manufacturer's instructions.
- G. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces that will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure within specified AISC tolerances and as follows:
    - a. At all slab edge conditions, provide a maximum deviation from grid line (or dimensioned point from grid line), to beam or column center, on the exterior or open side, of 1/2" at any given point. Grid line shall be considered a theoretically perfect plane.
    - b. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
  2. Splice members only where indicated and accepted on shop drawings.
- H. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.

- I. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds. Where welding to existing steel, clean existing steel surfaces prior to welding.
  - 1. Do not enlarge misaligned or undersized holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
- J. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members that are not under stress, as acceptable to Project Manager. Finish gas-cut sections equal to a sheared appearance when permitted.
- K. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.
- L. Beam Members: Deviation of member working point horizontal location and elevation with respect to the supporting member shall not exceed  $\pm 1/16$ " from the location and elevation shown on the drawings.
  - 1. Leveling and Plumbing: Based on mean temperature of 70 degrees F.
  - 2. Compensate for difference in temperature at time of erection.
- M. Headed Stud Shear Connectors: Automatically end weld in accordance with Specification Section 05999, AWS D1.1 and manufacturer's printed instructions.
- N. Reference Specification Section 01401 and Section 05999 Welding, Part 4 Independent Testing Agency Requirements for welding inspection.

### 3.02 INDEPENDENT TESTING AGENCY

- A. Contractor will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports. The Contractor's Quality Control Structural Inspector will coordinate the inspections and tests performed by the testing lab inspectors and testing personnel.
  - 1. The Contractor's Independent Testing Agency and Project Manager's staff shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom. All reports shall be delivered to the Project Manager. Results not complying with requirements are to be brought to the Project Manager's attention within 24 hours of discovery. All reports shall be sequentially numbered.
  - 2. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.
  - 3. The Contractor's Independent Testing Agency shall inspect structural steel at plant before shipment; however, Project Manager reserves right, at any time before final acceptance, to reject material not complying with specified requirements.
- B. The Contractor shall furnish such facilities and provide such assistance as may be required for carrying out the inspection prescribed herein. He shall notify the independent inspection agency and the DIA Project Manager at least two weeks in advance of the start of any qualification testing for welding.

- C. The Testing Agency's Inspector will perform his duties in such a way that neither fabrication nor erection is unnecessarily delayed or impeded. The testing agency shall notify the Project Manager of any scheduled inspections at least 48 hours prior to such time. The Project Manager shall also be notified as soon as possible prior to any unscheduled inspections. In no case will the inspector recommend or prescribe the method of repair of a defect.
- D. Shop Inspection for all columns and 20 percent of beams will include examination of steel for straightness and alignment, fissures, mill scale, and other defects and deformities, as described in ASTM A6, and examination of fabricated pieces for conformity with connections as required.
- E. Field Inspection will include examination of erected steel for proper fitting, tensioning of bolts, alignment, and compliance with tolerances required. Inspector shall check mill certificates for all steel for compliance with contract requirements. Inspect all steel members for loose rust, scale, and corrosion which may impair the application of fireproofing, painting, or other coatings, or which may impair the structural properties of the member. Submit written reports of deviations within 48 hours of erection.
- F. Welding: Inspection of welding shall be in accordance with Specifications Section 05999 Welding and applicable AWS codes.
- G. Bolting
  - 1. Bolt tension quality control (Self-indicating) - inspection of installed high strength fasteners shall insure that the requirements of Section 6 inspection of the "Specification for structural joints using ASTM A325 or A490 bolts" of the American Institute of Steel Construction are met by inspection.
  - 2. For direct tension indicator washers the following shall be used:
    - a. A visual inspection thereafter shall insure that all washer nubs have been flattened per ASTM F959.
    - b. When nubs are not flattened, the testing agency will determine that proper bolt tension requirements exist by the application of a properly calibrated testing torque. All cost of any torque inspection will be borne by the Contractor.
    - c. A minimum of 2 percent of each batch or shipment of high strength bolts shall be tested for compliance with ASTM A325 or A490 as appropriate.
  - 3. For torque control bolts the following shall be used:
    - a. A visual inspection shall ensure that all spline shanks have been cleanly broken without excessive distortion.
    - b. If distortion is encountered, the bolts should be tightened to a snug connection, followed by final tightening with the manufacturer's approved installation tool until the splines are sheared. Each such bolt shall then be torque tested. All cost of torque inspection will be borne by the Contractor.
    - c. A minimum of 0.5% of each batch or shipment of bolts shall be tested for tension and ductility values and for compliance with ASTM A325 or A490.
- H. Stud Connectors: Shall be inspected per requirements of Specifications Section 05999 Welding.
- I. Correct deficiencies in structural steel work that inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as

may be necessary to show compliance of corrected 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 unit price item, work order or lump sum bid item.

**END OF SECTION 05120**

## SECTION 05999

### WELDING

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Welding is that work defined in American Welding Society (AWS) "Standard Welding Terms and Definitions - AWS A2.4" and as otherwise shown on drawings.
  - 1. All welding on this project shall comply with requirement of specification, Section 05999 "Welding", and other documents such as but not limited to drawings. If there is a conflict between Project Drawings, codes, and specifications, the more stringent shall apply.
- B. Extent of welding work is shown on drawings, including schedules, notes and details to show size and location of welds. Welding Symbols shall be in accordance with AWS/A2.4-Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- C. Nothing stated in this Section shall be interpreted as diminishing or eliminating requirements stated in other Sections.

##### 1.02 RELATED DOCUMENTS

- A. Drawings, General and Special conditions, general requirements and other applicable Technical Specifications apply to work of this Section.
- B. IEEE-1992. Only welding machines that have been tested and comply with harmonic distortion requirements of IEEE-1992 shall be allowed to operate off of DIA electrical power system.

##### 1.03 RELATED SECTIONS

- A. This section "Section 05999 Welding" will apply to all welding performed under all other sections of this specification.
- B. Division 15 sections.

##### 1.04 REFERENCE STANDARDS

- A. Welding shall comply with the requirements of the reference standards noted herein, except where more stringent requirements are listed herein or otherwise required by the Contract Documents.
  - 1. AISC - American Institute of Steel Construction
  - 2. AWS - American Welding Society
  - 3. API - American Petroleum Institute
  - 4. AWWA - American Water Works Association
  - 5. ASME - American Society of Mechanical Engineers.
  - 6. ASTM - American Society for Testing and Materials

7. ASNT - American Society for Nondestructive Testing

**1.05 SUBMITTALS**

- A. Product Data: Submit producers or manufacturer's specifications and installation instructions for all products, including, but not limited to those listed below. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
  - 1. Welding Electrodes: Submit manufactures specifications, to include recommended parameters and technique, for each electrode to be used on this project.
- B. Submittal Requirements for Steel Studs
  - 1. Stud manufacturer's certification that the studs, as delivered, conform to the applicable requirements of AWS D1.1-2000, sections 7.2 and 7.3.
  - 2. Certified copies of the stud manufacturer's test reports covering the last completed set of in-plant quality control mechanical tests, required by AWS D1.1-2000, 7.3 for each diameter delivered. The quality control test shall have been made within the six month period before delivery of the studs.
  - 3. Certified material test reports (CMTR) from the steel supplier indicating diameter, chemical properties, and grade on each heat number delivered.
  - 4. In the absence of Quality Control tests the provisions of AWS D1.1-2000, 7.3.4 and 7.3.5 shall apply with the exception that DIA Project Manager or his representative will replace engineer in the process. All costs shall be at contractor's expense.
- C. Submit shop drawings as specified under Section 01300 for all work specified herein, including complete details and schedules for fabrication and assembly of members, procedures and diagrams. Shop drawings shall indicate how each and every component shall be welded. If another company manufactures a component to be welded to another part(s) or piece(s) to form a larger assembly, then the shop drawings shall include that manufacturer's recommended welding procedures for that component. Design construction drawings shall not be re-used as bases for submitted shop drawings. Shop drawings, which use reproductions of design plans or details, will not be reviewed. Drawings shall be submitted in complete units. Do not submit partial sets.
- D. Shop drawings shall clearly indicate profiles, sizes and locations of structural members, connections, attachments, anchorage's, framed openings, size and type of fasteners, and clearances. Indicate welded connections using standard AWS welding symbols, per AWS A2.4. Clearly indicate net weld lengths and sizes, root openings, bevel angles and other information required to satisfactorily complete welding operations.
- E. Calculations required in other Sections shall show all pertinent members and pieces. Calculations shall be submitted prior to, or with, relevant shop drawing submittals. It is contractor's responsibility to insure that field construction uses connection design as submitted and reviewed.
- F. Test Reports: Submit copies of all test reports conducted on shop and field welded connections. Include data on type(s) of tests conducted and test results. Reports must be sequentially numbered and submitted to the DIA Project Manager within 48 hours of completion.
- G. Individual Welder Qualifications: Submit Welding Performance Qualification Records



(WPQR) for all welders, shop and field, prior to any welding per Specification Paragraph 05999 1.06 B.

- H. Procedures: Submit Welding Procedure Specifications for all shop and field welding prior to any welding per Specification Paragraph 05999 1.06 B

## 1.06 QUALITY REQUIREMENTS

- A. Codes and Standards: Comply with provisions of following, as applicable
1. AISC American Institute of Steel Construction
    - a. AISC "Code of Standard Practice for Steel Buildings and Bridges", 1986.
    - b. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", including "Commentary" and Supplements thereto as issued.
  2. American Welding Society (AWS) D1.1 "Structural Welding Code Steel" and all other applicable A.W.S codes (latest editions).
  3. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".
  4. All welding shall be performed in accordance with the latest addition of applicable AWS, API, ASME code and ASTM Standards.
- B. Qualifications for Welding Work
1. All Welders shall have been qualified through welding tests in accordance with applicable AWS code per Specification paragraph 05999 1.04 A within one year prior to welding taking place. Evidence of qualification shall be through Welding Performance Qualification Records (WPQR).
  2. All welder qualifications test shall be or shall have been administered and witnessed by an Independent Testing Agency (ITA), AWS Certified Welding Inspector, (CWI).
  3. If recertification of welders is required, delay costs and retesting costs shall be borne by the Contractor.
  4. Welding that is to take place at each and every type of joint shall be per approved AWS procedure for that type of joint. Evidence of intended procedure shall be through written Welding Procedure Specifications.
  5. Any welding done without submission to and approval by the DIA Project Manager of Welding Performance Qualification Records of the individual welder(s) doing the welding and Procedure Specifications for the actual welding shall be considered defective and subject to the provisions of Title 17 of the General Conditions.
  6. All WPS and WPQR qualification testing shall be in accordance with this specification and the applicable welding code requirements.
- C. The Contractor shall periodically review each welders work quality and take any steps required to insure high quality work. This is in addition to Quality Control requirements.
- D. Fabricator Qualifications: Minimum of three years experience specializing in fabrication for similar projects.
- E. Design of Members and Connections: Details shown are typical; similar details apply to similar conditions, unless otherwise indicated. Verify dimensions at site whenever possible without causing delay in the work.

1. Promptly notify DIA Project Manager whenever design of members and connections for any portion of structure are not clearly indicated.
- F. Welding and materials shall be inspected and tested by an Independent Testing Agency furnished and paid for by the Contractor. The Independent Testing Agency will have authority to reject weldments and materials. Such rejection may be based on visual inspection where, in the Inspector's opinion, the weldment or material would not pass more detailed investigation. Reference Specification Section 05999 4.01 for inspection and testing requirements. DIA's Quality Assurance Inspector(s), per the provisions of General Conditions Title 17, will also inspect welding and materials. Inspections by either the Independent Testing Agency or DIA's Quality Assurance Inspector may take place in the mill, shop and field.
1. Promptly remove and replace materials or fabricated components that do not comply with requirements as set forth in the Contract Documents.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. Electrodes for Welding: Comply with AWS Code. Use E70 grade minimum unless otherwise approved. Store all electrodes and welding materials inside and protect from moisture, corrosion, and any other damage. Damaged electrodes shall not be used.

### **2.02 FABRICATION**

- A. Shop Fabrication and Assembly: Fabricate and assemble components in shop to greatest extent possible.
1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
  2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.
- B. Holes for Other Work: Provide holes required for securing other work to components, and for passage of other work through components, as shown on final shop drawings.
1. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.
  2. Cut, drill, or punch holes perpendicular to metal surfaces. The DIA Project Manager shall approve any enlarging of holes by flame cutting
- C. Contractor will notify DIA Project Manager or his representative at least 48 hours prior to any commencing fabrication. Notification to include starting date and duration of work.

### **2.03 SHOP CLEANING AND PAINTING**

- A. Components to be painted are as shown on the drawings.
1. Do not paint surfaces, which are to be welded.
  2. Do not paint over welded joints until after Independent Testing Agency and DIA Quality Assurance Inspector have approved them.

## **PART 3 - EXECUTION**

### **3.01 ERECTION**

- A. Do not enlarge misaligned or undersized holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
- B. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members, which are not under stress, as acceptable to DIA Project Manager. Finish gas-cut sections equal to a sheared appearance when permitted.
- C. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Once Independent Testing Agency and DIA Quality Assurance Inspector have approved welds, apply paint to exposed areas using same material as used for shop painting.
- D. No welding machines are to be operated off of DIA power until such machines have been tested for harmonic distortion per IEEE-1992 and approved by DIA Project Manager.
- E. Contractor will notify DIA Project Manager or his representative at least 48 hours prior to any inspections to be performed by ITA.

## **PART 4 - TESTING AND INSPECTION**

### **4.01 INDEPENDENT TESTING AGENCY (ITA)**

- A. See Division 1 for Independent Testing Agency requirements.
- B. The General Contractor shall provide the ITA for all subcontractors. Subcontractors shall not contract with a separate ITA.
- C. Contractor will engage an Independent Testing Agency to inspect welded connections and to perform tests and prepare test reports. The Contractor's Quality Control Inspector will coordinate the inspections and tests performed by the testing lab inspectors and testing personnel.
  - 1. The Contractor's Independent Testing Agency and DIA Project Manager's staff shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom. All reports shall be delivered to the Project Manager. Results not complying with requirements are to be brought to the Project Manager's attention within 24 hours of discovery. All reports shall be sequentially numbered.
  - 2. Provide access for Independent Testing Agency to places where work is being fabricated or produced so that required inspection and testing can be accomplished.
  - 3. The Independent Testing Agency shall inspect work at the plant before shipment; however, DIA Project Manager reserves right, at any time before final acceptance, to reject material not complying with specified requirements.
    - a. Inspections and tests conducted by the ITA or DIA 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.

4. Welding Inspection Personnel Qualifications: All visual welding inspections shall be performed by AWS Certified Welding Inspectors CWI, qualified in accordance with AWS QC1. Inspectors qualified in accordance with the most current edition of the American Society for Nondestructive Testing Recommended Practice No. SNT-TC 1A, shall perform all non-destructive inspections other than visual inspections
  5. Independent Testing Agency Inspectors working for the Contractor shall identify with a distinguishing mark all parts and joints they have inspected and accepted. Marks to be visible from at least 50 feet. DIA Project Manager and the Quality Control Inspectors shall mutually agree upon identifying marks.
  6. Independent Testing Agency welding inspector shall be on job site however much time it takes to guaranty that all requirements of Project Specifications and codes are being met and provide written reports showing specific requirements have been met. Shop inspections by ITA welding inspector shall be performed in such a manner as to guaranty that all provisions of Project Specifications and codes are being met and provide written reports showing specific requirements have been met.
- D. The Contractor shall furnish such facilities and provide such assistance as may be required for carrying out the inspection prescribed herein. He shall notify the Independent Testing Agency and the DIA Project Manager at least two weeks in advance of the start of any qualification testing for welding.
- E. The Testing Agency's Inspector will perform his duties in such a way that neither fabrication nor erection is unnecessarily delayed or impeded. The Testing Agency shall notify the DIA Project Manager of any scheduled inspections at least 48 hours prior to such time. The Project Manager shall also be notified as soon as possible prior to any unscheduled inspections. In no case will the inspector recommend or prescribe the method of repair of a defect.
- F. Inspection of welding will be such as to assure that all requirements of Project Specifications AWS D1.1, and other applicable welding codes are being complied with. Reports shall show the following items as being in conformance, but not be limited to just the items shown:
1. Verify that electrodes used for welding conform to the requirements Manufacturer, AWS, and other applicable Welding Codes and Standards.
  2. Verify that the approved Welding Procedure Specifications and the approved welding sequence are followed without deviation.
  3. Verify that only welding operators and welders who have been properly qualified will perform the welding. The inspection agency will witness such qualification testing of welding operations and welders, as may be required. Reference Specification Section 05999 1.06 B for Welder Qualification and Welding Procedure requirements.
  4. Verify that the fit up, joint preparation, size, contour, extent of reinforcement, and length and location of welds conform to specified requirements such as but not limited to applicable welding codes, Welding Procedure Specifications, and drawings.
  5. Review Mill Test Reports of material for compliance with Project Specifications, all applicable Codes, and Drawings.
  6. ITA inspection reports shall list all inspected, nonconforming, repaired, and accepted welds.
- G. DIA Project Manager shall be informed at least 48 hours prior to shop and field welding so random inspections can be performed as stipulated in these specifications and General

Conditions, TITLE 17.

- H. All welders shall mark their welds with identifying marks. Contractor shall furnish DIA Project Manager with list of welders and their marks. List shall be updated each time a welder is added or subtracted.

#### 4.02 STRUCTURAL STEEL

- A. The Independent Testing Agency will test shop and field welds per ASTM E 543 and applicable welding code requirements as follows:
1. All welds: 100% visual.
  2. Delamination and non-metallic inclusion tests of base metal:
    - a. Plates and portions of rolled shapes three inches or greater in thickness shall be 100% ultrasonically tested in a zone extending six inches in all directions from any full penetration groove weld which transmits stress through the thickness of the material, or any weld which, because of restraint and/or weld shrinkage will, in the opinion of the inspector, cause significant through-thickness (Z-direction) stress in the material. Such tests shall be made after completion of welding. Acceptance Criteria for such tests shall be in accordance with ASTM A435.
  3. All full penetration or partial penetration groove welds require 100% ultrasonic testing:
  4. All fabricated trusses including all fabricated trusses acting, as girders shall be 100% magnetic particle tested.
  5. Studs on all embed assemblies: 100% of studs tested by hammer method and visual inspection.
  6. Wall and roof deck connections
    - a. 10% Magnetic Particle
  7. All other welded connections: 10% Magnetic Particle.
  8. Additional Testing shall be performed by the Independent Testing Agency as noted in paragraph 4.02, B below.
- B. Additional Field Weld Testing
1. In addition, if defective welds are discovered, the remaining un-inspected welds shall receive such ultrasonic or magnetic particle inspection as may be required by the DIA Project Manager. If more than 10 percent of a welder's welds fail or when a CWI (Certified Welding Inspector) feels that the quality of the qualified welder's work appears to be below the requirements of the applicable AWS Code, he/she shall be removed from the job and retested to demonstrate compliance with AWS D1.1 (Latest Edition) or other applicable AWS codes and all other applicable AWS codes.
  2. Additional testing shall be required if more than 10% of the Magnetic Particle tested welds are rejected. Then an additional 10% will be tested using either Magnetic Particle or Dye Penetrant Testing. This 10% additional testing shall be repeated until rejection rate drops below one in 10.
  3. When ultrasonic indications arising from the weld root can be interpreted as either a weld defect or the backing strip, the backing strip shall be removed at the expense of the contractor, and if no root defect is indicated on this retest, and no significant amount of the base and weld metal have been removed, the joint needs no further repair or welding. If a defect is still indicated, it shall be repaired.

4. The welding inspector will have the authority to reject weldments. Such rejection may be based on visual inspection where in his opinion the weldment would not pass a more detailed investigation.
  5. Reports by the Independent Testing Agency inspector will contain, as a minimum, an adequate description of each weld tested, the identifying mark of the welder responsible for the weld, a critique of any defects noted by visual inspection or testing, and a statement regarding the acceptability of the weld tested, as judged by current A.W.S. standards. A copy of all tests results, including ultrasonic and x-ray, shall be provided to the DIA Project Manager within 48 hours of the test occurrence. This requirement includes all failed tests. Any test that shows work not in conformance with the contract requirement shall be retaken after the non-conformity is corrected. The retest shall refer to the failed test. Radiographic testing may be substituted for ultrasonic.
- C. Stud Connectors
1. Stud connectors - the testing agency will inspect headed stud connectors as follows:
    - a. All studs shall be acoustically inspected. Studs, which do not ring when struck with a hammer, shall be bent 15 degrees. If no fracture occurs, stud is considered acceptable and left bent.
    - b. In addition to the above, not less than one of each 50 studs shall be tested by bending 15 degrees. If no fracture occurs, stud is considered acceptable and left bent.
    - c. If at any time the number of rejectable studs on any level of structural steel framing exceeds 3% additional testing in accordance with paragraph above shall be performed on one of each 25 studs at this level and this increased frequency of testing shall be continued on all succeeding levels until the number of rejectable studs at a level is 3% or less. All cost of additional testing required by this paragraph shall be borne by the Contractor.
    - d. 100% visual inspection to be performed in accordance with AWS D1.1 acceptance criteria.
- D. Correct deficiencies in structural steel work, which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

#### 4.03 METAL FABRICATIONS

- A. Welding shall be performed in accordance with applicable AWS welding code and these specifications.
- B. 100% visual inspection of all welds.
- C. 10% Magnetic Particle testing of all welds.
  1. Additional testing shall be required if more than 10% of the Magnetic Particle tested welds are rejected. Then an additional 10% will be tested using either Magnetic Particle or Dye Penetrant Testing. This 10% additional testing shall be repeated until rejection rate drops below one in 10.
- D. Applicable sections of "4.02 Structural Steel" shall be met also.

#### 4.04 CONCRETE REINFORCING BARS

- A. Welding shall be performed in accordance with this specification, AWS D1.4, and other applicable AWS Codes and Standards.
- B. 100 % visual inspection of all welds, Per AWS D1.4 Structural Welding Code Reinforcing Steel, or other AWS Codes as applicable.
- C. 10% Magnetic Particle testing of all welds.
  - 1. Additional testing shall be required if more than 10% of the Magnetic Particle tested welds are rejected. Then an additional 10% will be tested using either Magnetic Particle or Dye Penetrant Testing. This 10% additional testing shall be repeated until rejection rate drops below one in 10.

#### 4.05 DIVISION 15 BASIC MECHANICAL MATERIALS AND METHODS

- A. All welding in Division 15 Mechanical shall comply with the applicable AWS, ASME, AWWA, and API codes, latest editions.
- B. All shop and field welds will be inspected per these specifications and applicable code for work being performed.
- C. All welds shall be 100% visually inspected by ITA supplied by Contractor. Additional testing shall be as required by other parts of 05999, applicable codes, DIA Project Manager and Designer of Record.
  - 1. Refrigerant Piping: ASME B31.5
    - a. 100% visual inspection per acceptance criteria of ASME B31.5.
    - b. All other requirements of ASME B31.5 as required for the application.
  - 2. Piping, ductwork and mechanical equipment supports: AWS D1.1 and other applicable AWS Codes.
    - a. 100 % visual inspection
    - b. Magnetic Particle Test requirements are the same as Part 4 of this specification for Structural Steel.
  - 3. Water Lines: Per AWWA, AWS D1.1 latest edition, and Denver Water Board Specifications. If there is a conflict the more stringent shall apply.
    - a. 100% visual inspection per AWS D1.1 visual acceptance criteria.
    - b. AWWA requires that welds be 100% Dye Penetrant Tested in place of Magnetic Particle testing.

### 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 05999**



**DIVISION 07 – THERMAL AND MOISTURE PROTECTION**

**SECTOPM 07270**

**FIRESTOPPING**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. This Section includes firestop sealant and safing insulation for the following locations:
  - 1. Openings between exterior walls and connecting floors.
  - 2. All pipes, ductwork or conduit penetrating a fire rated wall, floor assembly or roof assembly.
  - 3. Head of wall firestopping at fire rated full height partitions.
- B. Fire stop mortar not allowed.

**1.02 RELATED DOCUMENTS**

- A. Drawings, general and special conditions, general requirements and other applicable technical specifications apply to work of this Section:

**1.03 SUBMITTALS**

- A. Product Data from manufacturers for each joint firestop sealer grout or safing insulation product required, including instructions for joint preparation and joint sealer application and insulation installation instructions.
- B. Certified Test Reports: With product data, submit copies of certified test reports showing compliance with specified performance values, including r-values (aged values for plastic insulations), densities, compression strengths, fire performance characteristics, perm ratings, water absorption ratings and similar properties.
- C. Certificates from manufacturers of joint firestop sealers and safing insulation attesting that their products comply with specification requirements and are suitable for the use indicated.
- D. Samples of each product.
- E. Certificates: Submit certificates from manufacturer and installer.
- F. Product test reports for each type of joint firestop sealer evidencing compliance with requirements.

**1.04 QUALITY ASSURANCE**

- A. Manufacturers Certificate: Not less than 5 years experience manufacturing types of product specified.
- B. Installer Certificate: Engage an Installer who has successfully completed within the last 3 years at least 3 sealer applications similar in type and size to that of this Project and is

approved by manufacturer for this type of installation.

- C. Pre-installation conference to be attended by installer, contractor and Resident Engineer and representatives from affected trades.
- D. Warranty: Installer to warrant that the firestopping system will provide a permanent installation.
- E. Install firestopping materials to comply with the following:
  - 1. Openings between walls and connecting floors shall be per ASTM E 119 and comply with Underwriters laboratories designs J-900, U-900.
  - 2. Openings around all pipes, ductwork, conduit or similar penetrating a rated wall, floor or roof assembly shall comply with ASTM E 814.
  - 3. Head of wall firestopping at fire rated full height partitions shall comply with ASTM E 119 and Underwriters laboratories design U.
  - 4. The Denver Building Code.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to Project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.
- C. General Protection: Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

#### **1.06 PROJECT CONDITIONS**

- A. Environmental Conditions: Do not proceed with installation of firestop joint sealers under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside the limits permitted by manufacturers.
  - 2. When substrates are wet due to rain, frost, condensation, or other causes.
- B. Joint Substrate Conditions: Do not proceed with installation of firestop joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.

#### **1.07 OVERSTOCK**

- A. Provide minimum two gallons of each type of sealant. Store as directed by Resident Engineer.

### **PART 2 - PRODUCTS**

#### **2.01 FIRE-RESISTANT JOINT SEALERS**

- A. General: Provide manufacturer's standard fire-stopping sealant, with accessory materials, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Foamed-In-Place Fire-Stopping Sealant: Two-part, foamed-in-place, silicone sealant formulated for use in a through-penetration fire-stop system for filling openings around cables, conduit, pipes and similar penetrations through walls and floors.
- C. One-Part Fire-Stopping Sealant: One part elastomeric sealant formulated for use in a through-penetration fire-stop system for sealing openings around cables, conduit, pipes and similar penetrations through walls and floors.
- D. Available Products: Subject to compliance with requirements, products which may be incorporated in the Work include, but are not limited to, the following:
  - 1. Foamed-In-Place Fire-Stopping Sealant:
    - a. "Dow Corning Fire Stop Foam"; Dow Corning Corp.
    - b. "Pensil 851"; General Electric Co.
  - 2. One-Part Fire-Stopping Sealant:
    - a. "Dow Corning Fire Stop Sealant"; Dow Corning Corp.
    - b. "3M Fire Barrier Caulk CP-25"; Electrical Products Div./3M.
    - c. "RTV 7403"; General Electric Co.
    - d. "Fyre Putty"; Standard Oil Engineered Materials Co.
    - e. "Fyre Shield"; Tremco
    - f. "Fyre-Sil"; Tremco (High Movement)
    - g. "Metalcaulk 950"; Metalines
- E. Accessory Materials for Fire-Stopping Sealants: Provide forming, joint fillers, packing and other accessory materials required for installation of fire-stopping sealants as applicable to installation conditions indicated.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine surfaces indicated to receive joint sealers, with Installer present, for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Do not proceed with installation of joint sealers until unsatisfactory conditions have been corrected.

#### **3.02 PREPARATION**

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:
  - 1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; old joint sealers; oil; grease; waterproofing; water repellents; water; surface dirt; and frost.
  - 2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a

combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.

3. Remove laitance and form release agents from concrete.

B. Joint Priming: Prime joint substrates where recommended by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.

### 3.03 INSTALLATION

A. General: Comply with manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Installation of Fire-Stopping Sealant: Install sealant, including forming, packing, and other accessory materials to fill openings around mechanical and electrical services penetrating floors and walls to provide fire-stops with fire resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

C. At full height fire rated walls: Install firesafing insulation as shown on the drawings at wall head condition and as required to meet Denver Building Code requirements.

D. Protect all fire safing insulation by installing 22 gage galvanized sheet metal closure at top and bottom, which complies with the DBC for protection of fire safing insulation.

E. Tool exposed surfaces of mortar or sealants.

F. At plastic pipes penetrating floors provide a gauge galvanized steel sleeve around pipes, fire stop sealant within sleeve.

G. At opening between exterior walls and floors/roofs install firesafing insulation per DBC requirements and in accordance with AAMA Tir-A3

### 3.04 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

### 3.05 PROTECTION

A. Protect joint sealers and insulation from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and installations with repaired areas indistinguishable from original work.

## 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. The cost of the work described in this Section shall be included in the lump sum contract price.

**END OF SECTION 07270**

## DIVISION 09 - FINISHES

### SECTION 09912

#### PAINTING (PROFESSIONAL LINE PRODUCTS)

##### PART 1 - GENERAL

###### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

###### 1.02 SUMMARY

- A. This Section includes surface preparation and field painting of exposed [exterior] [and] [interior] items and surfaces.
  - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
  - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
  - 1. Prefinished items include the following factory-finished components:
    - a. Finished mechanical and electrical equipment.
  - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
    - a. Foundation spaces.
    - b. Pipe spaces.
  - 3. Finished metal surfaces include the following:
    - a. Stainless steel.
  - 4. Operating parts include moving parts of operating equipment and the following:
    - a. Valve and damper operators.
    - b. Linkages.
    - c. Sensing devices.
    - d. Motor and fan shafts.
  - 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- D. Related Sections include the following:

1. Division 2 Section "Hot-Mix Asphalt Paving" for traffic-marking paint.
  2. Division 2 Section "Cement Concrete Pavement" for traffic-marking paint.
  3. Division 5 Section "Structural Steel" for shop priming structural steel.
  4. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
- E. Alternates: Refer to Division 1 Section "Alternates" for description of Work in this Section affected by alternates.

### 1.03 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
  2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
  3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
  4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

### 1.04 SUBMITTALS

- A. Product Data: For each paint system indicated. Include block fillers and primers.
1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
  2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
- B. Samples for Initial Selection: For each type of finish-coat material indicated.
- C. Qualification Data: For Applicator.

### 1.05 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain [block fillers] [and] [primers] for each coating system from the same manufacturer as the finish coats.

### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
1. Product name or title of material.
  2. Product description (generic classification or binder type).
  3. Manufacturer's stock number and date of manufacture.

4. Contents by volume, for pigment and vehicle constituents.
  5. Thinning instructions.
  6. Application instructions.
  7. Color name and number.
  8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

## 1.07 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.
- C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.
- B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.
- C. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
1. Benjamin Moore & Co. (Benjamin Moore).
  2. Coronado Paint Company (Coronado).
  3. ICI Dulux Paint Centers (ICI Dulux Paints).
  4. Kelly-Moore Paint Co. (Kelly-Moore).
  5. M. A. Bruder & Sons, Inc. (M. A. B. Paint).
  6. PPG Industries, Inc. (Pittsburgh Paints).
  7. Sherwin-Williams Co. (Sherwin-Williams).

### 2.02 PAINT MATERIALS, GENERAL



- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
  - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: As indicated by manufacturer's designations and as selected by Architect from manufacturer's full range.

### 2.03 EXTERIOR PRIMERS

- A. Exterior Concrete and Masonry Primer: Factory-formulated alkali-resistant acrylic-latex primer for exterior application.
  - 1. Benjamin Moore; Moore's Acrylic Masonry Sealer No. 066: Applied at a dry film thickness of not less than 0.7 mils.
  - 2. Coronado; 48-11 Elast-O-Meric Acrylic Masonry Sealer: Applied at a dry film thickness of not less than 1.2 mils.
  - 3. ICI Dulux Paints; 2000-1200 Dulux Professional Exterior 100 Percent Acrylic Latex Primer: Applied at a dry film thickness of not less than 1.6 mils.
  - 4. Kelly-Moore; 247 Chem-Guard Acrylic Masonry Primer: Applied at a dry film thickness of not less than 1.9 mils.
  - 5. M. A. B. Paint; Lok Tite Latex Masonry Primer 056-125: Applied at a dry film thickness of not less than 1.5 mils.
  - 6. Pittsburgh Paints; 6-603 SpeedHide Interior/Exterior Acrylic Latex Alkali Resistant Primer: Applied at a dry film thickness of not less than 1.5 mils.
  - 7. Sherwin-Williams; Loxon Exterior Masonry Acrylic Primer A24W300: Applied at a dry film thickness of not less than 3.0 mils.
- B. Exterior Ferrous-Metal Primer: Factory-formulated rust-inhibitive metal primer for exterior application.
  - 1. Benjamin Moore; Moore's IMC Alkyd Metal Primer No. M06: Applied at a dry film thickness of not less than 2.0 mils.
  - 2. Coronado; 35-147 Rust Scat Alkyd Metal Primer: Applied at a dry film thickness of not less than 2.0 mils.
  - 3. ICI Dulux Paints; 4160-XXXX Devguard Multi-Purpose Tank & Structural Primer. Applied at a dry film thickness of not less than 2.0 mils.
  - 4. Kelly-Moore; 1711 Kel-Guard Alkyd White Rust Inhibitive Primer: Applied at a dry film thickness of not less than 2.0 mils.
  - 5. M. A. B. Paint; Rust-O-Lastic Anti-Corrosive Primer 073-132: Applied at a dry film thickness of not less than 2.0 mils.
  - 6. Pittsburgh Paints; 90-712 Pitt-Tech One Pack Interior/Exterior Primer Finish DTM In-

- dustrial Enamel: Applied at a dry film thickness of not less than 3.0 mils.
7. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than 3.0 mils.
- C. Exterior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application.
1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04: Applied at a dry film thickness of not less than 2.0 mils.
  2. Coronado; 36-11 Rust Scat Latex Metal Primer: Applied at a dry film thickness of not less than 1.4 mils.
  3. ICI Dulux Paints; 4020-XXXX Devflex DTM Flat Interior/Exterior Waterborne Primer & Finish: Applied at a dry film thickness of not less than 2.2 mils.
  4. Kelly-Moore; 1722 Kel-Guard Acrylic Galvanized Iron Primer: Applied at a dry film thickness of not less than 1.8 mils.
  5. M. A. B. Paint; Rust-O-Lastic Hydro-Prime II Acrylic (DTM) Maintenance Primer 073-189: Applied at a dry film thickness of not less than 2.0 mils.
  6. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils.
  7. Sherwin-Williams; primer not required over this substrate.
  8. Sherwin-Williams; Galvite HS Paint B50WZ3: Applied at a dry film thickness of not less than 2.0 mils.

## 2.04 EXTERIOR FINISH COATS

- A. Exterior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for exterior application.
1. Benjamin Moore; Moorcraft Super Spec Flat Latex House Paint No. 171: Applied at a dry film thickness of not less than 1.2 mils.
  2. Coronado; 8-Line Supreme Acrylic Latex Flat: Applied at a dry film thickness of not less than 1.3 mils.
  3. ICI Dulux Paints; 2200-XXXX Dulux Professional Exterior 100 Percent Acrylic Flat Finish: Applied at a dry film thickness of not less than 1.4 mils.
  4. Kelly-Moore; 1205 Color Shield Exterior Flat Acrylic House Paint: Applied at a dry film thickness of not less than 1.9 mils.
  5. M. A. B. Paint; Fresh Kote Latex House Paint 409 Line: Applied at a dry film thickness of not less than 1.7 mils.
  6. Pittsburgh Paints; 6-600 Series SpeedHide Exterior House Paint Flat Latex: Applied at a dry film thickness of not less than 1.3 mils.
  7. Sherwin-Williams; A-100 Exterior Latex Flat House & Trim Paint A6 Series: Applied at a dry film thickness of not less than 1.3 mils.
- B. Exterior Semigloss Acrylic Enamel: Factory-formulated semigloss waterborne acrylic-latex enamel for exterior application.
1. Benjamin Moore; Moorcraft Super Spec Latex House & Trim Paint No. 170: Applied at a dry film thickness of not less than 1.1 mils.
  2. Coronado; 12-Line Supreme Acrylic Semi-Gloss: Applied at a dry film thickness of not

- less than 1.5 mils.
3. ICI Dulux Paints; 2406-XXXX Dulux Professional Exterior 100 Percent Acrylic Semi-Gloss Finish: Applied at a dry film thickness of not less than 1.3 mils.
  4. Kelly-Moore; 1250 Acry-Lustre Exterior Semi-Gloss Acrylic Finish: Applied at a dry film thickness of not less than 1.6 mils.
  5. M. A. B. Paint; Sea Shore/Four Seasons Acrylic Latex Trim Enamel 024 Line: Applied at a dry film thickness of not less than 1.5 mils.
  6. Pittsburgh Paints; 6-900 Series SpeedHide Exterior House & Trim Semi-Gloss Acrylic Latex Paint: Applied at a dry film thickness of not less than 1.5 mils.
  7. Sherwin-Williams; A-100 Latex Gloss A8 Series: Applied at a dry film thickness of not less than 1.3 mils.
- C. Exterior Full-Gloss Acrylic Enamel for Concrete, Masonry, and Wood: Factory-formulated full-gloss waterborne acrylic-latex enamel for exterior application.
1. Benjamin Moore; Moore's IMC Acrylic Gloss Enamel M28: Applied at a dry film thickness of not less than 2.0 mils.
  2. Coronado; 414 Super Kote 5000 Acrylic Gloss Enamel: Applied at a dry film thickness of not less than 1.5 mils.
  3. ICI Dulux Paints; 3028-XXXX Dulux Interior/Exterior Acrylic Gloss Finish: Applied at a dry film thickness of not less than 1.6 mils.
  4. Kelly-Moore; 1780 Kel-Guard Acrylic Gloss Enamel: Applied at a dry film thickness of not less than 1.5 mils.
  5. M. A. B. Paint; Rust-O-Lastic Gloss Acrylic (DTM) Maintenance Finish 043 Line: Applied at a dry film thickness of not less than 1.6 mils.
  6. Pittsburgh Paints; 90 Line Pitt-Tech One Pack Interior/Exterior High Performance Waterborne High Gloss DTM Industrial Enamels: Applied at a dry film thickness of not less than 3.0 mils.
  7. Sherwin-Williams; DTM Acrylic Coating Gloss (Waterborne) B66W100 Series: Applied at a dry film thickness of not less than 2.4 mils.
  8. Sherwin-Williams; SuperPaint Exterior High Gloss Latex Enamel A85 Series: Applied at a dry film thickness of not less than 1.2 mils.
- D. Exterior Full-Gloss Acrylic Enamel for Ferrous and Other Metals: Factory-formulated full-gloss waterborne acrylic-latex enamel for exterior application.
1. Benjamin Moore; Moore's IMC Acrylic Gloss Enamel M28: Applied at a dry film thickness of not less than 2.0 mils.
  2. Coronado; 80 Line Rust Scat Acrylic Latex High Gloss Enamel: Applied at a dry film thickness of not less than 1.4 mils.
  3. ICI Dulux Paints; 3028-XXXX Dulux Interior/Exterior Acrylic Gloss Finish: Applied at a dry film thickness of not less than 1.6 mils.
  4. Kelly-Moore; 5780 DTM Acrylic Gloss Enamel: Applied at a dry film thickness of not less than 1.7 mils.
  5. M. A. B. Paint; Rust-O-Lastic Gloss Acrylic (DTM) Maintenance Finish 043 Line: Applied at a dry film thickness of not less than 3.0 mils.
  6. Pittsburgh Paints; 90-300 Series Pitt-Tech One Pack Interior/Exterior High Performance Waterborne High Gloss DTM Industrial Enamels: Applied at a dry film thick-

ness of not less than 3.0 mils.

7. Sherwin-Williams; DTM Acrylic Coating Gloss (Waterborne) B66W100 Series: Applied at a dry film thickness of not less than 2.4 mils.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application. Comply with procedures specified in PDCA P4.
  1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
  2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
  1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

### **3.02 PREPARATION**

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
  1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
  1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
  1. Provide barrier coats over incompatible primers or remove and reprime.
  2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
    - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
    - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
  3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use

- solvent or mechanical cleaning methods that comply with SSPC's recommendations.
- a. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
  - b. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
  2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
  3. Use only thinners approved by paint manufacturer and only within recommended limits.

### 3.03 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated on the drawings.
  2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
  3. Provide finish coats that are compatible with primers used.
  4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convactor covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
  5. Paint surfaces behind movable equipment the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
  7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
  2. Omit primer over metal surfaces that have been shop primed and touchup painted.

3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
  4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
  2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed.
- F. Mechanical items to be painted include, but are not limited to, the following:
1. Uninsulated metal piping.
  2. Uninsulated plastic piping.
  3. Pipe hangers and supports.
  4. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
  5. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
  6. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- G. Electrical items to be painted include, but are not limited to, the following:
1. Switchgear.
  2. Panelboards.
  3. Electrical equipment that is indicated to have a factory-primed finish for field painting.
- H. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- I. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

- J. Completed Work: Match approved samples for color, texture, and coverage. Remove, re-finish, or repaint work not complying with requirements.

### 3.04 FIELD QUALITY CONTROL

- A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:
  - 1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
  - 2. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

### 3.05 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
  - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

### 3.06 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
  - 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

### 3.07 EXTERIOR PAINT SCHEDULE

- A. Concrete, Stucco, and Masonry (Other Than Concrete Unit Masonry): Provide the following finish systems over exterior concrete, stucco, and brick masonry substrates:
  - 1. Flat Acrylic Finish: Two finish coats] over a primer.
    - a. Primer: Exterior concrete and masonry primer.
    - b. Finish Coats: Exterior flat acrylic paint.
  - 2. Low-Luster Acrylic Finish[Two finish coats over a primer.
    - a. Primer: Exterior concrete and masonry primer.
    - b. Finish Coats: Exterior low-luster acrylic paint.
  - 3. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Exterior concrete and masonry primer.
    - b. Finish Coats: Exterior semigloss acrylic enamel.
  - 4. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a primer.

- a. Primer: Exterior concrete and masonry primer.
  - b. Finish Coats: Exterior full-gloss acrylic enamel for concrete, masonry, and wood.
- B. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
1. Low-Luster Acrylic Finish Two finish coats over a rust-inhibitive primer.
    - a. Primer: Exterior ferrous-metal primer.
    - b. Finish Coat: Exterior low-luster acrylic paint.
  2. Semigloss Acrylic-Enamel Finish: Two finish coats over a rust-inhibitive primer.
    - a. Primer: Exterior ferrous-metal primer.
    - b. Finish Coats: Exterior semigloss acrylic enamel.
  3. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a rust-inhibitive primer.
    - a. Primer: Exterior ferrous-metal primer.
    - b. Finish Coats: Exterior full-gloss acrylic enamel for ferrous and other metals.
- C. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces:
1. Low-Luster Finish Two finish coat over a galvanized metal primer.
    - a. Primer: Exterior galvanized metal primer.
    - b. Finish Coat: Exterior low-luster acrylic paint.
  2. Semigloss Acrylic-Enamel Finish: Two finish coats over a galvanized metal primer.
    - a. Primer: Exterior galvanized metal primer.
    - b. Finish Coats: Exterior semigloss acrylic enamel.
  3. Full-Gloss Acrylic-Enamel Finish: [Two finish coats over a galvanized metal primer.
    - a. Primer: Exterior galvanized metal primer.
    - b. Finish Coats: Exterior full-gloss acrylic enamel for ferrous and other metals.
- D.
- E.

## **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. The cost of the work described in this Section shall be included in the lump sum contract price.

**END OF SECTION 09912**



## DIVISION 15 – MECHANICAL

### SECTION 15010

#### BASIC MECHANICAL REQUIREMENTS

#### PART 1 -GENERAL

##### 1.01 RELATED DOCUMENTS

- A. The General Conditions, Supplementary Conditions and Division 1, General Requirements apply to this Section, Section 15050 - Basic Mechanical Materials and Methods and Contractor shall review and adhere to all requirements of these Documents.

##### 1.02 WORK INCLUDED

- A. Basic requirements common to the work in general of Division 15 and other Divisions and Sections of the Specification where referenced.
- B. Provide, unless specified otherwise, all labor, materials and equipment necessary for completely finished and operational mechanical systems described and specified under other Sections of this Division 15.
- C. Provide all minor incidental items such as offsets, fittings, and accessories required as part of the work even though not specified or indicated.
- D. Inspection: Inspect work preceding or interfacing with work of Division 15 and report any known or observed defects that affect the Work to the General Contractor. Do not proceed with the work until defects are corrected.

##### 1.03 REFERENCES

- A. General.
1. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable Codes.
  2. The date of the standard is that in effect as the date of the Contract Documents, except when a specific date is specified.
  3. When required by individual Specifications Section by means of reference for cleaning or installation requirements, etc.; obtain a copy of the standard. Maintain the copy at job site during work until substantial completion. Copy may be in electronic format.
  4. Schedule of Referenced Organizations: The following is a list of the acronyms of organizations referenced in these Specifications:

<u>Acronym</u>	<u>Organization</u>
AABC	Associated Air Balance Council
ABMA	American Bearing Manufacturers Association
ACGIH	American Conference of Governmental Industrial Hygienists
ACI	American Concrete Institute
ADA	Americans with Disabilities Act

ASA	American National Standards on Acoustics and Vibrations
ADC	Air Diffusion Council
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing of Materials
AMCA	Air Movement and Control Association
AGA	American Gas Association
ANSI	American National Standards Institute
API	American Petroleum Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ARI	American Refrigerants Institute
ATA	Air Transport Association of America
AWS	American Welding Society
AWWA	American Water Works Association
EPA	Environmental Protective Agency
ETL	Electrical Testing Laboratories
CISPI	Cast Iron Soil Pipe Institute
CTI	Cooling Tower Institute
FM	Factory Mutual Insurance Association
HI	Hydronics Institute
IBC	International Building Code
IFC	International Fire Code
ISA	Instrument Society of America
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry
NACE	National Association of Corrosion Engineers
NAPCA	National Association of Pipe Coating Applicators
NEMA	National Electrical Manufacturers Association
NEBB	National Environmental Balancing Bureau
NFPA	National Fire Protection Association
NIST	National Institute of Science and Technology
NSF	National Sanitation Foundation.
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
SSPC	The Society for Protective Coatings
STI	Steel Tank Institute
UL	Underwriters' Laboratories
WH	Warnock Hersey

#### 1.04 DEFINITIONS

- A. Conform to Division 1: These Specifications are of abbreviated, simplified or streamlined type and include incomplete sentences. Singular words will be interpreted as plural and plural words will be interpreted as singular where applicable and where full context of the Contract Documents so indicates.
- B. The following words are re-defined and/or elaborated on for the context of Division 15 work:
1. Furnish: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.
  2. Install: Except as otherwise defined in greater detail, term "install" is used to describe operations at Project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

3. Provide: Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.
4. General Contractor: The term "General Contractor" used in Division 15 and elsewhere in the Contract Documents means the party with whom the Owner has executed the Owner-Contractor Agreement.

#### 1.05 QUALITY CONTROL

- A. Conform to Division 1. Materials and apparatus required for the work to be new and of first-class quality; to be furnished, delivered, erected, connected and finished in every detail; and to be so selected and arranged so as to fit properly into the building spaces and also provide the manufacturer's recommended maintenance clearance. Where no specific kind or quality of material is given, a first-class standard article shall be furnished.
- B. Unless otherwise specifically indicated, equipment and materials to be installed in accordance with the recommendations of the Manufacturer. This includes the performance of tests as recommended by the Manufacturer.

#### 1.06 REGULATORY REQUIREMENTS

- A. Comply with latest editions of all applicable Codes, Standards, Ordinances and Regulations in effect as of the date of the Contract Documents adopted by the City and County of Denver (CCD), Building Department (BD), and Fire Department (FD), including but not necessarily limited to the following:
  1. National Electrical Code NFPA-70.
  2. NFPA.
  3. ASHRAE.
  4. SMACNA.
  5. Underwriters Laboratories.
- B. If discrepancies occur between the Contract Documents and any applicable Codes, Guidelines, Ordinances, Acts, or Standards, the most stringent requirements shall apply.
- C. Where hourly fire ratings are indicated or required, provide components and assemblies meeting requirements of the American Insurance Association, Factory Mutual Insurance Association and listed by Underwriters Laboratories, Inc.

#### 1.07 PRODUCT OPTIONS AND SUBSTITUTIONS

- A. Substitutions: Refer to Division 1, General Requirements.
- B. Some materials and equipment are specified by Manufacturer and catalog numbers. The Manufacturer and catalog numbers are used to establish a degree of quality and style for such equipment and material.
- C. When alternate or substitute materials and equipment are used, Contractor shall be responsible for space requirements, configurations, performance, changes in bases, supports, structural members and openings in structure, electrical changes and other apparatus and trades that may be affected by their use.

- D. When providing a product and/or service under the qualification of "acceptable equal," Contractor shall be entirely responsible for additional costs incurred due to modifications to the civil, Architectural, structural, mechanical, and electrical design that may be required to accommodate the "acceptable equal."
- E. Substitute materials and equipment are only allowed to be provided from the Manufacturers listed as approved.

#### **1.08 SHOP DRAWINGS AND PRODUCT DATA**

- A. General: Comply with the General Conditions of the Contract and with Division 1 - General Requirements.
  - 1. All documents shall be submitted in electronic format. Each submittal shall be in a single security free PDF document. PDF documents shall be compatible with Adobe Acrobat 8.0 or newer. All as-built documents shall be submitted in AutoCAD 2007 or newer format and PDF plot files of the project.

#### **1.09 CONTRACT RECORD DOCUMENTS**

- A. General: Comply with the General Conditions of the Contract and with Division 1 - General Requirements,

#### **1.10 OPERATING AND MAINTENANCE DATA**

- A. Division 15 Contractor shall submit one (1) CD-ROM containing a single searchable PDF file of the entire maintenance manual to the DIA Project Manager, General Contractor for their approval.
- B. The manual shall have:
  - 1. Alphabetical list of all system components including the name, address, and 24-hour phone number of the company responsible for servicing each item during the first year's operation.
  - 2. Operating instructions for complete system, including emergency procedures for fire or failure of major equipment and procedures for normal starting/operating/shutdown and long-term shutdown.
  - 3. Maintenance instructions, including valves, valve tag and other identified equipment lists, proper lubricants and lubricating instructions for each piece of equipment and necessary cleaning/replacing/adjusting schedules.
  - 4. Manufacturer's data on each piece of equipment, including:
    - a. Installation instructions.
    - b. Drawings and specifications (approved shop drawings).
    - c. Parts lists.
    - d. Complete wiring and temperature control diagrams (approved shop drawings).
  - 5. Each piece identified on any schedule shall be bookmarked in the electronic file by its scheduled tag ID (IE: AHU-1)
- C. In addition to the maintenance manual, and keyed to it, the equipment shall be identified and tagged as specified elsewhere. Insert a copy.

1. Identify all starters, disconnect switches, and manually operated controls, except integral equipment switches with permanently applied, legible markers corresponding to operating instructions in the "Maintenance Manual".
  2. Tag all manual operating valves with 1-1/2" diameter brass tags attached with chains. Tags are to be sequence numbered with legible metal stamps.
  3. Provide a typed tag list or schedule mounted under glass in the room designated by DIA Project Manager stating number, location, and function of each tagged item. Insert a copy of tag list in each "Maintenance Manual".
- D. Division 15 Contractor shall be responsible for scheduling instructional meetings for maintenance personnel on the proper operation and maintenance of all mechanical systems, using the maintenance manual as a guide. These meetings must be scheduled through the Project Manager, and General Contractor far enough in advance so that all personnel can be notified.
- E. Division 15 Contractor shall provide proof of performance certification of all Mechanical Equipment and Systems to demonstrate that all Mechanical Equipment and Systems are operating to the intent of the design.

#### **1.11 FINAL OBSERVATION**

- A. Comply with the requirements of Division 1 and the following.
- B. Prior to the request for final observation, all Work under the contract shall be completed, all systems shall be in proper working order and placed in operation (System Startup of 48 hours).
- C. All HVAC systems shall be properly balanced with quantities shown on the Drawings, and all water circuits shall be adjusted to provide the proper flows.
- D. All equipment shall be cleaned, including but not limited to, plumbing fixtures. All debris and construction materials shall be removed from the DIA property to a suitable landfill off-airport.
- E. Pumps shall be tested in accordance with Sections 15990 and shall be in proper working order and placed in operation.
- F. The temperature control system shall be complete and in proper working order. All instruments shall be properly and accurately field calibrated.
- G. At the request of the Project Manager, a representative of the Contractor who is thoroughly familiar with the Project and operation of the various systems shall be present during the final observation to demonstrate proper operation of the equipment and controls. If requested by the Project Manager, the Contractor shall have representatives from his subcontractors present to assist during final observation.

#### **1.12 PROJECT CONDITIONS**

- A. Accessibility.
1. Division 15 Contractor shall be responsible for the sufficiency of the size of shafts and chases and the adequate clearance in double partitions and hung ceilings for proper installation of his work. He shall cooperate with Contractors of other Divisions of the

Work whose work is in the same space and shall advise the General Contractor of his requirements. Such spaces and clearances shall, however, be kept to the minimum size required.

2. Division 15 Contractor shall locate all equipment, which must be serviced, operated, or maintained in fully accessible positions. Such equipment shall include (but not be limited to) valves, shock absorbers, traps, cleanouts, motors, controllers, switchgear, and drain points. If required for better accessibility, furnish access doors for this purpose. Minor deviations from Drawings may be allowed to provide for better accessibility. Any changes shall be approved by the Project Manager prior to making the change.
3. Division 15 Contractor shall provide the General Contractor with the exact locations of access doors for each concealed valve, shock absorber control, damper, or other device requiring service. Locations of these doors shall be submitted in sufficient time to be installed in the normal course of work. All access doors shall be coordinated with architectural finishes and surfaces. Where walls and/or ceilings are fire rated, Contractor shall provide rated access doors equal to the rating of the wall and/or ceiling.
4. Provide carpentry, masonry, concrete and metal work required for work of this Division where not specifically called for under other Sections.

B. Fabrication.

1. Before any ductwork is fabricated and before running and/or fabricating any lines of piping or ductwork, the Contractor shall assure himself that they can be run as contemplated in cooperation with Contractors of other Divisions of the Work and the physical constraints of existing conditions and new Structural and Architectural Work.

C. Scaffolding, Rigging and Hoisting.

1. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery into the premises of any equipment and apparatus furnished; remove same from premises when no longer required. Conform to OSHA requirements and standards.

### 1.13 COORDINATION

- A. General: Coordinate and order the progress of mechanical work to conform to the progress of the work of the other trades. Complete the entire installation as soon as the condition of the building will permit.
- B. Coordination with Electrical Work: Comply with Division 16..
- C. Existing System Interruptions: Comply with Division 1.
- D. Cutting and Patching: Section 15050 and Division 1.
- E. Drawings and Specifications: The Mechanical Drawings indicate the general design and arrangement of lines, equipment, systems, etc. Information shown is diagrammatic in character and does not necessarily indicate every required offset, fitting, etc. Do not scale the Drawings for dimensions. Take dimensions, measurements, locations, levels, etc., from the Architectural Drawings and equipment to be furnished.

- F. Discrepancies: Examine Drawings and Specifications for other parts of the work, and if any discrepancies occur between the plans for the work of this Division and the plans for the work of others, report such discrepancies to the Project Manager and obtain written instructions for any changes necessary.
- G. Order of Precedence: The precedence of mechanical construction documents are as Specified in Article 4 of the General Conditions.

#### **1.14 START-UP PROCEDURES**

- A. Before start-up, manufacturer's shipping blocks and other similar materials shall be removed, each piece of equipment comprising a part of the system shall be checked for proper lubrication, drive rotation, belt tension, proper control sequence, and any other condition, which may cause damage to equipment or endanger personnel.
- B. Ensure that all control systems are fully operational in automatic mode.
- C. If systems are not to continue in use following the start-up procedures, steps should be taken to ensure against accidental operation or operation by unauthorized personnel. Contractor shall follow OSHA Standards for lockout/tag out procedures to secure equipment not yet placed in operation.
- D. Factory personnel shall be notified as appropriate to start systems requiring their services.
- E. Notify the DIA Project Manager in writing a minimum of 48 hours prior to start-up of all major mechanical equipment and systems.
- F. Should there be any equipment found which had not been properly started up, it will be the responsibility of the Contractor to arrange for the appropriate personnel to start up the equipment at his expense and at a time as scheduled by the DIA Project Manager.

#### **1.15 SCHEDULE OF TESTING**

- A. Provide testing in accordance with the General Conditions of the Contract.
- B. A schedule of testing shall be drawn up by the Division 15 Contractor in such a manner that it will show areas tested, test pressure, length of test, date, time and signature of testing personnel.
- C. Notify the DIA Project Manager, DIA Mechanical Inspector and DIA Mechanical Engineer in writing a minimum of 72 hours prior to testing of any mechanical equipment and systems.
- D. All testing must be performed in the presence Project Manager and or his designated representative; his signature for verification of the test must appear on the schedule.
- E. All testing must be performed in accord with the procedures set forth in Division 15 and other Sections of the Specifications where referenced. At completion of testing, the test reports shall be then submitted in triplicate to the Project Manager.
- F. Make all specified tests on piping, ductwork and related systems as necessary.
- G. Make sure operational and performance tests are made on seasonal equipment.

- H. Complete all tests required by Code Authorities, such as health codes, building codes, and safety codes.
- I. After test runs have been completed and systems have been demonstrated to be satisfactory and ready for permanent operation, all permanent pipeline strainers and filters shall be cleaned, air filters cleaned or replaced, valve and pump packing properly adjusted, belt tensions adjusted, drive guards secured in place, lubrication checked and replenished if required.

#### **1.16 CLEANING AND FINISHING**

- A. Provide cleaning in accordance with the General Requirements of the Contract
- B. Cleaning shall include but not be limited to removing grease, dirt, dust, stains, labels, fingerprints and other foreign materials from sight-exposed piping, ductwork, equipment, fixtures and other such items installed under Division 15 of the work. If finishes have been damaged, refinish to original condition and leave everything in proper working order and of intended appearance.

#### **1.17 WARRANTIES**

- A. Conform to Division 1: Provide a written warranty covering the entire mechanical work to be free from defective materials, equipment and workmanship for a period of two years after date of acceptance. During this period provide labor and materials as required to repair or provide labor and materials required to repair or replace defects. Provide certificates for such items of equipment, which have or are specified to have warranties in excess of one year.

**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 15010**



## SECTION 15050

### BASIC MECHANICAL MATERIALS AND METHODS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. This Section includes the following basic mechanical materials and methods to complement other Division 15 Sections.
  - 1. Field-fabricated metal equipment supports.
  - 2. Concrete bases
  - 3. Installation requirements common to equipment specification Sections.
  - 4. Mechanical demolition.

##### 1.02 RELATED SECTIONS

- A. Drawings and general provisions of Contract, including General and the Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 15010 – Basic Mechanical Requirements
- C. Section 05999 - Welding
- D. Section 15190 - Mechanical Identification: Labeling and identifying mechanical systems and equipment is specified in Division 15 Section "Mechanical Identification."

##### 1.03 DEFINITIONS

- A. Pipe, pipe fittings, and piping include tube, tube fittings, and tubing.
- B. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- C. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- D. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- E. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- F. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

#### 1.04 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Shop drawings detailing fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment. Wood supports are only allowed in roof equipment curbs. Supports inside the building shall be constructed entirely of metal.
- C. Prepare coordination drawings according to Division 1 Section "Submittals" to a 1/4 inch equals 1 foot scale or larger. Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Show where sequence and coordination of installations are important to the efficient flow of the Work. Include the following:
  - 1. Clearances for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
- D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the Quality Assurance Article.
- E. Floor x-rays and/or ground penetrating radar reports.
- F. All "As Built" Plans shall be provided in digital, AutoCAD/Revit and Acrobat PDF formats.
- G. Contractor shall submit fully dimensioned spool drawings for all welded piping work. Drawings shall indicate all weld types, sizes and materials to be used. The spool drawing size shall match the full size contract documents of either 24x36 or 34x44. Spool drawings shall be submitted in the latest version of AutoCAD (dwg) and the latest version of Adobe Acrobat (pdf). Adobe Acrobat files shall not contain security. Other file formats will not be accepted.
- H. Field Test Reports: Written reports of each pressure tests specified in Division 15 Sections. Include the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Failed test results and corrective action taken to achieve requirements.

#### 1.05 QUALITY CONTROL

- A. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing by the DIA Project Manager and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. No additional costs will be approved for these increases, if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.
- B. Electronic Equipment Compliance:
  - 1. Contractor warrants that all equipment, devices, items, systems, software, hardware, or firmware provided shall properly, appropriately, and consistently function and accurately process date and time data (including without limitation: calculating, comparing, and

sequencing). This warranty supersedes anything in the Specifications or other Contract Documents which might be construed inconsistently. This warranty is applicable whether the equipment, device, item, system, software, hardware, or firmware is specified with or without reference to a manufacturer's name, make, or model number.

- C. Unless specified otherwise, all materials and equipment shall be of domestic (USA) manufacture and shall be of the best quality used for the purpose in commercial practice.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.
- B. Protect stored ductwork, pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.
- C. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.
- D. Protect flanges, fittings, and piping specialties from moisture and dirt.
- E. Deliver ductwork and fittings with plastic sheeting to protect it from elements. Inspect duct liner for exposure to dirt and tears.

#### 1.07 SEQUENCING AND SCHEDULING

- A. Coordinate mechanical equipment installation with other building components.
- B. Coordinate the installation of required supporting devices.
- C. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work.
- D. Coordinate connection of electrical services.
- E. Coordinate installation of identifying devices after completing covering and painting where devices are applied to surfaces.

### PART 2 – PRODUCTS

#### 2.01 GROUT

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
  - 1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.
  - 3. Packaging: Premixed and factory-packaged.

## **PART 3 - EXECUTION**

### **3.01 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS**

- A. Install equipment to provide the maximum possible headroom where mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to the Project Manager.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.
- D. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
- E. Install equipment giving right-of-way to piping systems installed at a required slope.
- F. Install equipment allowing for usage during operation of surrounding equipment at all portions of operations. In no instance shall an appurtenance block operation of any equipment (Example: A valve handle open position shall not block access to a PT plug).

### **3.02 CONCRETE PENETRATIONS**

- A. Refer Division 1 for core drilling and saw cutting requirements.
- B. All penetrations required through completed concrete construction shall be core drilled or saw cut at minimum size required. All penetrations in concrete require an x-ray or ground penetrating radar to determine if the location is clear of reinforcing steel and embedded systems. Precautions shall be taken when drilling to prevent damage to structural concrete. The Contractor shall provide an interpretation of the x-rays or radar shot and obtain written acceptance from the DIA Project Manager before proceeding with drilling.

### **3.03 CONCRETE BASES**

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
  - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
  - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
  - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
  - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in DIVISION 3.

### 3.04 WELDING

- A. Qualify welding processes and operators for structural steel according to AWS D1.1 Structural Welding Code - Steel. See Division 5 for additional requirements.
- B. All welding shall be inspected in process by a contractor provided, Certified, Independent Testing Agency by an AWS certified welding inspector.
- C. Qualify welding processes and operators for piping according to ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications.
  1. Comply with provisions of ASME B31 Series "Code for Pressure Piping."
  2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.

### 3.05 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Refer to DIVISION 5 for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- C. Field Welding: Comply with AWS D1.1 Structural Welding Code - Steel, as referenced in Part1.

### 3.06 DEMOLITION

- A. Refer to DIVISION 1 for general demolition requirements and procedures.
- B. Where pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.
- C. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.
- D. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.
  1. Piping to Be Removed: Remove portion of piping and associated supports indicated to be removed, provide a shutoff valve with plug or cap in pressurized systems and cap or plug remaining piping with same or compatible piping material. No piping shall be abandoned in place. Repair insulation.
  2. Ducts to Be Removed: Remove portion of ducts and associated supports indicated to be removed and plug remaining ducts with same or compatible ductwork material. No ductwork shall be abandoned in place. Repair insulation.
  3. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
  4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
  5. Equipment to Be Removed: Disconnect and cap services and remove equipment.

6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
8. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

### 3.07 GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

### 3.08 ELECTRIC WIRING

- A. Furnish equipment requiring electrical connections to operate properly and deliver full capacity at electrical service available.
- B. All control wiring to be in accordance with Manufacturer's recommendations; all wiring shall be color coded to facilitate checking.
- C. Unless otherwise indicated, all mechanical equipment motors and controls shall be furnished, set in place, and wired in accordance with the schedule contained herein. Contractor should note that the intent of this electric wiring schedule is to have the Division 15 Contractor responsible for coordinating all control wiring as outlined, whether or not specifically called for by the Mechanical or Electrical Drawings and Specifications. Comply with the applicable requirements of Division 16 for electrical work of this Division 15, which is not otherwise specified. No extras will be allowed for Contractor's failure to provide for these required items. The Division 15 Contractor shall refer to the Division 16 Specifications and plans for all power and control wiring and shall advise the Project Manager of any discrepancies prior to bidding.

Table 3.11-1

Item	Furnished By	Set By	Power Wiring	Control Wiring
Equipment Motors	15	15	16	15
Fused and Unfused Disconnect Switches, Thermal Overloads and Heaters	16	16	16	---
Control Relays and Transformers (See Note 1)	15	15	16	15
Pushbutton Stations Pilot Lights, Manual Switches, not carrying Load Currents	15	15	16	15

**NOTES:**

- a. \* 15 = Mechanical Contractor Under Division 15 of the Work
- b. \* 16 = Electrical Contractor Under Division 16 of the Work
- c. Control wiring is any voltage required to accomplish sequence specified. Contractor listed is responsible.
- d. Control relays and control transformers shall be furnished under Division 15 except where furnishing such items are specifically required under Division 16 Specifications and/or Drawings.

**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 15050**

## SECTION 15072

### MECHANICAL REMOVALS AND DEMOLITION

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Removal of designated building equipment and fixtures.
- B. Removal of designated construction.
- C. Disposal of materials.
- D. Identification of utilities.

##### 1.02 RELATED SECTIONS

- A. Division 1 for Summary of Work, Demolition, and Construction Facilities and Temporary Controls.
- B. Section 15010 - Basic Mechanical Requirements.

##### 1.03 SUBMITTALS

- A. All "As Built" Plans shall be provided in digital, AutoCAD/Revit and Acrobat PDF formats.

##### 1.04 REGULATORY REQUIREMENTS

- A. Do not disable or disrupt building fire or life safety systems without 5 business days prior written notice and written acceptance of DIA Project Manager and DIA Life Safety Team.
- B. Conform to procedures applicable when hazardous or contaminated materials are discovered.

##### 1.05 SCHEDULING

- A. Schedule Work to coordinate with work of other trades and new construction.

##### 1.06 PROJECT CONDITIONS

- A. Conduct demolition to minimize interference with adjacent and occupied building areas.
- B. Cease operations immediately if structure appears to be in danger and notify DIA Project Manager. Do not resume operations until directed.

#### PART 2 - PRODUCTS (NOT USED)

#### PART 3 - EXECUTION

##### 3.01 PREPARATION

- A. Provide, erect, and maintain temporary barriers at locations indicated.



- B. Erect and maintain weatherproof closures for exterior openings.
- C. Protect existing materials and systems, which are not to be demolished.
- D. Notify affected utility companies before starting work and comply with their requirements.
- E. Mark location and termination of utilities.

### **3.02 DEMOLITION**

- A. Disconnect and identify designated utilities within demolition areas.
- B. Demolish in an orderly and careful manner. Remove all unused piping, ductwork or tubing back to source and cap. No piping, ductwork, or tubing is to be abandoned in place.
- C. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.
- D. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.
- E. Remove temporary Work.
- F. Contractor is responsible for verifying existing conditions prior to commencement of work.
- G. All preconditioned air units and associated components being removed shall remain the property of the owner and shall be removed and salvaged unless and until directed otherwise by the DIA project manager.
- H. Contractor shall coordinate all system outages with the DIA project manager.
- I. No preconditioned air units shall be taken out of service until all needed components are on site.
- J. Prior to commencement of work on a gate, outages are to be coordinated with and approved by the DIA project manager and the airline associated with that gate two weeks in advance of the contractor performing work.
- K. After removing the PCA units, contractor is responsible for patching, repairing, and painting any existing steel members of the PBB that may be damaged or worn in the location where the existing PCA unit was installed.

## **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 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 Lump Sum Contract price.

**END OF SECTION 15072**

## SECTION 15190

### MECHANICAL IDENTIFICATION

#### PART 1 -GENERAL

##### 1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.

##### 1.02 RELATED SECTIONS

- A. Section 15010 - Basic Mechanical Requirements.
- B. Section 15050 - Basic Mechanical Materials and Methods.

##### 1.03 REFERENCES

- A. Materials and workmanship shall conform to the latest issue of all industry standards, publications, or regulations referenced in this section and with the following references as applicable. Refer to Section 15010 for listing of issuing organizations or agencies.
- B. Applicable Standards:
  - 1. International Building Code (IBC) with the Denver Amendments
  - 2. International Fire Code (IFC) with the Denver Amendments

##### 1.04 SUBMITTALS

- A. Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- B. Include valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. All "As Built" Plans shall be provided in digital, AutoCAD/Revit and Acrobat PDF formats.

##### 1.05 PROJECT RECORD DOCUMENTS

- A. Record actual locations of tagged valves.

#### PART 2 - PRODUCTS

##### 2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturers:
  - 1. W.H. Brady Co.
  - 2. Panduit Corp.
  - 3. Seton Name Plate Corp.

4. Marking Services, Inc.
5. Substitutions: Under provisions of Section 15010.

## 2.02 MATERIALS

- A. Color: Unless specified otherwise, conform with ASME A13.1.
- B. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.
- C. Metal Tags: Brass or aluminum, with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

## PART 3 -EXECUTION

### 3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Division 9 for stencil painting.

### 3.02 INSTALLATION

- A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners and adhesive.
- B. Metal Tags: Install with corrosive-resistant chain.
- C. Controls: Identify control panels and major control components outside panels with plastic nameplates. Key to control schematics.

### 3.03 EQUIPMENT

- A. Equipment: Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates or stencil painting. Small devices, such as in-line pumps, may be identified with metal tags. At a minimum, the nameplate shall contain the following information:

1. Equipment Tag
2. Equipment location
3. Service Area
4. Flowrate (cfm/gpm)
5. Capacity (btuh/kw)
6. Denver International Airport



(nameplate example capacity and Owner not shown)

- B. Color code as follows:
  1. Green - HVAC equipment.
  2. ASME A13.1 Colors and Designs: For hazardous material exhaust.
  3. Letter Size\color: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering. Lettering color shall be black or white. White shall be used on dark backgrounds.

- C. Data: Distinguish among multiple units, indicate operational requirements, indicate safety and emergency precautions, warn of hazards and improper operations, and identify units.
- D. Include signs for the following general categories of equipment:
  - 1. Preconditioned Air Units.
- E. Install access panel markers with screws on equipment access panels.

**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 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 Lump Sum Contract price.

**END OF SECTION 15190**

## SECTION 15474

### PRECONDITIONED AIR DX AIR HANDLING UNITS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. This Section includes the following types of direct-expansion air handling units:
  - 1. Preconditioned air handling units for narrow-body, wide-body and jumbo aircraft (45, 60 and 90 tons).
- B. Related Work Specified Elsewhere:
  - 1. Electric Control Devices: Section 15478 - Preconditioned Air Electric Control Systems.
  - 2. Preconditioned Air Duct Work and Accessories: Section 15475 - Preconditioned Air Ductwork and Accessories.
  - 3. Air-handling Systems Testing, Adjusting, and Balancing Requirements and Procedures: Section 15990 - Testing, Adjusting, and Balancing.
  - 4. Disconnect Switches, Motor Starters, Starters and Fusible Switches: Division 16.
  - 5. Electric Motors: Section 16486.

##### 1.02 REFERENCES

- A. Materials and workmanship shall conform to the latest issue of all industry standards, publications, or regulations referenced in this section and with the following references as applicable. Refer to Section 15010 for listing of issuing organizations or agencies.
- B. Applicable Standards:
  - 1. American Bearing Manufacturers Association (ABMA).
  - 2. Air-Conditioning and Refrigeration Institute (ARI).
    - a. 410 - Standard for Forced-Circulation Air-Cooling and Air Heating Coils.
    - b. 850 - Commercial and Industrial Filter Equipment.
  - 3. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
    - a. 15 - Safety Code for Mechanical Refrigeration.
    - b. 52 - Method of Testing Air-Cleaning Device Used in General Ventilation for Removing Particulate Matter.
  - 4. American Society of Mechanical Engineers (ASME).
  - 5. International Building Code (IBC) with the Denver Amendments.
  - 6. International Fire Code (IFC) with the Denver Amendments
  - 7. National Fire Protection Association (NFPA):
    - a. 70 - National Electrical Code.
  - 8. National Electrical Manufacturer's Association (NEMA).
  - 9. Occupational Safety and Health Act (OSHA).
  - 10. Underwriters Laboratories (UL).

### 1.03 SUBMITTALS

- A. General: Submit the following in accordance with Division 1.
1. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, dimensions, required clearances, weights, furnished specialties and accessories; and installation and start-up instructions. Also include the following:
    - a. Fan performance curves with system operating conditions indicated.
    - b. Motor ratings and electrical characteristics plus motor and fan accessories.
    - c. Materials gauges and finishes.
    - d. Dampers, including housings, linkages, and operators.
    - e. Submit air filter manufacturer's technical product data including dimensions, weights, required clearances and access, flow capacity including initial and final pressure drop at rated air flow, efficiency and test method, fire classification, and installation instructions.
  2. Shop drawings detailing fabrication and installation for metal supports and anchorage for air handling unit equipment.
  3. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the Quality Assurance Article.
  4. Shop Drawings: Submit shop drawings detailing the manufacturer's electrical requirements for power supply wiring. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory installed and portions to be field-installed.
  5. Operation and Maintenance Data: Submit maintenance data and parts list for each air handling unit, including "troubleshooting" maintenance guide, servicing guide and preventative maintenance schedule and procedures. Include this data in the maintenance manual; in accordance with requirements of Division 1 and Section 15010.
  6. "As Built" Plans shall be provided in the same format and manner as described above. Plans drawings shall be submitted in AutoCAD (Release 2000 minimum) format Adobe Acrobat 6.0 (bookmarked and free of security) on CD-ROM or DVD-ROM .One (1) copy containing all drawing files shall be submitted directly to the DIA Mechanical Engineer as part of each submittal.

### 1.04 PROJECT RECORD DOCUMENTS

- A. Record actual locations of equipment, service entrances and accessories. Submit drawings on a single CD-ROM in AutoCAD (Release 2000 minimum) format.

### 1.05 QUALITY ASSURANCE

- A. ARI Compliance: Coils shall comply with ARI 410; Air filter equipment shall comply with ARI 850.
- B. ASHRAE Compliance: Air filters shall comply with ASHRAE Standard 52 for method of testing, and for recording and calculating air flow rates; and Standard 15 Safety Code for Mechanical Refrigeration.
- C. NFPA Compliance: Comply with applicable portions of NFPA 70, for components and installation of air handling units.

- D. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- E. UL Compliance: Components shall be UL listed and labeled.
- F. Comply with the local building and fire codes as required by jurisdictional authorities.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Lift and support units with the manufacturer's designated lifting or supporting points.
- B. Disassemble and reassemble units as required for movement into the final location, following manufacturer's written instructions.
- C. Deliver fan units as factory-assembled units to the extent allowable by shipping limitations, with protective crating and covering.
- D. Store all equipment and material in suitable facilities until delivery and acceptance by the Project Manager.
- E. Each air handling unit shall be easily mounted and removed from the aircraft bridge without permanent damage to the bridge or its operation.

#### 1.07 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Filters: One set of filters for each unit.

#### 1.08 WARRANTY

- A. Warranty of all equipment described in this Section shall meet warranty requirements of Section 15010 - Basic Mechanical Requirements.

### PART 2 -PRODUCTS

#### 2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Air Handling Units:
    - a. FCX Systems/Twist Inc.
    - b. Substitutions: Under provisions of 15010.
  - 2. Air Filters:
    - a. American Air Filter Company.
    - b. Farr Company.
    - c. Research Products Corp.
    - d. Substitutions: Under provisions of 15010.

#### 2.02 GENERAL DESCRIPTION

- A. The pre-conditioned air unit shall be an all electric, self-contained, automatically controlled air conditioning unit that provides ventilation, cooling, dehumidifying, filtering, and heating of air supplied to parked aircraft. The unit shall use direct expansion, vapor cycle technology.



The pre-conditioned air unit shall be designed to provide comfortable cabin temperatures for passengers and crew during pre-flight, turn-around, overnight parking and maintenance operations.

- B. Provide a compact, minimum-weight, and low-noise insulated DX air handling unit that can be mounted on equipment stands or passenger loading bridges, such that the operational characteristics of the bridge are unrestricted and the bridge's structural integrity is not compromised.
  - 1. 45 Ton Stand-Mounted: The DX units shall be stand mounted on the apron. All stands shall be designed and manufactured by the pre-conditioned air unit manufacturer. Any proposed apron-mounted air handling unit shall require a telescoping duct across the bridge. It is unacceptable to use flexible air duct (hose) from the rotunda out to the bogie. Location for mounting the air handling unit underneath the bridge shall be behind the bogie wheels and as indicated on the contract drawings.
  - 2. 45, 60, and 90 Tons Bridge-Mounted: The DX units shall be mounted to the underside of the passenger boarding bridges on the "C" Tunnel, as far back from drive column as possible. All support brackets and accessories shall be designed and provided and by the pre-conditioned air unit manufacturer.
- C. The air handling unit at each gate shall contain evaporator coils, evaporator blower, compressors, condenser coils, condenser fan, refrigeration and temperature controls, smoke detector, electric resistance heaters, filters, complete motor starting equipment (including disconnect switch), condensate drain pan, internal air/water separator and condensate discharge pump to provide the required cooled, ventilated or heated air to maintain the aircraft cabin temperature specified.
- D. The air handling unit(s) shall have the capacity required to sufficiently cool the largest designated aircraft parked at a gate, considering quantity of air to be delivered and static pressures.
  - 1. Units serving wide-body gates shall also operate properly when serving narrow-body aircraft at the same gate.
  - 2. Units servicing B-747 gates shall also operate properly when serving a wide-body or narrow-body aircraft at the same gate.
- E. The blower shall be sized for the appropriate variable volume airflow requirements. The unit size shall be selected so that the fan brake horsepower does not exceed the maximum required over the design operating range of the unit at the total static pressure.
- F. Unit external static pressure shall be defined as the gauge pressure measured at the outlet of the air handling unit.
  - 1. The Contractor shall submit data presenting the gauge pressure which the proposed air handling unit can produce at the outlet of the air handling unit and at the aircraft connection through 45 feet of hose and an aircraft adapter nozzle in the submittal.
- G. Horsepower shall be selected based on the Contractor's choice of equipment based on the external resistance of the system.
  - 1. Contractor shall furnish the fan motor and unit size adequate for final total static pressure and maximum brake horsepower requirements.
  - 2. Minimum horsepower requirement for narrow-body air handling units shall be 15; for wide-body air handling units, shall be 40; and for B-747/A340 air handling units shall be 50.
- H. Return air to the unit shall not be utilized.

- I. The Contractor shall submit evidence that coordination efforts have been made with the bridge manufacturer for bridge-mounted DX air handling units equipment weights, static and dynamic loading, location, and safety factors.
- J. The construction of the unit shall be:
  - 1. of a material sufficient to provide adequate structural rigidity of frame and enclosure;
  - 2. of a noncorrosive nature; and,
  - 3. provided with thermal insulation for conditions encountered in normal usage.
- K. Where applicable, equipment exterior shall be primed and painted to match bridge color. Equipment interior shall be manufacturer's standard.
- L. The maximum sound level for the DX air handling units at maximum cooling shall not exceed 85 dBA at a distance of 15 feet from the unit. Sound power level radiated by the unit outlet and at the unit inlet when the unit is operated at the designated capacity shall be furnished with the submittal.
- M. No dirty filter indications will be required. However, Contractor shall include in the O&M manuals provisions for scheduled, routine filter cleaning or replacement.
- N. All apron mounted DX air handling units shall be installed with guard posts for protection from ramp activities.
  - 1. Guard posts shall be 6 inches in diameter concrete filled steel pipes embedded 2'-0" minimum in an 18-inch square concrete foundation and projecting 3'-6" above grade.
  - 2. Guard posts shall be located at all corners of equipment and spaced no more than 4'-0" apart.
  - 3. All posts shall be painted to match existing posts.
- O. Capacity control and defrost control shall be identified and explained in submittal.
- P. Provide access doors of the hinge type or removable panels. Locate as required for proper access to the following:
  - 1. Compressors.
  - 2. Blower/damper.
  - 3. Filters.
  - 4. Coils.
- Q. Controls panel shall include, but are not limited to:
  - 1. A remote "start/stop" push-button station shall be provided, accessible from the ground level for each AHU.
  - 2. "ON" light.
  - 3. "Ready" light (lighted pushbutton).
  - 4. Stop/Reset Pushbutton (red light for fault)
  - 5. WB/NB pushbutton or JB/WB/NB pushbutton as applicable.
  - 6. Wireless connection to LonWorks compatible building automation system to monitor, view and control all points. Refer to Sections 15478 and 15955. Wiring, Conduit and interface shall be included with PC Air unit and coordinated with other components.

- R. Internal ductwork of air handler shall be stainless steel or aluminum construction.
- S. The unit shall have a variable frequency drive (VFD) to modulate and provide a soft start for airflow. The VFD shall gradually ramp up when the unit is activated to minimize hose snap.

**2.03 45, 60, AND 90 TON UNITS**

- A. The unit design shall consist of three refrigeration systems to provide multiple stages of control.
  - 1. Refrigeration Circuit Configuration: The refrigeration circuit configuration will consist of a Primary System, a Middle System, and a Secondary System.
    - a. Primary System: The Primary System to be comprised of basic refrigeration circuits consisting of an evaporator coil, compressor, condenser coils, necessary piping and a means of controlling the flow of refrigerant. The Primary System takes air from the outside, through the air filters, through the blower where it picks up the heat of compression from the blower, and cools the air. This stage takes a large amount of moisture out of the air. The air is then directed to the Middle System.
    - b. Middle System: The Middle System to be comprised of basic refrigeration circuits consisting of an evaporator coil, compressor, condenser coil, necessary piping, and a means of controlling the flow of refrigerant. The Middle System intakes air from the Primary System, where it was cooled, further cools it, and discharges it to the Secondary System.
    - c. Secondary System: The Secondary Systems to be comprised of basic refrigeration circuits consisting of an evaporator coil, compressor, condenser coil, necessary piping, and a means of controlling the flow of refrigerant. The Secondary System intakes air from the Middle System, where it was cooled, further cools it, and discharges it to the aircraft.
    - d. Control Stages from low ambient to high temperatures:
 

<u>Stage</u>	<u>System</u>	<u>Mode of Operation</u>
1	Three Stages of heat	Heat
2	Two Stages of heat	Heat
3	One Stage of heat	Heat
4	Blowers only	Ventilate
5	Secondary System	Cool
6	Primary & Secondary Systems	Cool
7	Primary, Middle, and Secondary	Cool
    - e. The unit shall be designed to use one blower system. The airflow shall be reduced with the VFD for heating modes.
    - f. The condensers shall use two or four condenser fans and motors.
    - g. The air shall be filtered with 2" thick aluminum washable type filters.

- 2. Air Conditioning Components:
  - a. Refrigerant Compressor: The refrigerant compressors shall be hermetic scroll type, 2-pole motor, unidirectional compressor with a solidly mounted compressor base assembly and with oil Sight glass and oil charging valve.
  - b. Condenser Coil: the condenser coil shall be copper-tube / aluminum fin heat exchanger. Copper tubes shall be rifled and aluminum fins raised lanced to intensify heat transfer.
  - c. Filter-Drier: A replaceable sealed-type filter-drier, installed in the liquid line, to remove moisture and contamination from the refrigerant. The filter-drier shall contain a 100-mesh screen and a molded blend of desiccants for acid and water removal.
  - d. Sight Glass: A combination moisture and liquid indicator shall be installed in the liquid line to monitor the flow and moisture content of the refrigerant. The sight

- glass color indicator is to be protected by a pad and screen and changes color on the basis of relative moisture in the refrigerant.
- e. Expansion Valve: A thermostatic expansion valve to automatically meter the refrigerant flow to the evaporator coil by sensing evaporating pressure and temperature of the vapor leaving the evaporator coil.
  - f. Evaporator Coil: The evaporator coil shall be copper tube / aluminum fin heat exchanger with rifled copper tubing and raised lanced aluminum fins to intensify the heat transfer process.
  - g. Electronic Discharge Bypass Valve: An electronic discharge bypass valve shall be installed in the Secondary System circuit to prevent the coil from dropping below freezing and to control the capacity of this coil.
  - h. Pressure Transducers: Located as appropriate according to sound engineering practices, the transducers shall be fully encapsulated, non-adjustable, direct mount controls for use with non-corrosive refrigerants. These controls shall be fitted with a 1/4 inch SAE female flare fitting with an internal depressor for the Schrader valves located in the piping to prevent refrigerant loss during replacement.
  - i. Access (Schrader) Valves: 1/4 inch SAE male valves designed for flare connection used as ports for pressure switch connections and access to the system.
  - j. A 3/8 SAE flare charging valve shall be installed in the suction and discharge lines for evacuating and charging the system.
3. Air moving Components
- a. Supply air blower
    - 1) 2-pole motor, direct driver, radial wheel turbo pressure type blower with anti spark and corrosion wheel.
    - 2) Blower motors shall be totally enclosed fan cooled, Direct-connected to blower impeller and of NEMA design B, Class F insulation, 1.15 service factor.
  - b. Cooling Air Fan: Axial type, 4-pole or 6-pole motor driven fan with spark and corrosion proof fan blades. The motor is fan-cooled, totally enclosed of NEMA Design B, Class F insulation, 1.15 Service Factor.
  - c. Air Filter: Used to filter intake ambient air, the air filter shall be the cleanable, viscous impingement type
  - d. Control of the unit shall be by means of three or four push buttons. Two or three buttons for Start, one button for Stop/Reset of the unit. These modes, and all of the components shall be controlled by a solid state Direct Digital Controller (DDC) with communication capability. This capability can be linked to monitor the performance of the unit.
4. Safety Provisions and Components:
- a. Circuit Protection: The following systems and / or components will be protected against short-circuit currents or grounds by means of properly selected circuit breakers or fuses:
    - 1) Main Power.
    - 2) Blower motor.
    - 3) Fan motors.
    - 4) Compressor motors.
    - 5) Heater stages.
    - 6) Transformer primary winding (2-pole).
    - 7) Transformer secondary winding, 24 volt (1-pole).
  - b. Overload Protection: Each motor shall be protected from damaging overload currents as follows:
    - 1) Compressor motors: With solid-state built in protection.
    - 2) Blower Motor: Overload protection provided by the VFD.

- 3) Fan Motors: With relays of the manual reset type and adjustable setting range type.
  - c. Refrigerant Extreme Pressure Protection: High and low-pressure limit transducers shall protect each refrigeration system. High and low limit pressure transducers shall be used on all refrigeration systems.
  - d. Compressor Short Cycling Protection: Each refrigerant compressor motor shall be protected against short cycling (multiple starts and stops over a short period) by a run-limit timer. The timer shall be programmed in the controller; wired to the motor control circuit to provide a minimum 3-minute delay on re-energizing the compressor motors after each stop.
5. Performance and Capabilities: The following are the design criteria that have been established for the air handler units (basic unit performance and configuration are shown in schedules on the drawings):
- 1) Outdoor Design Temperatures:
    - a) Summer:
      - (1) 92°F db/59°F wb
      - (2) 95°F db/63°F wb – Air Cooled Condensing Temperature
    - b) Winter:
      - (1) -5°F db
  - b. Performance Outputs: When operating in the Cooling Mode at design ambient conditions and at the nominal air flow rates, the unit shall deliver 34°F (1°C) air at the unit. When operating in the Heating Mode the unit shall deliver air temperatures between 100°F (38°C) and 160°F (71°C) at the unit.
  - c. Nominal airflow has been shown in the drawing schedules, however, the unit shall be capable of operating at increased airflow rates with a coincident decrease in static pressure. The unit shall be capable of delivering up to 15 percent greater airflow with a concomitant increase in cooling-duty supply air temperature of approximately 5° F.
  - d. Blowers must be adjusted for site altitude of 5,400 ft.
6. Miscellaneous Equipment:
- a. Supply Air Duct: The length of duct going from the pre-conditioned air unit to the aircraft shall be 60 feet.
  - b. Mode Selector: The controls shall be three or four push buttons mounted on the passenger loading bridge.
  - c. Hose Trolley: steel construction with safety yellow finish, toe brakes, capacity of 80 feet of 14" PCA duct.
  - d. Supply Hose Reducer: The PC air unit shall be supplied with a fabric duct that attaches into the 14-inch duct and reduces it to 8-inch duct.
  - e. Provide 2" tall reflective black and yellow, angle-striped, reflective safety tape on the bottom edges of all loading bridge mounted units.

**2.04 AIR HANDLING UNIT SUPPORT**

- A. All stand mounted air handling units shall be supported on a factory furnished stand. Stands shall be constructed of steel shapes complying with ASTM A 36, ASTM A 572 grade 50. Stands shall be coated with a baked enamel finish with the color matching the unit or safety yellow.
- B. Field Welding: Comply with AWS D1.1 Structural Welding Code - Steel, as referenced in Part1.
- C. Supports for all loading bridge mounted units shall be provided by the air handling unit supplier.

**2.05 CONTROL SYSTEMS**

- A. Refer to Sections 15478 - Preconditioned Air Electric Control Systems and 15479 - Preconditioned Air Sequence of Operation for controls requirements.

**2.06 EQUIPMENT SCHEDULES**

<b>45 -TON PRECONDITIONED AIR UNITS</b>	
Tons Nominal (Actual Compressor Tonnage)	45
Unit Weight (lbs)	4500
Refrigerant	R-410A
Power Voltage/Hertz/Phase	480-60-3
Rated Amps	150
Compressors, Scroll @ 60Hz Rating	15,15,15 Ton
Blower H.P.	25
Design Airflow lb/min (kgs)	275 (2.08)
Static at Aircraft in.Wc (kPa)	25 (6.25)
Cooling Discharge Temperature °F/°C	32 (0.6) - 36 (3.3)
Heating Discharge Temperature °F/°C	100 (38) -160 (71)
*Notes: Blowers shall be corrected for site altitude of 5,400 ft	

<b>60 -TON PRECONDITIONED AIR UNITS</b>	
Tons Nominal (Actual Compressor Tonnage)	60
Unit Weight (lbs)	4850
Refrigerant	R-410A
Power Voltage/Hertz/Phase	480-60-3
Rated Amps	200
Compressors, Scroll @ 60Hz Rating	20, 20, 20 Ton
Blower H.P.	40
Design Airflow lb/min (kgs)	325 (2.45)
Static at Aircraft in.Wc (kPa)	30 (7.5)
Cooling Discharge Temperature °F/°C	32 (0.6) - 38 (3.3)
Heating Discharge Temperature °F/°C	100 (38) -160 (71)
*Notes: Blowers shall be corrected for site altitude of 5,400 ft	

<b>90 -TON PRECONDITIONED AIR UNITS</b>	
Tons Nominal (Actual Compressor Tonnage)	90
Unit Weight (lbs)	7950

<b>90 -TON PRECONDITIONED AIR UNITS</b>	
Refrigerant	R-410A
Power Voltage/Hertz/Phase	480-60-3
Rated Amps	300
Compressors, Scroll @ 60Hz Rating	25, 25, (2)20 Ton
Blower H.P.	60
Design Airflow lb/min (kgs)	500 (3.78)
Static at Aircraft in.Wc (kPa)	35 (8.75)
Cooling Discharge Temperature °F/°C	32 (0.6) - 38 (3.3)
Heating Discharge Temperature °F/°C	100 (38) -160 (71)
Outlet Ducts	Two 14-inch diameter
*Notes: Blowers shall be corrected for site altitude of 5,400 ft	

**PART 3 -EXECUTION**

**3.01 EXAMINATION**

- A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of air handling units.
- B. Do not proceed until unsatisfactory conditions have been corrected.

**3.02 INSTALLATION, GENERAL**

- A. PCA air handling units shall be mounted underneath and on the bridge. Units may be apron mounted due to weight considerations, with Project Manager's approval.
- B. Arrange installation of units to provide access space around air handling units for service and maintenance.
- C. Furnish all necessary supports, brackets, guard posts, safety hooks, etc., for properly installing all air handling units.
- D. All air handling units shall be properly aligned, adjusted and lubricated before final acceptance.
- E. Perform system testing and balancing as specified in Section 15900 - Testing, Adjusting, and Balancing.

**3.03 CONNECTIONS**

- A. Duct installations and connections are specified in other Division 15 Sections. Make final duct connections with flexible connections.
- B. Electrical Connections: The following requirements apply:
  - 1. Electrical power wiring is specified in Division 16.
  - 2. Temperature control wiring and interlock wiring as specified in Section 15490 - Preconditioned Air Electrical Control Systems.
  - 3. Grounding. Connect unit components to ground in accordance with the National Electrical Code.

### **3.04 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Inspection: Arrange and pay for a factory authorized service representative to perform the following:
  - 1. Inspect the field assembly of components and installation of air handling units including ductwork and electrical connections.
  - 2. Prepare a written report on findings and recommended corrective actions.

### **3.05 DEMONSTRATION**

- A. Start-up Services:
  - 1. Provide the services of a factory-authorized service representative to start-up PCA DX air handling units, in accordance with manufacturer's written start-up instructions.
  - 2. Test controls and demonstrate compliance with requirements.
  - 3. Replace damaged or malfunctioning controls and equipment.
- B. Operating and maintenance training for Owner's Representative is described in Section 15900 - Testing, Adjusting and Balancing.

### **3.06 ADJUSTING, CLEANING, AND PROTECTING**

- A. Clean unit cabinet interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheel and cabinet.

## **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 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 Lump Sum Contract price.

**END OF SECTION 15474**



## SECTION 15475

### PRECONDITIONED AIR DUCTWORK AND ACCESSORIES

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. This Section includes telescoping ductwork, aircraft adapter nozzles, flexible aircraft duct (hose), miscellaneous hard ductwork and fittings, and flexible connections.
- B. Related Sections: The following sections contain requirements that relate to this Section:
  - 1. General requirements: Section 15010 - Basic Mechanical Requirements.
  - 2. Section 15474 – Preconditioned Air DX Air Handling Units
  - 3. Testing, adjusting, and balancing of ductwork: Section 15990 - Testing, Adjusting, and Balancing.

##### 1.02 REFERENCES

- A. Materials and workmanship shall conform to the latest issue of all industry standards, publications, or regulations referenced in this section and with the following references as applicable. Refer to Section 15010 for listing of issuing organizations or agencies.
- B. Applicable Standards:
  - 1. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).
  - 2. American Society for Testing and Materials (ASTM):
    - a. A 527 - Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality.
    - b. A 700 - Practices for Packing, Marking, and Loading Methods for Steel Products for Domestic Shipment.
  - 3. International Building Code (IBC) with the Denver Amendments
  - 4. International Fire Code (IFC) with the Denver Amendments
  - 5. Sheet Metal and Air-Conditioning Contractors National Association (SMACNA) HVAC Duct Construction Standards, 1985 edition.

##### 1.03 SUBMITTALS

- A. General: Submit the following in accordance with Division 1 requirements.
- B. Product Data: Submit manufacturer's technical product data for each type of ductwork, fitting, flexible connection, and aircraft adapter nozzle, including dimensions, capacities, and materials of construction; and installation instructions.
- C. Shop Drawings: Submit manufacturer's assembly-type shop drawings for each type of product data required, showing interfacing requirements with equipment, method of fastening or support, and methods of assembly of components.
- D. Maintenance Data: Submit manufacturer's maintenance data including parts list for each type of product data required. Include these data, product data, and shop drawings in maintenance manual in accordance with requirements of Division 1.

- E. "As Built" Plans shall be provided in the same format and manner as described above. Plans drawings shall be submitted in AutoCAD (Release 2000 minimum) format Adobe Acrobat 6.0 (bookmarked and free of security) on CD-ROM or DVD-ROM .One (1) copy containing all drawing files shall be submitted directly to the DIA Mechanical Engineer as part of each submittal.

#### 1.04 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of ductwork and accessories, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Codes and Standards:
1. SMACNA Compliance: Comply with applicable portions of SMACNA HVAC Duct Construction Standards, 1985 edition.
  2. Industry Standards: Comply with ASHRAE recommendations pertaining to construction of ductwork accessories, except as otherwise required.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store flexible aircraft ducts (hoses), aircraft adapter nozzles, hose trolleys, and telescoping ducts to the jobsite in original unopened containers with labels indicating manufacturer, product name, and related data.
- B. Examine all items for concealed damage or flaws and report any damage.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURER

- A. Subject to compliance with requirements, provide products from the following manufacturers.
1. Flexible Aircraft Duct (Hose):
    - a. AmCraft.
    - b. J&B Aviation
    - c. Sage Parts - RampTech
    - d. Substitutions: Under provisions of Section 15010.
  2. Aircraft Adapter Nozzle.
    - a. J&B Aviation
    - b. Devtec Corporation.
    - c. Sage Parts - RampTech
    - d. Substitutions: Under provisions of Section 15010.
  3. Telescoping Air Duct:
    - a. Cavotec INET US Inc.
    - b. Twist Inc.
    - c. Substitutions: Under provisions of Section 15010.
  4. Hose Trolley:
    - a. Metroplex Conveyor
    - b. Substitutions: Under provisions of Section 15010.

**2.02 FLEXIBLE AIRCRAFT DUCT (HOSE)**

- A. Flat Duct Characteristics – Outer Surface:
1. Orange colored outer cover shall be constructed of 1000 denier Nylon, tight weave construction, with polyurethane laminated backing. The finished material thread is nylon type thread 66. Vinyl outside surface is not acceptable.
  2. The minimal grab tensile strength shall be:
    - a. Warp 600 lbs.
    - b. Fill 500 lbs.
  3. The minimal Torque tear strength shall be:
    - a. Warp 50 lbs.
    - b. Fill 50 lbs.
  4. Material shall have fire resistance of 3 seconds max. for flame out, 5 seconds max. for glow, and 5 inches max. for char length.
  5. The abrasion resistance at the end of 1000 wear cycles the fabric coating shall not be worn to such an extent that the basic fabric is torn by the abraser wheel. (H-22 Abraser wheel under 1000).
  6. The material shall not exceed 10% thickness, 15% weight, and 20% volume increase if soaked for 48 hrs. in 91 octane gasoline, SAE No. 10 oil and water.
  7. No scorching or other harmful effects to be resulted following hot air flowing inside at 170 degrees F for two hrs. No harmful effects due to flexing and exposure to -65 degrees F for 24 hrs. Operating temperature range -46 degrees F to +200 degrees F intermittent to +170 degrees Fahrenheit.
  8. There shall be no visual evidence of deterioration or fungus growth per MIL-STD-810, Method 508.1, Procedure II.
  9. All stitching shall be nylon thread.
  10. 2-ply cuffs shall be at each end of each section of flat duct hose. Each section of hose shall have Velcro connections for means of attaching and securing additional sections.
- B. Flat Duct Characteristics – Inner Liner
1. Inner liner shall be constructed of tear resistant woven nylon material. Vinyl inner liner is not acceptable.
  2. The minimum grab tensile strength in lbs. shall be 600 lbs warp and 500 lbs fill.
  3. The minimum Tongue Tear shall be 50 lbs warp and 50 lbs fill.
  4. Material shall have fire resistance for 5 seconds max. on flame out, 8 seconds max. for glow, and 5 inches for char length.
  5. The inner liner shall be moisture resistant and cold resistant to -65 degrees F.
- C. Flat Duct Characteristics – Insulation
1. Insulation shall have the following characteristics:
    - a. Thickness: 0.05” nominal
    - b. Weight: 0.02 lbs/sq. ft.
    - c. Contact Temperature Range -60°F to 180°F
    - d. Flame spread: 25 in accordance with ASTM E 84
    - e. Smoke Development: 35
    - f. Linear shrinkage: none

- g. Puncture Resistance: 47 lbs./psi
  - h. Fire rating NFPA Class A/UBC Class 1
  - i. Emittance 0.03-0.04
  - j. Reflectivity 0.96-0.97 in accordance with ASTM C 1371
  - k. Aluminum foil sheet, bonded to woven polyethylene film, fungi resistant.
2. Thermal Values, R-Value of 3.25 or greater.
  3. Insulation (between the inner liner and the outside cover) shall not retain moisture nor create a wicking effect should the insulation come in contact with water or any fluids.
- D. Spiral-Reinforced Duct Characteristics – Outer Surface
1. Yellow colored outer surface shall be comprised of 3-ply high strength PVC fabric and black wearstrip. Finished material thickness shall be 0.029 inches.
  2. Spiral reinforcement shall be hard-drawn steel with 4" or 6" standard pitch.
  3. Temperature Rating: -20°F to 180°F
  4. 2-ply cuffs shall be at each end of each section of flat duct hose. Each section of hose shall have Velcro connections for means of attaching and securing additional sections.
- E. Spiral-Reinforced Duct Characteristics – Inner Liner
1. 3-ply PVC fabric designed to eliminate delamination commonly found in inner liners
  2. Finished material thickness shall be 0.017 inches.
- F. Spiral-Reinforced Duct Characteristics – Insulation
1. Stitch-bonded polyester insulation similar to high performance material found in cold weather clothing and camping products.
  2. Insulation shall not retain moisture nor create a wicking effect should the insulation come in contact with water or any fluids.

## 2.03 AIRCRAFT ADAPTER NOZZLE

- A. Properties and characteristics:
1. The adapter shall be manufactured using a Nylon material using Nylon 66 impact modified Super Tough Heat Stabilized and lubricated material known as Hylon Select N1000STHL. The connector is of injection molded construction.
  2. The connector shall be designed to withstand an IZOD tested impact of 16ft/lbs. The method used to conduct this test is ASTM D 256 for scored material.
  3. The connector assembly shall be capable of operating under the following conditions with no deleterious effect on the connector:
    - a. High Temperature range 250°F.
    - b. Low Temperature range -40°F.
  4. The connector shall have integral means to prevent the stainless hose clamps from sliding off.
  5. The connector flange to remain rigid under all operational conditions to provide positive seal to aircraft connection point to reduce risk of air loss. The gasket material for the flange shall be ½" thick and consist of foam neoprene, medium density. This gasket shall be glued to the flange.
  6. The inlet shall be beveled to prevent damage to flat duct hose.

- B. Latching Mechanism
  - 1. Connector latching mechanism shall be 100% slot filled and provide positive connection to mating aircraft flange preventing unintentional disengagement.
  - 2. Latching hooks shall be retractable to minimize risk of damage to hose in storage condition.
  - 3. Latching mechanism shall be removable to allow for easy access should repairs or adjustments become necessary.
- C. Operating Levers
  - 1. Each operating lever shall have dimensions of not less than 7 inches long and 1 inch wide.
  - 2. Each operating lever shall serve as a handle for the purpose of installing adapter to the aircraft.
  - 3. Handle shall be constructed of not less than 3/16", 303 stainless steel.
  - 4. The operators grip area shall be covered with resilient material not less than 4 inches in length for cold weather operation.

## 2.04 SHEET METAL MATERIALS

- A. Sheet Metal, General: Provide sheet metal in thicknesses required, packaged and marked as specified in ASTM A 700.
- B. Galvanized Sheet Steel: Lock-forming quality, ASTM A 527, Coating Designation G90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.

## 2.05 SEALING MATERIALS

- A. The Contractor shall insure that ductwork (hard and flexible) on the bridge is free from excessive air leaks. Contractor shall use sealants as recommended by the manufacturer for the application of preconditioned air ductwork.

## 2.06 HANGERS AND SUPPORTS

- A. Hangers: Furnish hangers and supporting systems in accordance with Section II of SMACNA and suitable for outdoor installation.
- B. Where galvanized steel ducts are installed, provide hot-dipped galvanized steel shapes and plates.
- C. Straps and Rod Sizes: Conform with Table 5-1 in SMACNA HVAC Duct Construction Standards, 2005 edition, for sheet steel width and gauge, and rod diameters. All materials must be suitable for outdoor installation.
- D. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials, and suitable for outdoor installation.

## 2.07 ROUND DUCT FABRICATION

- A. Round Ducts: Fabricate round supply ducts with spiral lockseam construction. Comply with SMACNA HVAC Duct Construction Standards, Table 3-2 for galvanized steel gauges.

## 2.08 ROUND SUPPLY FITTINGS FABRICATION

- A. Ninety Degree Tees and Laterals and Conical Tees: Fabricate to conform to SMACNA HVAC Duct Construction Standards, 2006 edition, Figures 3-4 and 3-5, and with metal thicknesses specified for longitudinal and straight duct.
- B. Static Pressure Classifications: Construct duct systems to the following pressure classifications:
  - 1. Wide-body Air Handling Unit: 0.3785 mm thickness.
  - 2. B747 Air Handling Unit: 0.3785 mm thickness.
- C. Elbows: Fabricated in die-formed, gored, pleated, or mitered construction. Fabricate the bend radius of die-formed, gored, and pleated elbows 1.5 times the elbow diameter. Provide elbows meeting the following requirements:
  - 1. Mitered Elbows: Fabricate mitered elbows with welded construction in metal thicknesses specified below.
    - a. Mitered Elbows Radius and Number of Pieces: Construct elbow to comply with SMACNA HVAC Duct Construction Standards, Table 3-1.
  - 2. Round Elbows: Larger than 350 mm: Gored elbows, except where space restrictions require a mitered elbow.

## 2.09 TELESCOPING AIR DUCTS

- A. General: The telescoping air duct shall be a complete assembly of rigid insulated tubing sections, air seals or gaskets, guide bearings, brackets and other mounting and alignment devices. It shall be designed to extend and retract during the full range of motion of a telescoping passenger loading bridge to which it is attached.
- B. Materials and Construction: Telescoping air duct shall be rigid cross-bridge, shall be foam core fiber glass with minimum 1/8" inner and outer fiberglass layer for rigid construction. Polyurethane insulation core shall be flame retardant, fireproof and smoke proof, as tested and demonstrated according to approved NFPA procedures. Telescoping section shall have Teflon bearings and foam seals to minimize air leaks. Seals shall be provided as necessary to limit air leakage during operation to less than 1% under the above rated air pressure conditions. Telescoping air duct to be designed to maximize airflow and minimize heat gains when utilizing subfreezing air flow. The number of telescoping sections shall match the number of tunnels of the passenger loading bridge at each gate. Provide no hindrance or resistance to bridge retraction or extension in excess of 110 lbs of force opposing the bridge motion.
- C. Ratings: The TAD shall be rated to carry pressurized air at up to 40 inches water column at temperatures between -20°F and +130°F. In order to accommodate the required airflows within acceptable pressure drop limits, the inner diameter of the smallest section of duct shall be at least 14 inches.
- D. Mounting: Furnish telescoping duct with all brackets and supports as recommended by the manufacturer's installation requirements.
- E. Quality: The construction shall allow extension and retraction of the duct assembly while mounted on the bridge for a minimum of 50,000 full cycles or ten (10) years without requiring inspection or any scheduled maintenance. This shall be proven in practice by a minimum of 100 previously-installed units in continuous service on passenger boarding bridges. Minimum overlap between duct sections is 12" regardless of duct diameter.
- F. Safety: Provide reflective 6" tall, black and yellow, angled-stripe, reflective safety tape on the bottom edges of ductwork.

**2.10 FLEXIBLE CONNECTIONS**

- A. Flexible Duct Connections: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric with dual clamps at the flexible duct connection to the AHU collar for ease of maintenance. Flexible connector shall be suitable for outdoor installation and pressure classification of supply air. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected air handling unit.
  
- B. Pantograph: Contractor shall provide a pantograph for the cables over the bridge service. Pantograph shall be four-piece with 3 looped hinges and have two cable conduits. One conduit shall remain as spare. Pantograph supports shall be by the manufacturer. Proposed device must have satisfactory service in other PCA systems for a minimum of two (2) years.

## 2.11 MISCELLANEOUS

- A. Provide one or two flat, insulated, flexible aircraft ducts per gate as required by PCA service for extension of the hard ductwork, from the loading bridge to the aircraft connection(s) at each gate. The flexible ducts shall be provided in segments with a connecting device to allow easy replacement in the field without special tools. The flexible ducts shall be a minimum of 18 M in length, but in no case requiring a "taut" over-extension to the connection point.
- B. Contractor shall supply two aircraft adapter nozzles for each gate.
- C. A three-wheel type metal hose trolley shall be provided to store the flexible supply ducts and aircraft adapter nozzles at each gate. The hose trolley shall be stainless steel and free of sharp edges. Trolleys connected to apron drive bridges shall be constructed such that the trolley can be readily removed and reconnected. All hinges shall be stainless steel. Wheels shall be composite urethane with stainless steel bearings and bushings. No plastic internals shall be used. Trolley design and location shall be approved by the DIA Project Manager.

## PART 3 -EXECUTION

### 3.01 INSPECTION

- A. Examine areas and conditions under which ductwork and accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.

### 3.02 DUCT INSTALLATION

- A. Duct System Pressure Class: Construct and install each duct system for the specific duct pressure classification required.
- B. Install ducts with the fewest possible joints.
- C. Use fabricated fittings for all changes in directions, changes in size and shape, and connections.
- D. Locate ducts, vertically and horizontally, parallel and perpendicular to passenger bridge lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct usable space or block access for servicing bridge and its equipment.
- E. Install ducts close to walls, overhead substrates, columns, and other structural and permanent enclosure elements of bridge.
- F. All rigid and flexible ductwork shall be insulated so as to maintain a 3 degree C maximum heat gain from leaving coil temperature to supply temperature at the aircraft.

### 3.03 INSTALLATION OF DUCTWORK ACCESSORIES

- A. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.



- B. Coordinate with other work, as necessary to interface installation of ductwork accessories properly with other work.

### **3.04 SEAM AND JOINT SEALING**

- A. General: Seal duct seams and joints as follows:
  - 1. Pressure Classifications Greater than 750 Pa: All transverse joints and longitudinal seams.

### **3.05 HANGING AND SUPPORTING**

- A. Install rigid round duct with support systems indicated in SMACNA HVAC Duct Construction Standards, Tables 4-1 through 4-3 and Figures 4-1 through 4-8.
- B. Support horizontal ducts within 600 mm of each elbow.
- C. Support vertical ducts at a maximum interval of 5 m.

### **3.06 CONNECTIONS**

- A. Air Handling Unit Connection: Connect equipment with flexible connectors.
- B. Aircraft Connection: Aircraft connections shall be made with a mating nozzle; referred to in this document as an aircraft adapter nozzle.

### **3.07 FIELD QUALITY CONTROL**

- A. Test for air leakage while system is operating. Remake leaking joints as necessary.

## **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 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 Lump Sum Contract price.

**END OF SECTION 15475**

## SECTION 15478

### PRECONDITIONED AIR ELECTRIC CONTROL SYSTEMS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. This Section includes control panels and all related components, controls and devices to complete the systems specified herein.
- B. General:
  - 1. Contractor shall furnish all design drawings and detailed submittal data corresponding to the complete control system included as part of the Preconditioned Air design. Drawings and specifications are to indicate general arrangement of the equipment, controls and devices, types of control schemes, and the extent of remote controls as required to make the complete system meet the performance specifications.
  - 2. Systems Included:
    - a. Ramp air handling systems.
    - b. The direct digital control system.
- C. Related Work Specified Elsewhere:
  - 1. Section 15479 - Preconditioned Air Sequence Of Operation
  - 2. Section 15955 – Building Automation System (Honeywell EBI)
  - 3. Electric motors shall be as specified in Section 16486 – Electric Motors.
  - 4. Electrical work shall be as specified in Division 16.
  - 5. For the following work: Division 16 Sections as applicable:
    - a. Power supply wiring for power source to power connection on controls and/or unit control panels. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.
    - b. Interlock wiring between electrically-operated equipment units; and between equipment and field-installed control devices. Interlock wiring specified as factory-installed is work of this Section.
  - 6. Provide the following electrical work as work of this Section, complying with requirements of Division 16 Sections:
    - a. Control wiring between field-installed controls, indicating devices, and unit control panels.

##### 1.02 REFERENCES

- A. Materials and workmanship shall conform to the latest issue of all industry standards, publications, or regulations referenced in this section and with the following references as applicable. Refer to Section 15010 for listing of issuing organizations or agencies.
- B. Applicable Standards:
  - 1. National Fire Protection Association (NFPA):
    - a. 70 - National Electrical Code.
    - b. 90A - Installation of Air Conditioning and Ventilating Systems.

2. National Electrical Manufacturers Association (NEMA) Standards.
3. Underwriters Laboratories (UL)

### **1.03 SUBMITTALS**

- A. Product Data: Submit manufacturer's technical product data for each control device furnished, indicating dimensions, capacities, performance characteristics, electrical characteristics, finishes of materials, and including installation instructions and start-up instructions.
  1. Furnish description or specification sheets on all control components.
  2. Other Submittals Required: Refer to Section 15479 - Preconditioned Air Sequence of Operation.
  3. Maintenance Data: Submit maintenance instructions and spare parts lists. Include these data, product data, and shop drawings in maintenance manuals; in accordance with requirements of Section 15010 and Division 1.
  4. "As Built" Plans shall be provided as required by Section 15050

### **1.04 QUALITY ASSURANCE**

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of electric control equipment, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.
- B. Codes and Standards:
  1. Electrical Standards: Provide electrical products, which have been tested, listed and labeled by UL and comply with NEMA standards; except AHUs which shall have components listed and labeled by UL, or shall be Owner approved.
  2. NEMA Compliance: Comply with NEMA standards pertaining to components and devices for electric control systems.
  3. NFPA Compliance: Comply with NFPA 90A where applicable to controls and control sequences.

### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Provide factory shipping cartons for each piece of equipment, and control device. Maintain cartons through shipping, storage and handling as required to prevent equipment damage, and to eliminate dirt and moisture from equipment. Store equipment and materials inside and protected from weather.

## **PART 2 - PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURERS**

- A. Manufacturer: Subject to compliance with requirements, provide electric control systems of one of the following:
  1. Honeywell, Inc.
  2. Johnson Controls, Inc.
  3. Siemens Corp.
  4. Substitutions: Under provisions of Section 15010.

## 2.02 MATERIALS AND EQUIPMENT

- A. General: Provide LonMark certified electric control products in sizes and capacities required, consisting of dampers, thermostats, clocks, sensors, controllers, and other components as required for complete installation. Provide manufacturer's standard control system components as indicated by published product information, designed and constructed as recommended by manufacturer. Provide electric control systems with all specified functional and construction features. Devices shall communicate seamlessly with existing DIA LonWorks-based Honeywell Building Solutions Facility Management System (FMS).

## 2.03 SPACE TEMPERATURE CONTROL ASSEMBLY - BRIDGE SERVICE

- A. Furnish a temperature sensor (probe), which can be placed by gate agents in the aircraft interior. This probe shall sense the aircraft space temperature and control the aircraft space temperature automatically.

## 2.04 RELAYS

- A. Electrical relays shall be approved industrial type with NEMA 12 general purpose enclosures and multiple contacts as required.
- B. All relays shall be 220 volts or less.
- C. All relays shall have A600 contact rating.
- D. All relays shall have two spare contacts (1 N.O. and 1 N.C.)

## 2.05 ELECTRONIC – ELECTRIC PROPORTIONAL OPERATORS

- A. Operators shall have single-phase 220-volt or 24-volt heavy-duty motors and sealed oil immersed gear train.
- B. Operators shall modulate the controlled device without exceeding the torque rating of the motor.
- C. Furnish integral spring return to permit fail safe operation upon power interruption.
- D. Provide built-in, adjustable, auxiliary switches where required.
- E. Furnish complete with mounting brackets, control arms, linkage, and cranks.

## 2.06 TEMPERATURE INDICATOR AND SELECTOR SWITCHES

- A. Control panel-mounted electronic precision temperature indicators and selector switches may be used in lieu of control panel-mounted dial temperature gauges.
- B. Sensing elements: Wire-wound resistance temperature elements.
- C. Provide automatic compensation for ambient temperature variations.
- D. Minimum calibrated accuracy shall be 1 percent of full scale range.
- E. Minimum scale length shall be adequate to provide 1 degree division and a range of approximately -10 to 50 degrees C.

- F. Temperature indicator readings shall not be affected by a supply voltage variation of plus or minus 10 percent line voltage fluctuation.
- G. Maximum response time shall be 6 seconds for full scale deflection.
- H. Selector switches shall be panel-mounted momentary-contact push-button type with approved type nameplates.

## 2.07 ELECTRICAL AND ELECTRONIC CONTROL DEVICES

- A. Switches, potentiometers, and other control components shall be rated at 220-volt service and have suitable dustproof enclosures equal to NEMA 12 general purpose. Provide indicating plates, and identifying nameplates unless otherwise specified.
- B. Transformers shall be furnished as required with enclosed terminals and adequate ratings for use with 220-volt ac primary supply voltage.
- C. Outdoor control devices shall have NEMA 4 weathertight enclosures. Electrical devices installed in hazardous AREAS shall have enclosures approved for the NEC classification.
- D. Local Control Panels: Panels shall be manufacturer's standard, completely enclosed, wall-mounted cubicle panels. Control arrangement shall be approved by the Construction Supervisor.
  - 1. Fabricate panels of 1.9 mm furniture-quality steel, or 6063-T5 extruded aluminum alloy, totally enclosed, with hinged doors and keyed lock, with manufacturer's standard shop-painted finish and color. Provide UL-listed cabinets for use with line voltage devices.
  - 2. Panel Mounted Equipment: Include temperature and humidity controllers, relays and automatic switches, except exclude low temperature protection thermostats, firestats, and other devices excluded in sequence of operation. Fasten devices with adjustments accessible through front of panels. Also include manual switches, including damper "minimum-off" positioning switches, "summer-winter" switches, and "manual-automatic" switches; and including dial thermometers.
  - 3. Nameplates: Furnish for all components located on the front of the panel. Nameplates shall be sizes, materials, and contain legends consistent with Contractor's standard practice.
  - 4. Terminal Block: Furnish for all electrical connections. Identify terminals.
  - 5. Control Panel Wiring: Wiring shall be as specified in Division 16. Control panels shall be prewired at the factory to terminal strips for field connections. Factory test all wiring. Wiring terminals shall be arranged for top rear control cable connections unless otherwise specified or required. Connect terminal blocks with approved flexible panelboard wiring to electrical control switches and devices mounted on the hinged door. Wiring shall be neatly arranged and supported in plastic or plated steel brackets.
- E. Central (Master) Control Panels: Provide central control panels of fully-enclosed steel cubicle type, with locking doors and/or locking removable backs. Match finish of panels and provide multi-color graphic displays, schematically showing system being controlled.
- F. Provide battery backup for all memory devices.

## 2.08 UNITARY CONTROLLERS

- A. General:

1. Unitary DDC controllers shall be integral to equipment and be pre-packaged, pre-installed and tested at the factory prior to shipment.
  2. Unitary DDC controllers (UCs) shall be standalone, EEPROM-based, configured to perform the sequences specified, and I/O selected for the application. All unitary DDC controllers (UCs) shall be LonMark-approved products and shall support the LonMark Functional Profile for the given application. UC s shall be tested and listed under UL916 for computing devices. UC enclosures shall be flame retardant, compact plastic conforming to UL94-V5 for plenum mounting or plated steel. UCs shall be CE approved and meet FCC Part 15 class B requirements. UC s shall be configured for DIN rail mounting, using industry-standard clip-on adapters, or for direct panel mounting. Each ASC shall be capable of standalone operation and shall continue to provide control functions without being connected to the network. Each ASC will contain sufficient I/O capacity to control the target system.
- B. Communication: The unitary controller shall communicate with other devices on the internetwork using EIA standard 709.1, the LonTalk™ protocol, as the common communication protocol with a minimum transmission speed of 78Kbaud. A twisted-pair cable utilizing T-Taps, star, and mixed topologies on the same network shall support this network. The free topology transceiver (FTT) network shall not be polarity sensitive. Network media shall be Level IV, 22AWG, twisted-pair wire, and shall conform to UL Category 4 for high-speed networks. Cable shall be supplied in plenum and non-plenum-rated versions. Network length shall not exceed 1640 ft without the addition of Echelon LonWorks repeater achieving an additional length of 3280 ft. For lengths in excess of 3280 ft, a daisy chain wiring scheme can be employed; using a repeater, this length can be extended to 10,000 ft. Lengths in excess of 10,000 ft will not be allowed. Repeater bus topologies shall include bus segments of 60 nodes unless routers are utilized. Systems communicating at slower speeds shall not exceed 30 nodes per segment to ensure adequate global data and alarm response times.
- C. Controller shall communicate to Honeywell FMS remote server via wireless transceiver:
1. Lantronix Wireless Device Server
  2. Device Specifications:
    - a. 802.11b/g wireless interface
    - b. Two DB9 DTE serial ports to support EIA-232, EIA-422 or EIA-485 communication.
    - c. Wireless security with IEEE 802.11i-pSK, WPA-PSK, TKIP protection
    - d. 256-bit AES, end-to-end encryption
    - e. Complete with power supply
- D. Environment: The hardware shall be suitable for the anticipated ambient conditions.
1. Controllers used outdoors or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for ambient temperature operation at -40 degrees C to +65 degrees C (-40 degrees F to +150 degrees F) and ambient humidity of 5 to 95 percent RH noncondensing.
- E. Serviceability: Each UC shall be provided with face-mounted LED type annunciation to continually display its operational mode—power, normal, or in an alarm state. As an alternative to the face-mounted integral LED, the control contractor shall provide relay-driven pilot lights mounted at the UC location, which shall provide the specified annunciation. UCs shall be configured for DIN rail mounting, using industry-standard clip-on adapters, or for direct panel mounting. Each controller shall be designed with on-board jacks for quick commissioning and troubleshooting with a portable programming tool.
- F. Immunity to power and noise: Controllers shall be able to operate at 90 percent to 110

percent of nominal voltage rating and shall perform an orderly shutdown below 80 percent. Operation shall be protected against electrical noise of 5-120 Hz and from keyed radios up to 5 W at 1 m (3 ft).

- G. Transformer: Power supply for the ASC shall be rated at a minimum of 125 percent of ASC power consumption and shall be of the fused or current-limiting type.
- H. Provide a standalone Single Zone DDC controller featuring preprogrammed heating and cooling and economizer control algorithms configurable for either standard single zone rooftop unit applications or heat pumps. Controller shall use Echelon LonWorks communication technology for field bus and shall utilize the LonMark Rooftop Unit (RTU) functional profile 8030 for interoperability with third-party LonMark devices in network applications. For rooftop applications, the controller shall have an extended operating temperature rating from -40 degrees F to +150 degrees F so the controller can be mounted directly in the wiring cabinet of AHU. If controller provided does not have a -40 degree F to 150 degree F temperature range, then the device shall be mounted in a separate enclosure with suitable heating and cooling to meet the controller operating temperature range. Controller application software shall include PID control, set-point resets for energy demand limit control, and economizer minimum position for IAQ control. Separate unoccupied heating and cooling set-points shall be provided. Provide an adaptive algorithm that continuously adjusts the discharge air setpoint as needed. A standby feature shall be provided to reset the occupied temperature set point back to a user-definable limit based on status from an auxiliary device, such as an occupancy sensor or window contact. The controller shall include a temperature wall module connection that may be used in applications where the wall module shall sense temperature, control set point temperature, control occupied and unoccupied, or control fan speed. In addition to internal I/O selected for the application, the controller shall support distributed I/O from the network.
- I. Provide a distributed input and output module that connects sensors and actuators onto the Echelon field bus network for use with a LonWorks general purpose controllers (GPCs) and unitary DDC controllers (UC). LonWorks controllers shall be configured to read and command these points as required or specified. These distributed I/O modules shall use a Neuron® chip and an FTT-10A free topology transceiver for communication on a LonWorks bus, and comply with LonMark Application Layer Guidelines V3.2. I/O. The device shall have extended operating temperature rating from -40 degrees F to +150 degrees F, so it can be mounted directly in a wiring cabinet of monitored appliances. The I/O device shall include a temperature wall module connection that may be used in applications where the wall module shall sense temperature, control set point temperature, control occupied and unoccupied, or control fan speed.

**2.09 DX PC AIR UNIT POINTS LIST**

	System Graphic	Digital Output	Digital Input	Analog Output	Analog Input	Alarm Point	Software Point
PC Air Unit	X						
Supply Fan Start-Stop and Status		X	X			X	
Outdoor Air Temperature					X		
Discharge Air Temperature					X		
Cabin Temperature					X		
Heating Stage 1				X			
Heating Stage 2				X			
Compressor Status (each)						X	
Condenser Fan Status (each)						X	
Damper position			X	X		X	
Duct Smoke Detectors (as needed)			X				
Condenser Fan Status (each)						X	
Aircraft size (each)					X		
Alarm Heat 1(as needed)		X				X	
Maintenance Alarm		X				X	
Unit Run Time (hrs)		X					

**PART 3 - EXECUTION**

**3.01 INSPECTION**

- A. Examine areas and conditions under which electric control systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

**3.02 INSTALLATION (BRIDGE-MOUNTED EQUIPMENT ONLY)**

- A. General:
  1. Field check for clearances and interferences before fabrication.
  2. Furnish all labor, tools, rigging equipment, scaffolding, and all other materials necessary to make a complete installation of the material and equipment specified and indicated.
  3. Prepare surfaces and spot apply primer and finishing paint on all equipment after installation where the shop paint has been damaged or flaked off.
  4. Installation shall equal or exceed the minimum requirements of the applicable codes and these specifications; however, where local codes and ordinances are more stringent, they shall govern.
  5. Include all material, labor and changes occasioned by the Contractor's choice of equipment.
  6. All equipment furnished shall be installed complete including necessary piping, electrical connections, wiring, mounting, etc.



7. Contractor shall coordinate his work and interface of his work with others as required, including coordination with the bridge manufacturer to prevent damage to the bridge due to installation of Contractor furnished equipment.
- B. Electrical Wiring and Installation:
1. Materials and equipment shall be in accordance with Division 16.
  2. Install wiring in conduits and provide separate conduits for electronic control circuits. All control circuit wiring shall be 220 volts or less.

### **3.03 INSTALLATION OF ELECTRIC CONTROL SYSTEMS**

- A. General: Install systems and materials in accordance with manufacturer's instructions. Install electrical components and use electrical products complying with requirements of applicable Division 16 Sections of these Specifications. Mount controllers at convenient locations and heights.
- B. Control Wiring: The term "control wiring" is defined to include providing of wire, conduit and miscellaneous materials as required for mounting and connecting electric control devices.
- C. Wiring System: Install complete control wiring system for electric control systems. Conceal wiring, except in mechanical rooms and AREAS where other conduit and piping are exposed. Provide multi-conductor instrument harness (bundle) in place of single conductors where number of conductors can be run along common path. Fasten flexible conductors bridging cabinets and doors, neatly along hinge side, and protect against abrasion. Tie and support conductors neatly.
- D. Number-code or color-code conductors appropriately for future identification and servicing of control system. Coding shall match designations shown on the manufacturer's control diagrams.
- E. Unit-Mounted Equipment: Where control devices are to be unit-mounted, ship such devices to unit manufacturer for mounting and wiring at factory.
- F. Furnish all the necessary components so that the system performs as specified.
- G. Completely adjust and test the systems specified to ensure those control systems perform satisfactorily.
- H. Group control components together in a neat orderly fashion in control panels.
- I. Permanently identify all control components by adhesive embossed plastic label corresponding to the numbers shown on the control diagrams submitted for approval.
- J. Post control diagrams and operating sequences in a frame with glass or clear plastic lens adjacent to the main control station panel. The control diagrams and sequences in final form shall be submitted for approval.
- K. Electronic sensing systems may use local control panel-mounted electronic precision temperature indicators and resistance temperature detectors with panel-mounted separate pushbuttons for each point of temperature indication in lieu of panel-mounted dial thermometers.

### **3.04 ADJUSTING AND CLEANING**

- A. Start-Up: Start-up, test, and adjust electric control systems in presence of manufacturer's authorized representative. Demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- B. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
- C. Final Adjustment: After completion of installation, adjust thermostats, motors and similar equipment provided as work of this Section.
  - 1. Final adjustment shall be performed by specially trained personnel in direct employ of manufacturer of primacy temperature control system.

### **3.05 CLOSEOUT PROCEDURES**

- A. Owner's Instruction: Provide services of manufacturer's technical representative for two 8-hour days to instruct Owner's personnel in operation and maintenance of electrical control systems.
- B. Schedule instruction with Owner, provide at least 7-day notice to Contractor and Construction Supervisor of training date.

## **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 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 Lump Sum Contract price.

**END OF SECTION 15478**

## SECTION 15479

### PRECONDITIONED AIR SEQUENCE OF OPERATION

#### PART 1 -GENERAL

##### 1.01 SUMMARY

- A. Sequence of operation is defined as the manner and method by which the control system (direct digital control) functions. Requirements for the preconditioned air system sequence of operation are specified in this section.
- B. Related Work Specified Elsewhere:
  - 1. Operating equipment, devices, and control system components required for control systems are specified in Section 15478 - Preconditioned Air Electric Control Systems.
  - 2. Building Automation System – Section 15955 - Building Automation System (Honeywell EBI).

##### 1.02 REFERENCES

- A. Materials and workmanship shall conform to the latest issue of all industry standards, publications, or regulations referenced in this section and with the following references as applicable. Refer to Section 15010 for listing of issuing organizations or agencies.
- B. Applicable Standards:
  - 1. EIA 485 - Standard for Electrical Characteristics of Generators and receivers for Use and Balanced Digital Multi-Point Systems.

##### 1.03 SUBMITTALS

- A. Submit sequence of operation description along with control architecture schematic diagram indicating methods and equipment applied to achieve specified operation of PCA system.
- B. "As Built" Plans shall be provided in accordance with Section 15050.

##### 1.04 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of electric control equipment, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.

##### 1.05 PRECONDITIONED AIR SYSTEM SEQUENCE OF OPERATION (GENERAL NOTES)

- A. General: The preconditioned air system shall provide heated, cooled, or ventilated air to gates as indicated on the drawings.
- B. The PCA system shall be designed such that the aircraft parked at the gates shall maintain an interior space temperature of 75 degrees F in the cooling season and 70 degrees F in the heating season (tolerance of +/-2 degrees F). A minimum ventilation rate of 10 cfm/seat for the cooling mode and 5 cfm/seat for the heating mode shall be required. Cooling shall be provided for outdoor air temperatures of 45 degrees F and above during the dedicated cooling season.

- C. The system shall be comprised of two major components:
  - 1. The air handling units and associated equipment located on each passenger bridge.
  - 2. The direct digital control system.
- D. Electrical and Miscellaneous Requirements:
  - 1. The system shall operate on 380V 3 phase 60 Hz electrical power.
  - 2. Stepdown transformers shall provide 220 and 24 V control power.
  - 3. Operating controls, circuit breakers, and fuses shall be incorporated in a motor control center located in each of the PCA mechanical rooms.
  - 4. Direct reading pressure gauges and thermometers shall be located in various locations to permit control, performance monitoring, and aid in troubleshooting.
  - 5. Provide all cable and conduit as required to perform the control sequences specified herein.

## 1.06 PRECONDITIONED AIR SYSTEM SEQUENCE OF OPERATION (DETAILED SEQUENCE)

- A. Start / Stop Control
  - 1. The system is started through a momentary "Start" push button. The system runs continuously unless stopped by the blower motor VFD, the smoke detector, the phase monitor, or pressing the "Stop" button.
  - 2. Upon depressing the "Start" push buttons, the appropriate control relay energizes. A normally open contact on the control relay closes and signals the PCA controller (PCAC) that the unit has been started. The PCAC then energizes the VFD relay, which tells the VFD to start the blower motor. When the blower starts the auxiliary contact on VFD opens and tells the PCAC that the blower is running. When the VFD relay is energized, the NO contact closes and power is provided to the rest of the control circuit. The PCAC will start the compressors or heaters as required.
  - 3. On system start-up, the VFD slowly starts the blower motor. This prevents power surges and hose snap.
- B. Fault Shut-Down
  - 1. The unit will initiate a "FAULT" (the red light on the "Stop" button) and shut the unit down for the following "out of normal" conditions.
    - a. The power monitor has tripped due to a phase reversal, voltage unbalance, low voltage, or loss of a phase.
    - b. The blower motor VFD overload has tripped.
    - c. The smoke detector has tripped.
  - 2. Pushing the "Stop" button will reset the fault. Other components can stop operating without stopping the unit. Reasons include:
    - a. The condenser fans will shut down and fail to restart when the condenser fan motor overload trips.
    - b. Any of the compressors will shut down and not restart when the compressor motor overload trips. The compressors will shut down and restart automatically when the low suction pressure sensor trips, or the high discharge pressure sensor trips.
    - c. The high pressure switch is manual reset. Push the reset button on the pressure switch to reset.
- C. Control Software - Data Base

1. The PCA controller will automatically select the appropriate operational mode based on the ambient temperature.
  2. The unit is controlled by the discharge temperature set point.
  3. Several stages of cooling are provided. Modulation in cooling mode is obtained by cycling the compressors and controlled with hot gas by-pass.
  4. If for any reason the discharge sensor becomes unreadable or unstable, the PCA controller will determine the sensor reading to be invalid and shutdown the unit. The unit will not restart until the sensor is repaired. The maintenance required light will turn on.
  5. If the ambient sensor becomes unreadable or unstable, the PCA controller will determine the sensor reading to be invalid and it will default to 53°F, (Vent mode) where the blower will run but no compressors or heaters will turn on.
  6. If the aircraft cabin sensor becomes unreadable or unstable, the PCA controller will determine the sensor reading to be invalid and it will default to 90°F in the cooling mode or 60°F in the heating mode. The maintenance required light will turn on. This will allow the unit to operate normally but will be in the full cool or heat mode.
- D. Control Logic
1. The PCAC status changes to "On" when the start push button is energized. The program then provides a signal to the blower output point, the compressor output points, and the condenser fan output point.
  2. There is a five-second delay between each component start-up to prevent high current in-rush.
  3. The discharge air temperature sensor reduces the capacity when the discharge air temperature drops below 32°F (0°C).
  4. The condenser fans runs whenever the unit is on. The second condenser fan will cycle on the high pressure. The fan will come on at 400 psig, and off at 300 psig.
  5. The VFD starts the blower motor slowly to provide a soft start preventing hose snap and high power inrush.
  6. The compressors have a three-minute off delay to prevent rapid cycling of the compressors.

## 1.07 PRECONDITIONED AIR SYSTEM CONTROL [JF1]

- A. The PCA system shall be controlled by a LonMark Certified direct digital control system, which shall monitor and control the use of the PCA system and communicate directly with the BAS. Upon failure of the automatic control system described below, the PCA system shall be operable manually through a Manual/Automatic Switch and position switches located inside each gate control unit (defined below).
- B. Provide a digital data acquisition network to interactively communicate with the gate PCA equipment, and a central DDC system. The Contractor shall be totally responsible for the detailed design, supply, delivery, installation, test, and training of personnel for the control system.
- C. This network shall serve all aircraft gates at the concourse of installation and additionally serve the system as a whole. A concourse specific central control and display system shall be installed in each PCA concourse mechanical equipment room. The concourse specific central control and display system (computer) shall allow control for the respective concourse it serves only. A central monitoring and display system (computer) shall be located in the building/terminal central mechanical plant and shall have the capability to

monitoring any of the individual concourse plants. Each concourse system shall be expandable up to 50 gates with no changes to the control system hardware.

- D. The PCA control system shall consist of the following four major functional elements:
1. A Gate Control Unit (GCU) installed at each passenger loading bridge. This unit shall provide all necessary interfaces between the ground handling personnel and the central control system. It shall also provide monitoring and selective control functions of gate ground support activity.
  2. A Data Acquisition System (DAS), which provides two-way data/control transmission between all gate control units and the central control unit. It shall also provide one-way data transmission (digital input) between the 400 Hz frequency converters, gate boxes, and the central control unit.
  3. A Building Automation System (BAS), which receives all data from, and passes information/control to, the gates via the DAS. The BAS shall store all gate and other defined data. The BAS shall provide selected control or status signals to the gate control units as pre-programmed or per manual input.
  4. Provide battery backup for all memory devices.
- E. A GCU shall be installed at each gate. The GCU unit shall have as a minimum, the following functions and features:
1. Monitoring of Aircraft: Each GCU shall automatically sense parked aircraft status to its associated passenger loading bridge.
    - a. Switch shall be located adjacent to AHU on/off control.
    - b. The switch shall be interlocked with the bridge so that a status light in the console of the bridge indicates PCA use.
  2. Monitoring and stand-alone control of Preconditioned Air (PCA) System: Each GCU shall perform the automatic monitoring and control of the gate's PCA to the aircraft as described in the points lists at the end of this section. Refer to Section 15955 for additional unit controller requirements.
  3. The GCU shall contain a weatherproof control panel to be interfaced by the ground crew operator. The control panel shall have the following features and may be mounted on the AHU:
    - a. Manual/Automatic switch (located inside GCU).
    - b. Manual position switches for positioning of glycol valve and air damper (locate inside GCU).
    - c. Lighted "PCA Disabled."
    - d. Lighted "400 Hz Disabled."
  4. The GCU shall contain a wireless transceiver interface to the DAS and thus to the BAS to supply and receive data.
  5. The GCU shall contain in addition to the above-defined interfaces and control panel, the required circuitry, power supplies, and other components necessary to perform the functional operation described below:
    - a. The GCU shall continuously scan the status of the PCA status described above and light the summary fault light(s) on its control panel and pass the data on to the DAS. The GCU shall also scan the inputs from the DAS (originating in the BAS).
    - b. The BAS shall accept data/control transmission from the DAS, associated with each 400 hertz frequency converter. Points are to be annunciated at the BAS screens.

- F. The Data Acquisition System (DAS) shall provide two-way data/control transmission between all GCU's and the BAS and shall accept digital inputs from the 400 hertz frequency converter's controls. Refer to section 15955 for router requirements.
  
- G. The major functional components of the Building Automation System (BAS) are defined in section 15955.

**PART 2 -- PRODUCTS (NOT USED)**

- A. SEE SECTIONS 15478 – PRECONDITIONED AIR ELECTRIC CONTROL SYSTEM AND SECTION 15995 – BUILDING AUTOMATION SYSTEM (HONEYWELL EBI).

**PART 3 --EXECUTION (NOT USED)****PART 4 -SEE SECTIONS 15478 – PRECONDITIONED AIR ELECTRIC CONTROL SYSTEM AND SECTION 15995 – BUILDING AUTOMATION SYSTEM (HONEYWELL EBI).MEASUREMENT****4.01 METHOD OF MEASUREMENT**

- A. No separate measurement will be made for work under this Section.

**PART 5 - PAYMENT****5.01 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 Lump Sum Contract price.

**END OF SECTION 15479**

**SECTION 15955  
BUILDING AUTOMATION SYSTEM (HONEYWELL EBI)**

**PART 1 -GENERAL**

**1.01 SECTION INCLUDES**

- A. Extent of control systems work required by this Section is indicated on drawings, schedules, by Section 15478 – Preconditioned Air Electric Control Systems, by Section 15479 – Preconditioned Air Sequence of Operation, and by requirements of this Section.
  - 1. Control sequences are specified in Section 15479 – Preconditioned Air Sequence of Operation and on the design drawing set.

**1.02 RELATED SECTIONS**

- A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are a part of this specification and shall be used in conjunction with this section as a part of the Contract documents. Consult them for further instructions pertaining to this work. The Contractor is bound by the provisions of Division 0 and Division 1.
- B. The following sections constitute related work:
  - 1. Section 15010 - Basic Mechanical Requirements
  - 2. Section 15474 - Preconditioned Air DX Air Handling
  - 3. Section 15478 - Preconditioned Air Electric Control System
  - 4. Section 15479 - Preconditioned Air Sequence of Operation
  - 5. Section 15990 - Test and Balance
  - 6. Section 16010—Basic Electrical Requirements
  - 7. Section 16142 - Electrical Connections for Equipment
  - 8. Section 16143 - Wiring Devices

**1.03 DESCRIPTION**

- A. Furnish all labor, materials, equipment, and service necessary for integrating the new preconditioned air (PCA) equipment into the existing temperature control system. Equipment and labor not specifically referred to here or on the plans, which are required to meet the functional intent, shall be provided without additional cost to the Owner. Performance and capabilities are based on the Honeywell Building Solutions Facility Management System (FMS).
- B. Temperature control system to be DDC with electronic sensors and electronic actuation of valves and dampers.
- C. Provide monitoring and control of packaged mechanical equipment, and use of LonWorks™ protocol as specified. The FMS may not utilize gateways.
- D. Work described in this section shall be installed, wired, circuit tested, and calibrated by factory-certified technicians qualified for this work and in the regular employment of the temperature control system manufacturer. Installing office shall have a minimum of five years of installation experience with the manufacturer and shall provide documentation in submittal package verifying longevity of the installing company's relationship with the



manufacturer. Supervision, calibration, and checkout of the system shall be performed by the employees of the local factory-owned temperature control contracting field office. Supplier shall have an in-place support facility within 50 miles of the site with technical staff, spare parts inventory, and all necessary test and diagnostic equipment. The Facility Management System (FMS) currently utilizes a client server architecture based around a modular PC network, utilizing industry standard operating systems, networks, and protocols.

- E. The current system allows the distribution of system functions such as monitoring, control, and graphical user interface across the network to allow maximum flexibility and performance. The architecture includes support of various Wide Area Networks (WANs) using standard hardware and software to link nodes into a single integrated system. The network protocol uses an industry standard TCP/IP. The system supports remote configuration and operation using standard dial-up modems or Internet connectivity.
- F. The server computer and operator workstation hardware interfaces to an IEEE 802.3 standard local area network (LAN). The LAN utilizes standard network cables. Acceptable cable types are thin Ethernet, thick Ethernet, fiber, and twisted pair.
- G. The FMS building management and control functions to be provided include:
  - 1. Monitoring and control of controllers, remote devices, and programmable logic controllers, including sensors, actuators, and environmental delivery systems (PCA units, electrical systems)
  - 2. Operator interface to allow general supervision of PCA controls
  - 3. Video display integration
  - 4. Data collection and historization
  - 5. Alarm management
  - 6. Trending
  - 7. Report generation
  - 8. Network integration
  - 9. Data exchange and integration with a diverse range of other computing and facilities systems using industry-standard techniques
- H. At a minimum, the following data shall be accessible (Coordinate with Section 15478):
  - 1. Space temperature
  - 2. Space temperature set point
  - 3. Occupancy status
  - 4. Operating mode
  - 5. Valve positions
  - 6. Air volume flow
  - 7. Percent terminal load
  - 8. Time schedules
  - 9. Zero energy bands
  - 10. Gate number Terminal type, e.g., fan coil
- I. Lon Works communications: The system shall provide a direct interface to LonWorks. Interface shall provide the functionality to operate a building management system based on LON devices, including alarming, data acquisition, supervisory control, and trending.

1. Interface shall use standard components such as Serial LonTalk Adapters (SLTA), PC LonTalk Adapters (PCLTA), or Ethernet to LonTalk routers such as the Echelon I-LON router to connect the FMS to the LonWorks network and devices. Solutions requiring gateways or data servers (e.g., OPC to LON or DDE to LON) are not acceptable.
2. The FMS interface to LonWorks shall be based on LON Network Services (LNS) Release 3.0 or later. The interface shall allow access to be configured for any network variable (NV) or configuration property (CP) in the LON device. LON devices conforming to LonMark functional profiles shall be able to be integrated into FMS without the need for software changes in FMS.
3. The system shall permit standard graphics to be created for configurable LonWorks devices so that all points for the same device type to use the same graphic.
  - 1) New PCA standard graphic required.
4. The LonWorks interface shall be compatible with any LonWorks vendor whose products conform to standard LonMark profiles.

#### **1.04 EXISTING CONTROL SYSTEM**

- A. The following control system is installed and in operation for this project:
  1. Company Name: Honeywell
  2. Manufacturer: Honeywell
  3. Product Line: Enterprise Building Integrator (EBI) and XL 5000
- B. The list of manufacturers above applies to client and server software, controller software, and computer-generated custom application programming.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer contracting qualifications:
  1. All work described in this section shall be installed, wired, circuit tested, and calibrated by factory-certified technicians qualified for this work and in the direct employment of the temperature control system manufacturer.
  2. The FMS contractor shall have a full service facility within 50 miles of the project that is staffed with engineers trained in integrating interoperable systems and technicians fully capable of providing LonWorks™ instructions and routine emergency maintenance service on all system components.
  3. The FMS contractor shall maintain a UL monitoring center manned 24 hours a day, 7 days a week, 365 days a year by company personnel capable of continuous monitoring of environmental conditions in various areas throughout the building. This monitoring center shall have certified energy managers and HVAC experts on staff, and it cannot be an answering service.
  4. Contractor shall provide 100 percent of all services with company personnel except for the electrical installation work. Only those electrical contractors who are experienced in the installation of the specified Honeywell control products shall be considered. No portion of services can be subcontracted to others without express written permission of the Owner; with such permission, all specifications, terms, and conditions specified herein shall be the responsibility of the prime Contractor.
  5. Mechanical equipment manufacturers desiring to provide Lon Works DDC-type controls as factory-mounted equipment shall provide a separate bid for their products, less all controls, actuators, valve assemblies, and sensors, which are specified to be provided by the FMS Contractor.

## 1.06 CODES AND STANDARDS

- A. All work, materials, and equipment shall comply with the rules and regulations of all codes and ordinances of the local, state, and federal authorities. Such codes, when more restrictive, shall take precedence over these drawings and specifications. As a minimum, the installation shall comply with the current editions in effect 90 days prior to receipt of bids of the following codes:
1. National Electric Code (NEC)
  2. International Building Code (IBC)
  3. International Mechanical Code (IMC)
  4. UL-916 Energy Management Systems, LonMark™, UL, ULC, FCC, Part 15, subpart J, Class A Computing Devices
  5. Unitary controllers, intelligent sensors, and intelligent actuators shall conform to the appropriate LonMark™ functional profile configurations based on intended use and shall be so labeled.

## 1.07 SYSTEM PERFORMANCE

- A. Performance standards: The system shall conform to the following:
1. Performance: Programmable controllers shall execute DDC PID control loops at a selectable frequency of at least once per second. The controller shall scan and update the process value and output generated by this calculation at this same frequency.

## 1.08 SUBMITTALS

- A. Product data and shop drawings: Meet requirements of Division 1 for Shop Drawings, Product Data, and Samples. In addition, contractor shall provide shop drawings or other submittals on all hardware, and installation to be provided. No work may begin on any segment of this project until submittals have been successfully reviewed for conformity with the design intent. 1 copy is required. All drawings shall be prepared on a CAD system that produces drawing files compatible with AutoCAD Release 2002 or higher and Adobe Acrobat and be provided on CD-ROM and as full-size reproducible drawings. When a manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and drawing that the submittal is to cover. General catalogs shall not be accepted as cut sheets to fulfill submittal requirements. Submittals shall include:
1. Direct Digital Control system hardware:
    - a. A complete bill of materials of equipment to be used indicating quantity, manufacturer, model number, and other relevant technical data. Manufacturer's description and technical data, such as performance curves, product specification sheets, and installation and maintenance instructions for the items listed below, and other relevant items not listed below, will be included:
      - 1) LonMark™ Direct Digital Controller (controller panels)
      - 2) Transducers and transmitters
      - 3) Sensors (including accuracy data)
      - 4) Actuators
      - 5) Valves
      - 6) Relays and switches
      - 7) Control panels
      - 8) Power supply
      - 9) Batteries
      - 10) Operator interface equipment

- 11) Wiring
  - 12) Wiring diagrams and layouts for each control panel. Show all termination numbers.
  - 13) Schematic diagrams for all field sensors and controllers. Provide floor plans of all sensor locations and control hardware.
2. Controlled systems:
    - a. A schematic diagram of each controlled system. The schematics shall have all control points labeled with point names shown or listed. The schematics shall graphically show the location of all control elements in the system.
    - b. A schematic wiring diagram for each controlled system. Each schematic shall have all elements labeled. Where a control element is the same as that shown on the control system schematic, it shall be labeled with the same name. All terminals shall be labeled.
    - c. Instrumentation list for each controlled system. Each element of the controlled system shall be listed in table format. The table shall show element name, type of device, manufacturer, model number, and product data sheet number.
    - d. A mounting, wiring, and routing plan-view drawing. The drawing shall be done in 1/4 in. scale. The design shall take into account HVAC, electrical, and other systems' design and elevation requirements. The drawing shall show the specific location of all concrete pads and bases and any special wall bracing for panels to accommodate this work.
    - e. A complete description of the operation of the control system, including sequences of operation. The description shall include and reference a schematic diagram of the controlled system.
    - f. A point list for each system controller, including both inputs and outputs (I/O), point number, the controlled device associated with the I/O point, and the location of the I/O device. Also included will be software points and alarm points.
  3. Quantities of items submitted shall be reviewed, but are the responsibility of the contractor.
  4. A description of the proposed process, along with all report formats and checklists to be used in Part 3: "Control System Demonstration and Acceptance."
  5. For LonWorks and LonMark devices, supply external interface (XIF) documentation and appropriate LonMark™ profiles indicating conformance to the LonMark Interoperability Standards.
  6. A sample graphic for each unique piece of controlled equipment shall be created and submitted for approval prior to final graphic creation and upload to FMS.
- B. Project record documents: Upon completion of installation, submit 1 copies of record as-built documents. Documents shall be submitted for approval prior to final completion and shall include:
1. Project record drawings. Shall be as-built versions of the submittal shop drawings. Provide one set of magnetic media, including CAD, .DWG, or .DXF and PDF drawing files.
  2. Testing and commissioning reports and checklists. Completed versions of all reports and checklists, along with all trend logs, used to meet the requirements of Part 3: "Control System Demonstration and Acceptance."
  3. Operation and Maintenance (O & M) Manual. This shall include as-built versions of the submittal product data. In addition to the information required for submittals, the O & M Manual shall include:
    - a. Names, addresses, and 24-hour telephone numbers of contractors installing equipment and the control systems, and the service representatives of each.

- b. Operator's manual with procedures for operating the control systems, including logging on and off, alarm handling, producing point reports, trending data, overriding computer control, and changing set points and other variables.
- c. Engineering, installation, and maintenance manual(s) that explain how to design and install new points, panels, and other hardware; preventive maintenance and calibration procedures; how to debug hardware problems; and how to repair or replace hardware.
- d. Complete original issue documentation, installation, and maintenance information for all third-party hardware provided, including computer equipment and sensors.
- e. Complete original issue diskettes for all software provided, including operating systems, programming language, operator workstation software, and graphics software.
- f. Licenses, guarantees, and warranty documents for all equipment and systems.

### 1.09 WARRANTY

- A. Warranty of all equipment described in this Section shall meet warranty requirements of Section 15010 - Basic Mechanical Requirements.
- B. Warrant all work as follows:
  - 1. Labor and materials for the control system specified shall be warranted free from defects for a period of 24 months after final completion and acceptance. Control system failures during the warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to the DIA. The contractor shall respond to the DIA's request for warranty service within 48 hours during normal business hours or if in an emergency situation, defined as no heating or cooling capability, warranty service shall be provided after hours including weekends and holidays.
  - 2. All work shall have a single warranty date, even when the Owner has received beneficial use due to an early system start-up. If the work specified is split into multiple contracts or a multiphase contract, then each contract or phase shall have a separate warranty start date and period.
  - 3. At the end of the final start-up, testing, and commissioning phase, if equipment and systems are operating satisfactorily to the DIA Project Manager, the DIA Project Manager shall sign certificates certifying that the control system's operation has been tested and accepted in accordance with the terms of this Specification. The date of acceptance shall be the start of warranty.
  - 4. Operator workstation software, project-specific software, graphic software, database software, and firmware updates that resolve known software deficiencies as identified by the contractor shall be provided at no charge during the warranty period. All corrective software modifications made during the warranty period shall be updated on all user documentation and on user and manufacturer archived software disks. Any upgrades or functional enhancements associated with the above-mentioned items can also be provided during the warranty period for an additional charge to the Owner by purchasing an in-warranty service agreement from the contractor. Written authorization by the DIA Project Manager, shall, however, be granted prior to the installation of any of the above-mentioned items.
  - 5. Exception: Contractor shall not be required to warrant reused devices, except for those that have been rebuilt or repaired. Contractor shall warrant all installation labor and materials, however, and shall demonstrate that all reused devices are in operable condition at the time of the Engineer's acceptance.

### 1.10 OWNERSHIP OF PROPRIETARY MATERIAL

- A. Project-developed software and documentation shall become the property of DIA. These include, but are not limited to:
1. Project graphic images
  2. Record drawings
  3. Project database
  4. Project-specific application programming code
  5. All documentation

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. The existing control system is on a Honeywell Enterprise Building Integrator (EBI) operator software platform with Excel 5000 system products.

### 2.02 MATERIALS

- A. All products used in this project installation shall be new and currently under manufacture and shall have been applied in similar installations for a minimum of two years. This installation shall not be used as a test site for any new products unless explicitly approved by the Owner's representative in writing. Spare parts shall be available for at least five years after completion of this contract.

### 2.03 COMMUNICATIONS

- A. Control products provided for this project shall utilize a LonWorks internetwork. Communication involving control components (i.e., all types of controllers and operator interfaces) shall conform to EIA standard 709.1, the LonTalk™ protocol.
- B. Contractor shall provide a dedicated Ethernet LAN, communication media, connectors, repeaters, hubs, and routers necessary for the internetwork operation not specified elsewhere in Division 15 sections.
- C. Communication services over the internetwork shall result in operator interface and value passing that is transparent to the internetwork architecture as follows:
1. Connection of an operator interface device to any one controller on the internetwork will allow the operator to interface with all other controllers as if that interface were directly connected to the other controllers. Data, status information, reports, system software, custom programs, etc., for all controllers shall be available for viewing and editing from any one controller on the internetwork.
  2. All database values (e.g., objects, software variables, custom program variables) of any one controller shall be readable by any other controller on the internetwork. A controller shall automatically perform this value passing when a reference to an object name not located in that controller is entered into the controller's database. An operator or installer shall not be required to set up any communication services to perform internetwork value passing.
- D. Time clocks in all controllers shall be automatically synchronized daily via the internetwork. An operator change to the time clock in any controller shall be automatically broadcast to all controllers on the internetwork.
- 1.

- E. Network Routers
1. Contractor shall provide any additional network routers required to fully integrate the equipment into the control system.
  2. Lon Works communications: The system shall provide a direct interface to LonWorks. Interface shall provide the functionality to operate a building management system based on LON devices, including alarming, data acquisition, supervisory control, and trending.
  3. Interface shall use standard components such as Ethernet to LonTalk routers such as the Echelon I-LON router or similar type device to connect the FMS to the LonWorks network and devices. Device shall serve as an IP server transforming the Internet or any IP-based WAN or LAN into a pathway for carrying Lonworks control information.
  4. Each router shall be furnished with a position off switch (POS). Switch shall either be as integral part of power transformer or separate as an illuminated power on/off toggle switch. Switch shall be mounted adjacent or on the router.
  5. Router to provide support Lonworks/IP channels up to 256 devices.
  6. Security features to include MD5 authentication for secure access.
  7. Minimum of 32 bit RISC processor
  8. Provide both TP/FT-10 and TP/XF-1250 Lonworks channel options to allow for the maximum amount of flexibility for free topology or high throughput applications.
  9. Provide router with support to connect to peer to peer and master-slave networks.
  10. Router provided with adjustable packet aggregation and bandwidth utilization parameters to allow for adaptation to existing network characteristics.
  11. LED indicators for power on, Ethernet link, activity, 10/100Mbps, and Lonworks Tx/Rx.

## 2.04 CUSTOM DISPLAY CREATION

- A. Create new graphic displays for PCA units by utilizing existing PCA graphics from Concourses A and C as a basis point. Modify and upgrade graphics to match control schematic and points illustrated in design drawings for new units.
- B. Create displays in the HTML (Hypertext Markup Language) format. This is essential so that the displays can also be viewed through a web browser as well as the normal FMS operator interface. Save displays in the standard HTML format. Graphic elements shall be available as HTML elements. It is not acceptable to have an HTML format which merely links to a proprietary object or bit map of the entire display. View and edit the resulting HTML file using a text editor. Systems that do not support HTML displays are not acceptable.
- C. Static objects created using the graphic display-building editor shall include static text, rectangles, arcs, and circles. It shall be possible to animate static objects to give the dynamic characteristics that the point represents.
- D. Link dynamic objects to the FMS database. This shall allow information to be displayed from the database or to allow an operator to interact with the objects in order to make changes in the database and to perform control actions. Dynamic objects shall include dynamic text, push buttons, indicators, charts, check boxes, combo boxes, pop-up boxes, ActiveX controls, and scroll bars.
- E. Include static and dynamic display objects on one display. The editor shall allow display objects to be manipulated by pointing, clicking, and dragging. The editor shall also allow display objects to be drawn, re-sized, copied, grouped, rotated, aligned, and layered over each other. It shall be possible to copy and paste objects within and between displays.

- F. The existing graphic display building editor supports the following features:
1. One-step display building (both background and dynamic information)
  2. Point and click operation
  3. Paste to and from the clipboard
  4. Absolute positioning object placement
  5. Ruler and grid
  6. Configurable tool, color, and line palettes
  7. Dialog boxes for definition of object properties
  8. Shape and page building
  9. On-line help
  10. Import graphics from third-party packages, including WMF, BMP, TGA, GIF, and JPEG formats
  11. Standard library of FMS industry objects
  12. Live video element
  13. Building of face plates
  14. ActiveX controls
  15. ActiveX documents
  16. Display scripts written in either JavaScript or VBScript
  17. Multilevel undo and redo
  18. Object manipulation, including combine, union, and intersection
  19. Polyline node editing
  20. Transparent images
- G. Animate display elements using standard HTML scripts such as JavaScript or VBScript. A script editor supporting one of the standard script languages shall be provided. By using script programs, individual elements on the display may be manipulated. Proprietary scripting languages or additional scripting and drawing packages shall not be acceptable. It shall be possible to perform a variety of animations, which include but are not limited to, moving, resizing and re-coloring objects, and providing pop-up messages and dialog boxes.
- H. Scripts may be activated on displays using the following events:
1. On mouse click
  2. On mouse enter
  3. On mouse move
  4. On page call-up
  5. On a timer
  6. On value or state change of a point on the display
- I. Displays created in the graphic display-building editor shall be usable in a web browser such as Microsoft's Internet Explorer without modification. All displays shall be usable in this manner, enabling operators to completely operate the system through a web browser if required. Displays may also incorporate data from an intranet, the Internet, or ActiveX documents, along with other building data.



- J. Launch applications (such as Microsoft Word, Excel, custom help files, or any third-party applications) from a custom display. If supported by the application, launch the application with a specified file opened within the launched application. Launching of such applications shall be possible from the operator workstation pull-down menus or from a push button on a custom display.

## 2.05 INPUT AND OUTPUT INTERFACE

- A. Hardwired inputs and outputs may tie into the system through general purpose, custom application, or unitary controllers.
- B. All input points and output points shall be protected such that shorting of the point to itself, to another point, or to ground will cause no damage to the controller. All input and output points shall be protected from voltage up to 24 V of any duration, such that contact with this voltage will cause no damage to the controller. Inputs and outputs shall be arranged on interchangeable modules or circuit boards to allow the replacement of a damaged module or board without replacing the entire controller.
- C. Digital inputs shall allow the monitoring of on and off signals from remote devices. The digital inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices, and shall be protected against the effects of contact bounce and noise. Digital inputs shall sense "dry contact" closure without external power (other than that provided by the controller) being applied.
- D. Totalizer input points: This type of point shall conform to all requirements of digital input points, and also accept up to 15 pulses per second for pulse accumulation.
- E. Analog inputs for GPCs shall be minimum 12-bit resolution and allow the monitoring of low-voltage (0 to 10 VDC), current (0 to 20 mA), negative temperature coefficient (NTC), and resistance to detector (RTD). Analog inputs shall be compatible with and field-configurable to commonly available sensing devices. To prevent thermal loading, RTDs and thermistors shall be scanned rather than have continuous power applied.
- F. Inputs shall be electrically isolated from their associated field points.
- G. Digital outputs shall provide for on and off operation, or a pulsed low-voltage signal for pulse width modulation control. Outputs shall be selectable for either normally open or normally closed operation.
- H. Analog outputs shall be minimum 8-bit resolution and provide a modulating signal for the control of end devices. Outputs shall provide either a 0 to 10 VDC or a 4 to 20 mA signal as required to provide proper control of the output device. Analog outputs on general purpose or custom application controllers shall have status lights and a two-position (Auto and Manual) switch and manually adjustable potentiometer with feedback for manual operation. Analog outputs shall not exhibit a drift of greater than 0.4 percent of range per year.
- I. Tri-State outputs: Provide tri-state outputs (two coordinated digital outputs) for control of three-point floating-type electronic actuators without feedback. Use of three-point floating devices shall be limited to zone control and terminal unit control applications (VAV terminal units, duct-mounted heating coils, zone dampers, radiation). Control algorithms shall run the zone actuator to one end of its stroke every 24 hours for verification of operator tracking.
- J. System point capacity: The system size shall be expandable to at least two times the number of hardware and software input and output points required for this project or 12,000 points, whichever is greater. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this project shall not require any hardware additions or software

revisions in order to expand the system.

- K. Spare I/O Points: At each controller location, provide spare points equal to 15 percent of total I/O points at that location or 2 AI, 2 AO, 2 DO and 2 DI, whichever is greater.

## 2.06 POWER SUPPLIES AND LINE FILTERING

- A. Control transformers shall be UL and CSA Listed. Furnish Class 2 current-limiting type or furnish over-current protection in both primary and secondary circuits for Class 2 service per NEC requirements. Limit connected loads to 80 percent of rated capacity
  - 1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0 percent line and load combined, with 100-microsecond response time for 50 percent load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand a 150 percent current overload for at least three seconds without trip-out or failure.
    - a. Unit shall operate between 32 degrees F and +120 degrees F. EM/RF shall meet FCC Class B and VDE 0871 for Class B and MIL-STD 810C for shock and vibration.
    - b. Line voltage units shall be UL Recognized and CSA approved.
- B. Power line filtering:
  - 1. Provide transient voltage and surge suppression for all workstations and controllers, either internally or as an external component. Surge protection shall have the following at a minimum:
    - a. Dielectric strength of 1,000 volts minimum
    - b. Response time of 10 nanoseconds or less
    - c. Transverse mode noise attenuation of 65 dB or greater
    - d. Common mode noise attenuation of 150 dB or better at 40 Hz to 100 Hz

## 2.07 AUXILIARY CONTROL DEVICES

- A. Relays:
  - 1. Control relays shall be UL Listed plug-in type. Contact rating, configuration, and coil voltage suitable for application. Honeywell R4228/8228 or equivalent.
  - 2. Time delay relays shall be UL Listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable  $\pm 200\%$  (minimum) from set point shown on plans. Contact rating, configuration, and coil voltage suitable for application. Provide NEMA 1 enclosure when not installed in local control panel.
- B. Current transmitters:
  - 1. AC current transmitters shall be self-powered combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4 to 20 mA two-wire output. Unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A full scale, internal zero and span adjustment, and  $\pm 1$  percent full-scale accuracy at 500 ohm maximum burden.
  - 2. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA Recognized.
  - 3. Unit shall be split-core type for clamp-on installation on existing wiring.
  - 4. Acceptable manufacturers: Veris Industries

- C. Voltage transmitters:
1. AC voltage transmitters shall be self-powered single loop (two-wire) type, 4 to 20 mA output, with zero and span adjustment.
  2. Ranges shall include 100 to 130 VAC, 200 to 250 VAC, 250 to 330 VAC, and 400 to 600 VAC full-scale, adjustable, with  $\pm 1$  percent full-scale accuracy with 500 ohm maximum burden.
  3. Transmitters shall be UL/CSA Recognized at 600 VAC rating and meet or exceed ANSI/ISA S50.1 requirements.
- D. Power monitors:
1. Power monitors shall be three-phase-type furnished with three-phase disconnect and shorting switch assembly, UL Listed voltage transformers, and UL Listed split-core current transformers.
  2. They shall provide a selectable rate pulse output for kWh reading and a 4 to 20 mA output for kW reading. They shall operate with 5 A current inputs with a maximum error of  $\pm 2$  percent at 1.0 power factor or  $\pm 2.5$  percent at 0.5 power factor.
- E. Current switches:
1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system.
  2. For fan systems provide split core type current switch with adjustable set point to allow monitoring of failure whenever a fan belt breaks or fails to operate.
  3. Acceptable Manufacturers: Veris Industries
- F. Local control panels:
1. All indoor control cabinets shall be fully enclosed NEMA 1 construction with hinged door, key-lock latch, and removable sub-panels. A single key shall be common to all field panels and sub-panels.
  2. Interconnections between internal and face-mounted devices pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL Listed for 600 volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.
  3. Provide on and off power switch with over-current protection for control power sources to each local panel.
  4. All control panels shall be built in accordance with UL508A standards and be labeled with separate UL label numbers.

## 2.08 WIRING AND RACEWAYS

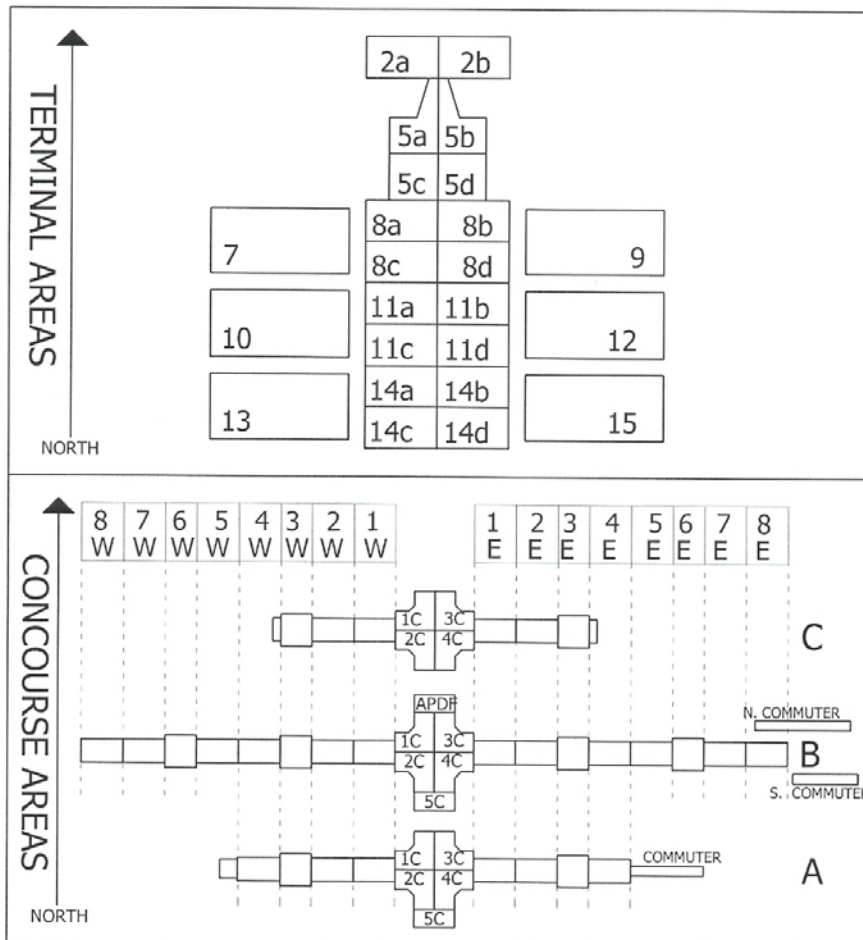
- A. General: Provide copper wiring, plenum cable, and raceways as specified in the applicable sections of Division 16.
- B. All insulated wire to be copper conductors, UL labeled for 90C minimum service.

## 2.09 CONTROLLER NAMING CONVENTION

- A. General: All controllers in the Terminal, AOB and Concourses shall use the following naming

convention in programming.

1. WW-X-YY-ZZZ
  - a. WW: The building identification of the controller
    - 1) MT = Main Terminal
    - 2) NT = North Terminal
    - 3) A = Concourse A
    - 4) B = Concourse B
    - 5) C = Concourse C
    - 6) AOB = AOB.
  - b. X: The building level location of the controller.
    - 1) B=Basement
    - 2) 1=Apron or Ramp level
    - 3) 2=Concourse level
    - 4) 3= Mezzanine level
    - 5) 4= fourth level, Etc.
  - c. Y: The building area location of the controller (IE: 3C, 2E, etc). See figure below.



- d. ZZZ: DIA equipment tag (IE: AHU42) or numerical sequence of VAV controller. VAV sequencing starts at 1 and increases by 1 for each VAV (IE: 7,8,etc).

## PART 3 -EXECUTION

### 3.01 EXAMINATION

- A. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the Architect and Engineer for resolution before rough-in work is started.
- B. The Contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the Engineer for resolution before rough-in work is started.
- C. The Contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate—or if any discrepancies occur between the plans and the Contractor's work, and the plans and the work of others—the Contractor shall report these discrepancies to the Engineer and shall obtain written instructions for any changes necessary to accommodate the Contractor's work with the work of others.
- D. Contractor shall disable alarms in existing controllers that are taken offline for construction. Alarms shall be re-established after work is complete.

### **3.02 PROTECTION**

- A. The Contractor shall protect all work and material from damage from its work or employees, and shall be liable for all damages thus caused.
- B. The Contractor shall be responsible for its work and equipment until finally inspected, tested, and accepted. The Contractor shall protect any material that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

### **3.03 COORDINATION**

- A. Site:
  - 1. Where the mechanical work will be installed in close proximity to, or will interfere with, the work of other trades, the Contractor shall assist in working out space conditions to make a satisfactory adjustment. If the Contractor installs its work before coordinating with other trades, so as to cause any interference with the work of other trades, the Contractor shall make the necessary changes in its work to correct the condition without extra charge.
  - 2. Coordinate and schedule work with all other work in the same area, or with work that is dependent upon other work, to facilitate mutual progress.
- B. Submittals: Refer to "Submittals" Article in Part 1 of this Specification for requirements.
- C. Test and balance:
  - 1. The Contractor shall furnish all tools necessary to interface to the control system for test and balance purposes.
  - 2. The Contractor shall provide training in the use of these tools. This training will be planned for a minimum of four hours.
  - 3. In addition, the Contractor shall provide a qualified technician to assist in the test and balance process, until the first 20 terminal units are balanced.
  - 4. The tools used during the test and balance process will be returned at the completion of the testing and balancing.
- D. Coordination with controls specified in other sections or divisions: Other sections and divisions of this Specification include controls and control devices that are to be part of or

interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the Contractor as follows:

1. All communication media and equipment shall be provided as specified in Part 2: "Communication" of this Specification.
2. Each supplier of a control product is responsible for the configuration, programming, startup, and testing of that product to meet the sequences of operation described in this section.

### 3.04 GENERAL WORKMANSHIP

- A. Install equipment, piping, and wiring raceway parallel to the building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.
- B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
- C. Install all equipment in readily accessible locations as defined by Chapter 1, Article 100, Part A of the National Electric Code (NEC).
- D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.
- E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility, and be executed in strict adherence to local codes and standard practices.

### 3.05 FIELD QUALITY CONTROL

- A. All work, materials, and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this Specification.
- B. Contractor shall continually monitor the field installation for code compliance and quality workmanship.
- C. Contractor shall have work inspected by local or state authorities having jurisdiction over the work.

### 3.06 WIRING

- A. All control and interlock wiring shall comply with national and local electrical codes and Division 16 of this specification. Where the requirements of this section differ with those in Division 16, the requirements of this section shall take precedence.
- B. All NEC Class 1 (line voltage) wiring shall be UL Listed in approved raceway per NEC and Division 16 requirements.
- C. All low-voltage wiring shall meet NEC Class 2 requirements. (Low-voltage power circuits shall be sub-fused when required to meet the Class 2 current limit.)
- D. Where NEC Class 2 (current limited) wires are in concealed and accessible locations, including ceiling return air plenums, approved cables not in the raceway may be used, provided that the cables are UL Listed for the intended application. For example, plenums shall be UL Listed specifically for that purpose.
- E. All wiring in mechanical, electrical, or service rooms—or where subject to mechanical damage—shall be installed in raceway at levels below 10ft.

- F. Do not install Class 2 wiring in raceway containing Class 1 wiring. Boxes and panels containing high-voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).
- G. Do not install wiring in raceway containing tubing.
- H. Where Class 2 wiring is run exposed, wiring is to be run parallel along a surface or perpendicular to it, and neatly tied at 10 ft intervals.
- I. Where plenum cables are used without raceway, they shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical raceways, piping, or ceiling suspension systems.
- J. All wire-to-device connections shall be made at a terminal block or terminal strip. All wire-to-wire connections shall be made at a terminal block or wire nut at junction box.
- K. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
- L. Maximum allowable voltage for control wiring shall be 120v. If only higher voltages are available, the contractor shall provide step-down transformers.
- M. All wiring shall be installed as continuous lengths, with no splices permitted between termination points.
- N. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations.
- O. Size of raceway and size and type of wire shall be the responsibility of the Contractor, in keeping with the manufacturer's recommendation and NEC requirements, except as noted elsewhere.
- P. Include one pull string in each raceway 1" or larger.
- Q. Use coded conductors throughout with different colored conductors.
- R. Control and status relays are to be located in designated enclosures only. These enclosures include packaged equipment control panel enclosures, unless they also contain Class 1 starters.
- S. Conceal all raceways, except within mechanical, electrical, or service rooms. Install raceway to maintain a minimum clearance of 6" from high-temperature equipment (e.g., steam pipes or flues).
- T. Secure raceways with raceway clamps fastened to the structure and spaced according to code requirements. Raceways and pull boxes may not be hung on flexible duct strap or tie rods. Raceways may not be run on or attached to ductwork.
- U. Adhere to Division 16 requirements where raceway crosses building expansion joints.
- V. Install insulated bushings on all raceway ends and openings to enclosures. Seal top end of all vertical raceways.
- W. The contractor shall terminate all control and interlock wiring, and shall maintain updated wiring diagrams with terminations identified at the job site.

- X. Flexible metal raceways and liquid-tight, flexible metal raceways shall not exceed 3 ft in length and shall be supported at each end. Flexible metal raceway less than 1/2 in. electrical trade size shall not be used. In areas exposed to moisture—including chiller and boiler rooms—liquid-tight, flexible metal raceways shall be used.
- Y. Raceway shall be rigidly installed, adequately supported, properly reamed at both ends and left clean and free of obstructions. Raceway sections shall be joined with couplings (per code). Terminations shall be made with fittings at boxes, and ends not terminating in boxes shall have bushings installed.

### **3.07 COMMUNICATION WIRING**

- A. The contractor shall adhere to the items listed in the “Wiring” Article in Part 3 of the Specification.
- B. Follow manufacturer’s installation recommendations for all communication cabling.
- C. Do not install communication wiring in raceway and enclosures containing Class 1 or other Class 2 wiring.
- D. Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer, shall not be exceeded during the installation.
- E. Contractor shall verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable.
- F. When a cable enters or exits a building, a lightning arrestor shall be installed between the lines and ground. The lightning arrestor shall be installed according to the manufacturer’s instructions.
- G. All runs of communication wiring shall be unspliced lengths when that length is commercially available.
- H. All communication wiring shall be labeled to indicate origination and destination data.
- I. Grounding of coaxial cable shall be in accordance with NEC regulations Article on Communication Circuits, Cable and Protector Grounding.

### **3.08 INSTALLATION OF SENSORS**

- A. Install sensors in accordance with the manufacturer’s recommendations.
- B. Mount sensors rigidly and adequately for the environment within which the sensor operates.
- C. All wires attached to sensors shall be air sealed in their raceways or in the wall to stop air transmitted from other areas affecting sensor readings.

### **3.09 IDENTIFICATION OF HARDWARE AND WIRING**

- A. All wiring, cabling, and tubing within factory-fabricated panels shall be labeled within 2" of termination with DDC address or termination number.
- B. Identify control panels with minimum 1/2" letters on laminated plastic nameplates.
- C. Manufacturers' name plates and UL or CSA labels are to be visible and legible after equipment is installed.



- D. Identifiers shall match record documents.

### 3.10 CONTROLLERS

- A. Provide a separate controller for each PCA unit or other HVAC system. A DDC controller may control more than one system, provided that all points associated with individual control loops are assigned to the same DDC controller. Points used for control loop reset, such as outside air or space temperature, are exempt from this requirement.

### 3.11 PROGRAMMING

- A. Provide sufficient internal memory for the specified sequences of operation and trend logging. There shall be a minimum of 25 percent of available memory free for future use.
- B. Point naming and point value: System point names and values shall be of sufficient size to allow flexibility in design, allowing easy operator interface without the use of a written point index or cryptic alphanumeric shorthand.
1. Point ID is used to designate the location of the point within the building, such as mechanical room, wing, or level, or the building itself in a multi-building environment. Point ID shall be a minimum of 40 characters in length.
  2. Point descriptors shall be a minimum of 132 characters.
  3. Point states shall be a minimum of 8 characters in length.
  4. Point engineering units shall be a minimum of 6 characters in length.
  5. Point values shall be a minimum of 15 characters in length with a variable decimal point.
- C. Software programming:
1. Provide programming for the system and adhere to the sequences of operation provided. Imbed into the control program sufficient comment statements to clearly describe each section of the program.
    - a. Graphic-based:
      - 1) Shall provide actions for all possible situations.
      - 2) Shall be documented in the form of a logic flowchart.
    - b. Text based:
      - 1) Shall provide actions for all possible situations.
      - 2) Shall be modular and structured.
      - 3) Shall be commented.
    - c. Parameter-based:
      - 1) Shall provide actions for all possible situations.
      - 2) Shall be documented.
- D. Operator interface:
1. Custom graphics: Provide new graphics for all newly installed mechanical systems and floor plans of the building. This includes each PCA unit equipment. Point information on the graphic displays shall dynamically update. Show on each graphic all input and output points for the system. Also show relevant calculated points such as set points.
  2. Show terminal equipment information on a "graphic" summary table. Provide dynamic information for each point shown.
  3. The contractor shall provide all the labor necessary to install, initialize, start up, and troubleshoot all operator interface software and their functions as described in this section. This includes any operating system software, the operator interface database,

and any third-party software installation and integration required for successful operation of the operator interface.

### 3.12 CONTROL SYSTEM CHECKOUT AND TESTING

- A. Startup testing: All testing listed in this Article shall be performed by the Contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the Owner's representative is notified of the system demonstration.
1. The Contractor shall furnish all labor and test apparatus required to calibrate and prepare for service all instruments, controls, and accessory equipment furnished under this Specification.
  2. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
  3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures per manufacturers' recommendations.
  4. Verify that all digital output devices (relays, solenoid valves, two-position actuators and control valves, and magnetic starters) operate properly and that the normal positions are correct.
  5. Verify that all analog output devices (I/Ps, actuators) are functional, that start and span are correct, and that direction and normal positions are correct. The Contractor shall check all control valves and automatic dampers to ensure proper action and closure. The Contractor shall make any necessary adjustments to valve stem and damper blade travel.
  6. Verify that the system operation adheres to the Sequences of Operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops and optimum start and stop routines.
  7. Alarms and interlocks:
    - a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.
    - b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.
    - c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action.

### 3.13 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

- A. Demonstration:
1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this Specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed its own tests.
  2. As each control input and output is checked, a log shall be completed showing the date, technician's initials, and any corrective action taken or needed.
  3. Demonstrate compliance with Part 1: "System Performance."
  4. Demonstrate compliance with Sequences of Operation through all modes of operation.
  5. Demonstrate complete operation of the operator interface.
    - a. Any device supplied by others but connected to the LonWorks™ system shall be checked out and commissioned by the supplier, and verification of interface interoperability shall be conducted by the Contractor.
  6. Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The Contractor shall be responsible for any necessary repairs or revisions

to the hardware or software to successfully complete all tests.

- B. Acceptance:
  - 1. All tests described in this Specification shall have been performed to the satisfaction of both the Engineer and Owner prior to the acceptance of the control system as meeting the requirements of Completion. Any tests that cannot be performed due to circumstances beyond the control of the Contractor may be exempt from the Completion requirements if stated as such in writing by the Engineer. Such tests shall then be performed as part of the warranty.
  - 2. The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved as required in Part 1: "Submittals."

### 3.14 CLEANING

- A. The Contractor shall clean up all debris resulting from its activities daily. The Contractor shall remove all cartons, containers, and crates under its control as soon as their contents have been removed. Waste shall be collected and placed in a designated location.
- B. At the completion of work in any area, the Contractor shall clean all of its work and equipment, keeping it free from dust, dirt, and debris.
- C. At the completion of work, all equipment furnished under this Section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

### 3.15 TRAINING

- A. Provide a minimum of 8 hours of training.
  - 1. Provide a minimum of two on-site or classroom training sessions, one half day each.
- B. Train the designated staff of Owner's representative and Owner to enable them to:
  - 1. Day-to-Day Operators:
    - a. Proficiently operate the system
    - b. Understand control system architecture and configuration
    - c. Understand DDC system components
    - d. Understand system operation, including DDC system control and optimizing routines (algorithms)
    - e. Access graphics, point reports, and logs
    - f. Adjust and change system set points, time schedules, and holiday schedules
    - g. Recognize malfunctions of the system by observation of the printed copy and graphical visual signals
    - h. Understand system drawings and the Operation and Maintenance manual
    - i. Understand the job layout and location of control components
    - j. Access data from general purpose controllers and unitary controllers

**PART 4 -SEQUENCE OF OPERATIONS (NOT USED)**

- A. SEE SECTION 15479 – PRECONDITONED AIR SEQUENCE OF OPERATION OR DESIGN DRAWING SET

**PART 5 -POINTS LISTS (NOT USED)**

- A. SEE SECTION 15478 – PRECONDITONED AIR ELECTRIC CONTROL SYSTEM OR DESIGN DRAWING SET.

**PART 6 -MEASUREMENT**

**6.01 METHOD OF MEASUREMENT**

- A. No separate measurement will be made for work under this Section.

**PART 7 -PAYMENT**

**7.01 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 Lump Sum Contract price.

**END OF SECTION 15955**

**SECTION 15990  
TESTING, ADJUSTING, AND BALANCING**

**PART 1 -GENERAL**

**1.01 GENERAL**

- A. This section of the Specifications covers testing and balancing of environmental systems, including, but not limited to distribution systems and the connected equipment and apparatus. The testing and balancing of all environmental systems shall be the responsibility of a single Testing, Balancing, and Adjusting (TBA) firm.
- B. Related Work Specified Elsewhere: General Requirements of Division One and Section 15010 "Basic Mechanical Requirements," pertain to and are hereby made part of the Work of this section of the Specifications.

**1.02 SECTION INCLUDES**

- A. Testing, adjustment, and balancing of air systems (supply, exhaust and ventilation).
- B. Measurement of final operating condition of environmental systems.
- C. Sound measurement of equipment under operating conditions.
- D. Vibration measurement of equipment under operating conditions.
- E. Space pressurization testing and adjusting.
- F. Vibration measuring.
- G. Verifying that automatic control devices are functioning properly.
- H. Reporting results of activities and procedures specified in this Section.

**1.03 RELATED SECTIONS**

- A. Section 01400 - Quality Control: Testing laboratory services Employment of testing agency and payment for services.
- B. Section 01650 - Starting of Systems.
- C. Section 01660 - Testing, Adjusting, and Balancing of Systems.
- D. Section 15010 - Basic Mechanical Requirements.

**1.04 ALLOWANCES**

- A. Cash Allowance: Include under provisions of Division 1.
- B. Allowance includes testing, adjusting, and balancing of mechanical systems. Work is included in this section and is part of the Contract Sum/Price.

## 1.05 DEFINITIONS

- A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.
- B. AABC: Associated Air Balance Council.
- C. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.
- D. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.
- E. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.
- F. NC: Noise criteria.
- G. NEBB: National Environmental Balancing Bureau.
- H. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.
- I. RC: Room criteria.
- J. Report Forms: Test data sheets for recording test data in logical order.
- K. Stair Pressurization System: A type of smoke-control system that is intended to positively pressurize stair towers with outdoor air by using fans to keep smoke from contaminating the stair towers during an alarm condition.
- L. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.
- M. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
- N. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.
- O. TAB: Testing, adjusting, and balancing.
- P. TABB: Testing, Adjusting, and Balancing Bureau.
- Q. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.
- R. Test: A procedure to determine quantitative performance of systems or equipment.
- S. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

## 1.06 REFERENCES

- A. Materials and workmanship shall conform to the latest issue of all industry standards, publications, or regulations referenced in this section and with the following references as applicable. Refer to Section 15010 for listing of issuing organizations or agencies.
- B. Applicable Standards:
  - 1. Associated Air Balance Council (AABC):
    - a. National Standards for Total System Balance.
  - 2. Air Diffusion Council (ADC):
    - a. Test Code for Grilles, Registers, and Diffusers.
  - 3. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
    - a. ASHRAE 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.
  - 4. International Building Code (IBC) with the Denver Amendments
  - 5. International Fire Code (IFC) with the Denver Amendments
  - 6. National Environmental Balancing Bureau (NEBB):
    - a. Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
  - 7. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA):
    - a. HVAC Systems Testing, Adjusting, and Balancing.

## 1.07 SUBMITTALS

- A. Submit name of adjusting and balancing agency for approval within 30 days after award of Contract to ensure that the TAB firm has met the requirements this section of the Specifications and is on the project from the outset of construction.
- B. All TAB submittals shall be electronically submitted in PDF format to the DIA Project Manager and directly to the DIA Mechanical Engineer: Lee Walinchus, [lee.walinchus@flydenver.com](mailto:lee.walinchus@flydenver.com)
- C. Field Reports: Submit under provisions of Section 15010.
- D. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- E. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.
- F. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for DIA Project Manager and for inclusion in operating and maintenance manuals.
- G. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.
- H. Test Reports: Indicate data on AABC National Standards for Total System Balance forms, or forms prepared following ASHRAE 111, NEBB or TABB forms. When necessary, supplement with forms containing information indicated in Schedules.
- I. Final Report: At least fifteen (15) days prior to Contractor's request for final inspection, submit in letter size, a single PDF file of the final test report on applicable reporting forms for



review. Each individual final reporting form must bear the signature of the person who recorded data and that of the reporting organization. Identify instruments of all types which were used and last date of calibration of each. Report shall include all items listed in PART 3- Execution.

1. A statement outlining all abnormal or notable conditions not covered in above data.
  2. Proposed resolutions to equipment that is performing outside of the specified performance ranges.
- J. "As Built" Plans shall be 34x44 and provided in the same electronic format and manner as described above.

#### **1.08 PROJECT RECORD DOCUMENTS**

- A. Record actual locations of flow measuring stations.

#### **1.09 QUALITY ASSURANCE**

- A. Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance, or ASHRAE 111, or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

#### **1.10 QUALIFICATIONS**

- A. TAB Contractor Qualifications: Engage a TAB entity with minimum of three years documented experience and certified by AABC, NEBB or TABB.
1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC, NEBB or TABB or registered Colorado Professional Engineer experienced in performance of this Work.
  2. TAB Technician: Employee of the TAB contractor and who is certified by AABC, NEBB or TABB as a TAB technician.

#### **1.11 COORDINATION**

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.
- B. Notice: Notify the DIA Project Manager, DIA Mechanical Inspector and DIA Mechanical Engineer in writing a minimum of 72 hours prior to testing of any equipment and/or systems. Include scheduled test dates and times.
- C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

#### **1.12 PRE-BALANCING CONFERENCE**

- A. Convene a conference one week prior to commencing work of this section.
- B. Attendance shall include representatives of all systems and equipment Installers having performed, or in the process of performing, project work subject to testing, balancing, and adjustment by the TAB firm.

- C. Conference agenda shall include review of status of installation and completion of each system requiring testing balancing and adjusting, for the purpose of confirming that the schedule of work to be performed will be planned so as to ensure readiness of systems.

### 1.13 SEQUENCING AND SCHEDULING

- A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

### 1.14 WARRANTY

- A. Warranty of all equipment described in this Section shall meet warranty requirements of Section 15010 - Basic Mechanical Requirements.
- B. National Project Performance Guarantee: Provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Duration of Guarantee shall be 90 days. Guarantee includes the following provisions:
  - C. Special Guarantee: Provide a guarantee on NEBB forms stating that NEBB will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Duration of Guarantee shall be 90 days. Guarantee shall include the following provisions:
    - 1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
    - 2. Systems are balanced to optimum performance capabilities within design and installation limits.

## PART 2 - PRODUCTS - NOT USED.

## PART 3 - EXECUTION

### 3.01 AGENCIES

- A. Subject to conformance with specified requirements, the following agencies are acceptable:
  - 1. Able Balance Corp.
  - 2. Griffith Engineering Service.
  - 3. Jedi Balancing, Inc.
  - 4. JPG Engineering, Inc.
  - 5. TAB Services, Inc.
  - 6. Substitutions: Under provisions of Section 15010.

### 3.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
  - 1. Systems are started and operating in a safe and normal condition.
  - 2. Temperature control systems are installed complete and operable.
  - 3. Proper thermal overload protection is in place for electrical equipment.

4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  5. Duct systems are clean of debris.
  6. Fans are rotating correctly.
  7. Air coil fins are cleaned and combed.
  8. Access doors are closed and duct end caps are in place.
  9. Air outlets are installed and connected.
  10. Duct system leakage is minimized.
- B. Submit field reports. Report defects and deficiencies noted during performance of services, which prevent system balance.
- C. Beginning of work means acceptance of existing conditions.

### 3.03 PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to DIA Project Manager to facilitate spot checks during testing.
- B. Provide additional balancing devices as required.

### 3.04 INSTALLATION TOLERANCES

- A. Set HVAC system airflow and water flow rates within the following tolerances:
1. Supply, Return, and Exhaust Fans and Equipment with Fans: minus 5 to plus 10%.
  2. Air Outlets and Inlets: 0 to plus 10%.
- B. Supply, return and exhaust air flow rate tolerances shall be identical for each system. (IE: If an AHU is balanced to 97% of design air flow rate, the corresponding exhaust fan should match this 97% tolerance.)

### 3.05 ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the DIA Project Manager.
- F. Check and adjust systems approximately six months after final acceptance and submit report.

### 3.06 TEMPERATURE CONTROLS

- A. Verify that controllers are calibrated and commissioned.
- B. Check transmitter and controller locations and note conditions that would adversely affect control functions.
- C. Record controller settings and note variances between set points and actual measurements.
- D. Check the operation of limiting controllers (i.e., high- and low-temperature controllers).
- E. Check free travel and proper operation of control devices such as damper and valve operators.
- F. Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.
- G. Check the interaction of electrically operated switch transducers.
- H. Check the interaction of interlock and lockout systems.
- I. Check main control supply-air pressure and observe compressor and dryer operations.
- J. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or nongrounded power supply.
- K. Note operation of electric actuators using spring return for proper fail-safe operations.
- L. VAV Boxes (Fan Powered and Shut off): Verify the following and report any discrepancies to the responsible installer:
  - 1. Velocity pressure sensor is receiving the proper signal and is then sending that signal to the regulator.
  - 2. Primary air damper will allow design flows without going to end point settings.
  - 3. Thermostats are calibrated.
  - 4. Control pressure is compatible with the primary damper motor range, dead band range and heating electric P.E. or valve motor range.
  - 5. Direct acting or reverse acting controls are properly installed.
  - 6. Primary fan static pressure controls are receiving the proper signal in their installed location and transmitting this signal to the fan controller.
- M. Include a written certificate (include in balance report) that the above items are functioning properly.

### 3.07 GENERAL PROCEDURES FOR TESTING AND BALANCING:

- A. Perform testing and balancing procedures on each system according to the procedures contained in SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and this Section.
- B. Cut insulation, ducts, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and

balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

- C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

### 3.08 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
- E. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling unit components.
- L. Check for proper sealing of air duct system.

### 3.09 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
  - 1. Measure fan static pressures to determine actual static pressure as follows:
    - a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
    - b. Measure static pressure directly at the fan outlet or through the flexible connection.
    - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
    - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
    - a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
  3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
  4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
  5. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
  6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
    - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
  2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure terminal outlets and inlets without making adjustments.
1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.
1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
  2. Adjust patterns of adjustable outlets for proper distribution without drafts.

### 3.10 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
1. Manufacturer, model, and serial numbers.
  2. Motor horsepower rating.
  3. Motor rpm.
  4. Efficiency rating.
  5. Nameplate and measured voltage, each phase.

6. Nameplate and measured amperage, each phase.
  7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

### 3.11 SCHEDULES

- A. Equipment Requiring Testing, Adjusting, and Balancing:
1. Preconditioned Air (PCA) Units

### 3.12 ELECTRIC HEATERS

- A. Check staging of heating devices and reset if required for proper operation.

### 3.13 MOTOR STARTERS AND THERMAL HEATERS

- A. Coordinate the requirement for the exchange of thermal overloads as required for proper motor protection on magnetic and manual starters. Check for correct sizing and notify Installers responsible for supply of proper devices of corrections or replacements needed.

### 3.14 REPORT OF WORK

- A. General: Electronic PDF, bookmarked into sections by tested and balanced systems.
- B. Include a certification sheet electronically signed by the certified testing and balancing engineer.
1. Include a list of instruments used for procedures, along with proof of calibration.
- C. Final Report Contents: In addition to certified field report data, include the following:
1. Fan curves.
  2. Manufacturers' test data.
  3. Field test reports prepared by system and equipment installers.
  4. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.
- D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
1. Title page.
  2. Name and address of TAB firm.
  3. Project name.
  4. Project location.
  5. Architect and Engineer's name and address.
  6. Contractor's name and address.
  7. Report date.
  8. Signature of TAB firm who certifies the report.

9. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
  10. Summary of contents including the following:
    - a. Indicated versus final performance.
    - b. Final performance percentage of design performance.
    - c. Equipment system or zone service
    - d. Notable characteristics of systems.
    - e. Description of system operation sequence if it varies from the Contract Documents.
  11. Nomenclature sheets for each item of equipment.
  12. A set of contract document drawings indicating 'as-built' conditions shall be included in the report with all terminals (VAV boxes, outlets, inlets, coils, unit heaters, etc.) and thermostat locations clearly marked and all equipment designated. Locations of all tests shall be clearly indicated.
  13. Data for terminal units, including manufacturer, type size, and fittings.
  14. Notes to explain why certain final data in the body of reports varies from indicated values and proposed resolutions for equipment measured outside of the acceptable specified ranges.
  15. Test conditions for fans and pump performance forms including the following:
    - a. Settings for outside-, return-, and exhaust-air dampers.
    - b. Conditions of filters.
    - c. Cooling coil, wet- and dry-bulb conditions.
    - d. Face and bypass damper settings at coils.
    - e. Fan drive settings including settings and percentage of maximum pitch diameter.
    - f. Inlet vane settings for variable-air-volume systems.
    - g. Settings for supply-air, static-pressure controller.
    - h. Other system operating conditions that affect performance.
- E. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outside, supply, return, and exhaust airflows.
  2. Duct, outlet, and inlet sizes.
  3. Terminal units.
  4. Balancing stations, locations, size, velocity and flow.
  5. Position of balancing devices.
- F. Equipment measurements shall include the following information.
1. Instrument list including instrument, manufacturer, model, serial number, range, calibration date.
  2. Data to be submitted for systems having electric motor drives, except as otherwise indicated, shall in all cases include the following to the extent applicable:
    - a. Electric Motor data including manufacturer, HP, Voltage, phase, amperage (name plate, actual (in all operating modes), no load), service factor, efficiency, power factor, starter size (brand, model, enclosure type, installed thermal heaters and the rating of the heaters, required thermal heaters and the rating of the heaters if different than installed).



- b. For motors controlled by variable frequency controllers, test data shall include amperage at one-third, two-thirds, and full speed motor RPM.
- c. V-Belt Drive data including identification/location, required driven RPM; driven sheave (diameter and RPM), belt (size and quality), motor sheave (diameter and RPM), center to center distance (maximum, minimum and final).
3. Static pressure across each individual component of the system and the total system.
4. Measurement of new PCA unit data upon completion of new work
  - a. Date of test on original equipment
  - b. Machine Serial Number
  - c. Time of Day
  - d. Run Time (per HM)
  - e. Mode
  - f. Line Volts, Amps, Frequency (Hz)
  - g. Ambient Dry Bulb (unit)
  - h. Ambient Dry Bulb (meter)
  - i. Ambient Wet Bulb (F)
  - j. Air Inlet at Filter (F)
  - k. Air Outlet D.B. at Unit
  - l. Air Outlet D.B. at End of Hose
  - m. Air Static Pressure @ Tube 1
  - n. Suction Pressure at all systems
  - o. Discharge Pressure at all systems
  - p. Suction Superheat at all systems (F)
  - q. Suction Temperature at all systems (F)
  - r. Liquid Line Temperature (F)
  - s. VSAT
  - t. Compressor Amps
  - u. Heater Amps
  - v. Fan Amps
  - w. VFD Reading (Hz, Amps, % load)
5. Instrument Calibration Reports:
  - a. Report Data:
    - 1) Instrument type and make.
    - 2) Serial number.
    - 3) Application.
    - 4) Dates of use.
    - 5) Dates of calibration.
6. Measurements outside of tolerance: If the final measurements differ from the design measurements in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED." TAB firm shall provide recommendations and/or solutions for resolving all FAILED measurements.

### 3.15 INSPECTIONS

- A. Initial Inspection:
  1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.

2. Randomly check the following for each system:
  - a. Measure airflow of at least 10% of air outlets.
  - b. Measure water flow of at least 5% of terminals.
  - c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
  - d. Measure sound levels at two locations.
  - e. Measure space pressure of at least 10% of locations.
  - f. Verify that balancing devices are marked with final balance position.
  - g. Note deviations to the Contract Documents in the Final Report.
  
- B. Final Inspection:
  1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by DIA Project Manager, DIA Mechanical Engineer or their designated representative(s).
  2. TAB firm test and balance engineer shall conduct the inspection in the presence of DIA Project Manager, DIA Mechanical Engineer or their designated representative(s).
  3. DIA Project Manager, DIA Mechanical Engineer or their designated representative(s) shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10% of the total measurements recorded, or the extent of measurements that can be accomplished in a normal 8-hour business day.
  4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
  5. If the number of "FAILED" measurements is greater than 10% of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
  6. TAB firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.
  7. Request a second final inspection. If the second final inspection also fails, Owner shall contract the services of another TAB firm to complete the testing and balancing in accordance with the Contract Documents and deduct the cost of the services from the final payment.

### 3.16 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional testing, inspecting, and adjusting during near-peak summer and winter conditions.
- C. Operational Testing: Contractor and Manufacturer shall coordinate to perform testing to ensure controls devices are calibrated, control system graphics match field values, heating and cooling stages activate and deactivate, and all devices are operational.

**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 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 Lump Sum Contract price.

**END OF SECTION 15990**

**DIVISION 16 – ELECTRICAL**  
**SECTION 16010**  
**BASIC ELECTRICAL REQUIREMENTS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Certain labor, materials, and equipment may be furnished under other Sections of these specifications, by utility Companies or by the Owner. When this is the case, the extent, source and description of these items will be as indicated on the drawings or as described in the specifications.
- B. Where a panel is installed, at least 25% of panel capacity, including main panel capacity, shall remain as spare capacity after project completion.
- C. Where existing panels are used for additional work, when six (6) or less spaces remain a new panel shall be installed.
- D. All electrical/electronic circuits, including audio, video and fire alarm systems, shall be in an approved raceway system. No “wild circuits” will be accepted.
- E. The Designer of Record shall not design or specify and the Contractor shall not install rigid metal conduit, electrical metallic tubing, flexible steel conduit, liquid-tight flexible steel conduit, non-metallic rigid conduit or innerduct in any horizontal or vertical concrete wall or slab structures or portions thereof, e.g., cast-in-place concrete floor slab on steel decking; cast-in-place concrete slabs integral with concrete structural support systems; prestressed concrete slabs; post-tensioned concrete slabs; precast concrete construction with or without field applied or plant fabricated concrete topping slabs, slabs on grade, foundation walls or in concrete cast-in-place walls, etc.

**1.02 RELATED DOCUMENTS**

- A. Drawings, General and Special Conditions, Division 1 - General Requirements and other applicable technical specifications apply to work of this Section.

**1.03 RELATED SECTIONS**

- A. Basic Electrical Requirements specifically applicable to all Division 16 Sections, in addition to Division 1 - General Requirements, and Division 15.
- B. All electrical/electronic circuits and equipment from any other Division shall meet the requirements of Division 16.
- C. Description: Work shall consist of furnishing all labor, equipment, supplies, and materials, unless otherwise specified, necessary for the installation of complete electrical systems as required by the specifications and as shown on the drawings, subject to the terms and conditions of the contract. The Work shall also include the completion of those details of electrical work not mentioned or shown which are necessary for the successful operation of all electrical systems.
- D. Temporary Power: See Division 1 for construction power constraints.

#### 1.04 REFERENCE STANDARDS

- A. Comply with the requirements of the reference standards noted herein, except where more stringent requirements are listed herein or otherwise required by the Contract Documents.
- B. Latest editions of the following:
  - 1. ANSI/NFPA 70 - National Electrical Code (as adopted and amended by the Denver Building Code).
  - 2. Uniform Fire Code (as amended by the Denver Fire Department).
  - 3. ANSI/IEEE C2 - National Electrical Safety Code.
  - 4. OSHA - Occupational Safety and Health Administration, as Amended
  - 5. Underwriter's Laboratory (UL)
  - 6. National Fire Protection Association (NFPA)
  - 7. Other references as listed elsewhere in these specifications.
  - 8. IEEE standard 519- recommended practices and requirement for harmonic control in electrical power systems.

#### 1.05 DEFINITIONS

- A. "Furnish" or "Provide": To supply, install and connect complete and ready for safe and regular operation of particular work unless specifically otherwise noted.
- B. "Install": To erect, mount and connect complete with related accessories.
- C. "Supply": To purchase, procure, acquire and deliver complete with related accessories.
- D. "Work": Labor, materials, equipment, apparatus, controls, accessories, and other items required for proper and complete installation.
- E. "Wiring": Raceway, fittings, wire, boxes and related items.
- F. "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.
- G. "Or Equal. Or Approved Equal": Refers to products that, in the opinion of the DIA Project Manager, are similar in all respect to products specified by proprietary brand name. (Refer to Section 01630 for procedures for submittal of proposed substitutions.)
- H. "Exposed": Not installed underground or "concealed" as defined above.
- I. "Indicated," "Shown" or "Noted": As indicated, shown or noted on drawings or specifications.
- J. "Similar" or "Equal": Same in materials, weight, size, design, construction, capacity, performance, and efficiency of specified product.
- K. "Reviewed," "Satisfactory," "Accepted," or "Directed": As reviewed, satisfactory, accepted, or directed by or to Project Manager.
- L. "Related Work" includes all "Work" required for a complete working system.

- M. "Equipment": A general term including material, fittings, devices, appliances, fixtures, apparatus, and the like used as a part of, or in connection with, an electrical installation.
- N. "Busbar": A rigid metallic conductor, lug or bar used to make a common connection between more than one circuit. (Includes all termination assemblies.)
- O. "Shall": Mandatory requirements of this specification are characterized by the use of the word "shall".
- P. Refer to Article 100 of the currently adopted National Electrical Code for other definitions as applicable to this project.

#### **1.06 WORK SEQUENCE**

- A. Construct Work in sequence under provisions of Division 1 where applicable.

#### **1.07 DRAWINGS AND SPECIFICATIONS**

- A. The drawings indicate the general arrangement of circuits, outlets, panelboards and other work. Information shown on the drawings is schematic; however, re-circuiting will not be permitted without specific acceptance. In cases of conflict between specifications and drawings, the specification shall have precedence. Data presented on the drawings is as accurate as planning can determine, but accuracy is not guaranteed and field verification of all dimensions, locations, levels, etc., to suit field conditions is required. Review all of the contract documents and adjust all work to conform to all conditions shown therein.
- B. Prior to submitting a bid, a site visit is required to ascertain all conditions affecting the proposed installation and to adjust all work accordingly. Costs for providing for these adjustments, including response to site constraints, shall be itemized and listed in the bid proposal.
- C. Discrepancies between different plans, between plans and specifications, between specifications, or regulations and codes governing this installation shall be brought to the attention of the Project Manager in writing 72 hours before the date of bid opening. In the event such discrepancies exist, and the Project Manager is not so notified, the adjudication of responsibility shall be solely at the discretion of the Project Manager.

#### **1.08 COORDINATION**

- A. Prior to fabrication or installation of any electrical work, participate in detailed coordination planning meetings with all other building utilities system trades, under the direction of the General Contractor, so as to completely establish routings, elevations, space requirements, and coordination of access, layout, and suspension requirements in relationship to the building structure and the work of all other trades.
- B. Any electrical work penetrating concrete walls or floors shall require saw cutting and/or core drilling and shall require approval by the Project Manager. The contractor shall submit shop drawings of any saw cutting or core drilling to the Project Manager prior to performing the work. Refer to Section 01410 - Cutting and Patching. Reference 3.02 C for additional information.
- C. Any power outages necessary to install or test electrical systems and/or equipment shall be coordinated with Denver International Airport Maintenance/Engineering A written shutdown request form shall be submitted to and approved by the Project Manager two weeks prior to the shutdown.

## 1.09 COORDINATION DRAWING

- A. Where the Contractor modifies the design, through selection of equipment differing from that shown, coordination drawings shall be provided by the Contractor in accordance with Division 1 to a scale of 1/4"=1'0" or larger for equipment rooms, details, congested areas and sections; other plans at a scale of 1/8"=1'0". These drawings are to detail major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. The Contractor shall indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
1. Indicate the proposed locations of raceway systems, equipment, and materials. Include the following:
    - a. Clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance.
    - b. Exterior wall and foundation penetrations.
    - c. Fire-rated wall and floor penetrations.
    - d. Equipment connections and support details.
    - e. Sizes and location of required concrete pads and bases.
    - f. Support details.
  2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
  3. Floor plans, elevations, and appropriate details are required to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

## 1.10 SUBMITTALS (REFER TO SECTIONS 01300 AND 01340)

- A. Submit shop drawings, coordination drawings and product data in accordance with provisions of Division 1. Submit all required information under a given specification section together. Do not split out submittals under the same specification section.
- B. Prior to submission, shop drawings, material lists and catalog cut sheets or manufacturer's printed data shall be thoroughly checked for compliance with contract requirements, compatibility with equipment being furnished by the Contractor or Owner, accuracy of dimensions, coordination with work of other trades, and conformance with sound and safe practice as to erection of installation. Each submittal shall bear Contractor's signed statement evidencing such checking.
- C. Clearly mark each shop drawing as follows for purposes of identification:
1. Shop Drawing
  2. Equipment Identification Used on Contract Drawings
  3. Date
  4. Name of Project
  5. Branch of Work
  6. Project Manager's Name
  7. Contractor's Name
- D. Clearly mark printed material, catalog cut sheets, pamphlets or specification sheets, and shop drawings with the same designation shown on the contract document schedules.

- E. Contractor agrees that submittals processed by the Project Manager are not change orders; that the purpose of submittals is to demonstrate to the Project Manager that the Contractor understands the design concept; and that the Contractor demonstrates this understanding by indicating which equipment and material he intends to furnish and install and by detailing the installation methods he intends to use.
- F. Contractor shall be responsible for dimensions (which he shall confirm and correlate at the job site), fabrication processes and techniques of construction, and coordination of his work with that of other trades. The Contractor shall check and verify all measurements and review shop drawings before submitting them. If any deviations from the specified requirements for any item of material or equipment exist, such deviation shall be expressly stated in writing and incorporated with the submittal.
- G. Maintain one copy of accepted shop drawings at the project field office until completion of the project, and make this copy available, upon request, to representatives of the Project Manager and Owner.
- H. No equipment or materials shall be installed or stored at the jobsite until submittals for such equipment or materials have been given review action by the Project Manager accepting their use.
- I. Shop drawings and manufacturer's published data shall be submitted for all equipment required for this project.

#### **1.11 RECORD DOCUMENTS**

- A. Maintain a contract set of electrical drawings and specifications at the site. Neatly mark all changes, discoveries and deviations from the original drawings. Use a reproducible color that contrasts with the prints. This shall be a separate set of drawings, not used for construction purposes, and shall be updated daily as the job progresses and shall be made available for inspection by the Project Manager at all times. Upon completion of the contract, this set of record drawings shall be delivered to the Project Manager. Follow DIA CADD standards, to be furnished to the successful bidder. Record documents to be provided by the Contractor shall clearly and accurately show the following:
  - 1. Provide horizontal and vertical dimensions for all raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.
  - 2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
  - 3. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

#### **1.12 REGULATORY REQUIREMENTS**

- A. Obtain and pay for all permits, plan review, and inspections from authority having jurisdiction.
- B. The drawings and specifications take precedence when they are more stringent than codes, statutes, or ordinances in effect. Applicable codes, ordinances, standards and statutes take precedence when they are more stringent than the drawings and specifications.

#### **1.13 ENVIRONMENTAL CONDITIONS**



- A. The equipment shall be designed and constructed to operate successfully at the rated values under the following environmental conditions:
  - 1. Location (Indoors/Outdoors)
  - 2. Altitude (5,500 feet above sea level)
  - 3. Temperature range -30°F to 120°F

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS AND EQUIPMENT**

- A. Materials and Equipment: Acceptable to the authority having jurisdiction as suitable for the use intended, except where more stringent requirements are indicated by the Contract Documents.
- B. All equipment and materials installed shall be new, unless otherwise specified.
- C. Defective or damaged materials shall be replaced or repaired, prior to final acceptance, in a manner acceptable to the Project Manager or Owner and at no additional cost to the Owner.
- D. All electrical "equipment" and assemblies shall be acceptable for installation only if labeled and listed by a nationally recognized testing laboratory, such as UL or an equivalent..
- E. All major equipment components shall have the manufacturer's name, address, model number, and serial number permanently attached in a conspicuous location.

### **2.02 STORAGE AND PROTECTION**

- A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.
- B. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering and provide ventilation to avoid condensation.
- C. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged and are maintained under required conditions.

### **2.03 PRODUCT OPTIONS**

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards.
- B. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not specifically named with supporting documentation.

### **2.04 PRODUCTS LIST**

- A. Within 15 days after date of Notice to Proceed, submit complete list of major products required for submittal under these specifications, with name of manufacturer, trade name, and model number of each product.

## 2.05 SUBSTITUTIONS

- A. Refer to DIVISION 1 - GENERAL REQUIREMENTS, Section 01630 Substitutions.

## 2.06 GUARANTEE

- A. The entire electrical system installed under this Contract shall be left in proper working order. Replace, at no additional cost to the Owner, any work, materials, or equipment which evidences defects in design, construction, or workmanship within two years, or any longer period specifically noted elsewhere in these specifications, from date of final acceptance.

## PART 3 - EXECUTION

### 3.01 WORKMANSHIP

- A. Only quality workmanship will be accepted. Poor workmanship, improper layout of work and lack of coordination of work, as determined by the Project Manager, is not acceptable and shall be corrected at the contractors cost.
- B. Contractor shall include no more than one apprentice per Journeyman Electrician. Apprentices shall be under the direct supervision of a licensed electrician at all times.
- C. Any changes or deviations from the drawings and specifications must be accepted in writing by the Project Manager. All errors in installation shall be corrected at the expense of the Contractor. All specialties shall be installed as detailed on the drawings. Where details or specific installation requirements are not provided, manufacturer's recommendations shall be followed.
- D. Upon completion of work, all equipment and materials shall be installed complete, thoroughly tested, checked, correctly adjusted, and left ready for intended use or operation. All work shall be thoroughly cleaned and all residues shall be removed from surfaces. Exterior surfaces of all material and equipment shall be left in a perfect, unblemished condition.
- E. Contractor shall provide a complete installation, including all required labor, material, cartage, testing, insurance, permits, and taxes.

### 3.02 CHASES, OPENINGS, CUTTING AND PATCHING

- A. Carefully lay out all work in advance so as to eliminate where possible, cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings and roofs. Any damage to the building, structure, piping, ducts, equipment or any defaced finish shall be repaired by skilled mechanics of the trades involved at no additional cost to the Owner and to the satisfaction of the DIA Project Manager. Any necessary cutting, channeling, drilling or welding as required for the proper support, concealment, installation or anchoring of raceways, outlets, or other electrical equipment shall be performed in a careful manner, and shall be pre-approved by the Project Manager.
- B. All openings made in fire-rated walls, floors, or ceilings shall be sealed and made tight in a manner to conform to the fire rating for the barrier penetrated.
- C. All penetrations required through completed concrete construction shall be core drilled at minimum size required. All penetrations in concrete require an x-ray or ground penetrating

radar to determine if the location is clear of reinforcing steel and embedded systems. Precautions shall be taken when drilling to prevent damage to structural concrete.

**3.03 ELECTRICAL INSTALLATIONS**

- A. Coordinate electrical systems, equipment, and material installation with other building components. If the Contractor furnishes equipment of a different size, the Contractor shall furnish and install the proper fuses, circuit breaker, disconnect switch, wire and conduit required for the equipment furnished, at no additional cost to the Owner, and as deemed acceptable by the DIA Project Manager.

**3.04 PROGRESS OF WORK**

- A. Order the progress of electrical work to conform to the progress of the work of the other trades. Complete the entire installation as soon as the condition of the sites will permit. Any cost resulting from defective or ill-timed work performed under this Division shall be borne by the Contractor.

**3.05 ELECTRICAL COMPLETION**

- A. Indoctrination of Operating and Maintenance Personnel: Furnish the services of a qualified representative of the supplier of each item or system itemized below who shall instruct specific personnel, as designated by the Owner, in the operation and maintenance of that item or system.
  - 1. Instruction shall be given when the particular system is complete, shall be of the number of hours indicated, and at the time requested by the Owner. A representative of the Contractor shall be present for all demonstrations.

Systems	Hours Of Instruction
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- B. Operating and Maintenance Manuals and Parts Lists: Deliver three complete operating & maintenance manuals and parts lists in three ring binders to the Owner at the time of the above required indoctrination. The information shall be provided on the manufacturer's original data sheets. Fully explain the contents of the manuals as part of required indoctrination and instruct the Owner's personnel in the correct procedure in obtaining service, both during and after the guarantee period.
  - 1. The operating and maintenance manuals and parts lists shall give complete information as to whom the Owner shall contact for service and parts. Include address and phone number. Furnish evidence that an authorized service organization regularly carries a complete stock of repair parts for these items (or systems), and that the organization is available for service. Service shall be furnished within 24 hours after requested.
- C. Operating and Acceptance Tests: Provide all labor, instruments, and equipment for the performance of tests as specified below and elsewhere in these specifications for all applicable equipment furnished and installed as part of this contracts. Submit three copies of test reports to the Project Manager for his approval.
- D. Clean Up: Remove all materials, scrap, etc., relative to the electrical installation, and leave the premises and all equipment, lamps, fixtures, etc. in a clean, orderly condition. Clean all electrical equipment, such as switchboards, panel boards, luminaries etc. of construction dirt, dust, etc. and touch-up or repaint all scratches, blemishes, rust spots etc. to its original

condition. Any costs to the Owner for clean up of the site will be charged against the Contractor.

- E. Acceptance Demonstration: Upon completion of the work, at a time to be designated by the Project Manager, the Contractor shall demonstrate for the Owner the operation of the entire installation, including all systems provided or modified under this contract.
- F. Final Acceptance by the Owner will not occur until all operating instructions are received and Owner's personnel have been thoroughly indoctrinated in the maintenance and operation of all equipment.

#### **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 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 Lump Sum Contract price.

**END OF SECTION 16010**

**SECTION 16015**  
**ELECTRICAL DEMOLITION**

**PART 1 – GENERAL**

**1.01 DESCRIPTION**

- A. The work specified in this section consists of performing electrical demolition.

**1.02 RELATED DOCUMENTS**

- A. Drawings, General and Special Conditions, Division 1 - General Requirements and other applicable technical specifications apply to work of this Section.

**1.03 RELATED SECTIONS**

- A. Division 16 - All sections.

**1.04 REFERENCE STANDARDS**

- A. Comply with the requirements of the reference standards noted herein and in Section 16010 except where more stringent requirements are listed herein or otherwise required by the Contract Documents

**PART 2 - PRODUCTS**

**2.01 PRODUCT**

- 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 PROCEDURES**

- A. Existing electrical systems shall not be abandoned in place except as authorized in writing by the Project Manager or as shown on the drawings.
- B. No area; new, remodeled, or existing shall be without a fully operational electrical system, except for scheduled outages.
- C. The contractor shall remove, relocate or replace any electrical equipment or systems as required for installation of any structural, mechanical or plumbing equipment,
- D. Maintain all existing electrical, control, communication and signaling systems to the extent required by the owner.
- E. Methods for maintaining the existing system in operation and for providing temporary systems shall be designed to assure complete safety. Requirements for protection, support and in-service maintenance of these systems shall be the sole responsibility of the contractor

- F. Where remodel or demolition interferes with circuits outside of the work area, schedule outages to rework the circuits as required.
- G. All items that are removed and not designated by the Project Manager to be used or turned over to the owner shall be removed from the airport.

**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 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 Lump Sum Contract price.

**END OF SECTION 16015**

## SECTION 16065

### TESTING, ACCEPTANCES AND CERTIFICATION

#### PART 1 – GENERAL

##### 1.01 REQUIREMENT

- A. The contractor shall provide the necessary field-testing and startup services for all electrical and mechanical equipment except as noted otherwise. The field-testing and startup services shall be in accordance with each equipment manufacturer's written recommendations for field-testing proving they meet contract standards.
- B. The contractor shall be responsible for furnishing all equipment, power source when needed, coordinating and performing electrical/electronic testing required by the contract documents. Testing requirements may be located on the drawings or other sections of the specifications.
- C. The contractor shall provide all necessary assistance and cooperation with any Independent Testing Organization furnishing by the City. The contractor shall correct, repair or replace all equipment found to be defective by the Independent Testing Organization.

##### 1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Without limiting the generality of other requirements of these Specifications, all work specified herein shall conform to or exceed the applicable requirements of the referenced Standards; provided, that wherever the provisions of said publications are in conflict with the requirements specified herein, the more stringent requirements shall apply unless in conflict with the equipment manufacturer's written recommendations:
  - 1. Building Code and DIA Standards.
  - 2. ANSI/IEEE C2 - National Electrical Safety Code.
  - 3. OSHA - Occupational Safety and Health Administration, as Amended
  - 4. NETA - National Electric Testing Association
  - 5. NEMA ICS 1 - General Standards for Industrial Control and Systems.
  - 6. NEMA ICS 2 - Standards for Industrial Control Devices, Controllers, and Assemblies.
  - 7. NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
  - 8. UL 1008 - Standard for Automatic Transfer Switches.
  - 9. NFPA 70 - National Electrical Code, including but not limited to use in emergency and standby systems in accordance with Articles 517, 700, 701 and 702.
  - 10. NFPA 72 - National Fire Alarm Code (as adopted and amended by the Denver Building Code and DIA Standards).
  - 11. NFPA 101 - National Electrical Safety Code (as adopted and amended by the Denver Building Code and DIA Standards).
  - 12. NFPA 110 - Standard for Emergency and Standby Power Systems (as adopted and amended by the Denver Building Code and DIA Standards).

13. IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems (Orange Book)
14. NEMA Standard ICS-2-447 - AC Automatic Transfer Switches.
15. IEC - Standard for Automatic Transfer Switches

### 1.03 CONTRACTOR SUBMITTALS

- A. Comply with Division 1 submittal requirements.
- B. Five copies of complete certified test reports shall be submitted to the Project manager by the contractor. The test reports shall include the following as a minimum:
  1. Power cable high potential test reports
    - a. Insulation resistance tests.
    - b. Continuity tests.
  2. Transformer test reports to include where applicable:
    - a. Transformer turns ratio
    - b. Winding resistance
    - c. Insulation power factor
    - d. K Factor
  3. All electrical/electronic equipment and systems functional test report.
  4. All other reports required by individual specification sections.
  5. Generator load bank test report
  6. Transfer Switch test report
  7. Load balance report for each switch board, panel board and switch gear.

## PART 2 - MATERIALS

### 2.01 GENERAL REQUIREMENTS

- A. The electrical and mechanical equipment shall be completely tested in the field in the presents of DIA Inspectors in accordance with good engineering practices to assure that:
- B. The equipment has not been damaged during manufacturing, shipping or installation.
- C. The equipment has been installed according to the requirements contract documents.
- D. The equipment meets the requirements of the contract documents.
- E. If the contractor finds during the testing that any piece of equipment failed to satisfactorily pass the required field test, the Project manager shall be promptly notified and the contractor shall take the necessary actions for the prompt repair or replacement. A retest to demonstrate the equipment will meet the requirements of the contract documents shall be scheduled with the Project Manager.

### 2.02 HVAC

- A. Test the operation of all heaters and air conditioners
- B. Test the Lead Lag Control circuits.



### 2.03 GROUND RESISTANT TEST

- A. Before connecting a ground rod to the system test the resistance to earth. Where test show resistance to ground over 5 OHMS, an additional ground rod shall be added.
- B. Upon completion of installation of electrical grounding system, test ground resistance to earth in accordance with ANSI/IEEE81. Submit test results to the Project Manager

### 2.04 CONDUCTOR INSULATION TEST

- A. Prior to energizing, all building service cables feeders to and/or from transformers, switchboards, panel boards are to be tested with a 1000-volt insulation megohm meter to determine insulation resistance levels. Test cables rated for three hundred volt with a 500-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 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 (AWG or KCMIL)	Resistance (Megohms-1,000ft)
12-8	200
6-2/0	100
3/0-750	100

## PART 3 - EXECUTION

### 3.01 TESTING

- A. The contractor shall allow only certified personnel to perform the testing.
- B. The contractor shall perform the testing using all necessary safety precautions and proper test equipment.
- C. The contractor shall notify the Project manager three days in advance of the proposed testing dates.
- D. Witness of testing by DIA Inspector, Electrical Maintenance and Electrical Inspector.

## 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 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 Lump Sum Contract price.

**END OF SECTION 16065**

**SECTION 16110**  
**RACEWAYS AND FITTINGS**

**PART 1 – GENERAL**

**1.01 SUMMARY**

- A. Rigid metal conduit and fittings.
- B. Intermediate metal conduit - Not Acceptable.
- C. Electrical metallic tubing and fittings.
- D. Flexible steel conduit and fittings.
- E. Liquid-tight flexible steel conduit and fittings.
- F. Non-metallic rigid conduit and fittings.
- G. Innerduct

**1.02 RELATED DOCUMENTS**

- A. Drawings, General and Special Conditions, Division 1 – General Requirements and other applicable technical specifications apply to work of this Section.

**1.03 RELATED SECTIONS**

- A. Division 1 – Cutting and Patching.
- B. Division 16 – All sections.

**1.04 REFERENCE STANDARDS**

- A. Comply with the requirements of the reference standards noted herein, except where more stringent requirements are listed herein or otherwise required by the Contract Documents.
  - 1. ANSI C80.1 – Rigid Steel Conduit, Zinc-Coated.
  - 2. ANSI C80.3 – Electrical Metallic Tubing, Zinc-Coated.
  - 3. ANSI/NEMA FB 1 – Fittings and Supports for Conduit and Cable Assemblies.
  - 4. FS WW-C-566 – Specification for Flexible Metal Conduit.
  - 5. NEMA RN 1 – PVC Externally-Coated Galvanized Rigid Steel Conduit and Electrical Metallic Tubing
  - 6. NEMA TC-3 PVC fittings for use with rigid PVC conduits.
  - 7. NEMA TC 15 PVC Fiber Optic Innerduct.
  - 8. All equipment furnished under this section shall carry a listing from an independent testing lab such as UL or an equivalent.

**PART 2 - PRODUCTS**

## 2.01 RIGID METAL CONDUIT AND FITTINGS

- A. Rigid Steel Conduit
- B. PVC Externally Coated Conduit: rigid steel conduit with external 40 mil PVC coating and internal galvanized surface.
- C. Fittings and Conduit Bodies: threaded type, steel or malleable iron. PVC coated fittings and conduit bodies.

## 2.02 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

- A. EMT: galvanized tubing.
- B. Fittings, Conduit Bodies, couplings, and connectors: steel or malleable iron

## 2.03 FLEXIBLE STEEL CONDUIT AND FITTINGS

- A. Conduit: steel.
- B. Fittings and Conduit Bodies: steel or malleable iron.

## 2.04 LIQUID-TIGHT FLEXIBLE CONDUIT AND FITTINGS

- A. Conduit: Flexible steel conduit with PVC jacket.
- B. Fittings and Conduit Bodies: steel or malleable iron.

## 2.05 NON METALLIC RIGID CONDUIT AND FITTINGS

- A. Conduit: Schedule 40 PVC.
- B. Fittings and Conduit Bodies

## 2.06 CONDUIT SUPPORTS

- A. Conduit Clamps, Straps, and Supports: Steel or malleable iron. In accordance with Section 16190

## 2.07 INNERDUCT

- A. Inner duct, meeting or exceeding the following requirements, shall be used to partition conduit
  1. Melting point: 260° F., minimum.
  2. Tensile yield strength: 3600 psi/sq. in., minimum
  3. Brittleness temperature, maximum: -140° F.
  4. Heat distortion temperature: 170° F minimum.

## 2.08 PROHIBITED MATERIALS

- A. Intermediate conduits
- B. Aluminum conduit, Zinc Die Cast boxes and fittings

- C. Power poles.
- D. Non metallic flexible conduit.

### **PART 3 - EXECUTION**

#### **3.01 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT**

- A. Size conduit for conductor type installed or for Type THHN conductors, whichever is larger; 3/4-inch minimum size, 1/2" minimum size for all tenant work. For communication 1 inch is the minimum
- B. Arrange conduit to maintain headroom and present a neat appearance. Refer to Section 16010 for coordination requirements.
- C. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.
- D. Maintain a minimum of six inches (6") between conduit and other piping. Maintain twelve inches (12") clearance between conduit and a heat source such as heating pipes, exhaust flues and heating appliances.
- E. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.
- F. Do not support conduit from cable tray or cable tray supports.
- G. Support conduit at a maximum of 8 feet on center, within two feet of a box or fitting, and at each change of direction.
- H. All vibrating equipment such as motors, transformers, and generators shall be connected with flexible steel conduit, not to exceed six feet in length.
- I. Flexible conduit shall not be less than one-half (1/2) inch except when supplied with lighting fixtures.
- J. When anchoring to a dual sheet metal pan deck and concrete, anchors of any type when placed from below the deck shall be placed only in the lower pan form. No anchors shall be installed in the upper (high) pan.
- K. X-ray or ground penetrating radar studies shall be made of concrete floors, walls or CMU walls.

#### **3.02 CONDUIT INSTALLATION**

- A. Use only factory cast hubs for fastening conduit to cast boxes, and use steel or malleable iron hubs for fastening conduit to sheet metal boxes or equipment in damp or wet locations.
- B. All exposed and concealed conduit runs shall be squared with the building lines. Use conduit bodies to make changes in direction around beams or columns.
- C. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

- D. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture during construction.
- E. Provide a 200 lb. Nylon measuring pull string in all empty conduits.
- F. Use PVC-coated rigid steel factory elbows for bends greater than 45 degrees in plastic conduit runs.
- G. Exposed conduits to be rigid steel to 8'-0" above floor, deck or grating except in electrical, communications and mechanical rooms.
- H. Conduit stubbed up shall be two inches above slab or house keeping pad and the empty conduits shall be capped. Under freestanding equipment conduits with conductors shall be sealed with duct seal.
- I. Flexible steel conduit runs shall not exceed 3' in length when connecting equipment, 6' in length when connecting light fixtures or when fished in hollow spaces with written approval by Project Manager and shall contain a grounding conductor.
- J. Raceways shall not be installed in stairways or on the exterior of any building.
- K. Electrical installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be so made that the possible spread of fire or products of combustion will not be substantially increased. Openings around electrical penetrations through fire-resistant-rated walls, partitions, floors or ceilings shall be fire stopped using UL approved, classified, listed or labeled material and/or methods to maintain the fire resistant rating.

### 3.03 CONDUIT INSTALLATION SCHEDULE

- A. Underground Installations More Than Five Feet From Foundation Wall: Polyvinyl Chloride (PVC) conduit Schedule 40. All bends greater than 45 degrees in non-metallic conduit shall be galvanized rigid steel conduit with a factory coating of polyvinyl chloride (PVC).
- B. Installation In Concrete Slab: Not allowed.
- C. In Slab Above Grade: Not allowed.
- D. Wet Interior Locations: Rigid steel.
- E. Concealed Dry Interior Locations: Electrical metallic tubing.

## 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 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 Lump Sum Contract price.

**END OF SECTION 16110**

**SECTION 16120**  
**WIRES AND CABLES**

**PART 1 – GENERAL**

**1.01 SUMMARY**

- A. Building wire.
- B. Cable.
- C. Wiring connections and terminations.

**1.02 RELATED DOCUMENTS**

- A. Drawings, General and Special Conditions, Division 1 - General Requirements and other applicable technical specifications apply to work of this Section.

**1.03 RELATED SECTIONS**

- A. Division 16 - All Sections.

**1.04 REFERENCE STANDARDS**

- A. Comply with the requirements of the reference standards noted herein, except where more stringent requirements are listed herein or otherwise required by the Contract Documents.

**1.05 SUBMITTALS (REFER TO SECTIONS 01300 AND 01340)**

- A. Submit shop drawings and product data under the provisions of Division 1.

**1.06 PROJECT CONDITIONS**

- A. Verify that field measurements are as shown on Drawings.
- B. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required by field verification.

**1.07 COORDINATION**

- A. Coordinate Work under provisions of Section 16010.
- B. Determine required separation between wiring and other work.
- C. Determine routing to avoid interference with other work.

**PART 2 - PRODUCTS**

**2.01 BUILDING WIRE**

- A. All conductors shall be copper.

- B. All building wire and cable shall be installed in an approved raceway.

## 2.02 REMOTE CONTROL AND SIGNAL CABLE

- A. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600 volt insulation, individual conductors twisted together, shielded, and covered with a PVC jacket.
- B. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, individual conductors twisted together, shielded, and covered with a PVC jacket; UL listed.
- C. All power, control, data, communication and signal wire or cable shall be installed in an approved raceway.

## PART 3 - EXECUTION

### 3.01 GENERAL WIRING METHODS

- A. Minimum wire size shall be based on the over current protection device and as governed by the NEC.
- B. Size circuit conductor for 20 ampere, 120- volt and 277-volt branch circuit home runs for a maximum of 3% voltage drop.
- C. Place an equal number of conductors for each phase in the same raceway or cable.
- D. Neatly train and lace wiring inside boxes, equipment, and panel boards. Make temporary connections to panel board devices with sufficient slack conductor to facilitate reconnections required for balancing loads between phases.
- E. Where harmonic currents exist on circuits, that supply electric discharge lighting, data processing or similar equipment, a full size neutral conductor shall be provided for each single-phase circuit.
- F. Verify raceways are open, continuous and clear of debris before installing cables.

### 3.02 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use a listed wire pulling lubricant for pulling No. 4 AWG and larger wires.
- B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.
- C. Completely and thoroughly swab raceway system before installing conductors.
- D. Conductors shall not be pulled in concrete encased conduits before concrete is placed.

### 3.03 CABLE INSTALLATION

- A. Provide protection for exposed cables where subject to damage.
- B. Use suitable cable fittings and connectors.
- C. All cable shall be racked and supported in manholes.



- D. Pulling winches and other necessary pulling equipment shall be of adequate capacity to ensure a continuous pull on the cable. Strain gages shall be used to monitor the cable pulling tension.
- E. Cable and Wire pulling lubricants that are non-corrosive and harmless to hands and clothes shall be used. Lubricants shall be compatible with cable jackets and insulation.

### 3.04 WIRING CONNECTION AND TERMINATIONS

- A. Splice only in accessible junction and outlet boxes.
- B. For No. 8 AWG and smaller, use insulated spring wire connectors with plastic caps.
- C. Use irreversible compression for copper wire splices and taps, No. 6 AWG and larger. Tape un-insulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor – protect edges from wear.
- D. Thoroughly clean wires before installing lugs and connectors.
- E. All control cable and conductor splices shall be made on numbered terminal strips. Wire nuts are not acceptable for control cable and conductor splices.

### 3.05 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Division 1.
- B. Inspect wire and cable for physical damage and proper connection.
- C. Torque conductor connections and terminations to manufacturer's recommended values.
- D. Perform continuity test on all feeder and branch circuit conductors. Verify proper phasing connections.
- E. Verify cables are colored coded and labeled according to contract documents.
- F. Prior to energizing, all building service cables, feeders to and/or from transformers, switchboards and panel boards are to be tested with a 500-volt insulation megohm meter to determine insulation resistance levels. All field test data is to be recorded, corrected to a baseline temperature and furnished to the DIA Project Manager. A test is to include meggering for one minute 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 (AWG or k CMIL)	Resistance (Megohms-1,000 ft)
12-8	200-MOhms
6-2/0	100-MOhms
3/0-750	100-MOhms

### 3.06 WIRE AND CABLE INSTALLATION SCHEDULE

- A. Concealed Interior Locations: in approved raceways.
- B. Exposed Interior Locations: in approved raceways.

- C. Above Accessible Ceilings: in approved raceways.
- D. Wet or Damp Interior Locations: in approved raceway.
- E. Exterior Locations: in approved raceways.
- F. Underground Locations: in approved raceways.
- G. Control data, Communication and signal cable (less than 48 volt): raceway and/or cabletray.
- H. MC cable, AC cable and Modular wiring are not permitted unless indicated otherwise in the contract documents or as approved by the Project Manager..

### 3.07 WIRE AND CABLE COLOR CODING

- A. Wire No. 6 AWG and smaller shall be factory color-coded. Wire No. 4 AWG and larger shall be color-coded by color taping of 6 inch length of exposed ends.

120/208 Volts		277/480 Volts	
A =	Black	A =	Brown
B =	Red	B =	Orange
C =	Blue	C =	Yellow
Neutral =	White	Neutral =	Gray
Ground =	Green	Ground =	Green
Isolated Ground = Green with a yellow tracer			

## 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 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 Lump Sum Contract price.

**END OF SECTION 16120**

## SECTION 16135

### ELECTRICAL BOXES AND BOX FITTINGS

#### PART 1 – GENERAL

##### 1.01 SUMMARY

- A. Wall and ceiling outlet boxes.
- B. Floor boxes.
- C. Pull and junction boxes.

##### 1.02 RELATED DOCUMENTS

- A. Drawings, General and Special Conditions, Division 1 - General Requirements and other applicable technical specifications apply to work of this Section.

##### 1.03 RELATED SECTIONS

- A. Division 16 - Electrical, All Sections.

##### 1.04 REFERENCE STANDARDS

- A. Comply with the requirements of the reference standards noted herein, except where more stringent requirements are listed herein or otherwise required by the Contract Documents
- B. ANSI/NFPA 70 - National Electrical Code.

##### 1.05 PROJECT CONDITIONS

- A. Verify field measurements are as shown on Drawings.
- B. Verify locations outlets and small pull-boxes prior to rough in.
- C. Electrical and pull boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose.

#### PART 2 - PRODUCTS

##### 2.01 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: galvanized steel.
- B. Cast Boxes: Provide cover with gasket by box manufacturer. Provide threaded hubs.

##### 2.02 FLOOR BOXES

- A. Floor Boxes: fully adjustable.

##### 2.03 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: galvanized steel.
- B. Large Pull Boxes: Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.
  - 1. Interior Dry Locations: Use hinged covered enclosure.
  - 2. Interior damp or wet locations: Use nema 3R hinged cover boxes.
- C. All boxes shall be NEMA rated for the location.

#### **2.04 EQUIPMENT AND TERMINAL BOXES**

- A. Shall be hinged enclosures.
- B. All boxes shall be NEMA rated for the location.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. Install electrical boxes as shown on Drawings, and as required for equipment, terminal strips, splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- B. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed light fixture.
- C. Electrical installations in hollow spaces, vertical shafts, and ventilation or air-handling ducts shall be so made that the possible spread of fire or products of combustion will not be substantially increased. Openings around electrical penetrations through fire-resistant-rated walls, partitions, floors or ceilings shall be firestopped using UL approved, classified, listed or labeled material and/or methods to maintain the fire resistant rating.
- D. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.
- E. Do not install flush mounting boxes back-to-back in walls; provide minimum 8 inch separation.
- F. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- G. Use adjustable steel channel fasteners or all thread for hanging ceiling outlet box, support box from structure.
- H. Support boxes in the ceiling with ¼" threaded rod as a minimum.
- I. Use appropriate gang box where more than one device is mounted together.
- J. Use 4 inch square box with plaster ring for single device outlets.
- K. Use malleable iron outlet box when surface mounted: on exterior of building, in wet location or damp location.
- L. Set floor boxes level.

- M. Minimum junction and pull box size 4-11/16" x 4-11/16" x 2-1/8".
- N. Minimum outlet box size 4" x 4" x 2-1/8" including feed through outlet boxes.
- O. Minimum junction box size for fire alarm pull stations, control module, monitor module, 4" x 4" x 2-1/8". Provide plaster ring at all pull station locations.
- P. Use flush mounting outlet boxes in finished areas.
- Q. Install knockout closure in unused box openings.

### **3.02 INTERFACE WITH OTHER PRODUCTS**

- A. Coordinate installation of outlet or equipment boxes for systems or products furnished under other sections.
- B. Coordinate mounting heights and locations of boxes or outlets so as not to be interfered with by grounding systems, electrical panels, or any other building accessory.

### **3.03 ADJUSTING**

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Adjust floor box flush with floor finish.

## **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 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 Lump Sum Contract price.

**END OF SECTION 16135**

## SECTION 16142

### ELECTRICAL CONNECTIONS FOR EQUIPMENT

#### PART 1 – GENERAL

##### 1.01 SUMMARY

- A. Electrical connections to equipment specified under other Sections or furnish by the Owner

##### 1.02 RELATED DOCUMENTS

- A. Drawings, General and Special Conditions, Division 1 – General Requirements and other applicable technical specifications apply to work of this Section.

##### 1.03 RELATED SECTIONS

- A. Division 1 - General Requirements.
- B. Division 15 – Mechanical Equipment.
- C. Division 16 – All Sections.

##### 1.04 REFERENCED STANDARDS

- A. Comply with the requirements of the reference standards noted herein, except where more stringent requirements are listed herein or otherwise required by the Contract Documents.

##### 1.05 WORK INCLUDED

- A. Applications of electrical power, control and monitoring connections specified in this section include the following:
  - 1. From electrical source to motor starters
  - 2. From motor starters to motors
  - 3. To lighting fixtures and wiring devices
  - 4. To converters, rectifiers, transformers, inverters, switchgear, switchboards, panel boards, generators and similar equipment
  - 5. To grounds including ground electrode connections.
  - 6. Equipment furnished in other Divisions (unless indicated otherwise).
  - 7. Electrical connections for equipment, that are not furnished as integral part of equipment, are specified in Division 15 and other Division 16 sections, and are criteria of this section.
  - 8. Refer to Division 15 sections for motor starters and controllers furnished integrally with equipment; not criteria of this section.
  - 9. Refer to Division 15 sections for control system wiring, not criteria of this section.
  - 10. Junction boxes and disconnect switches required for connecting motors and other electrical units of equipment are specified in applicable Division 16 sections, and are criteria of this section.

## 1.06 QUALITY ASSURANCE

- A. Products, materials, equipment and systems shall comply with the following Codes and Standards:
1. NFPA Compliance: NFPA 70, "National Electrical Code (NEC)" as adopted and amended by the Denver Building Code and as applicable to products used and the installation of electrical power connections (terminals and splices), junction boxes, motor starters and disconnect switches.
  2. IEEE Compliance: Std. 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to connections and terminations.
  3. ANSI Compliance: Applicable requirements of ANSI/NEMA and ANSI/EIA standards pertaining to products and installation of electrical connections for equipment.
  4. UL Compliance: UL Std. 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors" including, but not limited to, tightening of electrical connectors to torque values indicated. Electrical connection products and materials are to be UL-listed and labeled.

## 1.07 SUBMITTALS

- A. The following data shall be submitted in accordance with Sections 01300 – Approved Submittals required prior to starting installation:
1. Product Data: Manufacturer's data on electrical connections for equipment products and materials.
  2. Complete wiring diagrams and/or shop drawings for installation purposes shall be furnished under the Mechanical or other Divisions, as applicable to DIA Project Manager prior to installation.

## PART 2 - PRODUCTS

### 2.01 MATERIALS AND COMPONENTS

- A. Products shall be as specified in other Sections of this Division.
- B. General: Each electrical connection shall be a complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape, heat-shrinkable insulating tubing, cable ties, stress cones, splice kits, termination kits, solder less wire nuts, and other items and accessories as needed to complete splices and terminations as required.
1. Connectors and Terminals: Electrical connectors and terminals shall mate and match, including sizes and ratings, with equipment terminals that are recommended by equipment manufacturer for intended applications.
  2. Electrical Connection Accessories: Electrical insulating tape, heat-shrinkable insulating tubing and boots, stress cones, splice kits, termination kits, wirenuts and cable ties as recommended for use by accessories manufacturers for type of services required.

### 2.02 MECHANICAL AND ELECTRICAL COORDINATION

- A. Responsibility: It is the contractor's responsibility to complete the EXHIBIT A SCHEDULE included at the end of this specification section. The Contractor shall include all costs and work associated with these items in his bid.

- B. Verify location, size and characteristics of all mechanical equipment before installation of electric service. In all cases of the installation of heating, ventilating, air conditioning, plumbing and other mechanical equipment, the contractor is responsible for all revisions, changes and modifications necessary to properly supply electric services to the equipment.

### **PART 3 - EXECUTION**

#### **3.01 INSPECTION**

- A. Verify that equipment is ready for electrical connection, wiring and energization.

#### **3.02 PREPARATION**

- A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

#### **3.03 INSTALLATION**

- A. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.
- B. Make conduit connections to equipment using flexible conduit. Use liquid-tight flexible conduit in damp or wet locations. Length shall be six feet (6') maximum.
- C. Install pre-finished cord set where connection with attachment plug is indicated or specified, use attachment plug with suitable strain-relief clamps.
- D. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.
- E. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring as required for a complete operating system.
- F. Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches as required for a complete operating system. Connect with conduit and wiring as required for a complete operating system.

#### **3.04 EQUIPMENT CONNECTION SCHEDULE**

- A. Furnish, set in place, and wire, except as may be otherwise indicated, all heating, ventilating, air conditioning, plumbing, fire protection, and other motors and controls in accordance with the electrical/mechanical coordination schedule. The contractor shall carefully coordinate with work performed under the Mechanical and other Divisions if these specifications.
- B. All line and low voltage wiring shall be installed utilizing materials and methods as specified in the Electrical Division of the specifications.
- C. Provide NEMA-rated motors and equipment suitable for operation on the voltage systems as designated below, with tolerances for the allowable voltage variations above and below the nominal:



1. Rated Motor Voltage

Service Voltage and Phase	1/3 HP and smaller Smaller 1-Phase	½ HP and Larger 3-Phase
120/208V, 3Ø 277/480V, 3Ø	115V	208V (only when 480v is not available) 460V

**3.05 INSTALLATION OF ELECTRICAL CONNECTIONS**

- A. Electrical connections shall be installed in accordance with equipment manufacturer's written instructions and with recognized industry practices, and complying with applicable requirements of UL, NEC and NECA's "Standard of Installation" to ensure that products fulfill requirements.
1. As a minimum: Each feeder circuit to panelboards, switchboards, motor control centers, transformers, and 480-volt (and higher) motor circuits shall have an insulated equipment ground conductor.
  2. All medium voltage splices and terminations are to be made by a certified cable splicer/terminator.
  3. Electrical service and feeders are to be maintained to occupied areas and operational facilities when temporary service is required during interruptions to existing facilities. Momentary outages for replacing existing wiring systems with new wiring systems shall be scheduled. When the "cutting-over" has been successfully accomplished, temporary wiring is to be removed.
  4. Splices shall be covered with electrical insulating material equivalent to, or of greater insulation rating, than electrical insulation rating of those conductors being spliced.
  5. Cables and wires shall be trimmed as long as practicable and routing shall be arranged to facilitate inspection, testing and maintenance.
  6. Connectors and terminals, including screws and bolts, shall be tightened in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Proper torquing tools, including torque screwdriver, beam-type torque wrench, and ratchet wrench with adjustable torque settings shall be used to comply with torquing values contained in UL 496A or the manufacturer's literature.
  7. Identification markers are to be fastened to each electrical power supply wire/cable conductor in accordance with Section 16195 "Electrical Identification."
    - a. Markers are to be affixed on each terminal conductor, as close as possible to the point of connection.

**3.06 FIELD QUALITY CONTROL**

- A. The correct direction of rotation of each motor is to be verified.
- B. Provide measured torquing value checklist with witness signature to DIA Project Manager.

**PART 4 - MEASUREMENT**

**4.01 MEASUREMENT**

- A. No separate measurement will be made for the work specified in this Section.

**PART 5 - PAYMENT**

**5.01 PAYMENT**

- A. No separate payment will be made for work specified in this Section, but shall be included in the Contract Lump Sum Bid Price for Division 16 - Electrical, which price shall include all necessary and incidental material and work thereto.

**SEE NEXT PAGE FOR EXHIBIT A**

**EXHIBIT A**

It is the contractor's responsibility to complete the following schedule and include all costs associated with these items in his bid.

ITEM	FURNISHED BY *	SET/ INSTALLED BY *	POWER WIRING BY*	CONTROL WIRING BY* AND **
EQUIPMENT MOTORS AND THERMAL OVERLOADS.				
MOTOR CONTROL CENTERS, MOTOR CONTROLLERS, MAGNETIC STARTERS, VARIABLE FREQUENCY DRIVES AND OVERLOAD RELAYS.				
DISCONNECT SWITCHES (FUSED OR UNFUSED), THERMAL OVERLOAD SWITCHES AND FUSES, TIMER SWITCHES.				
PUSHBUTTON STATIONS, PILOT LIGHTS, MULTI-SPEED SWITCHES, FLOAT AND PRESSURE SWITCHES, THERMOSTATS, CONTROL TRANSFORMERS, CONTROL AND MONITOR PANELS, MOTOR OPERATED VALVES, DAMPER MOTORS OR SOLENOIDS, SOLENOID VALVES, EP AND PE SWITCHES AND INTERLOCKES.				
CONTRACTORS AND CONTROL CIRCUITS FOR CONTROL PANELS.				
AUTOMATIC AND/OR MANUAL CONTROL STATIONS, PANELS OR SYSTEMS.				
ALL WIRING INCLUDING POWER AND CONTROL RELATED TO DIRECT DIGITAL CONTROL SYSTEM.				
POWER AND CONTROL EQUIPMENT FURNISHED AS PART OF FACTORY WIRED EQUIPMENT.				
SPECIALTY MECHANICAL AND ELECTRICAL ITEMS OR SYSTEMS.				
ALARM AND MONITORING STATIONS AND PANELS.				
FIRE PROTECTION MONITORING AND CONTROL FUNCTIONS.				
FIRE AND SMOKE DUCT MOUNTED DETECTORS				
A. SAMPLE TUBE       MODULE				
B. MONITOR MODULE				
FIRE AND SMOKE DETECTORS, RELAYS FOR FAN START/STOP FUNCTIONS, AS IT RELATES TO SMOKE CONTROL.				
ADDITIONAL ITEMS:				

- MC = MECHANICAL CONTRACTOR
- EC = ELECTRICAL CONTRACTOR
- MFR = EQUIPMENT MANUFACTURER
- CC = CONTROL CONTRACTOR
- FA = FIRE ALARM CONTRACTOR
- FP = FIRE PROTECTION CONTRACTOR
- TC = TEMPERATURE CONTROL CONTRACTOR
- N/A = NOT APPLICABLE

\*\* ANY CONTROL WIRING ABOVE ONE (1) VOLT.

**END OF SECTION 16142**

**SECTION 16143**  
**WIRING DEVICES**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Wall switches.
- B. Receptacles.
- C. Device plates and box covers.

**1.02 RELATED DOCUMENTS**

- A. Drawings, General and Special Conditions, Division 1 - General Requirements and other applicable technical specifications apply to work of this Section.

**1.03 RELATED SECTIONS**

- A. Division 16 - Electrical: All Sections

**1.04 REFERENCE STANDARDS**

- A. Comply with the requirements of the reference standards noted herein, except where more stringent requirements are listed herein or otherwise required by the Contract Documents.

**1.05 SUBMITTALS (REFER TO SECTIONS 01300 AND 01340)**

- A. Submit product data under provisions of Division 1.
- B. Provide product data showing grade, configurations, finishes, and dimensions.

**PART 2 - PRODUCTS**

**2.01 ACCEPTABLE MANUFACTURERS - WALL SWITCHES**

- A. Hubbell
- B. Leviton
- C. Pass & Seymour
- D. Lutron
- E. General Electric

**2.02 WALL SWITCHES**

- A. Wall Switches for Lighting Circuits: heavy-duty.

- B. Device Body: Plastic with toggle handle.
- C. Voltage Rating: 120-277 volts, AC.
- D. 120/277 volt wall switches shall be specification grade, rated 20 ampere and totally enclosed case.
- E. Switch color to be gray, unless otherwise specified.

### **2.03 ACCEPTABLE MANUFACTURERS - RECEPTACLES**

- A. Hubbell
- B. Leviton
- C. Pass & Seymour
- D. General Electric

### **2.04 RECEPTACLES**

- A. Specification Grade grounding type Duplex Receptacles: Type 5, 20R, gray, unless otherwise specified.
- B. GFCI Receptacles: 20 Amp duplex convenience receptacle with integral ground fault current interrupter.
- C. Tamper Resistant NEMA 5-20R, UL Listed Hospital Grade.

### **2.05 ACCEPTABLE MANUFACTURERS - WALL PLATES**

- A. Hubbell
- B. Leviton
- C. Pass & Seymour
- D. Arrow & Hart
- E. General Electric

### **2.06 WALL PLATES**

- A. Decorative Cover Plate: Stainless steel SS#4 unless noted otherwise.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install wall switches 48 inches to bottom above finished floor, or as shown on drawings.
- B. Install convenience receptacles 18 inches to the top of box above finished floor with grounding pole on bottom.

- C. Install decorative plates on switch, receptacle, and blank outlets in finished areas
- D. Install devices and wall plates flush and level.
- E. All devices to be grounded to box with ground jumper except isolated ground receptacles.
- F. Install blank covers on all unused openings.
- G. Device plates shall be marked on the inside with adhesive label (Brady) or a fine point permanent marker indicating panel and circuit number that the device is connected to.

**END OF SECTION 16143**

**SECTION 16170**  
**CIRCUIT AND MOTOR DISCONNECTS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Disconnect switches.
- B. Enclosures.

**1.02 RELATED DOCUMENTS**

- A. Drawings, General and Special Conditions, Division 1 - General Requirements and other applicable technical specifications apply to work of this Section.

**1.03 RELATED SECTIONS**

- A. Division 16 - All Sections

**1.04 REFERENCE STANDARDS**

- A. Comply with the requirements of the reference standards noted herein, except where more stringent requirements are listed herein or otherwise required by the Contract Documents.

**1.05 SUBMITTALS (REFER TO SECTIONS 01300 AND 01340)**

- A. Submit product data under provisions of Section 16010.
- B. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit.

**PART 2 - PRODUCTS**

**2.01 ACCEPTABLE MANUFACTURERS - DISCONNECT SWITCHES**

- A. Cutler Hammer.
- B. General Electric.
- C. Square D.
- D. Allen Bradley
- E. Substitutions: Under provisions of Section 16010.

**2.02 DISCONNECT SWITCHES**

- A. Fusible Switch Assemblies:

1. Heavy Duty; UL listed, Horsepower rated, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
- B. Non-Fusible Switch Assemblies:
  1. Heavy Duty; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
- C. Enclosures: Nema rating as applicable.
- D. Switches shall have switchblade fully visible in the "OFF" position when door is open.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. Install disconnect switches where specified, indicated on drawings or as required by code.
- B. Install fuses in fusible disconnect switches.
- C. Provide one set of spare fuses for each size of fuse used on the project.

#### **3.02 FIELD QUALITY CONTROL**

- A. Testing: All contacts shall be inspected and cleaned. Each switch enclosure shall be opened for inspection of interior, mechanical linkage, electrical connections, fuse installation (if required), verification of power on load side of fuse, fuse type and rating of fuses installed.

### **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 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 Lump Sum Contract price.

**END OF SECTION 16170**



**SECTION 16190**  
**SUPPORTING DEVICES AND SEALS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Raceway, cable tray and equipment supports.
- B. Fastening hardware.
- C. Wall and floor seals.

**1.02 RELATED DOCUMENTS**

- A. Drawings, General and Special Conditions, Division 1 - General Requirements and other applicable technical specifications apply to work of this Section.

**1.03 RELATED SECTIONS**

- A. Refer to Section 16010 for coordination requirements.
- B. Division 16 - All Sections.

**1.04 REFERENCE STANDARDS**

- A. Comply with the requirements of the reference standards noted herein, except where more stringent requirements are listed herein or otherwise required by the Contract Documents.
- B. NFPA - 70: National Electrical Code.

**1.05 QUALITY CONTROL**

- A. Support systems shall be safe and adequate for weight of equipment and conduit, including wiring, that they carry.

**PART 2 - PRODUCTS**

**2.01 MATERIAL**

- A. Support Channel: Hot dipped galvanized for damp or wet locations, dry locations only painted steel.
- B. Hardware: Corrosion-resistant steel

**PART 3 - EXECUTION**

**3.01 INSTALLATION**

- A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using precast insert system, expansion anchors, preset inserts, or beam clamps, and caddy type fasteners.
- B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchors on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.
- C. Do not fasten supports to piping, ductwork, mechanical equipment, cable tray or conduit.
- D. Do not drill structural steel members.
- E. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- F. Install all freestanding electrical equipment on a 4" nominal concrete housekeeping pad.
- G. Install surface-mounted cabinets and panel boards with minimum of four anchors.
- H. Bridge studs top and bottom with channels to support flush-mounted cabinets and panel boards in stud walls.
- I. Where conduit penetrates fire-rated walls, concrete and/or masonry walls and floors, seal opening around conduit with a product listed for the purpose.
- J. Where conduit penetrates waterproofed floors or exterior walls subject to entry of moisture, seal annular space around conduit with a product UL listed for the purpose.
- K. Route conduit through roof openings provided for piping and ductwork where possible; otherwise, route through roof jack with sealant approved by the roofing manufacturer.
- L. Suspended conduit or box supports shall not be less than 1/4" diameter steel rod. Rod used as pedestal support is not acceptable. The contractor shall not use tie wire or wire of any type to support conduits, junction boxes or pull boxes.
- M. No more than five (5) 1/2" conduits, three (3) 3/4" conduits or two (2) 1" conduits shall be supported on a single 1/4" diameter steel rod.
- N. All conduits shall be supported by approved hangers. Supports installed and used by other trades such as duct hangers, pipe hangers, ceiling hangers, etc. shall not be used for conduit support. No conduit shall be hung from air handling duct of any type.
- O. Cable tray and cable tray supports shall not be used to support conduits or other equipment. Cable tray and cable tray supports "shall stand alone."
- P. All light fixtures shall be independently supported at opposite corners from structure, or from trapeze supported from structure by the electrical contractor.
- Q. Wall-mounted fixtures shall be supported from building structure with backing support as approved by the Project Manager to prevent any damage to the wall.
- R. Use vibration isolation pads for vibrating equipment such as transformers.
- S. Plastic or fiber anchors are prohibited.

- T. Anchoring deeper than 1-1/2" in overhead cast in place, pre-tensioned or post-tensioned concrete is prohibited unless x-ray or ground penetrating radar study are performed and approved by the DIA 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 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 Lump Sum Contract price.

**END OF SECTION 16190**

**SECTION 16195**  
**ELECTRICAL IDENTIFICATION**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Underground warning tape.
- B. Electrical power, control, signal, security, data, fiber optic, and communication conductors and raceways.
- C. Operational instructions and warnings.
- D. Danger signs.
- E. Equipment/system identification signs.

**1.02 RELATED DOCUMENTS**

- A. Drawings, General and Special Conditions, Division 1 - General Requirements and other applicable technical specifications apply to work of this Section.

**1.03 RELATED SECTIONS**

- A. Division 16 - All Sections

**1.04 REFERENCE STANDARDS**

- A. Comply with the requirements of the reference standards noted herein, except where more stringent requirements are listed herein or otherwise required by the Contract Documents.

**1.05 QUALITY ASSURANCE**

- A. Comply with "OSHA" sign standards for danger, caution, warning, etc.

**1.06 SUBMITTALS (REFER TO SECTIONS 01300 AND 01340)**

- A. Submit product data under provisions of Division 1.
- B. Include schedule for all specified applications of electrical identification.

**PART 2 - PRODUCTS**

**2.01 ELECTRICAL IDENTIFICATION MATERIALS**

General: The manufacturer's standard products of categories and types required are to be used for each application.

- A. Underground Type Plastic Detectable Line Marker:

1. Manufacturer's standard permanent red, continuous-printed plastic tape with a metalized foil core, intended for direct-burial service; not less than 3 inches wide x 4 mils thick. Printing is required on tape that most accurately indicates type of service.
- B. Wire and Cable Marker:
1. For wire/cables smaller than No. 2/0 use manufacturer's standard vinyl-cloth self-adhesive cable/conductor markers of wrap-around type, either pre-numbered plastic coated type, or write-on type with clear plastic self-adhesive cover flap are to be used and numbered to show circuit identification.
  2. For cables No. 4 AWG and larger heat shrink sleeving is to be used for phase color coding.
- C. Plasticized Tags:
1. Manufacturer's standard preprinted or partially preprinted accident-prevention and operational tags, on plasticized card stock with matte finish suitable for writing, approximately 3-1/4-inch x 5-5/8-inch, with brass grommets and wire fasteners, and with appropriate preprinted wording including large-size primary wording, e.g., DANGER, CAUTION, DO NOT OPERATE.
- D. Baked Enamel Danger Signs:
1. Manufacturer's standard "DANGER" signs of baked enamel finish on 20-gauge steel; of standard red, black and white graphics; 14-inch x 10-inch size except where 10-inch x 7-inch is the largest size which can be applied where needed; with recognized standard explanation wording, e.g., XXXX VOLTS, KEEP AWAY, BURIED CABLE, DO NOT TOUCH SWITCH, etc.
- E. Engraved Plastic-Nameplates:
1. All electrical equipment shall be identified unless stated otherwise. Nameplate shall be laminated phenolic black letters on a white background. Nameplate for emergency equipment shall be white letters on a red background. Nameplates shall be attached with a minimum of two stainless steel machine screws. Embossed plastic adhesive (dymo) tape will not be accepted for nameplates.
  2. Thickness: 1/16", for units up to 20 square inches or 8 inches in length, 1/8 inch for larger units.
  3. Provide phenolic nameplates with a minimum letter height as indicated below. Examples are given below for the size of letters to use for a given application and this not a list of the equipment to be identified. All equipment is required to be identified.
    - a. For equipment designation: switchboards and motor control centers: 1/2 inch, panel boards: 1/4 inch. For voltage, bus ampacity, feeder source, and circuit number: 1/8 inch.
    - b. Individual circuit breakers and or motor starters in motor control centers: For equipment designation and section number: 1/4 inch, for load served and location of load: 1/8 inch. Inside the door, a typed label shall provide complete motor data including nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.
    - c. Individual breakers in switchgears and switchboards: for breaker number (address number) and equipment designation; 1/4 inch, for breaker frame size and trip setting; 1/8 inch
    - d. Individual circuit breaker and spaces in panel boards: for numbers (section number) 1/4 inch.
    - e. Individual circuit breakers in distribution panel boards: 1/4 inch for panel being

- fed and 1/8 inch for its location.
- f. Transformers: 1/4 inch for equipment designation and size; 1/8 inch for primary and secondary voltages, primary source and circuit number, secondary load and its location.
  - g. Individual remote indicating lights, meters, instruments and control switches: 1/8 inch, indicate unit, equipment, or fire detector being monitored and condition indicated by illumination.
  - h. Individual switches and pilots: 1/8 inch, identify mechanical unit being served.
  - i. Disconnects, relay panels, lighting contactors: 1/4 inch for 1/8 inch for voltage and source circuit number.
4. All branch circuit panel boards shall have a typed panel schedule indicating the type of equipment served and its location. Contractors name and date.
- F. Lettering and Graphics:
1. Numbers, lettering and wording as required or as recommended by manufacturer or as required for proper identification and operation/maintenance of electrical systems and equipment shall be used. Gothic letters shall be provided.

### **PART 3 - EXECUTION**

#### **3.01 APPLICATION AND INSTALLATION**

- A. General Installation Requirements:
1. Laminated plastic nameplates shall be fastened with two machine screws.
- B. System Color Coding Schedule:
1. Where electrical emergency power is exposed, conduit shall be painted with "RED" stripes on each section every 5 feet of electrical conduit (visible from the floor or above a suspended ceiling) and within 3 feet of all equipment. ). All junction or pull boxes shall have the cover painted red.
  2. Paging system conduits shall have "GREEN" bands painted, 5' on centers for the entire length of conduit run. All junction or pull boxes shall have the cover painted green with the associated zone number written neatly on the box cover with permanent marker.
  3. Security system conduits shall have "BLUE" bands painted, 5' on centers for the entire length. All junction or pull boxes shall have the cover painted blue.
  4. Temperature control conduits shall have "BROWN" bands painted, 5' on centers for the entire length. All junction or pull boxes shall have the cover painted brown.
  5. Closed circuit television (CCTV) conduits shall have YELLOW bands, painted 5' on center for the entire length. All junction or pull boxes shall have the cover painted yellow.
  6. Fire Alarm conduit shall be a continuous red factory finish
- C. Underground Conduit and Duct bank Identification:
1. During back-filling/top-soiling of each exterior underground conduit and ductbank, a continuous underground red detectable type line marker, located directly over conduit or duct bank at a maximum of 12 inches below finished grade or 4 inches below paving, shall be provided.

- D. Cable/Conductor Identification:
1. The application of cable/conductor identification, with circuit number, on each wire / cable in each box/enclosure/cabinet is required. The identification shall match the marking system used in panel boards, shop drawings, and contract documents.
- E. Junction Box and Pull Box Identification:
1. On the cover of each junction box or pull box: the panel name and circuit number(s) of the enclosed conductors are to be legibly written with a black permanent ink broad tip marking pen. The system shall be identified for: FO (fiber optics), CCTV (closed circuit television), PA (paging system), RF (radio frequency), FA (fire alarm) , EM (emergency work) TC (temperature control).
  2. Covers for emergency system junction boxes and pull boxes shall be painted red.
  3. Covers for the Fire Alarm System junction boxes and pull boxes shall be painted red.
- F. Operational Identification and Warnings:
1. Wherever required to ensure safe and efficient operation and maintenance of electrical systems, and electrically connected mechanical systems and general systems and equipment, including prevention of misuse of electrical facilities by unauthorized personnel, self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls, devices and covers of electrical enclosures shall be provided. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for intended purposes.
- G. Danger Signs:
1. Critical Switches/Controls: Danger signs shall be provided on switches and similar controls, regardless of whether concealed or locked up, where untimely or inadvertent operation could result in danger to persons, or damage to equipment, or damage to or loss of property.
- H. Caution Signs:
1. The following red caution sign is to be provided for all circuit breakers and switchboards where turning off a circuit will automatically start an emergency operation:
    - a. "Caution Turning Off this Circuit will Automatically Start Emergency Operation"
  2. The following red caution sign is to be provided for all automatic transfer switches, switches, circuit breakers, equipment, and emergency panels that are energized by the emergency power system:
    - a. "Caution Automatically Energized by Emergency Power Supply System"
- I. Equipment/System Identification:
1. An engraved plastic-laminated sign is to be provided on each unit of electrical equipment furnished; including central or master unit of each electrical system including communication/control/signal/alarm systems. Provide single line of text, letter height as specified, black lettering on white field for normal and white letters on a red field for emergency. Provide text matching terminology and numbering of the contract documents and shop drawings. The sign shall include unit designation, source circuit number, circuit voltage, and other data specifically indicated. Also, the sign shall indicate normal source circuit number ("Fed from . . .") and emergency source circuit number when the equipment is a transfer switch or fed directly from a

transfer switch. Include signs for each unit of the following categories of electrical work: List is not inclusive.

- a. Switchboards, panel boards (include main bus ampacity on sign), electrical cabinets and enclosures.
  - b. Access panel/doors to electrical facilities.
  - c. Major electrical switchgear (include main bus ampacity on sign).
  - d. Disconnect switch.
  - e. Push buttons, selector switches, indicating lights. (Circuit number and voltage not required on sign).
  - f. Power transfer equipment: Contactors and transfer switches.
  - g. Transformers. (Include primary and secondary voltages)
  - h. Battery racks.
  - i. Power generating units.
  - j. Telephone cabinets and switching equipment. (Circuit number and voltage not required on sign.)
  - k. Fire alarm panels.
  - l. Security monitoring master station.
  - m. Uninterruptible Power Supplies (UPS).
  - n. Relays
  - o. Lighting contactors
  - p. Individual distribution circuit breakers
2. The installation of signs are required at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. The sign shall be secured to the substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate substrate.
  3. All panel boards shall have a typed panel schedule indicating the date, contractor, type of equipment served and its location.

J. Equipment Designation (See Next Page)

### 3.02 ELECTRICAL PANEL NAMING CONVENTIONS

#### NAMING ELECTRICAL PANELS for Grounds & Outlying Buildings

Use DIA utility map for main and secondary grids

Example: **L-13F4TDEH1-A**

- L-13** Utility map book page location choices:  
**A** through **FF** (West to East) and **1** through **31** (South to North)
- F4** Location grid on above page choices: **A** through **J** (West to East) and **1** through **10** (North to South)
- T** Indicates AIRLINE TENANT, or **R** for Retail / Food and Beverage tenant or panel if appropriate choices: **T** or **R** [TENANT] or blank [no space] if DIA
- D** Indicates distribution panel if appropriate choices: **D** [DISTRIBUTION] or blank [no space] if NOT DISTRIBUTION
- E** Indicates panel feeder function choices: **E** [EMERGENCY] or ES[ESSENTIAL POWER] or **U** [UPS origin].
- H** Panel voltage choices: **H** = 600 or 480Y/277 or **L** = 208Y/120 or 240/120
- 1** Sequence number of this panel supplied from this source choices: **1...N**
- A** Sub-fed panel suffix, if appropriate choices: **-A** ...as required

#### NAMING ELECTRICAL PANELS for Concourse Buildings and Tunnel System

Example: **B-AW1TDEL1-A**



- B- Concourse letter choices: **A** through **C** (South to North)
- A Floor choices: **T** [tunnel] or **B** [basement] or **A** [apron] or **C** [concourse] or **M** [mezzanine] or **4** [fourth floor] or **5** [fifth floor] or **R** [roof]
- W1 Core area choices: **CE** [center core east side] or **CW** [center core west side] or **E1 ... E3** [sub-core number east of center core] or **W1 ... W3** [sub-core number west of center core]
- T Indicates AIRLINE TENANT, or **R** for Retail / Food and Beverage tenant or panel if appropriate choices: **T** or **R** [TENANT] or blank [no space] if DIA
- D Indicates distribution panel if appropriate choices: **D** [DISTRIBUTION] or blank [no space] if NOT DISTRIBUTION
- E Indicates panel feeder function choices: **E** [EMERGENCY] or **ES**[ESSENTIAL POWER] or **U** [UPS origin]
  
- L Panel voltage choices: **H** = 600 or 480Y/277 or **L** = 208Y/120 or 240/120
- 1 Sequence number of this panel supplied from this source choices: **1...N**
- A Sub-fed panel suffix, if appropriate choices: **-A ...**as required

#### **NAMING ELECTRICAL PANELS for Terminal, AOB & Parking Structures**

Example: **6-11CTDEL2-A**

- 6- Floor choices: **T** [tunnel] or **1** through **11**, depending on building
- 11C Module designation (see Architectural designation) choices: **01** through **15** and **A** through **D**
- T Indicates AIRLINE TENANT, or **R** for Retail / Food and Beverage tenant or panel if appropriate choices: **T** or **R** [TENANT] or blank [no space] if DIA
- D Indicates distribution panel if appropriate choices:  
**D** [DISTRIBUTION] or blank [no space] if NOT DISTRIBUTION
- E Indicates panel feeder function choices: **E** [EMERGENCY] or [ES ESSENTIAL POWER] or **U** [UPS origin]
- L Panel voltage choices: **H** = 600 or 480Y/277 or **L** = 208Y/120 or 240/120
- 2 Sequence number of this panel supplied from this source choices: **1...N**
- A Sub-fed panel suffix, if appropriate choices: **-A ...**as required

#### **Naming Disconnects and Transformers**

Disconnects shall have the same as the equipment they serve.

Transformers shall have the same name as the low-voltage panel they supply power to with the extension of **-X**

### **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 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 Lump Sum Contract price.

**END OF SECTION 16195**

## SECTION 16452

### GROUNDING

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Power system grounding.
- B. Communication system grounding.
- C. Electrical equipment and raceway grounding and bonding.
- D. Perimeter ground loop.

##### 1.02 RELATED DOCUMENTS

- A. Drawings, General and Special Conditions, Division 1 - General Requirements and other applicable technical specifications apply to work of this Section.

##### 1.03 RELATED SECTIONS

- A. With the requirements of the reference standards noted herein, except where more stringent requirements are listed herein or otherwise required by the Contract Documents.
- B. NFPA Compliance: NFPA 70 "National Electrical Code (NEC)," as adopted and amended by the Denver Building Code, Chapter 10.
- C. UL Compliance: Applicable requirements of UL Standards Nos. 467 "Electrical Grounding and Bonding Equipment," and 869, "Electrical Service Equipment," pertaining to grounding and bonding of systems, circuits and equipment. In addition, require compliance with UL Std 486A, "Wire Connectors." Grounding and bonding products shall be UL-listed and labeled for the use.
- D. IEEE Compliance: Applicable requirements and recommended installation practices of IEEE Standards 80, 81, 141 and 142 pertaining to grounding and bonding of systems, circuits and equipment.

##### 1.04 SYSTEM DESCRIPTION

- A. Ground the electrical service system neutral at service entrance equipment to the metallic water pipe service on building side only and to supplementary grounding electrodes, as required by the contract documents and as required by the NEC.
- B. External (underground) metal pipes, water, gas, fuel, drain/sewer etc., are not available for electrical grounding. This is due to extensive cathodic protection and isolation joints of all underground metal pipes at DIA. These systems shall be bonded to the grounding system on the building side only.
- C. Ground each separately derived system neutral to nearest referenced ground plate in the electrical room.

- D. Provide communications system with a # 6 copper grounding conductor at point of service entrance and connect to nearest referenced ground plate.
- E. Bond together at a service and at a separately derived systems; neutral conductor, equipment enclosures, all non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, and grounding electrode connector.
- F. Provide a 2/0 minimum building perimeter-grounding conductor buried thirty inches (30") below finished grade thirty-six inches (36") from foundation. Install a 3/4" x 10' copper clad ground rod at each corner, each change of direction and at intervals not to exceed one hundred feet (100').
- G. Provide a minimum of three inch by twelve inch by one-quarter inch (3" x 12" x 1/4") copper ground bar in the electrical room for connecting the grounding systems.
- H. An insulated equipment ground conductor shall be installed continuous from the main switchgear or service entrance to all branch panelboards, motor control centers, transformers and all motors. This conductor shall be bonded to the conduit and metal enclosures that it passes through utilizing bonding bushings and terminal devices.

**1.05 SUBMITTALS (REFER TO SECTIONS 01300 AND 01340)**

- A. Submit shop drawings under provisions of Section 16010.
- B. Indicate layout of ground ring, location of system grounding electrode connections, and routing of grounding electrode conductors.
- C. Submit all field test reports.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. Ground Rods: Copper-clad steel, 3/4-inch diameter, and minimum length of 10 feet; in manholes ground rods shall be stainless steel 3/4-inch diameter and a minimum length of 10 feet.
- B. Grounding Connection Accessories:
  - 1. Electrical insulating tape, heat-shrinkable insulating tubing, welding materials, bonding straps, as recommended by accessories manufacturers for type of service required.
- C. Exothermic welded connections are required where grounding conductors connect to underground grounding conductors and to underground grounding electrodes, and for bonding to steel. All underground connections shall be exothermic welded.
- D. All ground wires shall be copper except where stainless steel is specified for manholes, sized according to the NEC or as shown on the drawings which ever is larger.

**PART 3 - EXECUTION**

**3.01 INSTALLATION**

- A. Provide a separate, insulated, equipment-grounding conductor in all branch circuit conduits.

- B. Supplementary Grounding Electrode: Use grounding mats, where indicated, or driven ground rods. Install ground rods in suitable recessed well; fill with gravel after connection is made.
- C. Provide a No. 6 AWG and ground plate to each Communications Room or board. Connect to nearest Electrical Room ground plate.
- D. Provide isolated and insulated ground conductors for all microprocessor and data processing equipment.
- E. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, connections are to be tightened to comply with tightening torque values specified in UL 486A to assure permanent and effective grounding.
- F. Provide code-sized ground cable bonding jumpers, installed with ground clamps, across all conduit expansion couplings and fittings, including flexible steel conduit used as expansion fittings.
- G. Provide a corrosion-resistant finish to field connections, buried metallic bonding products, and where factory applied protective coatings have been destroyed.
- H. All continuous runs of cable tray and all isolated sections of cable tray shall be bonded and grounded.
- I. Provide an equipment-grounding conductor in all conduits.
- J. A non-continuous metallic raceway enclosing the service grounding electrode conductor or the separately derived system grounding electrode conductor shall be bonded at each end of the conduit to the grounding electrode conductor. If bonding jumpers are used they shall be sized per N.E.C. table 250-66.
- K. An earth electrode system shall be buried a minimum depth of two and a half feet. A # 2/0 bare copper ground wire, or if larger as sized on the drawings shall be run between ground rods.
- L. All receptacles and switches shall be provided with ground jumper from outlet box to ground terminal of the device. Exception isolated ground receptacles.
- M. Provide parallel equipment bonding jumper for parallel conduit feeders.
- N. Provide bonding jumpers around all concentric or eccentric knockouts.
- O. Include a bare # 2 copper ground conductor in all duct banks.

### 3.02 FIELD QUALITY CONTROL

- A. Test the ground resistance to earth of each ground rod prior to connection to the system. Where test show resistance to ground is over 5 OHMS, report to DIA Project Manager locations and values. Submit test results to the DIA Project Manager.
- B. Upon completion of installation of electrical grounding system, test ground resistance to earth in accordance with ANSI / IEEE 81 Submit test results to the DIA 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 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 Lump Sum Contract price.

**END OF SECTION 16452**

**\*NOTE SEE SUPPLEMENT AT THE END OF THIS APPENDIX FOR A  
REPORT: "LIGHTNING, GROUNDING, AND CATHODIC PROTECTION STUDY"**

**SECTION 16480**  
**MOTOR CONTROLLERS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Manual motor starters.
- B. Magnetic motor starters.
- C. Combination magnetic motor starters.
- D. Variable frequency drive controller.

**1.02 RELATED DOCUMENTS**

- A. Drawings, General and Special Conditions, Division - General Requirements and other applicable technical specifications apply to work of this section.

**1.03 RELATED SECTIONS**

- A. Division 16 - Electrical: All Sections.

**1.04 REFERENCE STANDARDS**

- A. Comply with the requirements of the reference standards noted herein, except where more stringent requirements are listed herein or otherwise required by the Contract Documents.
  - 1. ANSI/NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
  - 2. NEMA AB 1 - Molded Case Circuit Breakers.
  - 3. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.

**1.05 SUBMITTALS (REFER TO SECTIONS 01300 AND 01340)**

- A. Submit under provisions of Section 16010.
- B. Provide product data on motor starters and combination motor starters, relays, pilot devices, and switching and overcurrent protective devices.

**1.06 OPERATION AND MAINTENANCE DATA**

- A. Submit operation and maintenance data under provisions of Section 16010.
- B. Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site under provisions of Division 1.
- B. Store and protect products under provisions of Section 16010.

## PART 2 - PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS - MOTOR STARTERS

- A. Allen-Bradley.
  - 1. General Electric.
  - 2. Square D.
  - 3. Cutler Hammer.
  - 4. Danfoss.

### 2.02 MANUAL MOTOR STARTERS

- A. Manual Motor Starter: NEMA ICS 2; AC general-purpose Class A manually operated non-reversing full-voltage controller for induction motors rated in horsepower, with overload relay for each phase, low-voltage protection, red pilot light, field-convertible auxiliary contact, and toggle operator.
- B. Fractional Horsepower Manual Starter: NEMA ICS 2; AC general-purpose Class A manually operated, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light, and key or toggle operator as indicated.
- C. Motor Starting Switch: NEMA ICS 2; AC general-purpose Class A manually operated pole, full-voltage controller for fractional horsepower induction motors, without thermal overload unit, red pilot light, field convertible auxiliary contact, and toggle operator.
- D. Enclosure: ANSI/NEMA ICS 6; Type 1 for indoor and type 3R for outdoor.

### 2.03 MAGNETIC MOTOR STARTERS

- A. Magnetic Motor Starters: NEMA ICS 2; AC general-purpose Class A magnetic controller for induction motors rated in horsepower.
- B. Full Voltage Starting: Reversing or non-reversing type as indicated.
- C. Reduced Voltage Starting: Reactor, open-circuit transition wye-delta or full-voltage part-winding type.
- D. Two-Speed Starting: Two-speed, one or two winding as required, variable torque type. All two-speed motors with 2:1 ratio shall be single-winding type; all other two-speed motors shall be two-winding type. Division under which motor starters will be supplied is responsible for verifying speed ratio so as to assure proper motor starter selection. Include integral time delay transition between FAST and SLOW speeds, and between FORWARD and REVERSE rotation, as applicable. Starters for motors rated 25 horsepower or larger shall include controls forcing low-speed start followed by transition to high speed, irrespective of concurrent control systems demand for high-speed operation.
- E. Coil Operating Voltage: 24 volts, 60 hertz.
- F. Size: NEMA ICS 2; size as shown on Drawings.
- G. Overload Relay: NEMA ICS 2; bimetal.
- H. Enclosure: NEMA ICS 6; Type 1 for indoor and type 3R for outdoor.

- I. Combination Motor Starters: Combine motor starters with motor circuit protector disconnect in common enclosure. Disconnecting means shall be equipped with provisions enabling locking in the "OFF" position.
- J. Auxiliary Contacts: NEMA ICS 2; two field-convertible contacts in addition to seal-in contact.
- K. Push buttons: NEMA ICS 2; START/STOP in front cover.
- L. Indicating Lights: NEMA ICS 2; RUN: green in front cover with press-to-test lamp testing feature.
- M. Selector Switches: NEMA ICS 2; HAND/OFF/AUTO, locking type, in front cover.
- N. Relays: NEMA ICS 2; as required.
- O. An individually fused 480-24 volt control transformer shall be furnished with each combination starter. The control transformer shall be sized by the manufacturer to have a minimum of 20 percent capacity in excess of the continuous voltampere requirements of the holding coil, indicating lights and any externally located devices such as a solenoid valves, external relays, etc. The control transformer shall be capable of operation with an inrush current twenty (20) percent greater than required by the holding coil, indicating lights and external-device, if any.

**2.04 VARIABLE FREQUENCY DRIVES (VFD) MOTORS MUST MEET "NEMA-MGI, I PARTS 30 AND 31 INVERTER - FED MOTORS"**

- A. General:
  - 1. Where specified, solid-state variable-speed controllers shall be provided for equipment. Drive shall convert 60 Hz AC line to a variable frequency, variable voltage AC output suitable for control of a standard NEMA Design B induction motor over a 10:1 speed range. (Current source drives may be used when in compliance with all other requirements of this specification.)
  - 2. The VFD shall consist of a 3-phase converter section to rectify the incoming AC source, a filtered DC bus section, PWM type inverter section, as specified below. Power switching devices shall be rated 1200 PIV minimum in the converter section, and 1000 PIV minimum in the inverter section.
  - 3. The VFD and options shall be tested to ANSI/UL Standard 508 and listed by either UL or ETL.
  - 4. Power line noise shall be limited to a voltage distortion factor and line notch depth as defined in IEEE Standard 519, Guide for Harmonic Control and Reactive Compensation of Static Power Converters.
  - 5. The VFD shall not emit either conducted or radiated RFI in excess of the limitations set forth in FCC Rules and Regulations.
  - 6. The VFD torque characteristic shall match the driven load.
  - 7. Controller Input: 460 volt, 3-phase, 60 Hz. Voltage Tolerance: -5% to +10%; Frequency Tolerance: +/-2%.
  - 8. Controller Output 46-460 volts, 3-phase, 6-60 Hz.
  - 9. Ambient Operating Conditions: Temperature, 0-40°C; Relative Humidity, 0-95%, non-condensing.
  - 10. Enclosure: NEMA 1 Indoor and 3R for Outdoor



11. All printed circuit boards and power subassemblies shall be burned in at elevated temperature (50°C minimum) for 48 hours minimum. The completed assembled VFD shall be functionally tested under motor load before shipment to ensure proper operation. The manufacturer shall provide certification that these tests have been completed.
  12. Displaced power factor: 0.95 lagging over rated speed range.
- B. Basic Features:
1. Control power transformer with fused primary and 24v fused secondary.
  2. AC input disconnect switch or circuit breaker, interlocked with door.
  3. AC line input current-limiting fuses rated 200,000 AIC minimum.
  4. HAND/OFF/AUTO Selector Switch to start and stop the motor. In AUTO position, drive starts and stops motor from remote contact closure. In HAND position, motor is started and stopped from start/stop push buttons.
  5. AUTO/MANUAL Selector Switch: In AUTO position, motor speed is proportional to follower signal. In MANUAL position, motor speed is set with the manual speed potentiometer.
  6. Manual speed potentiometer.
  7. Start and stop push buttons.
  8. Meters and Indicating Lights:
    - a. Amp meter.
    - b. Speed meter.
    - c. Power On pilot light.
    - d. Fault pilot light.
  9. Auxiliary Form C dry contacts to indicate the following:
    - a. VFD in run mode.
    - b. VFD in zero speed.
    - c. VFD fault.
  10. Terminals for field-installed external safeties.
  11. Field-selectable Auto Restart on power source failure.
  12. Adjustable voltage boost for starting high torque loads.
  13. Drive shall be capable of starting into a spinning motor by matching frequency and phase angle to the motor back EMF.
  14. Signal Follower: In Auto Speed mode, motor speed shall be proportional to external 4-20 ma speed control signal.
  15. The VFD shall be capable of supplying 150% of rated full load current for one minute at maximum ambient temperature.
  16. Operate in by pass mode
  17. Thermal overload relay to protect motor in bypass mode.
- C. VFD Controllers:
1. PWM type designs shall utilize an adjustable frequency carrier to tune out audible noise generated in the motor. The carrier frequency shall be adjustable over a minimum 10:1 range. The drive output shall be sine-weighted from a minimum of 11

pulses per half cycle at 20% speed to a minimum of 3 pulses per half cycle at full speed.

D. Adjustments:

1. Maximum Frequency: 55 to 66 Hz.
2. Minimum Frequency: 6 to 35 Hz.
3. Acceleration Time: 2 to 20 second minimum range.
4. Deceleration Time: 2 to 20 second minimum range.
5. Volts/Hz Ratio: +/-15% from 7.67 V/Hz.
6. Voltage Boost: Low frequency V/Hz.
7. Critical Speed Lockout: Two critical speeds with adjustable bandwidth.
8. Current Limit: 50 to 110% sine wave current rating.
9. Noise level of PWM drive and motor shall not be greater than 4 db above the noise level of a 6-step drive and motor of the same horsepower.

E. Protective Features:

1. Power source over-voltage, under-voltage, and phase loss protection.
2. DC bus over-voltage protection.
3. Instantaneous shutdown when load current exceeds 150%.
4. Inverse time characteristic overcurrent overload protection for the motor.
5. The VFD shall be capable of withstanding randomly applied short circuit current applied across the output terminals without damage.
6. Internal protection of VFD for any external disconnects between the drive and the motor.
7. DC bus discharge circuit for protection of service personnel.

F. Trouble-Shooting Diagnostic Features:

1. Indicator lights on inverter power module to indicate correct operation (or failure) of individual power switching devices.
2. Indicator lights to show drive fault/ready states, and reason for fault shutdown, including: Instantaneous overload, motor overload, output or DC bus over-voltage, or source over-voltage, under-voltage, or phase loss.

G. Input Transient Protection:

1. AC line reactors to minimize noise and notching in the incoming line without the requirement for an input isolation transformer.
2. Metal oxide varistors and RC snubbers to limit high voltage spikes.

H. Acceptable Manufacturers:

1. All VFDs shall be of a single manufacturer.
2. Approved VFD Manufacturers:
  - a. Honeywell
  - b. Graham.
  - c. Reliance.

- d. Robicon.
- e. Cutler Hammer.
- f. Eaton
- g. Square D

## 2.05 CONSTANT SPEED BYPASS

- A. Provide pre-assembled add-on enclosure containing bypass-only functions for pumps and AHU-D units. Enclosure shall include:
  - 1. A circuit breaker disconnect with door interlock handle (in addition to the VFD compartment disconnect). This disconnect shall provide positive shutdown of all power to both the bypass circuitry and the VFD.
  - 2. A VFD output contactor and constant speed contactor.
  - 3. A 3-pole motor overload relay with heaters connected to shut down the motor in both the VFD and bypass modes.
  - 4. Operator's Controls and Indicator Lights as specified hereinafter.
  - 5. Provision for motor winding over-temperature switch (if provided).
  - 6. Control power transformer with fused primary and 24 volt fused secondary.
  - 7. Interlock to allow a controlled VFD deceleration ramp to stop.
  - 8. Panel arranged to allow power-off maintenance of the VFD while motor is operating on bypass. Bypass circuitry in the same compartment as the VFD will not be allowed.
- B. Operating Controls: Provide the following operating controls in the bypass enclosure:
  - 1. VFD/OFF/BYPASS selector switch.
  - 2. POWER ON light.
  - 3. MOTOR ON VFD light.
  - 4. MOTOR ON-LINE light.
  - 5. MOTOR FAULT light.
  - 6. A control relay and bypass mode HAND/OFF/AUTO switch to allow remote 2-wire start/stop control of the motor in both VFD (AUTO) and BYPASS (AUTO) modes.
  - 7. Control relays and terminal strip to allow external dry contact type safety devices to shut down the motor in both VFD and BYPASS modes, or independently in VFD or BYPASS mode only.

## 2.06 CONTROLLER OVERCURRENT PROTECTION AND DISCONNECTING MEANS

- A. Motor Circuit Protector: NEMA AB 1; circuit breakers with integral instantaneous magnetic trip in each pole.
- B. Non-Fusible Switch Assemblies: NEMA KS 1; HD type, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install motor control equipment in accordance with manufacturer's instructions.
- B. Select and install heater elements in motor starters to match installed motor characteristics.
- C. Motor Data: Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.
- D. Floor mounted equipment shall be on a 4" concrete housekeeping pad.
- E. Name plates per Section 16195.

**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 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 Lump Sum Contract price.

**END OF SECTION 16480**

**SECTION 16486**  
**ELECTRIC MOTORS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Single-phase electric motors.
- B. Three-phase electric motors, NEMA frame.
- C. Magnetic motor starters. See Sections 16480 & 16481.

**1.02 RELATED DOCUMENTS**

- A. Drawings, General and Special Conditions, Division 1 - General Requirements and other applicable technical specifications apply to Work of this Section.

**1.03 RELATED SECTIONS**

- A. Section 16142 - Electrical Connections for Equipment.
- B. Section 16480 - Motor Controllers. Magnetic Motor Starters.
- C. Division 16 – Electrical: All Sections.

**1.04 REFERENCE STANDARDS**

- A. Comply with the requirements of the latest issue of the reference standards noted herein, except where more stringent requirements are listed herein or otherwise required by the Contract Documents.
  - 1. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
  - 2. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.
  - 3. ANSI/IEEE 112 - Test Procedure for Polyphase Induction Motors and Generators.
  - 4. ANSI/NEMA MG 1 - Motors and Generators including parts 30 and 31 if applicable.

**1.05 SUBMITTALS (REFER TO SECTIONS 01300 AND 01340)**

- A. Submit product data under provisions of Section 16010.
- B. Submit test results verifying nominal efficiency and power factor for three-phase motors larger than 20 horsepower.
- C. Submit electric load summary for all motors

**1.06 OPERATION AND MAINTENANCE DATA**

- A. Submit operation and maintenance data under provisions of Section 16010. Include assembly drawings, bearing data including replacement sizes and lubrication instructions.

### 1.07 REGULATORY REQUIREMENTS

- A. Conform to ANSI/NFPA 70. (NEC)

### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 1.
- B. Store and protect products under provisions of Section 16010.
- C. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weatherproof covering. For extended outdoor storage, remove motors from equipment and store separately. Connect motor heaters where furnished.

### 1.09 ENVIRONMENTAL CONDITIONS

- A. The equipment shall be designed and constructed to operate successfully at the rated values under the following environmental conditions:
  - 1. Location: Outdoors
  - 2. Altitude: 5,500 feet above sea level
  - 3. Ambient Temperature Range: -30° F to 120° F

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Magnetek E plus 3 and inverter grade
  - 1. Baldor
  - 2. General Electric.
  - 3. Reliance.
  - 4. Westinghouse.
  - 5. Toshiba
  - 6. US Motor

### 2.02 GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Coordination: Refer to Section 16142 Electrical Connections for Equipment.
- B. Motors: Motors shall be utility or industrial grade. Design for continuous operation in 40EC environment, and for temperature rise in accordance with ANSI/NEMA MG 1 limits for insulation class, Service Factor, and motor enclosure type. All motors shall be NEMA Premium™, except where more stringent requirements are listed herein or otherwise required by Approved Contract Documents
- C. Explosion-Proof Motors: UL approved and labeled for hazard classification, with over temperature protection.
- D. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, Service Factor, Power Factor, efficiency.

- E. Electrical Connection: Conduit connection boxes, threaded for conduit. For fractional horsepower motors where connection is made directly, provide screwed conduit connection in end frame. All motor lead terminal boxes shall have, as a minimum, the inside dimensions shown in the following table or shall be the manufacturer's nearest standard size:

<u>MOTOR HORSEPOWER</u>	<u>HEIGHT INCHES</u>	<u>WIDTH INCHES</u>	<u>DEPTH INCHES</u>
0 thru 3		Manufacturer's Standard	
5 thru 25	8	6	6
30 thru 50	9	7	7
60 thru 75	12	8	8
100 thru 125	12	10	10
150 thru 200	14	12	12

- F. Motors used with adjustable voltage or adjustable frequency controls shall meet NEMA MG1, Part 30 and 31.
- G. Application: (Except medium voltage motors)
1. Motors shall be designed for across-the-line voltage. Motor torque characteristics shall be selected to ensure acceleration of the driven equipment within a time limit acceptable to the motor manufacturer. Motors shall be capable of starting the driven equipment while operating at 90 percent rated terminal voltage.
  2. Motors shall be NEMA Design B, unless otherwise noted or required.
  3. The supplying contractor shall be responsible for all additional electrical and other costs involved to accommodate any motors which exceed the scheduled horsepower sizes as called for in Contract Documents.
  4. Insulation for motors 1-1/2 HP and larger shall be NEMA Class B or F. Insulation on smaller motors and single-phase motors shall be NEMA Class A or B.
  5. Motors rated 1/2 to 200 HP shall be 460/3/60.
  6. Motors rated less than 1/2 HP shall be 115/1/60.
  7. All motor wiring and windings shall be copper.
  8. Motor safe locked rotor time at rated locked rotor current shall be equal to or greater than, the maximum accelerating time at minimum specified starting voltage.
  9. Motors shall be capable of withstanding a full voltage bus transfer from one source to another within a transfer time of 6 cycles. The 6 cycle dead time is the difference between the instant that the arc in the normal source circuit breaker is completely extinguished and the time that the standby source circuit breaker is completely closed.
  10. The continuous nameplate rating shall be greater than or equal to the maximum brake horsepower required by the driven equipment when that equipment is operated at any point within the operating range specified in the specifications or drawings. Service factor shall not be used to meet this requirement. Motors shall have service factors in accordance with NEMA Standard MG1.
  11. All terminal boxes shall have a bolt type copper ground connector brazed, welded or bolted inside the box.
  12. All motors rated above 10 horsepower which are to be located outdoors and have totally-enclosed or weather-protected enclosures shall be furnished with space heaters. Space heaters shall be of sufficient capacity to keep the motor windings and internal parts dry when the motors are not running. Heaters shall be chrome steel sheath strip, ring or disc elements.

13. All space heaters shall be rated 240 volts and sized for operation on 120 volts single phase.
14. All weather-protected motors shall be furnished with filters and guard screens. Filters shall be arranged to be readily removable for cleaning and replacement while the motor is in service. Guard screens shall be of stainless steel or and approved corrosion-resistant material.
15. All totally enclosed motors shall be furnished with drain-breather elements, Crouse-Hinds Type ECD "Universal" or approved equal.
16. All motors shall be provided with suitable lifting devices or attachments for motor installation and removal.
17. Aluminum frame motors are not acceptable.

### **2.03 SINGLE-PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS**

- A. Starting Torque: Exceeding one-fourth of full-load torque.
- B. Starting Current: Up to six times full-load current.
- C. Multiple Speed: Through tapped windings.
- D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50EC temperature rise) insulation, minimum 1.0 Service Factor, pre-lubricated sleeve or ball bearings, automatic reset overload protector.

### **2.04 SINGLE-PHASE POWER - CAPACITOR START MOTORS**

- A. Starting Torque: Three times full-load torque.
- B. Starting Current: Less than five times full-load current.
- C. Pull-up Torque: Up to 350 percent of full-load torque.
- D. Breakdown Torque: Approximately 250 percent of full-load torque.
- E. Motors: Capacitor in series with starting winding; capacitor-start/capacitor-run motors shall have two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
- F. Drip-Proof Enclosure: Class A (50EC temperature rise) insulation, NEMA Service Factor, pre-lubricated sleeve or ball bearings.
- G. Enclosed Motors: Class A (50EC temperature rise) insulation, 1.0 Service Factor, pre-lubricated ball bearings.

### **2.05 THREE-PHASE POWER - SQUIRREL CAGE MOTORS**

- A. Starting Torque: Between one and 1-1/2 times full-load torque.
- B. Starting Current: limited by maximum allowable by the latest issue of NEC and NEMA-MG1.
- C. Power Output, Locked Rotor Torque, Breakdown or Pullout Torque: NEMA Design B characteristics.



- D. Design, Construction, Testing, and Performance: Conform to ANSI/NEMA MG 1 for Design B motors.
- E. Insulation System: NEMA Class B or better. Motors with weatherproof enclosures or motors for outdoor application shall have sealed or encapsulated insulation systems produced by a vacuum impregnated MICA - EPOXY process.
- F. Motor Frames: NEMA standard T-frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.
- G. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for re-lubrication, rated for minimum AFBMA 9, L-10 life of 25,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate. All vertical motors shall be furnished with antifriction thrust bearings which meet ANSI 83.15 OR 16, minimum L-10 Life of 35,000 hours.
- H. Sound Power Levels: To ANSI/NEMA MG 1.
- I. Multi-Speed Motors: All two-speed motors with 2:1 speed ratio shall be of single-winding type. Provide two-winding type motors for all other multi-speed applications.
- J. Power Factor: Motors shall have a labeled power factor, at nameplate rating and rated voltage, of not less than 95 percent. If a motor draws less than 1000 watts labeled rating, it is excluded from the 95% PF requirement. If, through motor or design (i.e., rpm less than 1200), a 95% PF is not available, the supplier shall furnish power factor correction components capable of correcting to 95 percent or better. Provide power factor correction for single speed motors only. Variable speed motors shall have a minimum power factor of 85% at rated RPM.
- K. Product Scope and Nominal Efficiency Levels: The NEMA Premium™ efficiency electric motor program scope is single-speed, polyphase, 1-500 horsepower, 2, 4, and 6 pole, squirrel cage induction motors, NEMA Design A or B, continuous rated. Products must meet or exceed the nominal energy efficiency levels specified in NEMA Standards Publication MG 1- 2003 (or its most recent revision), in Tables 12-12 and 12-13, respectively.
- L. Derating: Temperature rise for motors shall not exceed that specified in NEMA MG1-20.40 for the class of insulation used. Motors shall be fully derated for the effects of high ambient temperatures and altitude of 5500 feet above sea level.
- M. Motors shall be capable of withstanding the number of starts imposed by the drive equipment without appreciable loss of service life.

### PART 3 - EXECUTION

#### 3.01 APPLICATION

- A. Motors drawing less than 250 watts and intended for intermittent service may be germane to equipment manufacturer and need not conform to these Specifications.
- B. Motors shall be open drip-proof type, except where specifically noted otherwise.

#### 3.02 NEMA OPEN MOTOR SERVICE FACTORS

HP	SERVICE FACTOR
1/6-1/3	1.35

1/2	1.15
3/4	1.15
1	1.15
1.5-150	1.15

**PART 4 - MEASUREMENT**

**4.01 METHOD OF MEASUREMENT**

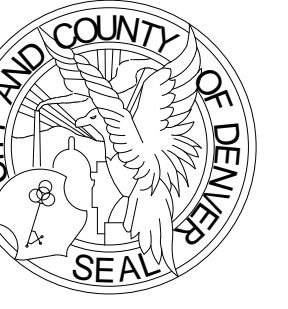
- A. No separate measurement shall be made for work under this section.

**PART 5 - PAYMENT**

**5.01 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 Lump Sum Contract price.

**END OF SECTION 16486**



# Denver International Airport

## CONCOURSE B PRECONDITIONED AIR EQUIPMENT REPLACEMENT

City Design Project #: CE-03024-05  
City Construction Project #:

### ISSUED FOR CONSTRUCTION

**Project Address:**

Concourse B: 8900 Pena Blvd (R18-1)  
Denver, Colorado 80249

**Issue Date:**  
29 AUGUST 2014



**Burns & McDonnell  
Engineering Co.**

Aurom Mahobian P.E.  
9785 Maroon Circle, Suite 400  
Centennial, CO 80112  
Ph: 303-474-2267  
Fax: 303-721-0563  
BMcD Project Number: 65967



**CONCOURSE B PCA EQUIPMENT  
REPLACEMENT**



ISSUE RECORD					
NO.	BY	PURPOSE	DATE	CHKD	
01	JMH	IFC	03/28/14	MM	

SCALE: NONE

DATE: 03/28/14

DRAWN BY: B. KYSTER

CHECKED BY: A. MAHOBIAN

FAA AIP NO:

WORK BREAKDOWN NO:

DESIGN CONTRACT NO. CE-03024-05

CONST. CONTRACT NO:

VOLUME NO. 01

SHEET TITLE

COVER

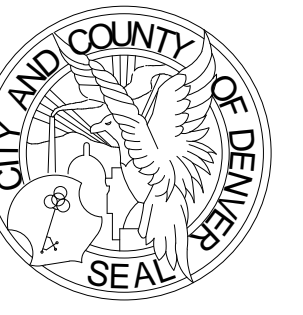
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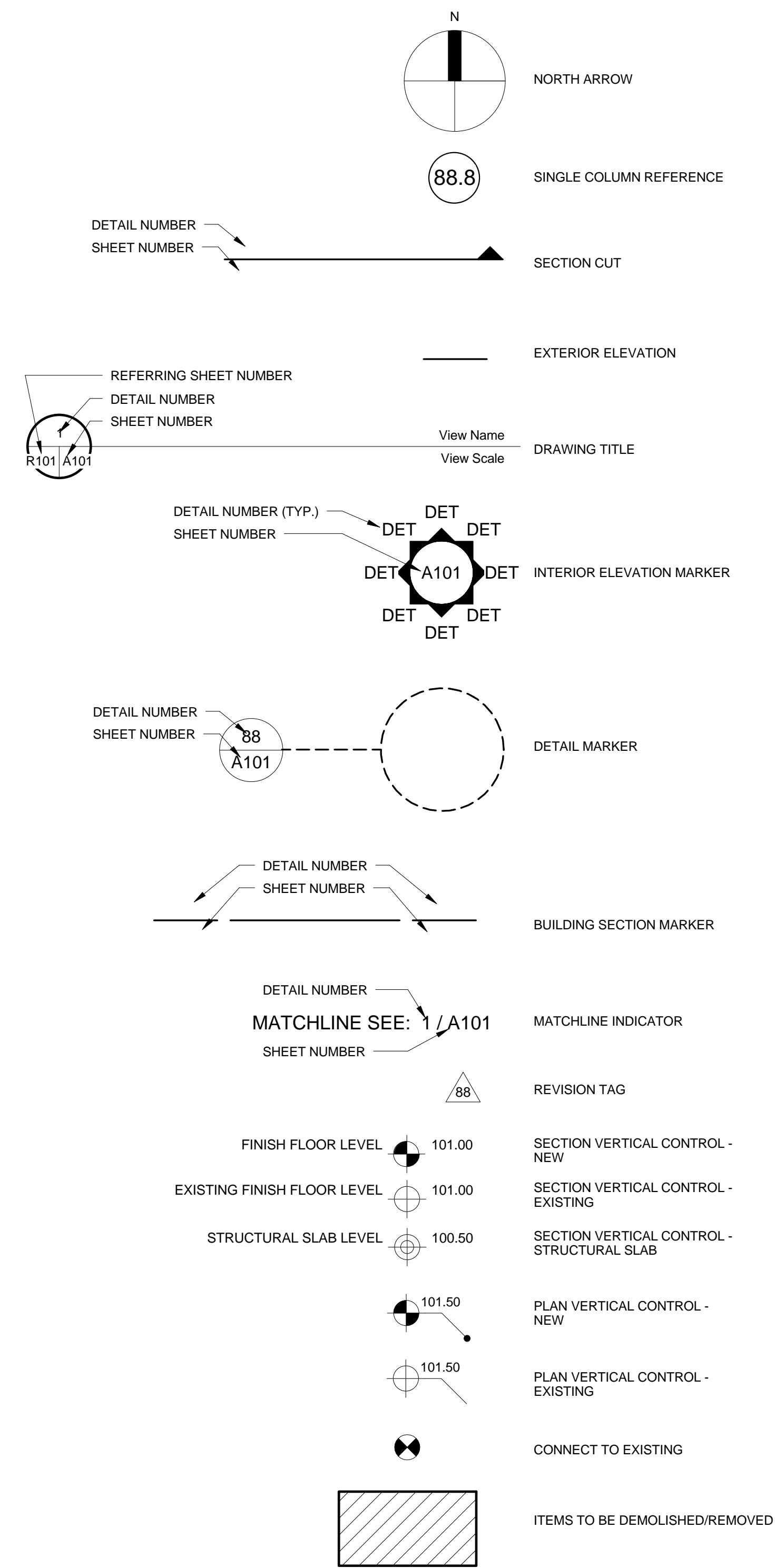








**MECHANICAL SYMBOLS**



**MECHANICAL ABBREVIATIONS**

ABV	ABOVE
AFF	ABOVE FINISHED FLOOR
APPROX	APPROXIMATE
AUTO	AUTOMATIC
BHP	BRAKE HORSEPOWER
BLDG	BUILDING
BTUH	BRITISH THERMAL UNITS PER HOUR
CFM	CUBIC FEET PER MINUTE
CONC	CONCRETE
CONN	CONNECTION
CONT	CONTINUATION
DB	DRY BULB
DDC	DIRECT DIGITAL CONTROL
DET	DETAIL
DIA. Ø	DIAMETER
DN	DOWN
DWG	DRAWING
EA	EACH, EXISTING AIR
EL	ELEVATION
ELEC	ELECTRICAL
ENT	ENTERING
EQUIP	EQUIPMENT
EXIST. (E)	EXISTING
FIN	FINISHED
FLEX	FLEXIBLE
FLR	FLOOR
FBM	FEET PER MINUTE
FT	FLOOR, FEET
°F	DEGREES FAHRENHEIT
GAL	GALLON
GPM	GALLONS PER MINUTE
HGT	HEIGHT
HORIZ	HORIZONTAL
HP	HORSEPOWER
HR	HOUR
HVAC	HEATING, VENTILATING AND AIR CONDITIONING
HZ	HERTZ
IN	INCH, INCHES
IN WG	INCHES WATER GAUGE
KW	KILOWATT
LB	POUND
LVG	LEAVING
MAX	MAXIMUM
MCC	MOTOR CONTROL CENTER
MECH	MECHANICAL
MIN	MINIMUM
MISC	MISCELLANEOUS
MTD	MOUNTED
MTG	MOUNTING
NTS	NOT TO SCALE
OA	OUTSIDE AIR
PBB	PASSENGER BOARDING BRIDGE
PCA	PRECONDITIONED AIR
PD	PRESSURE DROP
PRESS	PRESSURE
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAUGE
REQD	REQUIRED
RLA	RATED LOAD AMPS
RPM	REVOLUTIONS PER MINUTE
SA	SUPPLY AIR
SHT	SHEET
SP	STATIC PRESSURE
SPECS	SPECIFICATIONS
SQ	SQUARE
SS	STAINLESS STEEL
STD	STANDARD
STRUCT	STRUCTURAL
TEFC	TOTALLY ENCLOSED FAN COOLED
TEMP	TEMPERATURE
TYP	TYPICAL
VERT	VERTICAL
VFD	VARIABLE FREQUENCY DRIVE
W/	WITH
WB	WET BULB
WT	WEIGHT

**GENERAL NOTES**

- CONTRACTOR IS RESPONSIBLE FOR FURNISHING ALL THE NECESSARY COMPONENTS AND ACCESSORIES TO PROVIDE COMPLETE SYSTEMS IN ACCORDANCE WITH THESE DRAWINGS AND THE SPECIFICATIONS.
- EQUIPMENT CAPACITIES SHOWN ON THESE DRAWINGS ARE FOR CONDITIONS AT AN ELEVATION OF 5,400 FT ABOVE SEA LEVEL. CONTRACTOR SHALL ENSURE THAT ALL EQUIPMENT FURNISHED IS PROPERLY DERATED TO OPERATE AT THE SITE CONDITIONS.
- DUCT CONNECTIONS TO EQUIPMENT SHALL BE VERIFIED AND ADJUSTED TO MATCH ACTUAL EQUIPMENT FURNISHED.
- CONTRACTOR IS RESPONSIBLE FOR VERIFYING EXISTING CONDITIONS PRIOR TO COMMENCEMENT OF WORK.
- REFER TO ELECTRICAL DRAWINGS TO COORDINATE MECHANICAL WORK WITH OTHER TRADES AS REQUIRED.



1  
M0.01 TYPICAL EXISTING PCA UNIT INSTALLATION  
NOT TO SCALE

**CONCOURSE B PCA EQUIPMENT  
REPLACEMENT**



NO.	BY	PURPOSE	DATE	CKD

SCALE: NONE

DATE: 03/28/14

DRAWN BY: B. KYSTER

CHECKED BY: A. MAHOBBIAN

FAA AIP NO.:

WORK BREAKDOWN NO.:

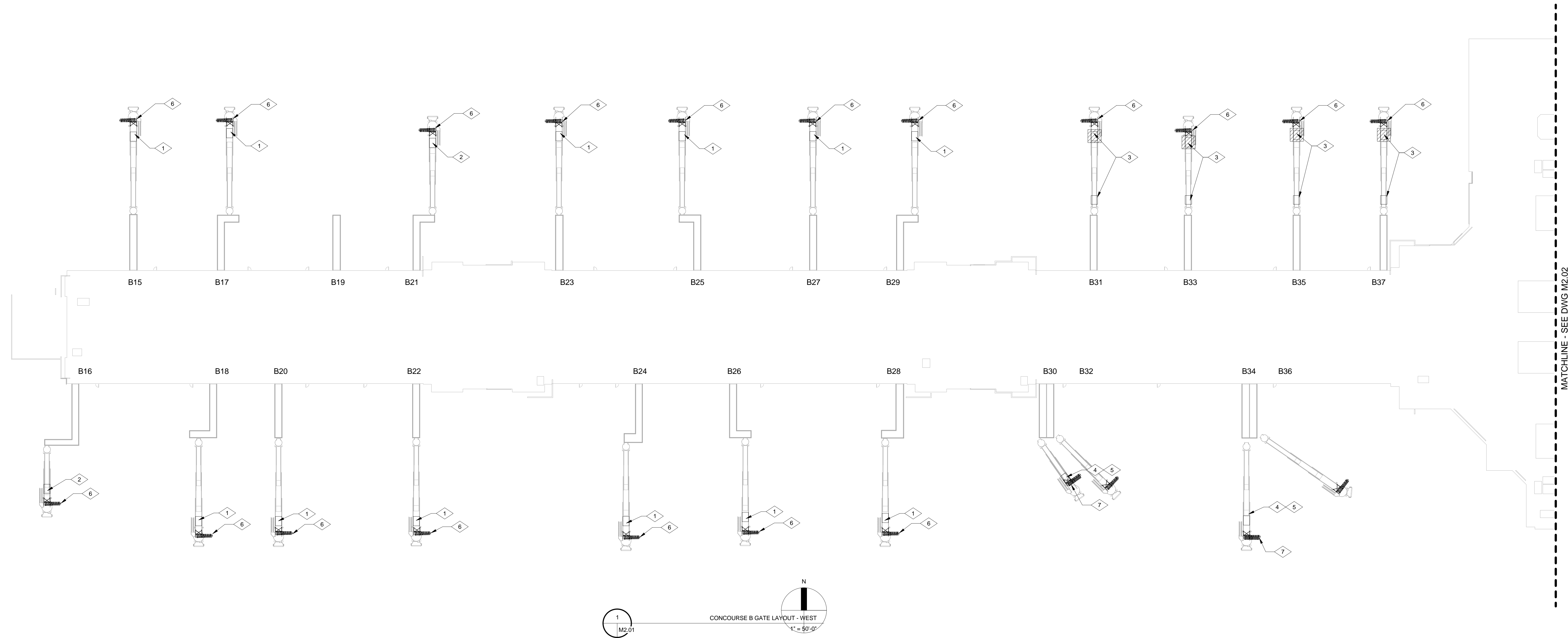
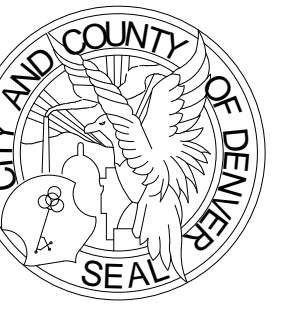
DESIGN CONTRACT NO. CE-03024-05

CONST. CONTRACT NO.:

VOLUME NO. 01

SHEET TITLE  
**MECHANICAL  
LEGEND AND  
ABBREVIATIONS**

SHEET NO.  
M0.01



**NOTES:**

1. CONTRACTOR IS RESPONSIBLE FOR REMOVING ALL ACCESSORIES AND APPURTENANCES ASSOCIATED WITH EXISTING PCA UNITS AND REPLACING WITH NEW AS INDICATED IN DRAWINGS AND SPECIFICATIONS.
2. PCA UNIT MANUFACTURER SHALL PROVIDE ALL MOUNTING PROVISIONS FOR MOUNTING TO THE PASSENGER BOARDING BRIDGES AND THE APRON.
3. SEE PCA UNIT REPLACEMENT SCHEDULE ON M7.01 FOR NEW UNIT SIZES, MOUNTING, AND BID REQUIREMENTS.
4. SEE M3.01 FOR TYPICAL DEMOLITION ELEVATION.
5. SEE M3.01 FOR TYPICAL NEW INSTALLATION ELEVATIONS.

**KEYED NOTES:**

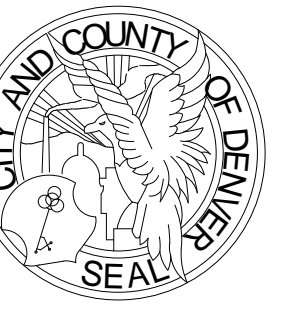
1. REPLACE EXISTING PCA UNIT WITH NEW 45 TON PCA UNIT. NEW UNIT SHALL BE INSTALLED ON THE UNDERSIDE OF THE PBB IN SAME LOCATION AS EXISTING UNIT. SEE NOTES 4 AND 5.
2. REPLACE EXISTING PCA UNIT WITH NEW 60 TON PCA UNIT. NEW UNIT SHALL BE INSTALLED ON THE UNDERSIDE OF THE PASSENGER BOARDING BRIDGE IN SAME LOCATION AS EXISTING UNIT. SEE NOTES 4 AND 5.
3. DEMOLISH EXISTING PCA UNIT AND INSTALL NEW 45 TON STAND-MOUNTED PCA UNIT ON THE APRON UNDERNEATH THE PBB AND AS CLOSE TO THE ROTUNDA AS POSSIBLE. SEE DETAIL 2 ON M3.01 FOR PCA STAND MOUNT ELEVATION. SEE NOTES 4 AND 5.
4. REMOVE AND PRESERVE EXISTING 60 TON PCA UNIT ALONG WITH ALL ASSOCIATED EQUIPMENT, SUPPORTS AND ACCESSORIES INCLUDING BUT NOT LIMITED TO: HOSE, HOSE TROLLEY, DUCTWORK & FITTINGS, UNIT CONTROLLER AND UNIT SUPPORTS. EXISTING UNIT IS TO BE REINSTALLED AT A DIFFERENT GATE. SEE SCHEDULE ON DRAWING M7.01.
5. INSTALL NEW 90 TON PCA UNIT. NEW UNIT SHALL BE INSTALLED ON THE UNDERSIDE OF THE PASSENGER BOARDING BRIDGE IN SAME LOCATION AS EXISTING UNIT. SEE NOTE 5.
6. INSTALL NEW HOSE TROLLEY DESIGNED FOR 40 AND 60 TON PCA UNITS. CONNECT TO PASSENGER BOARDING BRIDGE AT DRIVE COLUMN. SEE DETAILS 1 AND 2 ON M6.01 FOR HOSE TROLLEY DETAIL.
7. INSTALL NEW HOSE TROLLEY DESIGNED FOR 90 TON PCA UNIT. CONNECT TO PASSENGER BOARDING BRIDGE AT DRIVE COLUMN. SEE DETAILS 1 AND 3 ON M6.01 FOR HOSE TROLLEY DETAIL.

**CONCOURSE B PCA EQUIPMENT  
REPLACEMENT**



NO.	BY	PURPOSE	DATE	CKD

SCALE: As Indicated  
DATE: 03/28/14  
DRAWN BY: B. KYSTER  
CHECKED BY: A. MAHOBIAN  
FAA AIP NO.:  
WORK BREAKDOWN NO.:  
DESIGN CONTRACT NO.: CE-03024-05  
CONST. CONTRACT NO.:  
VOLUME NO.: 01  
SHEET TITLE: CONCOURSE B GATE LAYOUT WEST  
SHEET NO.: M2.01



CONCOURSE B PCA EQUIPMENT  
REPLACEMENT



ISSUE RECORD				
NO.	BY	PURPOSE	DATE	CHKD

SCALE: As indicated

DATE: 03/28/14

DRAWN BY: B. KYSTER

CHECKED BY: A. MAHOBIAN

FAA AIP NO:

WORK BREAKDOWN NO:

DESIGN CONTRACT NO:

CE-03024-05

CONST. CONTRACT NO:

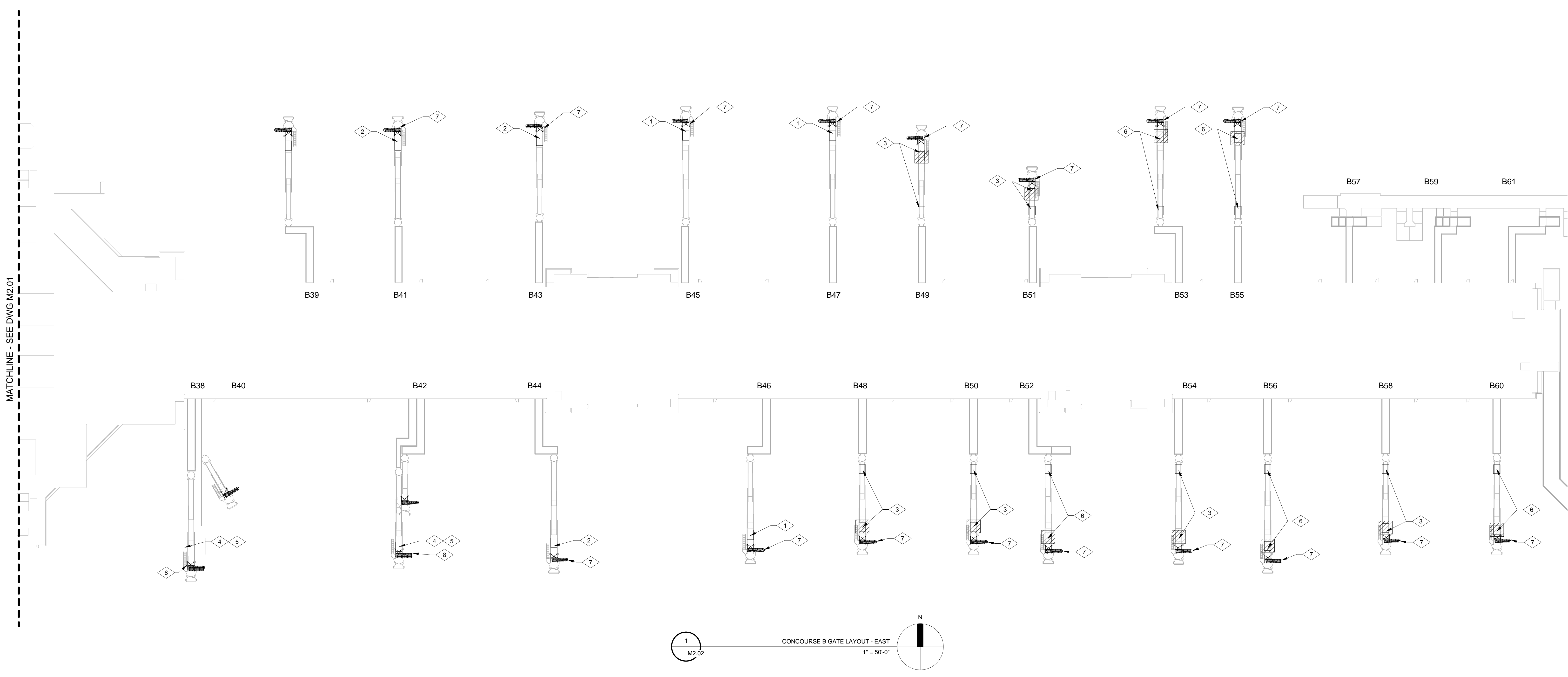
VOLUME NO: 01

SHEET TITLE

CONCOURSE B  
GATE LAYOUT  
EAST

SHEET NO:

M2.02



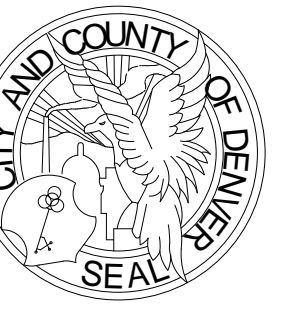
**NOTES:**

- CONTRACTOR IS RESPONSIBLE FOR REMOVING ALL ACCESSORIES AND APPURTENANCES ASSOCIATED WITH EXISTING PCA UNITS AND REPLACING WITH NEW AS INDICATED IN DRAWINGS AND SPECIFICATIONS.
- PCA UNIT MANUFACTURER SHALL PROVIDE ALL MOUNTING PROVISIONS FOR MOUNTING TO THE PASSENGER BOARDING BRIDGES AND THE APRON.
- SEE PCA UNIT REPLACEMENT SCHEDULE ON M7.01 FOR NEW UNIT SIZES, MOUNTING, AND BID REQUIREMENTS.
- SEE M3.01 FOR TYPICAL DEMOLITION ELEVATION.
- SEE M3.01 FOR TYPICAL NEW INSTALLATION ELEVATIONS.

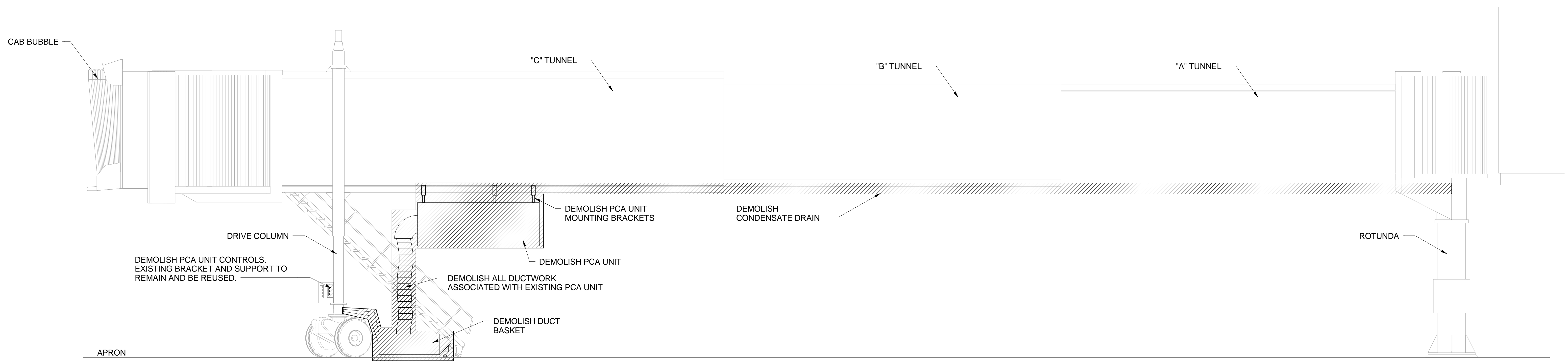
**KEYED NOTES:**

- REPLACE EXISTING PCA UNIT WITH NEW 45 TON PCA UNIT. NEW UNIT SHALL BE INSTALLED ON THE UNDERSIDE OF THE PBB IN SAME LOCATION AS EXISTING UNIT. SEE NOTES 4 AND 5.
- REPLACE EXISTING PCA UNIT WITH NEW 60 TON PCA UNIT. NEW UNIT SHALL BE INSTALLED ON THE UNDERSIDE OF THE PASSENGER BOARDING BRIDGE IN SAME LOCATION AS EXISTING UNIT. SEE NOTES 4 AND 5.
- DEMOLISH EXISTING PCA UNIT AND INSTALL NEW 45 TON STAND-MOUNTED PCA UNIT ON THE APRON UNDERNEATH THE PBB AND AS CLOSE TO THE ROTUNDA AS POSSIBLE. SEE DETAIL 2 ON M3.01 FOR PCA STAND MOUNT ELEVATION. SEE NOTES 4 AND 5.
- REMOVE AND PRESERVE EXISTING 60 TON PCA UNIT ALONG WITH ALL ASSOCIATED EQUIPMENT, SUPPORTS AND ACCESSORIES INCLUDING BUT NOT LIMITED TO: HOSE, HOSE TROLLEY, DUCTWORK & FITTINGS, UNIT CONTROLLER AND UNIT SUPPORTS. EXISTING UNIT IS TO BE REINSTALLED AT A DIFFERENT GATE. SEE SCHEDULE ON DRAWING M7.01.
- INSTALL NEW 90 TON PCA UNIT. NEW UNIT SHALL BE INSTALLED ON THE UNDERSIDE OF THE PASSENGER BOARDING BRIDGE IN SAME LOCATION AS EXISTING UNIT. SEE NOTE 5.
- DEMOLISH EXISTING PCA UNIT AND INSTALL PRESERVED STAND-MOUNTED 60 TON PCA UNIT FROM GATES SPECIFIED IN SCHEDULE ON DRAWING M7.01. UNIT IS TO BE INSTALLED ON THE APRON UNDERNEATH THE PASSENGER BOARDING BRIDGE AND AS CLOSE TO THE ROTUNDA AS POSSIBLE. SEE DETAIL 2 ON M3.01 FOR PCA STAND MOUNT ELEVATION. SEE NOTES 4 AND 5.
- INSTALL NEW HOSE TROLLEY DESIGNED FOR 40 AND 60 TON PCA UNITS. CONNECT TO PASSENGER BOARDING BRIDGE AT DRIVE COLUMN. SEE DETAILS 1 AND 2 ON M6.01 FOR HOSE TROLLEY DETAIL.
- INSTALL NEW HOSE TROLLEY DESIGNED FOR 90 TON PCA UNIT. CONNECT TO PASSENGER BOARDING BRIDGE AT DRIVE COLUMN. SEE DETAILS 1 AND 3 ON M6.01 FOR HOSE TROLLEY DETAIL.





CONCOURSE B PCA EQUIPMENT  
REPLACEMENT



1  
MD3.01 TYPICAL PCA DEMOLITION ELEVATION 1/4" = 1'-0"

NOTES:

1. CONTRACTOR IS RESPONSIBLE FOR VERIFYING EXISTING CONDITIONS PRIOR TO COMMENCEMENT OF WORK.
2. ALL PRECONDITIONED AIR UNITS AND ASSOCIATED COMPONENTS BEING REMOVED SHALL REMAIN THE PROPERTY OF THE OWNER AND SHALL BE REMOVED AND SALVAGED UNLESS AND UNTIL DIRECTED OTHERWISE BY THE DIA PROJECT MANAGER.
3. CONTRACTOR SHALL COORDINATE ALL SYSTEM OUTAGES WITH THE DIA PROJECT MANAGER.
4. NO PRECONDITIONED AIR UNITS SHALL BE TAKEN OUT OF SERVICE UNTIL ALL NEEDED COMPONENTS ARE ON SITE.
5. PRIOR TO COMMENCEMENT OF WORK ON A GATE, OUTAGES ARE TO BE COORDINATED WITH AND APPROVED BY THE DIA PROJECT MANAGER AND THE AIRLINE ASSOCIATED WITH THAT GATE TWO WEEKS IN ADVANCE OF THE CONTRACTOR PERFORMING WORK.
6. AFTER REMOVING THE PCA UNITS, CONTRACTOR IS RESPONSIBLE FOR PATCHING, REPAIRING, AND PAINTING ANY EXISTING STEEL MEMBERS OF THE PBB THAT MAY BE DAMAGED OR WORN IN THE LOCATION WHERE THE EXISTING PCA UNIT WAS INSTALLED.



ISSUE RECORD				
NO.	BY	PURPOSE	DATE	CHKD
01	JMH	IFC	2/24/14	JZ

SCALE: 1/4" = 1'-0"

DATE: 03/28/14

DRAWN BY: B. KYSTER

CHECKED BY: A. MAHOBIAN

FAA AIP NO:

WORK BREAKDOWN NO:

DESIGN CONTRACT NO. CE-03024-05

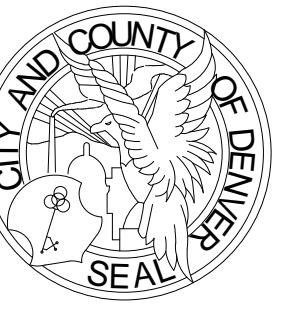
CONST. CONTRACT NO:

VOLUME NO. 01

SHEET TITLE

MECHANICAL  
DEMOLITION  
ELEVATION

SHEET NO. MD3.01



CONCOURSE B PCA EQUIPMENT  
REPLACEMENT



ISSUE RECORD				
NO.	BY	PURPOSE	DATE	CHKD
1	JMH	IFC	2/24/14	JZ

SCALE: 1/4" = 1'-0"

DATE: 03/26/14

DRAWN BY: B. KYSTER

CHECKED BY: A. MAHOBIAN

FAA AIP NO:

WORK BREAKDOWN NO:

DESIGN CONTRACT NO. CE-03024-05

CONST. CONTRACT NO.

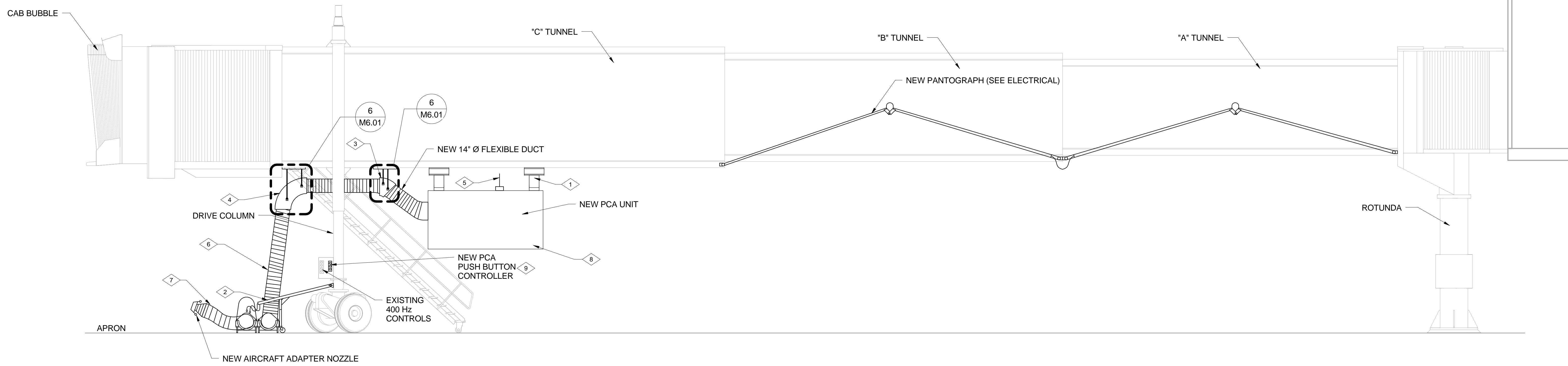
VOLUME NO. 01

SHEET TITLE

MECHANICAL  
ELEVATIONS

SHEET NO.

M3.01



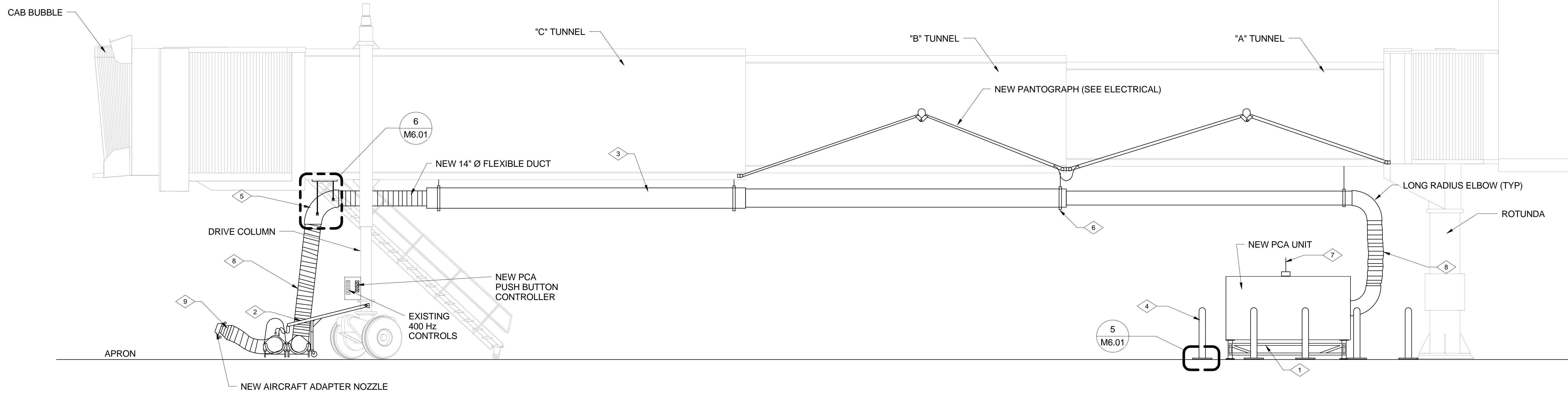
1  
M3.01  
PCA BRIDGE MOUNT ELEVATION  
NOT TO SCALE

NOTES:

- PBB IS SHOWN AS LEVEL FOR CLARITY. ACTUAL BRIDGE LEVEL WILL CHANGE WITH EACH AIRCRAFT.
- CONTRACTOR SHALL INSTALL PCA UNIT AS FAR BACK ON "C" TUNNEL, AWAY FROM BRIDGE DRIVE COLUMN AS POSSIBLE.
- ELECTRICAL CONDUIT, CABLE TRAY AND OTHER APPURTENANCES (NOT SHOWN) EXIST ON THE UNDERSIDE OF THE BRIDGE. CONTRACTOR SHALL ENSURE THAT NEW PCA UNIT DOES NOT INTERFERE WITH EXISTING ITEMS.
- CONTRACTOR SHALL PROVIDE ALL PCA ACCESSORIES AND APPURTENANCES REQUIRED FOR A FULLY OPERATIONAL PCA UNIT.
- MINIMUM CLEARANCE ON TOP AND BOTTOM OF PCA UNIT IS 15 INCHES.
- 90 TON PCA UNITS REQUIRE TWO PARALLEL SUPPLY AIR DUCT RUNS FROM DUAL PCA UNIT OUTLET TO TWO SEPARATE AIRCRAFT ADAPTER NOZZLES.
- PBB SHOWN IN THIS VIEW IS A "TYPICAL" ARRANGEMENT, BUT AS SHOWN DOES NOT FULLY DEPICT THE EXISTING CONDITIONS (EQUIPMENT, CABLES, ETC.) AT EACH GATE. CONTRACTOR SHALL COORDINATE NEW INSTALLATIONS WITH ALL EXISTING CONDITIONS AT EACH GATE. CONTRACTOR IS FULLY RESPONSIBLE FOR PROTECTING ALL EXISTING SITE COMPONENTS THAT WILL REMAIN.

KEYED NOTES:

- PROVISIONS FOR MOUNTING PCA UNIT TO PBB SHALL BE SELECTED BY PCA UNIT MANUFACTURER TO BE COMPATIBLE WITH SPECIFIC BRIDGE AT EACH GATE AND SHALL BE PROVIDED WITH NEW PCA UNIT.
- PROVIDE FACTORY-INSTALLED MOUNTING BRACKETS FOR PCA HOSE TROLLEYS AS REQUIRED. HOSE TROLLEYS SHALL BE SIDE-MOUNTED TO THE BRIDGE DRIVE COLUMN TO ALLOW PBB TO FULLY LOWER WITHOUT DAMAGING TROLLEY OR HOSE. PROVIDE PROTECTIVE SHIELD/COWLING BETWEEN BRIDGE DRIVE AND TROLLEY.
- PROVIDE 16" RIGID DUCT 45 DEG LONG RADIUS ELBOW MOUNTED TO BRIDGE. ROUTE FLEX DUCT THROUGH ELBOW.
- PROVIDE 16" RIGID DUCT 90 DEG LONG RADIUS ELBOW MOUNTED TO BRIDGE. ROUTE FLEX DUCT THROUGH ELBOW.
- WIFI ANTENNA SHALL BE INSTALLED TO MAINTAIN LINE OF SIGHT TO BUILDING AT ALL TIMES.
- ALL FLEXIBLE DUCT FROM PCA UNIT DISCHARGE TO AIRCRAFT SIDE OF TROLLEY SHALL BE HELICAL WIRE-REINFORCED HOSE.
- ALL FLEXIBLE DUCT FROM AIRCRAFT SIDE OF TROLLEY TO AIRCRAFT SHALL BE FLAT HOSE.
- PROVIDE AND INSTALL REFLECTIVE BLACK AND YELLOW STRIPED CAUTION TAPE AT THE BOTTOM EDGES OF EACH PCA UNIT PER TSS 15474.
- GATES WITH A 90 TON PCA UNIT SERVING B787 AIRCRAFT (GATES B30/B32B, B34/B36B, B38/B40B, AND B42B) SHALL HAVE A FOURTH PUSH BUTTON CONTROL TO PROVIDE FULL COOLING LOAD THROUGH A SINGLE HOSE.



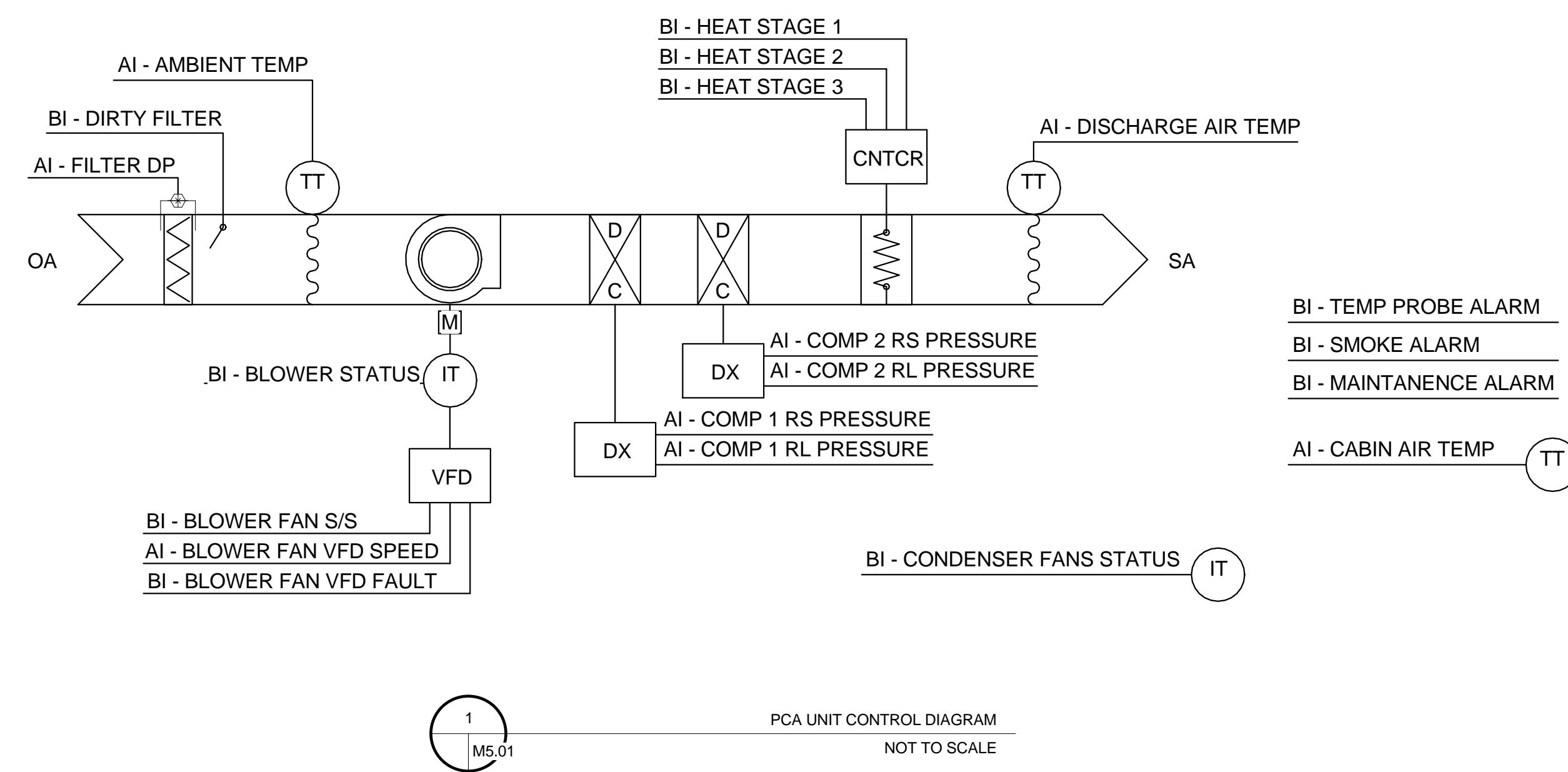
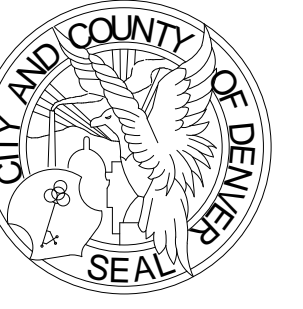
2  
M3.01  
PCA STAND MOUNT ELEVATION  
NOT TO SCALE

NOTES:

- PBB IS SHOWN AS LEVEL FOR CLARITY. ACTUAL BRIDGE LEVEL WILL CHANGE WITH EACH AIRCRAFT.
- ELECTRICAL CONDUIT, CABLE TRAY AND OTHER APPURTENANCES (NOT SHOWN) EXIST ON THE UNDERSIDE OF THE BRIDGE. CONTRACTOR SHALL ENSURE THAT NEW DUCTWORK DOES NOT INTERFERE WITH EXISTING ITEMS.
- CONTRACTOR SHALL PROVIDE ALL PCA ACCESSORIES AND APPURTENANCES REQUIRED FOR A FULLY OPERATIONAL PCA UNIT.
- GATE EQUIPMENT AND ACESORIES (NOT SHOWN) EXIST NEAR THE ROTUNDA AT EACH GATE. EXISTING CONDITIONS VARY PER GATE. CONTRACTOR SHALL ENSURE THAT NEW PCA UNIT LOCATION DOES NOT INTERFERE WITH CURRENT GATE OPERATION.
- MINIMUM CLEARANCE ON TOP AND BOTTOM OF PCA UNIT IS 15 INCHES.
- PBB SHOWN IN THIS VIEW IS A "TYPICAL" ARRANGEMENT, BUT AS SHOWN DOES NOT FULLY DEPICT THE EXISTING CONDITIONS (EQUIPMENT, CABLES, ETC.) AT EACH GATE. CONTRACTOR SHALL COORDINATE NEW INSTALLATIONS WITH ALL EXISTING CONDITIONS AT EACH GATE. CONTRACTOR IS FULLY RESPONSIBLE FOR PROTECTING ALL EXISTING SITE COMPONENTS THAT WILL REMAIN.

KEYED NOTES:

- PROVISIONS FOR MOUNTING NEW PCA UNIT TO THE APRON SHALL BE DESIGNED AND SUPPLIED BY THE PCA UNIT MANUFACTURER.
- PROVIDE FACTORY-INSTALLED MOUNTING BRACKETS FOR PCA HOSE TROLLEYS AS REQUIRED. HOSE TROLLEY SHALL BE SIDE-MOUNTED TO THE BRIDGE DRIVE COLUMN TO ALLOW PBB TO FULLY LOWER WITHOUT DAMAGING TROLLEY OR HOSE. PROVIDE PROTECTIVE SHIELD/COWLING BETWEEN BRIDGE DRIVE AND TROLLEY.
- TELESCOPING DUCT SHALL BE PROVIDED AS NECESSARY FOR CONNECTING NEW STAND-MOUNTED PCA UNIT TO THE HOSE TROLLEY ASSEMBLY AT THE BRIDGE DRIVE COLUMN. LENGTHS AND HEIGHTS WILL VARY FOR EACH GATE. TELESCOPING DUCT SHALL BE SUPPORTED FROM PBB AS REQUIRED AND SHALL NOT INTERFERE WITH BRIDGE OPERATION, ELECTRICAL EQUIPMENT, OR ACCESS TO ELECTRICAL EQUIPMENT. SEE SPECIFICATIONS SECTION 15475 FOR TELESCOPING DUCT REQUIREMENTS.
- ALL APRON-MOUNTED PCA UNITS SHALL BE INSTALLED WITH GUARD POSTS FOR PROTECTION FROM RAMP ACTIVITIES. SEE GUARD POST DETAIL ON THIS SHEET. CLEANING OF HOLES AND PLACEMENT OF EPOXY ADHESIVE AND ANCHORS SHALL BE CONTINUOUSLY INSPECTED. GUARD POSTS SHALL BE LOCATED AT ALL CORNERS OF EQUIPMENT AND SPACED NO MORE THAN 4'-0" APART. MINIMUM CLEARANCE BETWEEN GUARD POSTS AND PCA UNIT IS 4'-0". ALL POSTS SHALL BE PAINTED YELLOW TO MATCH EXISTING GUARD POSTS.
- PROVIDE 16" RIGID DUCT 90 DEG LONG RADIUS ELBOW MOUNTED TO BRIDGE. ROUTE FLEX DUCT THROUGH ELBOW.
- DUCT SUPPORTS FOR TELESCOPING DUCT TO BE DESIGNED AND PROVIDED BY THE PCA UNIT MANUFACTURER. COORDINATE DUCT SUPPORT DESIGN AND MOUNTING WITH THE SPECIFIC PASSENGER BOARDING BRIDGE AT EACH GATE. SEE SCHEDULE ON M7.01 FOR THE BRIDGE MAKE/MODEL AT EACH GATE.
- WIFI ANTENNA SHALL BE INSTALLED TO MAINTAIN LINE OF SIGHT TO BUILDING AT ALL TIMES.
- ALL FLEXIBLE DUCT FROM PCA UNIT DISCHARGE TO AIRCRAFT SIDE OF TROLLEY SHALL BE HELICAL WIRE-REINFORCED HOSE.
- ALL FLEXIBLE DUCT FROM AIRCRAFT SIDE OF TROLLEY TO AIRCRAFT SHALL BE FLAT HOSE.



PCA UNIT CONTROL POINTS LIST							
	SYSTEM GRAPHIC	DIGITAL OUTPUT	DIGITAL INPUT	ANALOG OUTPUT	ANALOG INPUT	ALARM POINT	SOFTWARE POINT
PCA UNIT	X						
SUPPLY FAN START-STOP AND STATUS		X	X			X	
OUTDOOR AIR TEMPERATURE					X		
DISCHARGE AIR TEMPERATURE					X		
CABIN TEMPERATURE					X		
HEATING STAGE 1				X			
HEATING STAGE 2				X			
COMPRESSOR STATUS (EACH)						X	
CONDENSER FAN STATUS (EACH)						X	
DAMPER POSITION		X	X			X	
DUCT SMOKE DETECTORS (AS NEEDED)		X					
CONDENSER FAN STATUS (EACH)						X	
AIRCRAFT SIZE (EACH)					X		
ALARM HEAT 1 (AS NEEDED)		X				X	
MAINTENANCE ALARM		X				X	
UNIT RUN TIME (HRS)		X					

**PCA UNIT CONTROL SEQUENCE**

- A. Start / Stop Control**
- The system is started through a momentary "Start" push button. The system runs continuously unless stopped by the blower motor VFD, the smoke detector, the phase monitor, or pressing the "Stop" button.
  - Upon depressing the "Start" push buttons, the appropriate control relay energizes. A normally open contact on the control relay closes and signals the PCA controller (PCAC) that the unit has been started. The PCAC then energizes the VFD relay, which tells the VFD to start the blower motor. When the blower starts the auxiliary contact on VFD opens and tells the PCAC that the blower is running. When the VFD relay is energized, the NO contact closes and power is provided to the rest of the control circuit. The PCAC will start the compressors or heaters as required.
  - On system start-up, the VFD slowly starts the blower motor. This prevents power surges and hose snap.
- B. Fault Shut-Down**
- The unit will initiate a "FAULT" (the red light on the "Stop" button) and shut the unit down for the following "out of normal" conditions.
    - The power monitor has tripped due to a phase reversal, voltage unbalance, low voltage, or loss of a phase.
    - The blower motor VFD overload has tripped.
    - The smoke detector has tripped.
  - Pushing the "Stop" button will reset the fault. Other components can stop operating without stopping the unit. Reasons include:
    - The condenser fans will shut down and fail to restart when the condenser fan motor overload trips.
    - Any of the compressors will shut down and not restart when the compressor motor overload trips. The compressors will shut down and restart automatically when the low suction pressure sensor trips, or the high discharge pressure sensor trips.
    - The high pressure switch is manual reset. Push the reset button on the pressure switch to reset.
- C. Control Software - Data Base**
- The PCA controller will automatically select the appropriate operational mode based on the ambient temperature.
  - The unit is controlled by the discharge temperature set point.
  - Several stages of cooling are provided. Modulation in cooling mode is obtained by cycling the compressors and controlled with hot gas by-pass.
  - If for any reason the discharge sensor becomes unreadable or unstable, the PCA controller will determine the sensor reading to be invalid and shutdown the unit. The unit will not restart until the sensor is repaired. The maintenance required light will turn on.
  - If the ambient sensor becomes unreadable or unstable, the PCA controller will determine the sensor reading to be invalid and it will default to 53°F. (Vent mode) where the blower will run but no compressors or heaters will turn on.
  - If the aircraft cabin sensor becomes unreadable or unstable, the PCA controller will determine the sensor reading to be invalid and it will default to 90°F in the cooling mode or 60°F in the heating mode. The maintenance required light will turn on. This will allow the unit to operate normally but will be in the full cool or heat mode.
- D. Control Logic**
- The PCAC status changes to "On" when the start push button is energized. The program then provides a signal to the blower output point, the compressor output points, and the condenser fan output point.
  - There is a five-second delay between each component start-up to prevent high current in-rush.
  - The discharge air temperature sensor reduces the capacity when the discharge air temperature drops below 32°F (0°C).
  - The condenser fans runs whenever the unit is on. The second condenser fan will cycle on the high pressure. The fan will come on at 400 psig, and off at 300 psig.
  - The VFD starts the blower motor slowly to provide a soft start preventing hose snap and high power inrush.
  - The compressors have a three-minute off delay to prevent rapid cycling of the compressors.

CONCOURSE B PCA EQUIPMENT  
REPLACEMENT



ISSUE RECORD				
NO.	BY	PURPOSE	DATE	CHKD
TO	DATE	IFC	DATE	BY

SCALE: NONE

DATE: 03/26/14

DRAWN BY: B. KYSTER

CHECKED BY: A. MAHOBIAN

FAA AIP NO:

WORK BREAKDOWN NO:

DESIGN CONTRACT NO. CE-03024-05

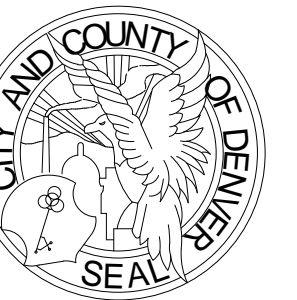
CONST. CONTRACT NO.

VOLUME NO. 01

SHEET TITLE  
PCA CONTROL  
DIAGRAM

SHEET NO.  
M5.01





CONCOURSE B PCA EQUIPMENT REPLACEMENT



ISSUE RECORD				
NO.	BY	PURPOSE	DATE	CHKD

SCALE: As indicated

DATE: 03/28/14

DRAWN BY: B. KYSTER

CHECKED BY: A. MAHOBIAN

FAA AIP NO.:

WORK BREAKDOWN NO.:

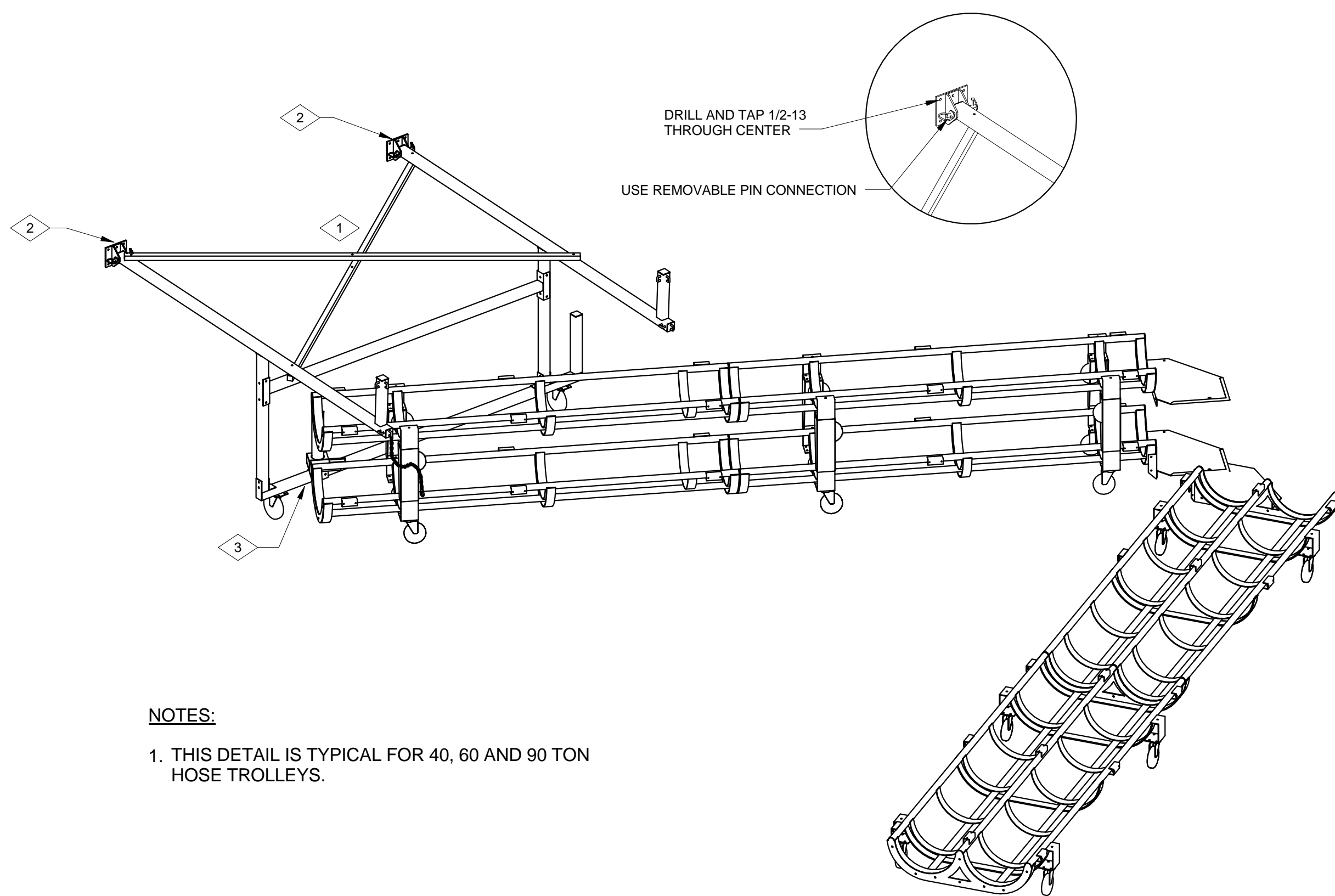
DESIGN CONTRACT NO.:

CONST. CONTRACT NO.:

VOLUME NO. 01

SHEET TITLE  
MECHANICAL DETAILS

SHEET NO.  
M6.01



NOTES:

1. THIS DETAIL IS TYPICAL FOR 40, 60 AND 90 TON HOSE TROLLEYS.

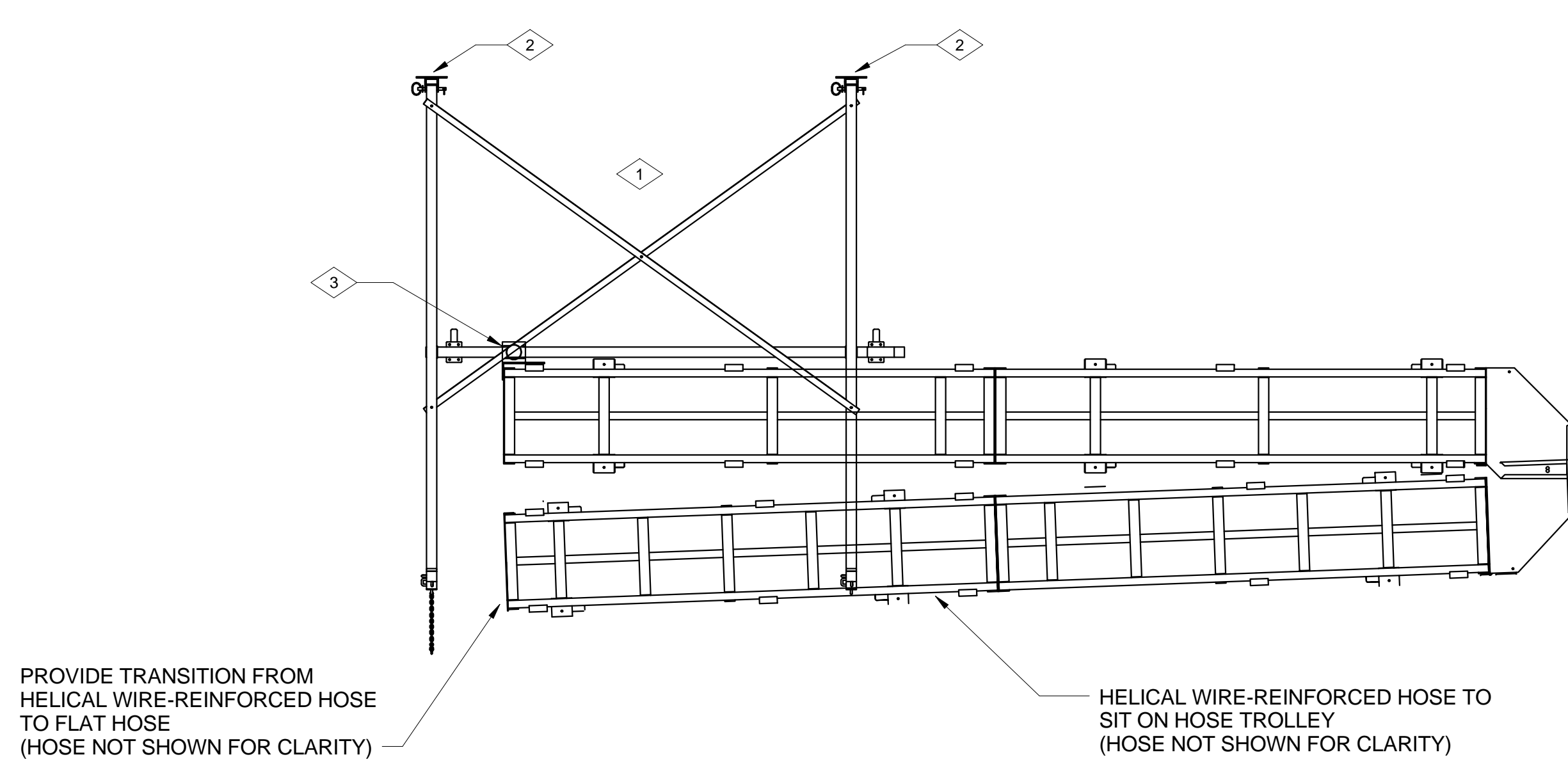
1 HOSE TROLLEY FRAME DETAIL  
M6.01 NOT TO SCALE



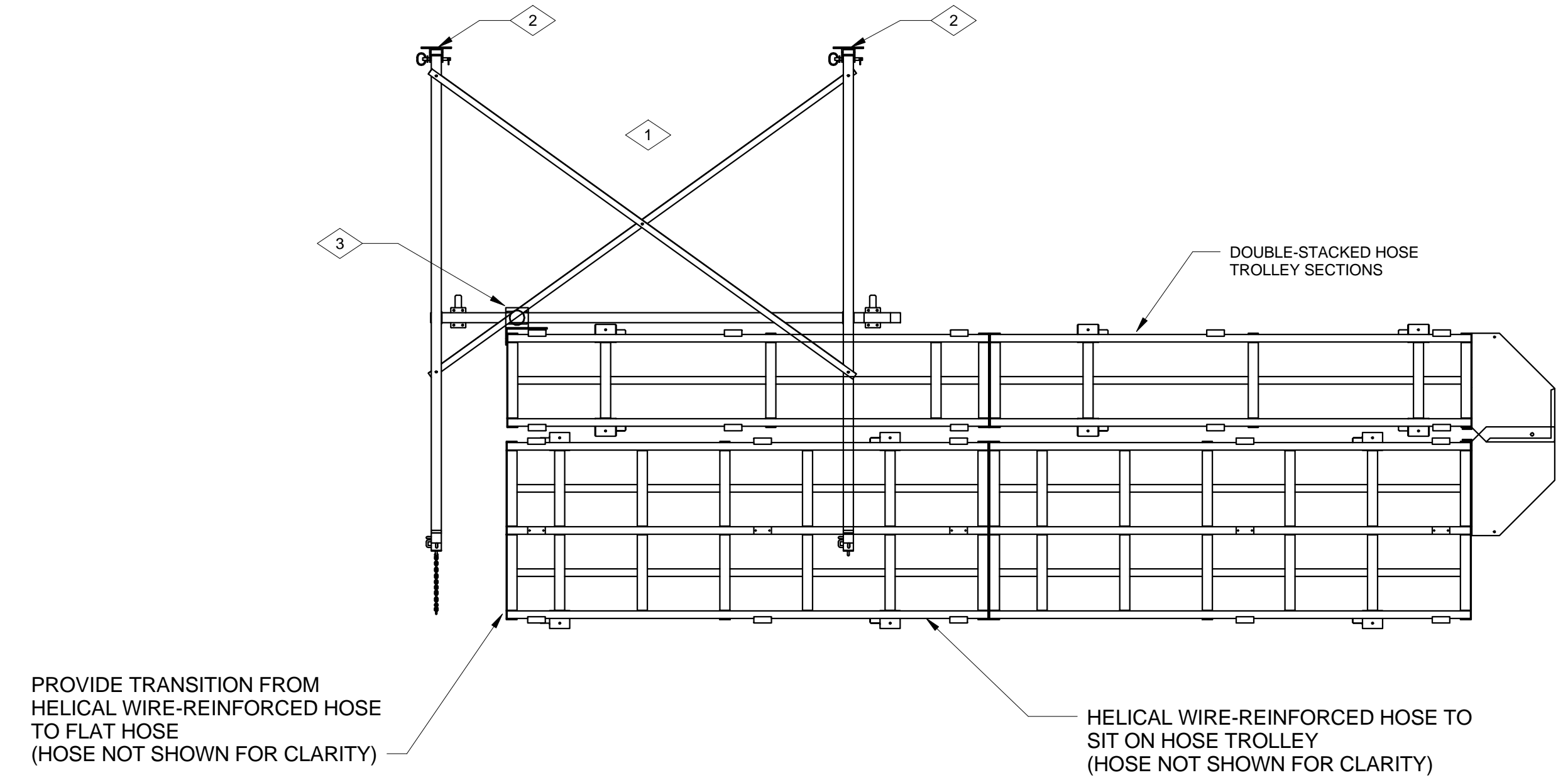
2 HOSE TROLLEY DETAIL PHOTO  
M6.01 NOT TO SCALE

KEYED NOTES:

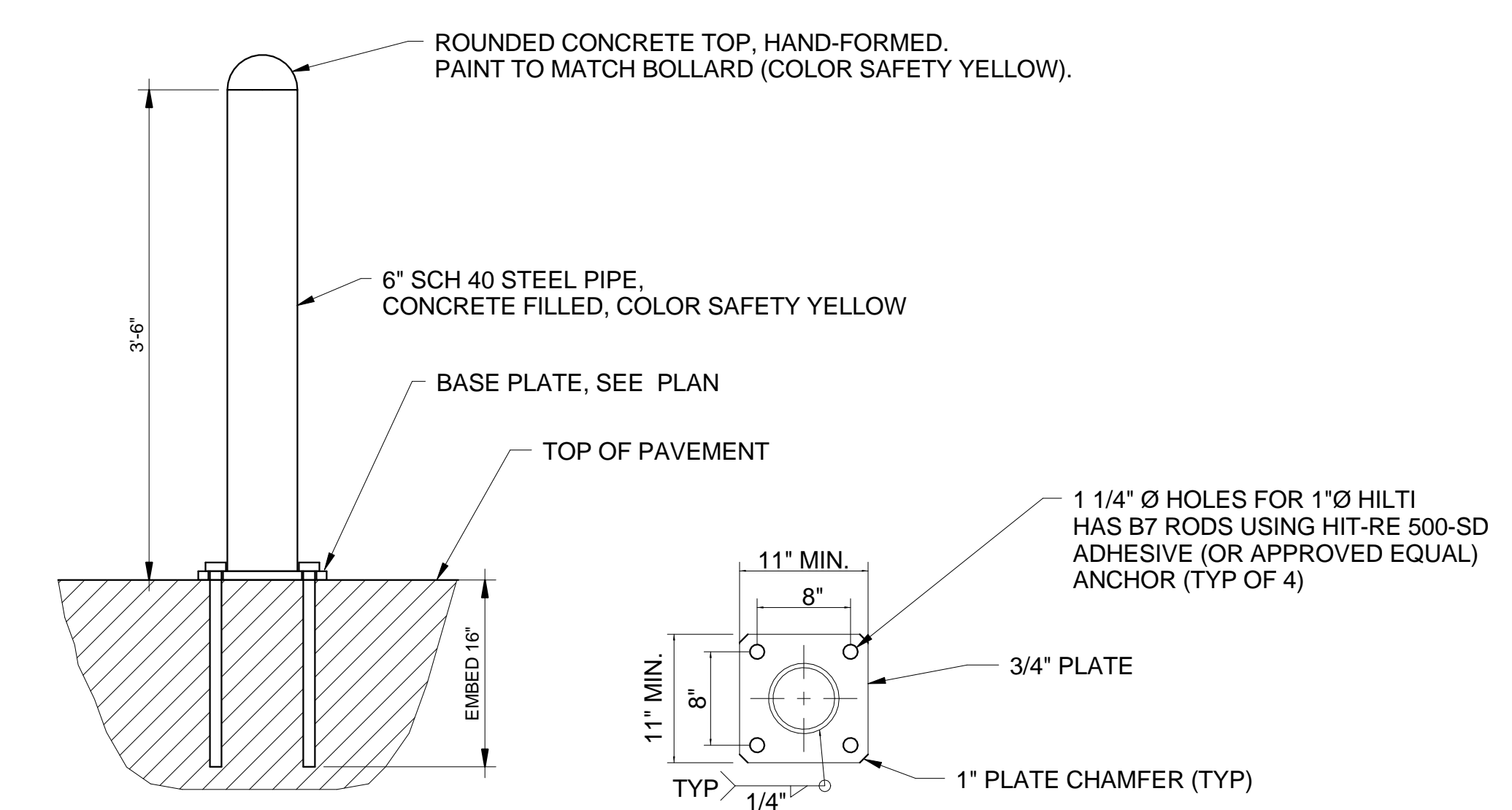
- 1 PROVIDE AND INSTALL CHAIN LINK FENCE AT GAP BETWEEN HOSE TROLLEY AND PBB CONNECTION TO PREVENT HOSE FROM INTERFERING WITH TIRES. THREAD FENCE THROUGH STEEL ROD BOLTED ACROSS HOSE TROLLEY FRAME AND SECURE FENCE TO FRAME WITH CLAMPS. SEE DETAIL 2 FOR PHOTO.
- 2 HOSE TROLLEY ATTACHMENT TO PBB.
- 3 HOSE TROLLEYS WILL BE PROVIDED TO THE SITE WITH HINGE POINT AND HOSE TROUGHS UNATTACHED. CONTRACTOR SHALL ATTACH IN THE FIELD AS FOLLOWS: LOCATION OF HINGE POINT (ADJUSTABLE) TO BE COORDINATED WITH UAL AND DIA OPERATIONS FOR EACH GATE TO ENSURE PROPER CLEARANCES ARE ACHIEVED FOR ALL RAMP SERVICING OPERATIONS. FOR EXAMPLE, ON GATES WHERE B757-200 IS IN THE FLEET MIX, THIS HINGE POINT MUST BE SHIFTED TOWARDS THE AIRCRAFT TO AVOID INTERFERENCE WITH THE LAVATORY TRUCK. CONTRACTOR SHALL DRILL HOLES INTO BOTTOM TUBE OF HOSE TROLLEY AS NEEDED TO LOCATE THE HINGE POINT APPROPRIATELY.



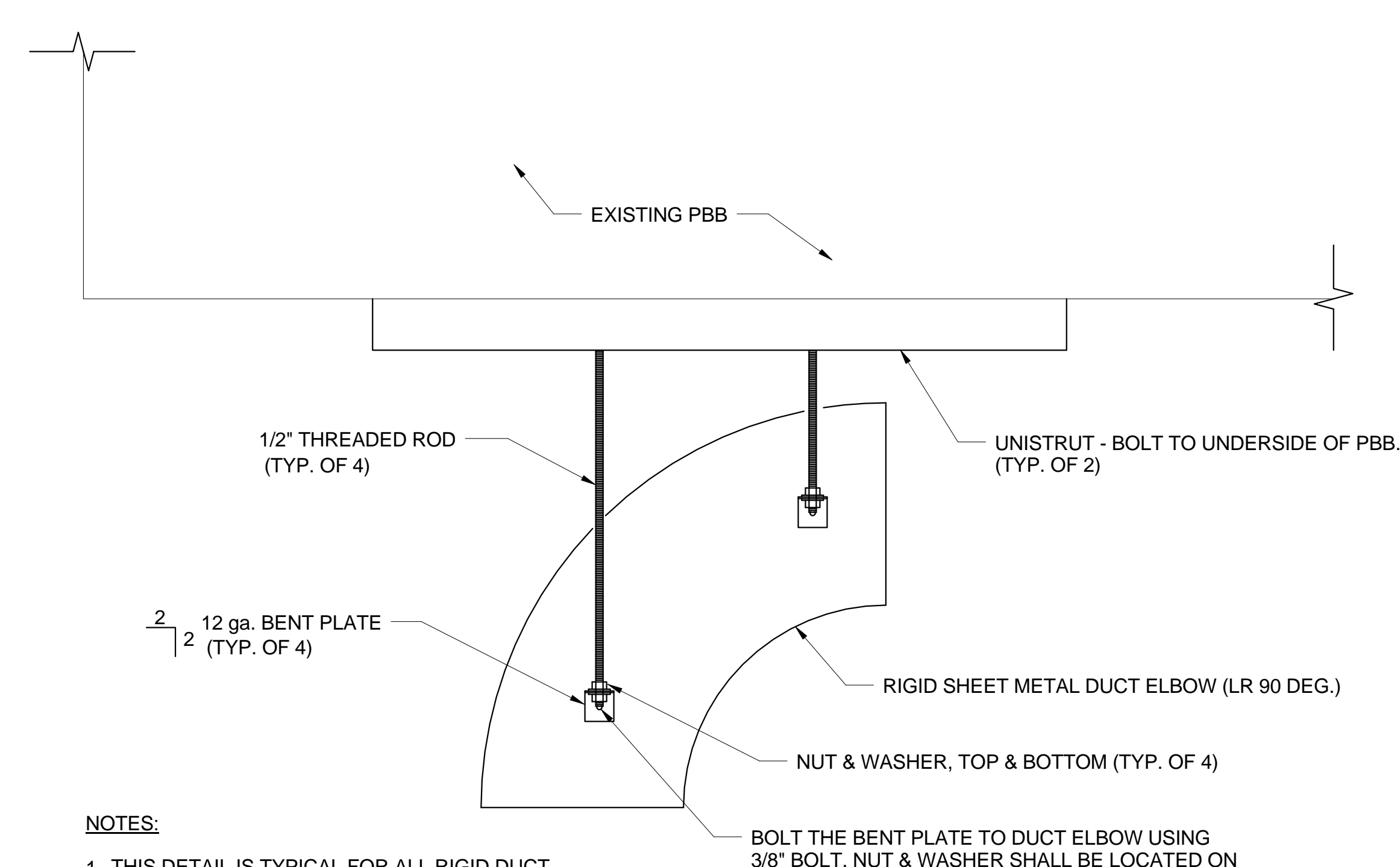
3 45 & 60 TON HOSE TROLLEY PLAN  
M6.01 NOT TO SCALE



4 90 TON HOSE TROLLEY PLAN  
M6.01 NOT TO SCALE



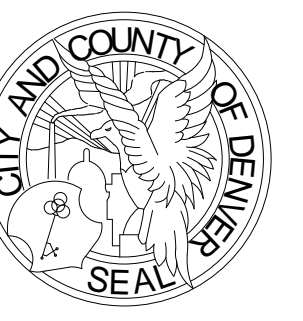
5 GUARD POST (BOLLARD) DETAIL  
M6.01/M6.01 1" = 1'-0"



NOTES:

1. THIS DETAIL IS TYPICAL FOR ALL RIGID DUCT ELBOWS (45 DEG & 90 DEG) INSTALLED ON THE UNDERSIDE OF THE PBBs.

6 RIGID DUCT ELBOW DETAIL  
M6.01/M6.01 NOT TO SCALE



DESIGNER OF RECORD  
BURNS & MCDONNELL  
975 MARSHON CIRCLE, SUITE 400  
CENTENNIAL, CO 80112

CONCOURSE B PCA EQUIPMENT  
REPLACEMENT

CONCOURSE B PCA UNIT REPLACEMENT SCHEDULE													
GATE NUMBER	GATE MAKE	GATE MODEL	GATE SERIAL #	MAX. AIRCRAFT SIZE	MIN. AIRCRAFT SIZE	DOOR SILL HEIGHT OF MIN. AIRCRAFT	EXISTING UNIT MODEL NO. (SIZE)	EXISTING UNIT INSTALLMENT DATE	NEW UNIT MODEL NO. (SIZE)	NEW UNIT WEIGHT (LBS.)	NEW PCA UNIT MOUNTING	INSTALLATION ORDER PREFERENCE	NOTES
B15	JETWAY	A3-60/119-125R	31147	A321	ENJ-145	4'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	BRIDGE	28	--
B16	JETWAY	A3-60/119-125R	31145	B757-3W	ERJ-145	4'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC060B (60 TONS)	4850	BRIDGE	15	--
B17	JETWAY	A3-60/119-125R	39857	A321	ENJ-145	4'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	BRIDGE	29	--
B18	JETWAY	A3-60/119-125R	31148	B757-3W	ERJ-145	4'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	BRIDGE	23	--
B20	JETWAY	A3-60/119-125R	31146	B757-3W	ERJ-145	4'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	BRIDGE	16	--
B21	STEARNS	A3-07-59/104	21591A07465	B757-3W	CRJ-700	5'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC060B (60 TONS)	4850	BRIDGE	24	--
B22	JETWAY	A3-60/119-125R	30876	B757-3W	E170	8'-11"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	BRIDGE	17	--
B23	JETWAY	A3-60/119-125R	30874	A320	E170	8'-11"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	BRIDGE	18	--
B24	JETWAY	A3-60/119-125R	39858	B757-3W	CRJ-700	5'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	BRIDGE	10	--
B25	JETWAY	A3-60/119-125R	30312	B757-2	CRJ-700	5'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	BRIDGE	19	--
B26	JETWAY	A3-60/119-125R	39861	B757-2	CRJ-700	5'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	BRIDGE	20	--
B27	JETWAY	A3-60/119-125R	30313	B757-2	CRJ-700	5'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	BRIDGE	25	--
B28	JETWAY	A3-60/119-125R	31190	B757-2	CRJ-700	5'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	BRIDGE	26	--
B29	JETWAY	A3-60/119-125R	39859	B757-2	CRJ-700	5'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	BRIDGE	11	--
B30/B32B	JETWAY	A3-60/119-125R	31380	B747-4	CRJ-700	5'-10"	GSAC060B (60 TONS)	2012	GSAC090B (90 TONS)	7950	BRIDGE	1	PRESERVE & RELOCATE EXISTING PCA UNIT TO B52
B31	JETWAY	A3-60/119-125R	39860	B737-9W	CRJ-700	5'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	STAND	27	--
B33	STEARNS	A07-59/104	21591A07471	B737-9W	CRJ-700	5'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	STAND	30	--
B34/B36B	JETWAY	A3-60/119-125R	30680	B787-9	CRJ-700	5'-10"	GSAC060B (60 TONS)	2012	GSAC090B (90 TONS)	7950	BRIDGE	2	PRESERVE & RELOCATE EXISTING PCA UNIT TO B53
B35	JETWAY	A3-60/119-125R	30875	B737-3W	B757-2W	--	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	STAND	31	--
B37	JETWAY	A3-60/119-125R	31381	B737-9W	CRJ-700	5'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	STAND	12	--
B38/B40B	JETWAY	A3-60/119-125R	31382	B747-4	B737-500	9'-1/8"-7"	GSAC060B (60 TONS)	2012	GSAC090B (90 TONS)	7950	BRIDGE	3	PRESERVE & RELOCATE EXISTING PCA UNIT TO B55
B41	JETWAY	A3-60/119-125R	31189	A320	CRJ-700	5'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC060B (60 TONS)	4850	BRIDGE	32	--
B42B	JETWAY	A07-59/104	21591A07469	B787-9	B737-500	9'-1/8"-7"	GSAC060B (60 TONS)	2012	GSAC090B (90 TONS)	7950	BRIDGE	4	PRESERVE & RELOCATE EXISTING PCA UNIT TO B57
B43	JETWAY	A3-64/131-125R	30432	B757-3W	B767-3	13'-7"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC060B (60 TONS)	4850	BRIDGE	33	--
B44	JETWAY	A3-68/141-125R	39862	A320	CRJ-700	5'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC060B (60 TONS)	4850	BRIDGE	13	--
B45	STEARNS	A09-61/110	21591A09488	B757-3W	CRJ-700	5'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	BRIDGE	21	--
B46	STEARNS	A11-63/116	21591A11479	B757-2	ENJ-145	4'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	BRIDGE	14	--
B47	STEARNS	A13-65/122	21591A	B757-3	CRJ-700	5'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	BRIDGE	22	--
B48	STEARNS	A07-59/104	21591A07457	A320	ENJ-145	4'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	STAND	34	--
B49	STEARNS	A07-59/104	21591A07454	B737-9W	CRJ-700	5'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	STAND	35	--
B50	STEARNS	A07-59/104	21591A07458	EMB120	E120	5'-2/4"-9"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	STAND	36	--
B51	JETWAY	A3-60/119-125R	30879	EMB170	ENJ-145	4'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	STAND	37	--
B52	STEARNS	A11-63/116	21591A11480	B737-9W	ENJ-145	4'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC060B (60 TONS)	4850	STAND	5	INSTALL PRESERVED PCA UNIT FROM B32B
B53	STEARNS	A11-63/116	21591A114821	B737-9W	ENJ-145	4'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC060B (60 TONS)	4850	STAND	6	INSTALL PRESERVED PCA UNIT FROM B36B
B54	STEARNS	A11-63/116	21591A11481	EMB170	ENJ-145	4'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	STAND	38	--
B55	STEARNS	A11-63/116	21591A11483	B737-9W	ENJ-145	4'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC060B (60 TONS)	4850	STAND	7	INSTALL PRESERVED PCA UNIT FROM B38B
B56	STEARNS	A13-65/122	21591A133497	B737-9W	ENJ-145	4'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC060B (60 TONS)	4850	STAND	8	--
B58	JETWAY	AT360/119-125R	31679	EMB170	ENJ-145	4'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC045B (45 TONS)	4500	STAND	39	--
B60	JETWAY	A3-58/110	35791	B737-9W	ENJ-145	4'-10"	DXU-102 (20 TONS)	ORIGINAL CONSTRUCTION	GSAC060B (60 TONS)	4850	STAND	9	INSTALL PRESERVED PCA UNIT FROM B42B

PCA UNIT EQUIPMENT SCHEDULE			
PCA UNIT	45 TON	60 TON	90 TON
LENGTH (IN)	114	114	150
WIDTH (IN)	87.75	87.75	87.75
HEIGHT (IN)	59	59	62
WEIGHT (LBS)	4500	4850	7950
REFRIGERANT	R-410A	R-410A	R-410A
POWER VOLTAGE/HERTZ/PHASE	480/60/3	480/60/3	480/60/3
RATED AMPS	150	200	300
COMPRESSORS, SCROLL @ 60 HZ RATING	15, 15, 15 TON	20, 20, 20 TON	25, 25, (2)20 TON
BLOWER HP	25	40	60
DESIGN AIRFLOW (LB/MIN)	275	325	500
STATIC AT AIRCRAFT (IN W.C.)	25	30	35
COOLING DISCHARGE TEMPERATURE (°F)	32-38	32-38	32-38
HEATING DISCHARGE TEMPERATURE (°F)	100-160	100-160	100-160
DESIGN AMBIENT COOLING	100°F DB/76°F WB	100°F DB/76°F WB	100°F DB/76°F WB
DESIGN AMBIENT HEATING	-10°F/50% RH	-10°F/50% RH	-10°F/50% RH
OUTLET DUCTS (14 IN. DIAMETER)	1	1	2
NOTES	1	1	1
NOTES:	1. BLOWERS SHALL BE CORRECTED FOR SITE ALTITUDE OF 5,400 FT.		

**NOTES:**

- REFER TO SPECIFICATIONS "SECTION 01010 - SUMMARY OF WORK" FOR THE DESCRIPTION OF WORK TO BE INCLUDED FOR THE PCA INSTALLATION AT EACH GATE.
- GATES B57, B59, B61, B63, B67, B69, B71, B73, B75, B77, B79 DO NOT UTILIZE PRECONDITIONED AIR UNITS.
- GATES B19, B39, B80, B81, B82, B83, B84, B85, B86, B87, B88, B89, B90, B91, B92, B93, B94 UTILIZE PRECONDITIONED AIR UNITS, BUT THE UNITS ARE NOT BEING REPLACED.
- ALL UNITS SHALL BE PROVIDED WITH APPROPRIATE MOUNTING ASSEMBLIES FROM THE UNIT MANUFACTURER TO ALLOW FOR MOUNTING AS DETAILED ON THE DRAWINGS.
- UNIT SHALL BE PROVIDED WITH FLEX DUCT (HOSE), HOSE TROLLEY, CABIN TEMPERATURE PROBE, AIRCRAFT ADAPTER NOZZLE AND PUSH BUTTON CONTROLLER. SEE SPEC SECTIONS 15474 & 15475 FOR DETAILS.
- MODEL NUMBERS SHOWN ON SCHEDULE FOR NEW PCA UNITS ARE FROM TWIST INC/FCX SYSTEMS.

**DESIGN CRITERIA FOR NEW UNITS:**

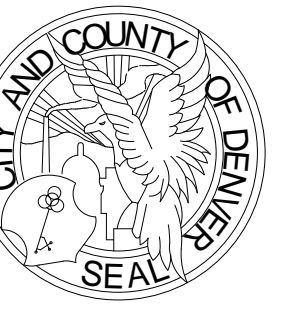
- OUTDOOR DESIGN TEMPERATURES:
  - A. SUMMER:  
92°F DRY BULB / 59°F WET BULB  
96°F DRY BULB / 63°F WET BULB - AIR COOLED CONDENSING TEMPERATURE
  - B. WINTER:  
-5°F DRY BULB
- WHEN OPERATING IN THE COOLING MODE AT DESIGN AMBIENT CONDITIONS AND AT THE NOMINAL AIRFLOW RATES, THE UNIT SHALL DELIVER 34°F (1°C) AIR AT THE UNIT. WHEN OPERATING IN THE HEATING MODE THE UNIT SHALL DELIVER AIR TEMPERATURES BETWEEN 100°F (38°C) AND 150°F (66°C) AT THE UNIT.
- THE UNIT SHALL BE CAPABLE OF OPERATING AT INCREASED AIRFLOW RATES WITH A COINCIDENT DECREASE IN STATIC PRESSURE. THE UNIT SHALL BE CAPABLE OF DELIVERING UP TO 15% GREATER AIRFLOW WITH A CONCOMITANT INCREASE IN COOLING DUTY SUPPLY AIR TEMPERATURE OF APPROXIMATELY 5°F.
- BLOWERS MUST BE ADJUSTED FOR SITE ALTITUDE OF 5,400 FT.
- STAND MOUNTED UNIT DESIGN SHALL ACCOUNT FOR AN ADDITIONAL 2 INCHES OF STATIC PRESSURE DUE TO TELESCOPING DUCT.



ISSUE RECORD				
NO.	BY	PURPOSE	DATE	CHKD
TO	DATE	IFC	20/01/14	20/

SCALE: NONE  
DATE: 03/28/14  
DRAWN BY: B. KYSTER  
CHECKED BY: A. MAHOBIAN  
FAA AIP NO:  
WORK BREAKDOWN NO:  
DESIGN CONTRACT NO: CE-03024-05  
CONST. CONTRACT NO:  
VOLUME NO: 01  
SHEET TITLE: MECHANICAL SCHEDULES  
SHEET NO: M7.01





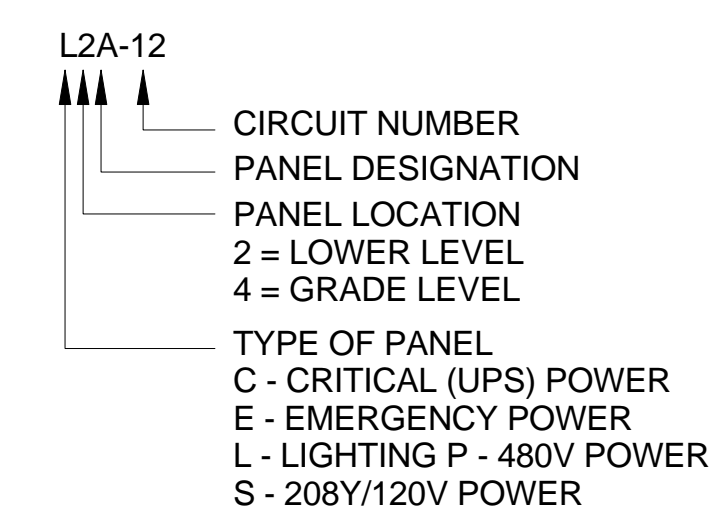
**POWER SYMBOLS**

	PUSH BUTTON
	JUNCTION BOX
	DISCONNECT SWITCH
	CONDUIT/WIRING DOWN
	CONDUIT/WIRING UP
	WIRE/CONDUIT CONTINUATION
	MOTOR
	SURFACE MOUNTED POWER PANEL BOARD
	KEYED NOTE SYMBOL
	DUPLEX RECEPTACLE, NEMA 5-20R 18" AFF UON
	DISCONNECT SWITCH, SURFACE MOUNTED
	COMBINATION MOTOR STARTER
	CONDUIT AND WIRING RUN, ARROWHEAD DENOTES HOMERUN. ALL POWER CONDUITS SHALL HAVE A GREEN EQUIPMENT GROUNDING CONDUCTOR.
	CONDUIT AND WIRING RUN EXPOSED, ARROWHEAD DENOTES HOMERUN. ALL POWER CONDUITS SHALL HAVE A GREEN EQUIPMENT GROUNDING CONDUCTOR.

**ONE LINE/RISER SYMBOLS**

	POWER TRANSFORMER
	POTENTIAL TRANSFORMER
	CURRENT TRANSFORMER
	CURRENT TRANSFORMER - ZERO SEQUENCE
	120V CONTROL TRANSFORMER
	GROUNDING CONNECTION
	GROUNDING WYE WINDING CONNECTION
	DELTA WINDING CONNECTION
	RELAY CONTACTS - OPEN
	RELAY CONTACTS - CLOSED
	SEPARABLE CONNECTOR
	CONDUCTOR CONNECTION
	CIRCUIT BREAKER
	NON-FUSED DISCONNECT SWITCH
	FUSE
	CAPACITOR
	MEDIUM OR HIGH VOLTAGE DRAW - OUT CIRCUIT BREAKER
	MOTOR THERMAL OVERLOAD PROTECTOR
	PROGRAMMABLE MOTOR PANEL
	GROUNDING TERMINAL
	CONTACTOR COIL
	SOLID STATE REDUCED VOLTAGE MOTOR CONTROLLER
	START PUSHBUTTON
	STOP PUSHBUTTON
	HAND-AUTO PUSHBUTTON
	2 SPEED PUSHBUTTON

**EXPLANATION OF CIRCUIT DESIGNATIONS**



**ELECTRICAL ABBREVIATIONS**

A	AMPERE	LP	LIGHTNING PROTECTION, LAN PRINTER
AF	AMPERE FRAME	LT	LIGHT
AFB	ABOVE FINISHED FLOOR	LTG	LIGHTING
AFG	ABOVE FINISHED GRADE		
AIC	AMPERE INTERRUPTING CAPACITY (RMS SYMMETRICAL)	MAX	MAXIMUM
APPROX	APPROXIMATELY	MCA	MINIMUM CIRCUIT AMPACITY
AS	AMPERE SWITCH	MCB	MAIN CIRCUIT BREAKER
AT	AMPERE TRIP	MCC	MOTOR CONTROL CENTER
ATS	AUTOMATIC TRANSFER SWITCH	MCP	BRIDGE POWER DISTRIBUTION PANEL
		MDP	MAIN DISTRIBUTION PANELBOARD
BC	BARE COPPER	MDS	MAIN DISTRIBUTION SWITCHBOARD
BKBD	BACKBOARD	MECH	MECHANICAL
BKR	BREAKER	MH	MANHOLE, METAL HALIDE
BLDG	BUILDING	MIN	MINIMUM
		MLO	MAIN LUGS ONLY
C	CONDUIT	MOC	MAXIMUM OVERCURRENT PROTECTION
CB	CIRCUIT BREAKER	MT	MOUNT
CCTV	CLOSED CIRCUIT TELEVISION	MTD	MOUNTED
CIRC	CIRCULAR, CIRCUIT	MTG	MOUNTING
CKT	CIRCUIT	MTS	MANUAL TRANSFER SWITCH
CL	CENTERLINE		
CLG	CEILING	NC	NORMALLY CLOSED
CO	CONDUIT ONLY	NEC	NATIONAL ELECTRICAL CODE
COMM	COMMUNICATIONS	NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
CONC	CONCRETE	NIC	NOT IN CONTRACT
CONT	CONTINUED	NL	NIGHT LIGHT
CONTR	CONTROL	NO	NORMALLY OPEN
CR	CARD READER	NTS	NOT TO SCALE
CT	CURRENT TRANSFORMER	OC	ON CENTER
CU	COPPER	OH	OVERHEAD
CWL	DOMESTIC COLD WATER LINE		
		PA	PUBLIC ADDRESS
DDC	DIRECT DIGITAL CONTROL	PB	PULLBOX
DET	DETAIL	PCA	PRECONDITIONED AIR
DIA	DIAMETER	PNL	PANEL
DISC	DISCONNECT	PP	POWER PACK
DIST	DISTRIBUTION	PR	PASSIVE INFRARED
DTC	DATA TERMINAL CABINET	PT	POTENTIAL TRANSFORMER
DVR	DIGITAL VIDEO RECORDER	PTZF	PAN TILT ZOOM FOCUS
DWG	DRAWING	PVC	POLYVINYL CHLORIDE
DWP	DEPARTMENT OF WATER AND POWER		
		REC	RECEPTACLE
E, EXIST	EXISTING	RECD	REQUIRED
E/G	EMERGENCY GENERATOR	RGS	RIDGID GALVANIZED STEEL
EES	EARTH ELECTRODE SYSTEM	RM	ROOM
ELEC	ELECTRICAL		
EMH	ELECTRICAL MANHOLE	SCE	SOUTHERN CALIFORNIA EDISON
EPO	EMERGENCY POWER OFF	SCHED, SCH	SCHEDULE
EPU	EMERGENCY POWER UNIT	SHD	SHIELDED
EQUIP	EQUIPMENT	SHT	SHEET
		SMFO	SINGLE MODE FIBER OPTIC CABLE
FA	FIRE ALARM	SRG	SIGNAL REFERENCE GRID
FACP	FIRE ALARM CONTROL PANEL	SW	SWITCH
FL, FLR	FLOOR	SWBD	SWITCHBOARD
FLA	FULL LOAD AMPS	SWGR	SWITCHGEAR
FLUOR	FLUORESCENT	SYM	SYMMETRICAL, SYMBOL
FO	FIBER OPTIC		
FOT	FIELD OPERATIONAL TEST	TB	TELEPHONE BACKBOARD
FT	FEET	TBD	TO BE DETERMINED
		TC	TERMINAL CABINET
GFCI	GOVERNMENT FURNISHED, CONTRACTOR INSTALLED	TEL, T	TELEPHONE
GND	GROUND	TMC	TRANSPORTATION MANAGEMENT CENTER
GRN	GREEN	TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION
		TYP	TYPICAL
HH	HANDHOLE		
HID	HIGH INTENSITY DISCHARGE	UG, U/G	UNDERGROUND
HPF	HIGH POWER FACTOR	UON	UNLESS OTHERWISE NOTED
HPS	HIGH PRESSURE SODIUM	UPS	UNINTERRUPTABLE POWER SUPPLY
HT	HEIGHT		
HV	HIGH VOLTAGE	V	VOLT, VOLTAGE
HZ	HERTZ	VFD	VARIABLE FREQUENCY DRIVE
IC	INTERCOM	W	WATT
IG	ISOLATED GROUND	W/	WITH
IN	INCHES	WP	WEATHERPROOF
INCAND	INCANDESCENT		
		XFMR	TRANSFORMER
J-BOX	JUNCTION BOX	XP	EXPLOSION PROOF
KA	KILO AMPERE		
kamil	THOUSAND CIRCULAR MILS		
KVA	KILOVOLT AMPERE		
KW	KILOWATT		
KWH	KILOWATT-HOUR		
L	LAN		
LAN	LOCAL AREA NETWORK		
LC	LIGHTING CONTROL		

**CONCOURSE B PCA EQUIPMENT REPLACEMENT**



NO.	BY	PURPOSE	DATE	CHKD

SCALE: NONE

DATE: 03/28/14

DRAWN BY: A. SCHNECKLOTH

CHECKED BY: M. MCNUITT

FAA AIP NO:

WORK BREAKDOWN NO:

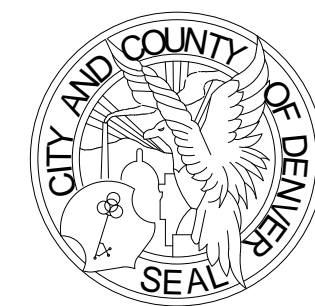
DESIGN CONTRACT NO. CE-03024-05

CONST. CONTRACT NO.

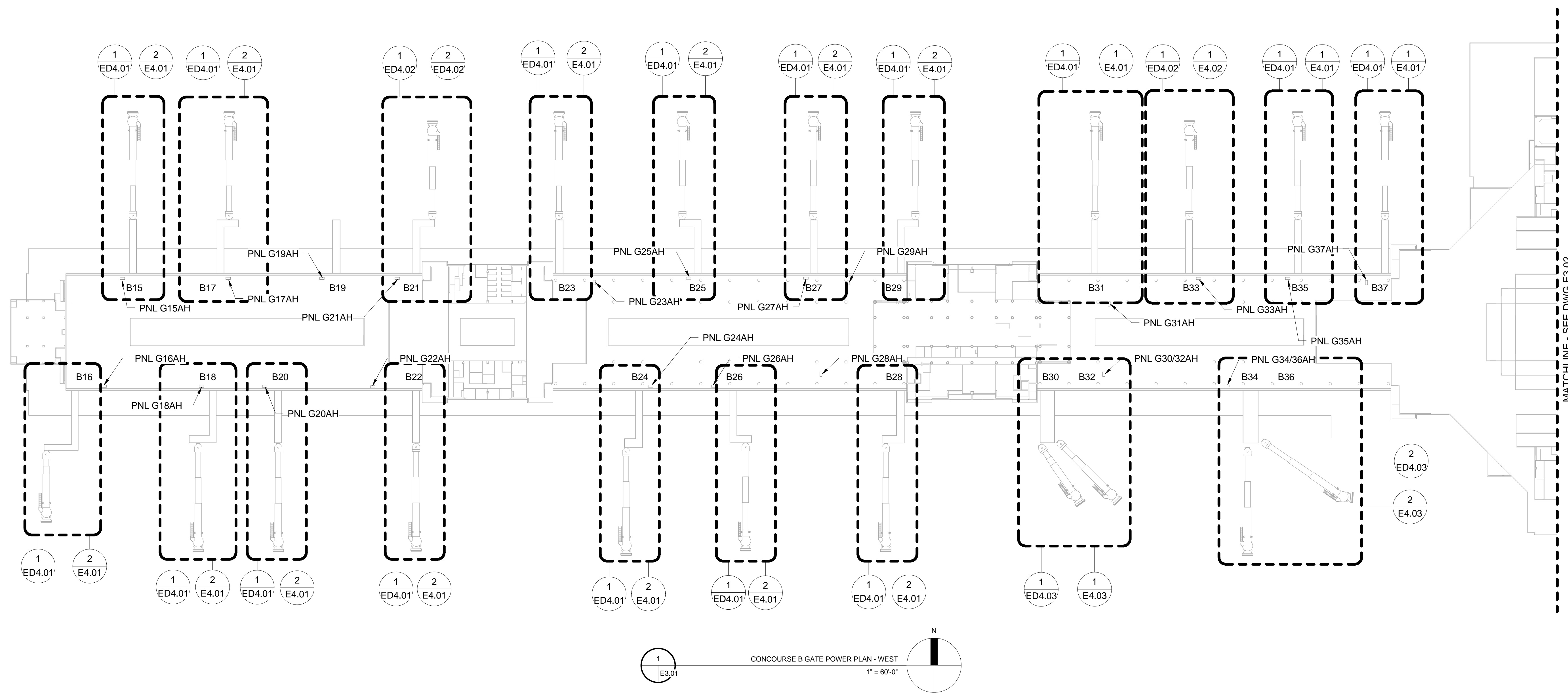
VOLUME NO. 01

SHEET TITLE  
**ELECTRICAL LEGEND**

SHEET NO.  
E0.01



# CONCOURSE B PCA EQUIPMENT REPLACEMENT



ISSUE RECORD				
NO.	BY	PURPOSE	DATE	CKD

SCALE: 1" = 60'-0"

DATE: 03/26/14

DRAWN BY: A. SCHNECKLOTH

CHECKED BY: M. MCNUITT

FAA AIP NO:

WORK BREAKDOWN NO:

DESIGN CONTRACT NO: CE-03024-05

CONST. CONTRACT NO:

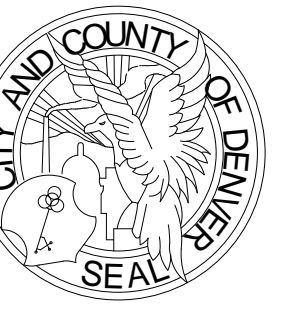
VOLUME NO: 01

SHEET TITLE  
CONCOURSE B  
GATE POWER PLAN  
WEST

SHEET NO:  
E3.01







# CONCOURSE B PCA EQUIPMENT REPLACEMENT



ISSUE RECORD				
NO.	BY	PURPOSE	DATE	CHKD
1	MM	IFC	20/1/14	SDK

SCALE: As indicated

DATE: 03/28/14

DRAWN BY: A. SCHNECKLOTH

CHECKED BY: M. MCNUITT

FAA AIP NO:

WORK BREAKDOWN NO:

DESIGN CONTRACT NO. CE-03024-05

CONST. CONTRACT NO.

VOLUME NO. 01

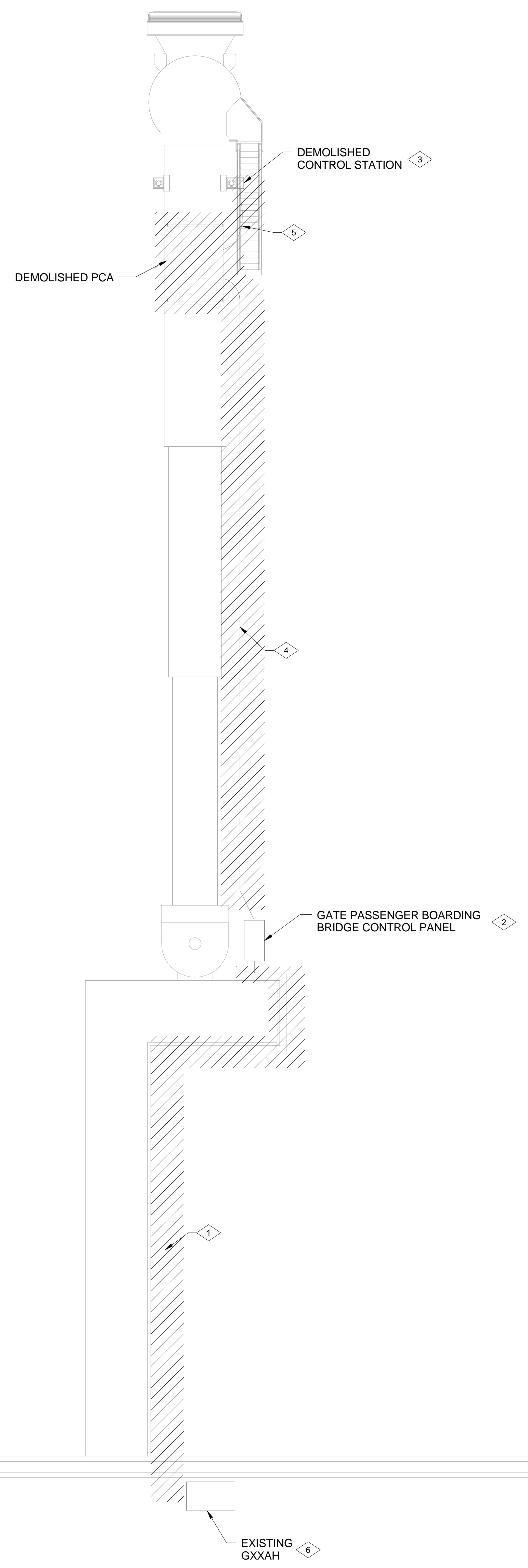
SHEET TITLE

ELECTRICAL  
ENLARGED DEMO  
PLAN 1

SHEET NO.  
ED4.01



2 TYPICAL GATE PASSENGER BOARDING BRIDGE CONTROL PANEL  
ED4.01 NOT TO SCALE



1 ENLARGED PLAN - TYPICAL PCA DEMO WITH MCP  
E3.01 ED4.01 1/8" = 1'-0"

**NOTES:**

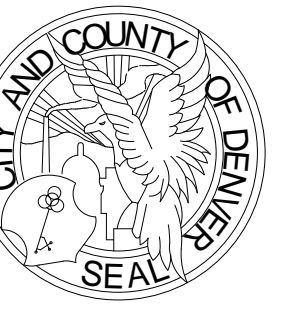
- REFER TO DRAWINGS E3.01 AND E3.02 FOR OVERALL GATE LAYOUT LOCATIONS.

**KEYED NOTES:**

- DEMOLISH EXISTING CABLE AND CONDUIT FROM GXXAH FEEDING THE GATE'S PASSENGER BOARDING BRIDGE CONTROL PANEL FOR THE PCA.
- REMOVE THE EXISTING CIRCUIT BREAKER IN THE GATE'S MCP THAT SUPPLIES THE DEMOLISHED PCA. REFER TO PICTURE ON THIS DRAWING FOR EXACT CIRCUIT BREAKER. CIRCUIT BREAKER SHALL BE GIVEN TO THE OWNER.
- REMOVE EXISTING CONTROL STATION INCLUDING CABLE AND MOUNTING HARDWARE. CONTROL STATION SHALL BE GIVEN TO OWNER AFTER DEMOLISHING.
- ABANDON IN PLACE EXISTING CABLE FROM GATE'S MCP TO THE PCA IN CABLE CARRY CADDY.
- DEMOLISH EXISTING CABLE FROM PCA TO THE CONTROL STATION.
- EXISTING CIRCUIT BREAKER IN GXXAH SHALL BECOME A SPARE CIRCUIT BREAKER. PROVIDE UPDATED TYPICAL PANELBOARD SCHEDULE TO REFLECT NEW SPARE CIRCUIT BREAKER. REFER TO DRAWING E6.03 FOR PANELBOARD SCHEDULE.







CONCOURSE B PCA EQUIPMENT  
REPLACEMENT



NO.	BY	PURPOSE	DATE	CHKD
1	MM	IFC	20/14	SDK

SCALE: 1/8" = 1'-0"

DATE: 03/26/14

DRAWN BY: A. SCHNECKLOTH

CHECKED BY: M. MCNUITT

FAA AIP NO.:

WORK BREAKDOWN NO.:

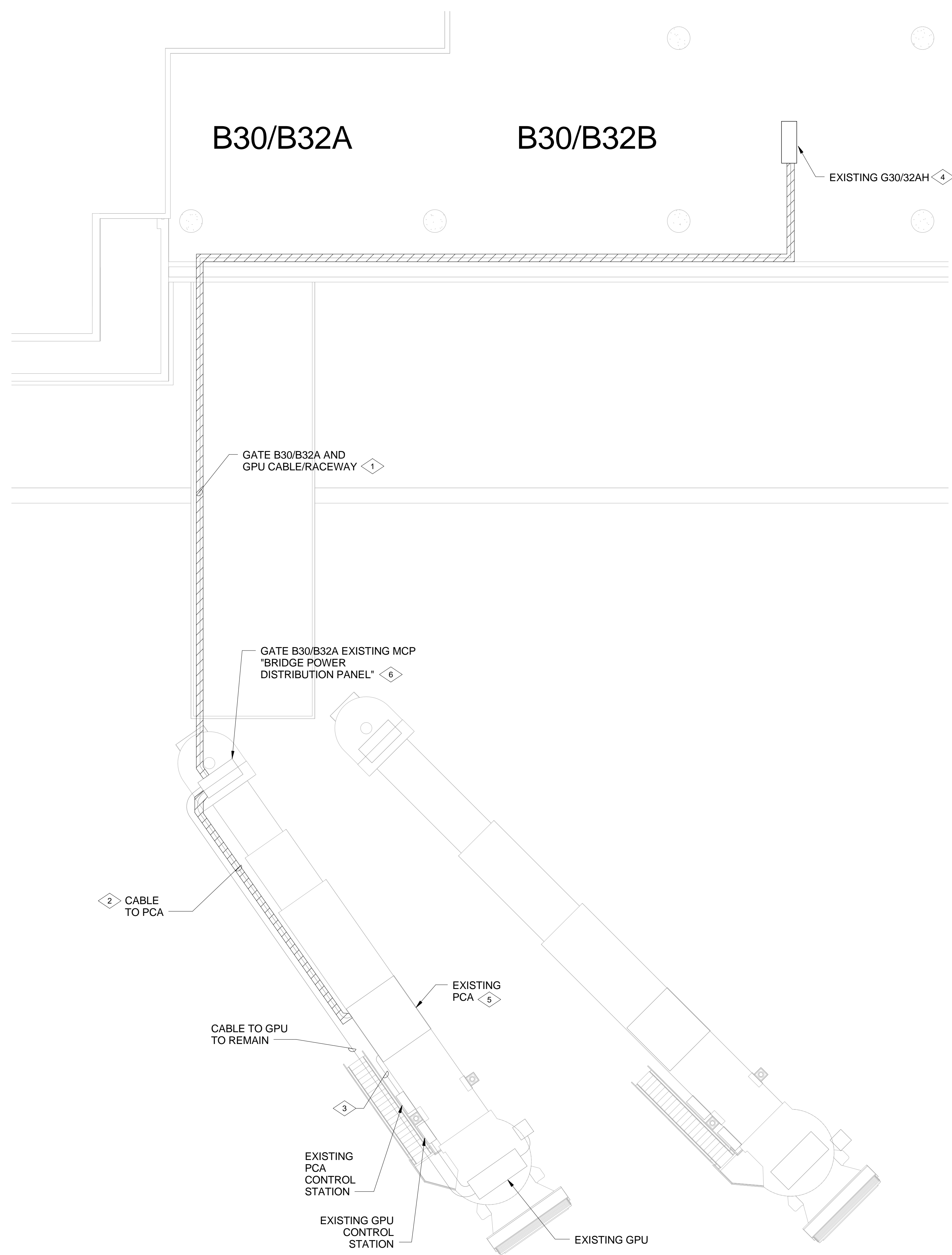
DESIGN CONTRACT NO.:

CONST. CONTRACT NO.:

VOLUME NO.:

SHEET TITLE  
ENLARGED ELEC.  
DEMO GATES  
B30/32, B34/36

SHEET NO.  
ED4.03

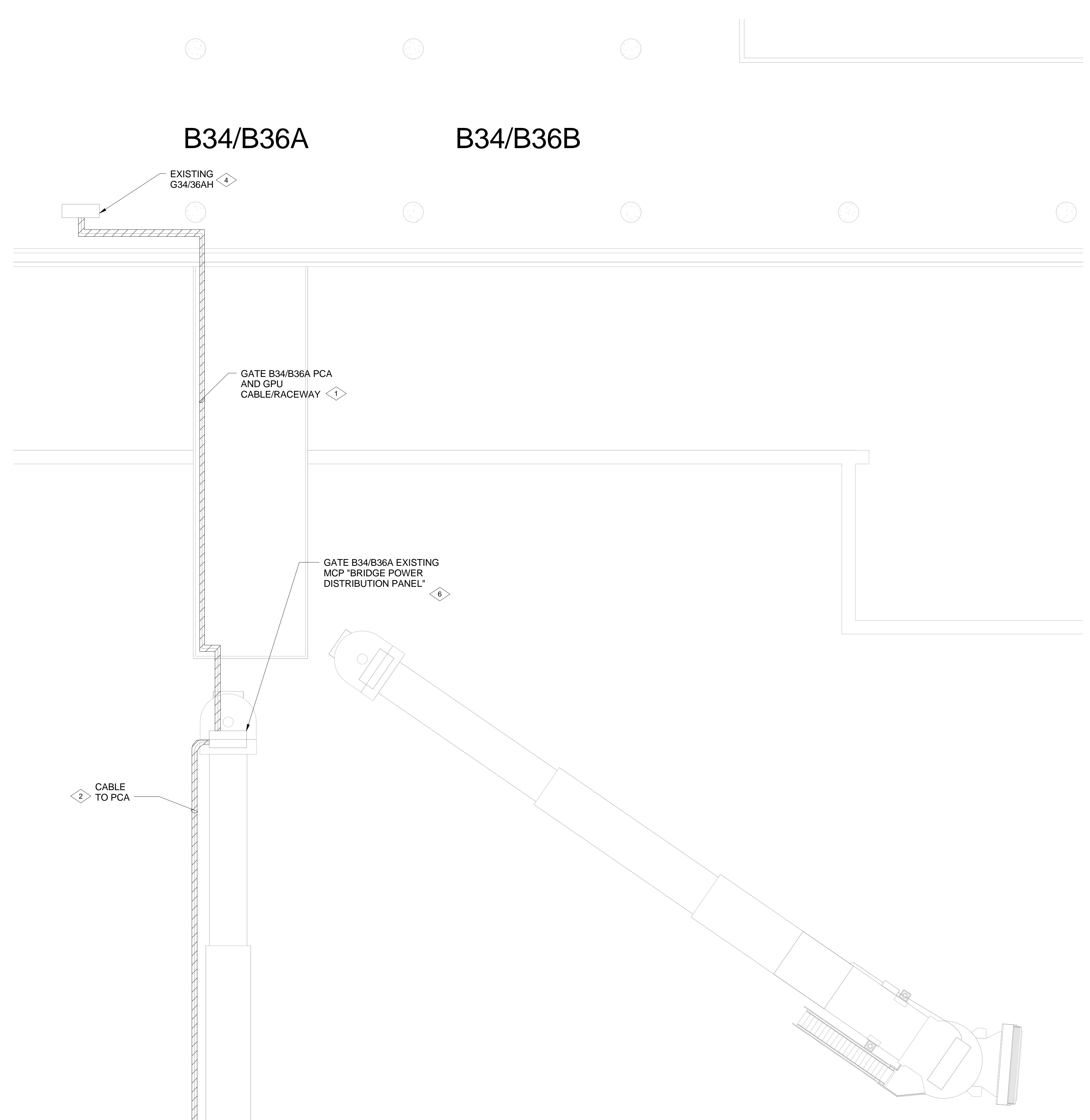


KEYED NOTES:

- 1 DEMOLISH WIRE BETWEEN G30/32AH AND MCP FEEDING EXISTING PCA UNIT. RACEWAY TO REMAIN. WIRE FEEDING GPU TO REMAIN.
- 2 DEMOLISH WIRE BETWEEN MCP AND PCA UNIT.
- 3 DISCONNECT AND REMOVE PCA CONTROL CABLES. CABLES SHALL BE REUSED ON NEW 90 TON PCA UNIT.
- 4 EXISTING 200A, 3P CIRCUIT BREAKER LOCATED ON POLES 14, 16, AND 18 SHALL BECOME A SPARE. LABEL ACCORDINGLY.
- 5 DISCONNECT ALL POWER AND CONTROL ASSOCIATED WITH PCA UNIT. PCA TO BE RELOCATED TO GATE B52. REFER TO E4.06 FOR RELOCATION.
- 6 DISCONNECT AND REMOVE EXISTING CIRCUIT BREAKER FEEDING PCA UNIT. RETURN TO OWNER.

NOTES:

- 1. REFER TO DRAWING E6.01 FOR ALL CABLE AND CONDUIT SIZE AND AIC RATINGS.
- 2. REFER TO DRAWINGS E3.01 AND E3.02 FOR OVERALL GATE LAYOUT LOCATIONS.
- 3. BOTH GATES SHALL REMAIN INOPERABLE DURING CONSTRUCTION. EXISTING GATE POWER PANEL FEEDS EQUIPMENT IN BOTH GATES.



KEYED NOTES:

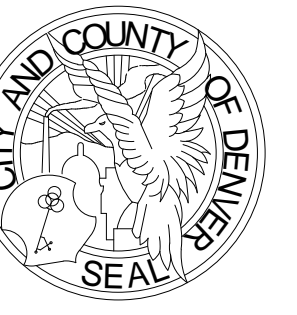
- 1 DEMOLISH WIRE BETWEEN G34/36AH AND MCP PCA UNIT. RACEWAY TO REMAIN. WIRE FEEDING GPU TO REMAIN.
- 2 DEMOLISH WIRE BETWEEN MCP & PCA UNIT.
- 3 DISCONNECT AND REMOVE PCA CONTROL CABLES. CABLES SHALL BE REUSED ON NEW 90 TON PCA UNIT.
- 4 EXISTING 200A, 3P CIRCUIT BREAKER LOCATED ON POLES 14, 16 AND 18 SHALL BECOME A SPARE. LABEL ACCORDINGLY.
- 5 DISCONNECT ALL POWER AND CONTROL ASSOCIATED WITH PCA UNIT. PCA TO BE RELOCATED TO GATE B53. REFER TO E4.05 FOR RELOCATION.
- 6 DISCONNECT AND REMOVE EXISTING CIRCUIT BREAKER FEEDING PCA UNIT. RETURN TO OWNER.











**CONCOURSE B PCA EQUIPMENT  
REPLACEMENT**



ISSUE RECORD				
NO.	BY	PURPOSE	DATE	CHKD
1	MEM	IFC	20/11/14	SDK

SCALE: 1/8" = 1'-0"

DATE: 03/28/14

DRAWN BY: A. SCHNECKLOTH

CHECKED BY: M. MCNUITT

FAA AIP NO:

WORK BREAKDOWN NO:

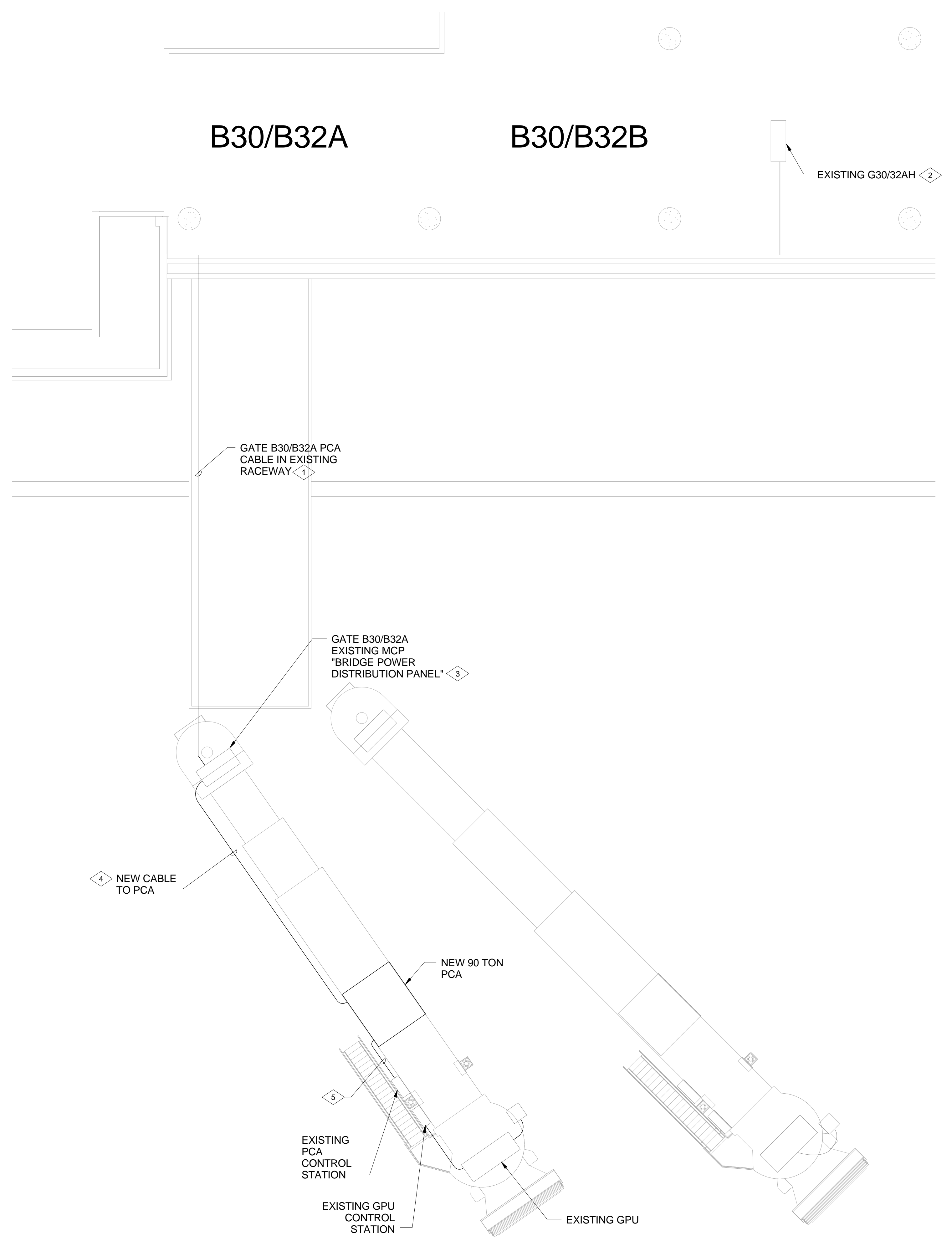
DESIGN CONTRACT NO:

CONST. CONTRACT NO:

VOLUME NO:

SHEET TITLE  
**ENLARGED ELEC.  
GATES B30/32 AND  
B34/36**

SHEET NO.  
**E4.03**

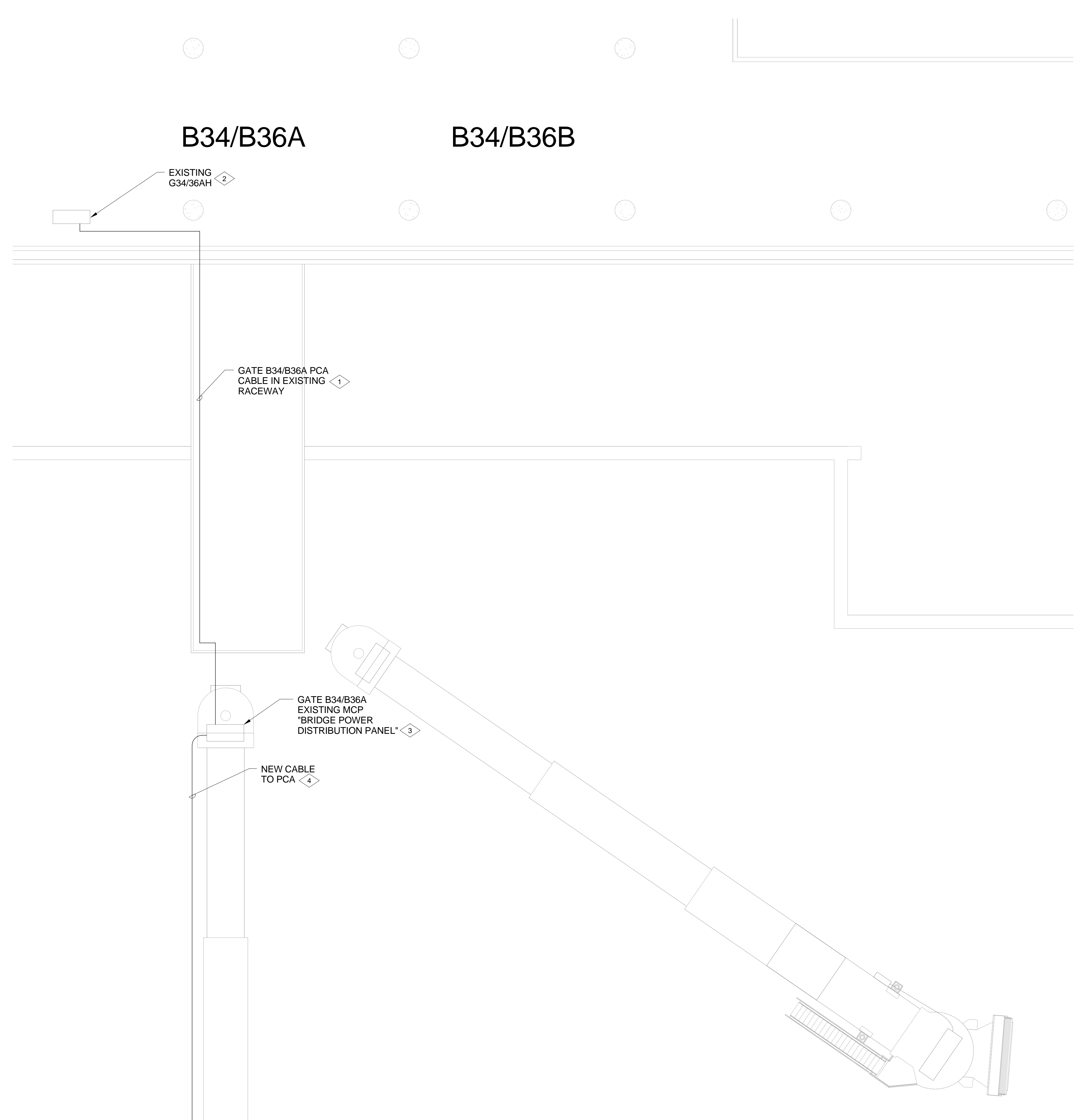


**KEYED NOTES:**

- 1 PROVIDE AND INSTALL NEW WIRE FOR PCA ACCORDING TO EQUIPMENT SCHEDULE ON DRAWING E6.01. VERIFY EXISTING RACEWAY HAS AVAILABLE CAPACITY FOR NEW CABLE.
- 2 PROVIDE AND INSTALL CIRCUIT BREAKER IN EXISTING G30/32AH, PER PANELBOARD SCHEDULE ON DRAWING E6.04.
- 3 PROVIDE AND INSTALL NEW CIRCUIT BREAKER PER EQUIPMENT SCHEDULE ON DRAWING E6.01 IN EXISTING MCP LOCATED UNDER PASSENGER BRIDGE.
- 4 PROVIDE AND INSTALL NEW JETWAY RATED CABLE TYPE "W" ROUTED ON SIDE OF PASSENGER BRIDGE IN NEW PANTOGRAPH OR "DOG LEG" RACEWAY PROVIDED BY OWNER AND INSTALLED BY CONTRACTOR. VERIFY EXISTING BRIDGE WILL SUPPORT NEW CABLES FOR THE PCA. REFER TO EQUIPMENT SCHEDULE ON E6.01 FOR CABLE SIZE.
- 5 INSTALL/RECONNECT EXISTING JETWAY RATED CONTROL CABLE FROM PCA TO CONTROL STATION. PROVIDED SUFFICIENT SLACK IN CABLE AND SUPPORT CABLE ACCORDINGLY.

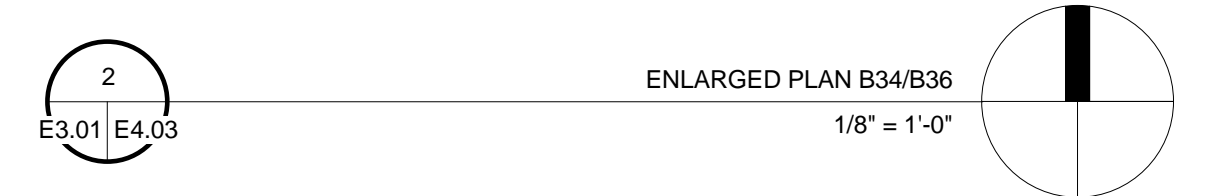
**NOTES:**

- 1. REFER TO DRAWING E6.01 FOR ALL CABLE AND CONDUIT SIZE AND AIC RATINGS.
- 2. REFER TO DRAWINGS E3.01 AND E3.02 FOR OVERALL GATE LAYOUT LOCATIONS.
- 3. BOTH GATES SHALL REMAIN INOPERABLE DURING CONSTRUCTION. EXISTING GATE POWER PANEL FEEDS EQUIPMENT ON BOTH GATES.

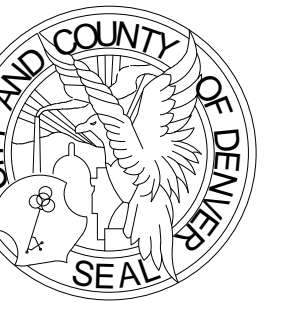


**KEYED NOTES:**

- 1 PROVIDE AND INSTALL NEW WIRE FOR PCA ACCORDING TO EQUIPMENT SCHEDULE ON DRAWING E6.01. VERIFY EXISTING RACEWAY HAS AVAILABLE CAPACITY FOR NEW CABLE.
- 2 PROVIDE AND INSTALL CIRCUIT BREAKER IN EXISTING G34/36AH, PER PANELBOARD SCHEDULE ON DRAWING E6.04.
- 3 PROVIDE AND INSTALL NEW CIRCUIT BREAKER PER EQUIPMENT SCHEDULE ON DRAWING E6.01 IN EXISTING MCP LOCATED UNDER PASSENGER BRIDGE.
- 4 PROVIDE AND INSTALL NEW JETWAY RATED CABLE TYPE "W" ROUTED ON SIDE OF PASSENGER BRIDGE IN NEW PANTOGRAPH OR "DOG LEG" RACEWAY PROVIDED BY OWNER AND INSTALLED BY CONTRACTOR. VERIFY EXISTING BRIDGE WILL SUPPORT NEW CABLES FOR THE PCA. REFER TO EQUIPMENT SCHEDULE ON E6.01 FOR CABLE SIZE.
- 5 INSTALL/RECONNECT EXISTING JETWAY RATED CONTROL CABLE FROM PCA TO CONTROL STATION. PROVIDED SUFFICIENT SLACK IN CABLE AND SUPPORT CABLE ACCORDINGLY.







**CONCOURSE B PCA EQUIPMENT  
REPLACEMENT**



ISSUE RECORD					
NO.	BY	PURPOSE	DATE	CHKD	DATE
1	MEM	IFC	20/11/14	SDK	

SCALE: 1/8" = 1'-0"

DATE: 03/26/14

DRAWN BY: A. SCHNECKLOTH

CHECKED BY: M. MCNUITT

FAA AIP NO:

WORK BREAKDOWN NO:

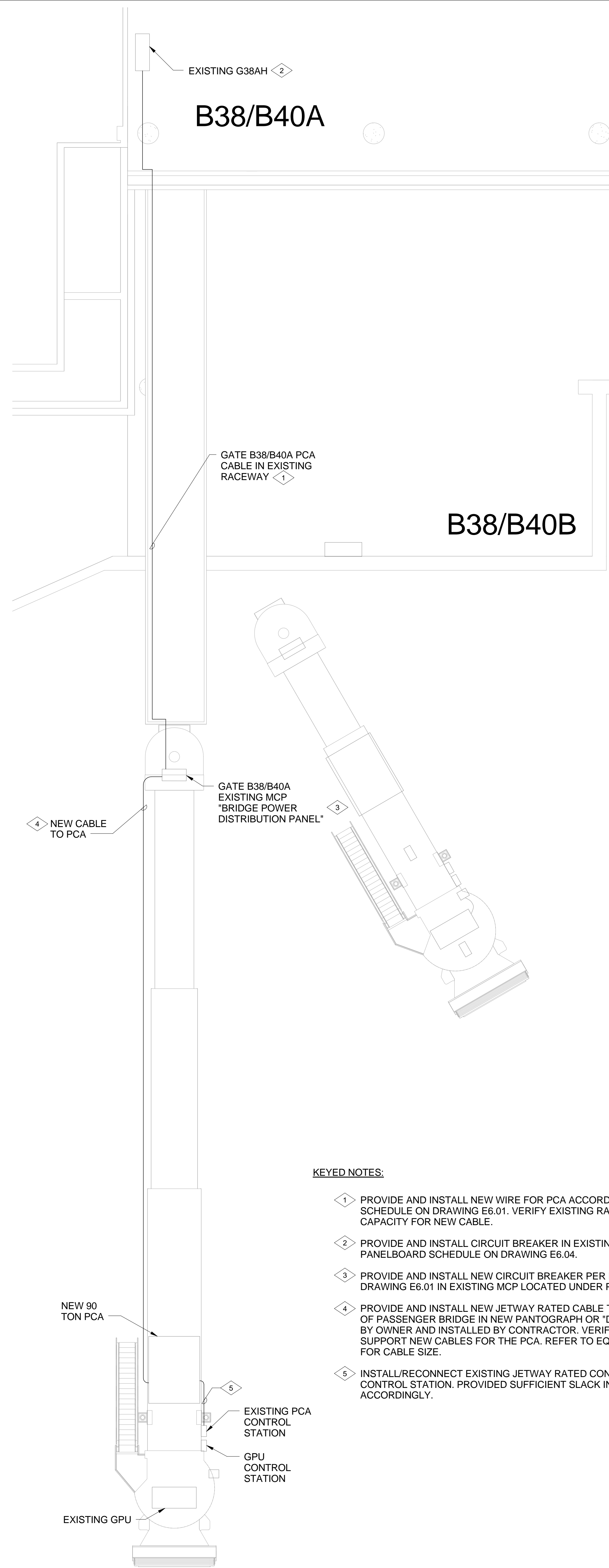
DESIGN CONTRACT NO:

CONST. CONTRACT NO:

VOLUME NO:

SHEET TITLE  
**ENLARGED ELEC.  
GATES B38/40, B39,  
B42B**

SHEET NO.  
**E4.04**

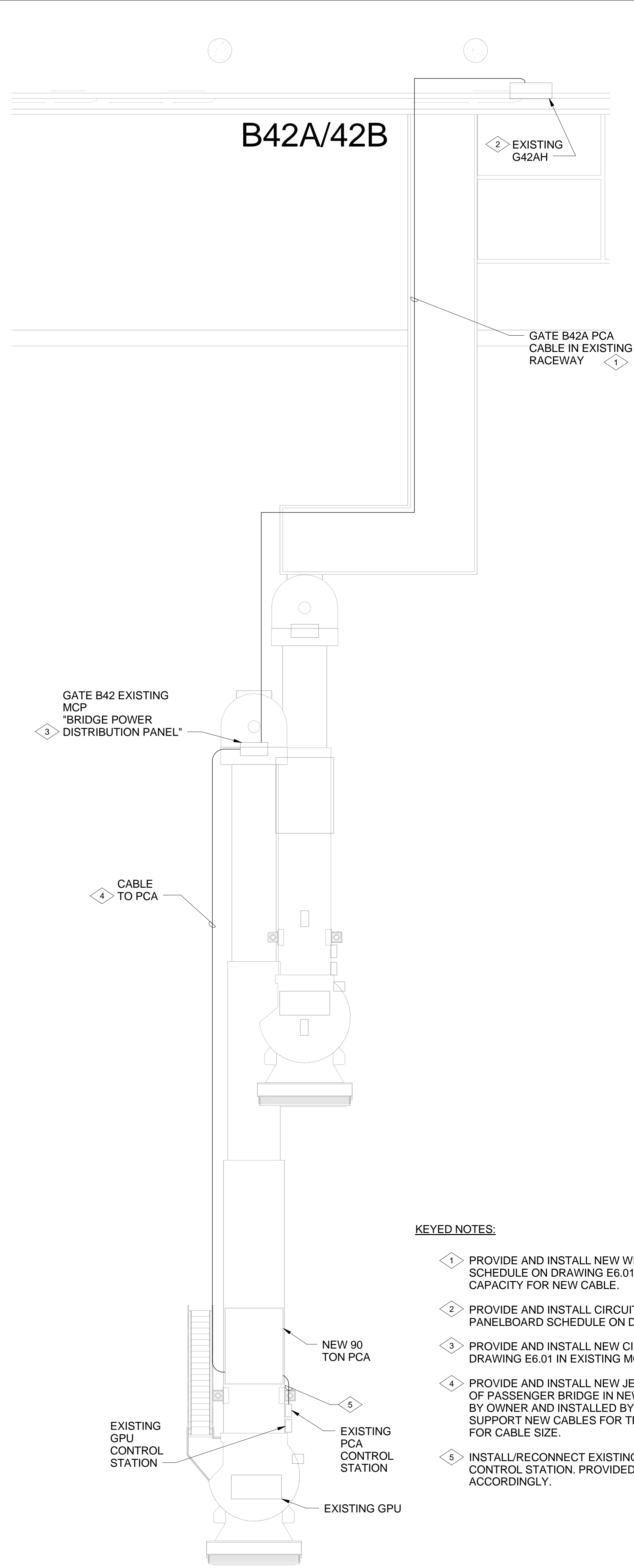


**KEYED NOTES:**

- 1 PROVIDE AND INSTALL NEW WIRE FOR PCA ACCORDING TO EQUIPMENT SCHEDULE ON DRAWING E6.01. VERIFY EXISTING RACEWAY HAS AVAILABLE CAPACITY FOR NEW CABLE.
- 2 PROVIDE AND INSTALL CIRCUIT BREAKER IN EXISTING G40H, PER PANELBOARD SCHEDULE ON DRAWING E6.04.
- 3 PROVIDE AND INSTALL NEW CIRCUIT BREAKER PER EQUIPMENT SCHEDULE ON DRAWING E6.01 IN EXISTING MCP LOCATED UNDER PASSENGER BRIDGE.
- 4 PROVIDE AND INSTALL NEW JETWAY RATED CABLE TYPE "W" ROUTED ON SIDE OF PASSENGER BRIDGE IN NEW PANTOGRAPH OR "DOG LEG" RACEWAY PROVIDED BY OWNER AND INSTALLED BY CONTRACTOR. VERIFY EXISTING BRIDGE WILL SUPPORT NEW CABLES FOR THE PCA. REFER TO EQUIPMENT SCHEDULE ON E6.01 FOR CABLE SIZE.
- 5 INSTALL/RECONNECT EXISTING JETWAY RATED CONTROL CABLE FROM PCA TO CONTROL STATION. PROVIDED SUFFICIENT SLACK IN CABLE AND SUPPORT CABLE ACCORDINGLY.

1  
E3.02 E4.04

ENLARGED PLAN B38/B40  
1/8" = 1'-0"



**KEYED NOTES:**

- 1 PROVIDE AND INSTALL NEW WIRE FOR PCA ACCORDING TO EQUIPMENT SCHEDULE ON DRAWING E6.01. VERIFY EXISTING RACEWAY HAS AVAILABLE CAPACITY FOR NEW CABLE.
- 2 PROVIDE AND INSTALL CIRCUIT BREAKER IN EXISTING G42AH, PER PANELBOARD SCHEDULE ON DRAWING E6.04.
- 3 PROVIDE AND INSTALL NEW CIRCUIT BREAKER PER EQUIPMENT SCHEDULE ON DRAWING E6.01 IN EXISTING MCP LOCATED UNDER PASSENGER BRIDGE.
- 4 PROVIDE AND INSTALL NEW JETWAY RATED CABLE TYPE "W" ROUTED ON SIDE OF PASSENGER BRIDGE IN NEW PANTOGRAPH OR "DOG LEG" RACEWAY PROVIDED BY OWNER AND INSTALLED BY CONTRACTOR. VERIFY EXISTING BRIDGE WILL SUPPORT NEW CABLES FOR THE PCA. REFER TO EQUIPMENT SCHEDULE ON E6.01 FOR CABLE SIZE.
- 5 INSTALL/RECONNECT EXISTING JETWAY RATED CONTROL CABLE FROM PCA TO CONTROL STATION. PROVIDED SUFFICIENT SLACK IN CABLE AND SUPPORT CABLE ACCORDINGLY.

2  
E3.02 E4.04

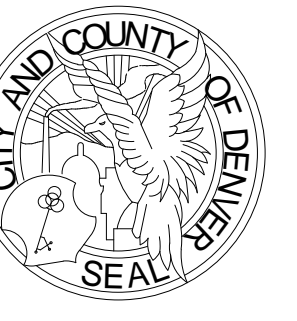
ENLARGED PLAN B42  
1/8" = 1'-0"



**NOTES:**

1. REFER TO DRAWING E6.01 FOR ALL CABLE AND CONDUIT SIZE AND AIC RATINGS.
2. REFER TO DRAWINGS E3.01 AND E3.02 FOR OVERALL GATE LAYOUT LOCATIONS.
3. BOTH GATES SHALL REMAIN INOPERABLE DURING CONSTRUCTION. EXISTING GATE POWER PANEL FEEDS EQUIPMENT ON BOTH GATES.





CONCOURSE B PCA EQUIPMENT  
REPLACEMENT



ISSUE RECORD				
NO.	BY	PURPOSE	DATE	CHKD

SCALE: 1/8" = 1'-0"

DATE: 03/26/14

DRAWN BY: A. SCHNECKLOTH

CHECKED BY: M. MCNUITT

FAA AIP NO.:

WORK BREAKDOWN NO.:

DESIGN CONTRACT NO.:

CONST. CONTRACT NO.:

VOLUME NO.:

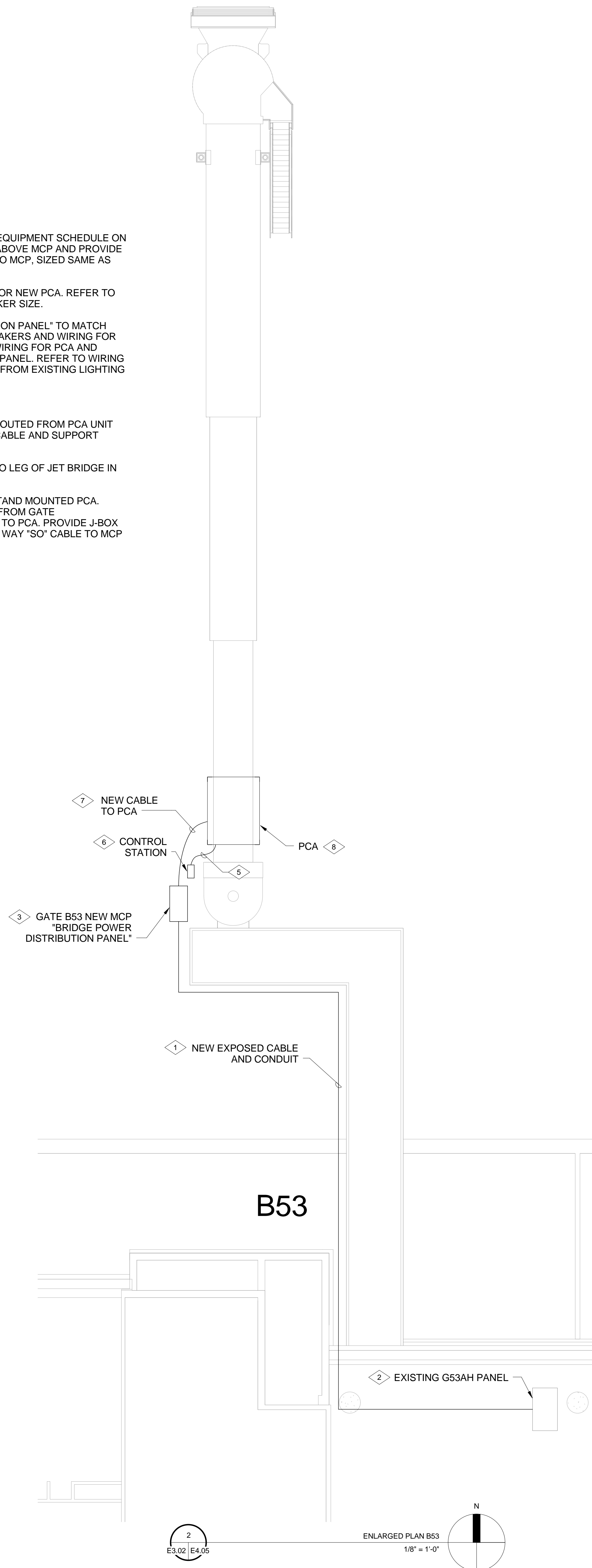
SHEET TITLE

ENLARGED ELEC.  
GATES B53 AND  
B55

SHEET NO.  
E4.05

KEYED NOTES:

- 1 PROVIDE AND INSTALL NEW CABLE AND RACEWAY PER EQUIPMENT SCHEDULE ON DRAWING E6.01. TERMINATE CABLE IN TERMINATE BOX ABOVE MCP AND PROVIDE NEW FLEXIBLE SO-TYPE CABLE FROM TERMINATE BOX TO MCP, SIZED SAME AS THE MCP FEEDER.
- 2 PROVIDE AND INSTALL NEW 3-POLE CIRCUIT BREAKER FOR NEW PCA. REFER TO PANELBOARD SCHEDULE ON DRAWING E6.03 FOR BREAKER SIZE.
- 3 PROVIDE AND INSTALL NEW "BRIDGE POWER DISTRIBUTION PANEL" TO MATCH EXISTING BY JBT AEROTECH. PROVIDE ALL CIRCUIT BREAKERS AND WIRING FOR PCA, GPU AND GATE CONTROL POWER. PROVIDE NEW WIRING FOR PCA AND REUSE EXISTING WIRING FOR GPU AND GATE CONTROL PANEL. REFER TO WIRING DIAGRAM ON E5.03 FOR DETAILS. PROVIDE NEW WIRING FROM EXISTING LIGHTING AND GATE CONTROLS TO NEW MCP.
- 4 NOT USED.
- 5 PROVIDE AND INSTALL 20/C #16 JETWAY RATED CABLE ROUTED FROM PCA UNIT TO CONTROL STATION. PROVIDE SUFFICIENT SLACK IN CABLE AND SUPPORT CABLE ACCORDINGLY.
- 6 INSTALL CONTROL STATION PROVIDED WITH PCA UNIT TO LEG OF JET BRIDGE IN SAME LOCATION AS DEMOLISHED.
- 7 PROVIDE AND INSTALL NEW CABLE AND RACEWAY TO STAND MOUNTED PCA. CABLE AND RACEWAY SHALL BE SIZED SAME AS CABLE FROM GATE PANELBOARD TO MCP. PROVIDE FLEXIBLE CONNECTION TO PCA. PROVIDE J-BOX WITH TERMINATIONS ABOVE MCP FOR CONNECTING JET WAY "SO" CABLE TO MCP AND CABLE TO PCA.
- 8 NEW PCA SHALL BE RELOCATED FROM GATE B34/B36B.

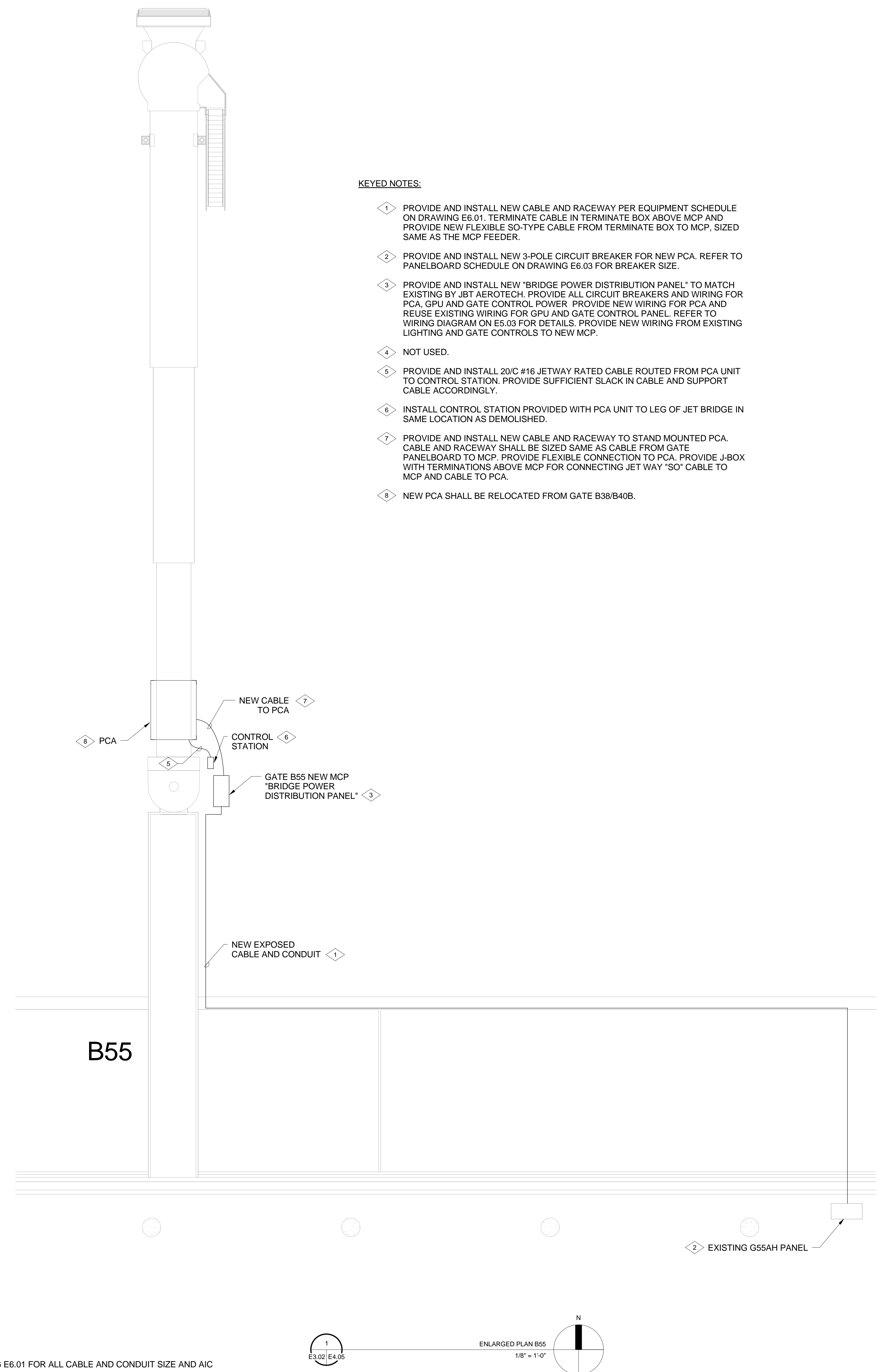


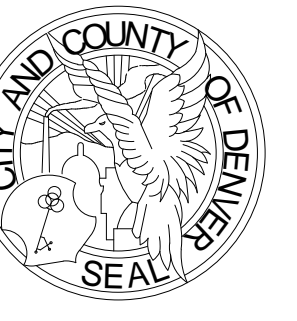
NOTES:

- 1. REFER TO DRAWING E6.01 FOR ALL CABLE AND CONDUIT SIZE AND AIC RATINGS.
- 2. REFER TO DRAWINGS E3.01 AND E3.02 FOR OVERALL GATE LAYOUT LOCATIONS.

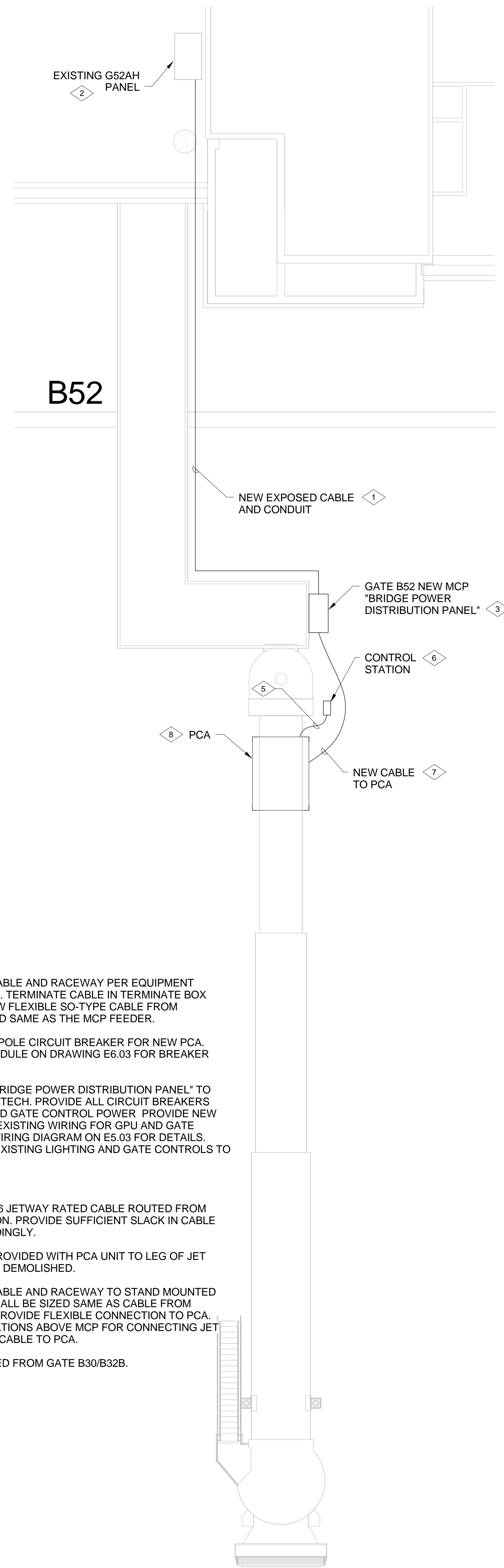
KEYED NOTES:

- 1 PROVIDE AND INSTALL NEW CABLE AND RACEWAY PER EQUIPMENT SCHEDULE ON DRAWING E6.01. TERMINATE CABLE IN TERMINATE BOX ABOVE MCP AND PROVIDE NEW FLEXIBLE SO-TYPE CABLE FROM TERMINATE BOX TO MCP, SIZED SAME AS THE MCP FEEDER.
- 2 PROVIDE AND INSTALL NEW 3-POLE CIRCUIT BREAKER FOR NEW PCA. REFER TO PANELBOARD SCHEDULE ON DRAWING E6.03 FOR BREAKER SIZE.
- 3 PROVIDE AND INSTALL NEW "BRIDGE POWER DISTRIBUTION PANEL" TO MATCH EXISTING BY JBT AEROTECH. PROVIDE ALL CIRCUIT BREAKERS AND WIRING FOR PCA, GPU AND GATE CONTROL POWER. PROVIDE NEW WIRING FOR PCA AND REUSE EXISTING WIRING FOR GPU AND GATE CONTROL PANEL. REFER TO WIRING DIAGRAM ON E5.03 FOR DETAILS. PROVIDE NEW WIRING FROM EXISTING LIGHTING AND GATE CONTROLS TO NEW MCP.
- 4 NOT USED.
- 5 PROVIDE AND INSTALL 20/C #16 JETWAY RATED CABLE ROUTED FROM PCA UNIT TO CONTROL STATION. PROVIDE SUFFICIENT SLACK IN CABLE AND SUPPORT CABLE ACCORDINGLY.
- 6 INSTALL CONTROL STATION PROVIDED WITH PCA UNIT TO LEG OF JET BRIDGE IN SAME LOCATION AS DEMOLISHED.
- 7 PROVIDE AND INSTALL NEW CABLE AND RACEWAY TO STAND MOUNTED PCA. CABLE AND RACEWAY SHALL BE SIZED SAME AS CABLE FROM GATE PANELBOARD TO MCP. PROVIDE FLEXIBLE CONNECTION TO PCA. PROVIDE J-BOX WITH TERMINATIONS ABOVE MCP FOR CONNECTING JET WAY "SO" CABLE TO MCP AND CABLE TO PCA.
- 8 NEW PCA SHALL BE RELOCATED FROM GATE B38/B40B.





CONCOURSE B PCA EQUIPMENT REPLACEMENT

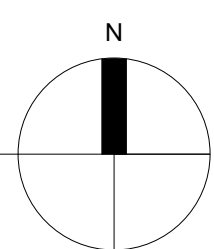


KEYED NOTES:

- 1 PROVIDE AND INSTALL NEW CABLE AND RACEWAY PER EQUIPMENT SCHEDULE ON DRAWING E6.01. TERMINATE CABLE IN TERMINATE BOX ABOVE MCP AND PROVIDE NEW FLEXIBLE SO-TYPE CABLE FROM TERMINATE BOX TO MCP, SIZED SAME AS THE MCP FEEDER.
- 2 PROVIDE AND INSTALL NEW 3-POLE CIRCUIT BREAKER FOR NEW PCA. REFER TO PANELBOARD SCHEDULE ON DRAWING E6.03 FOR BREAKER SIZE.
- 3 PROVIDE AND INSTALL NEW 'BRIDGE POWER DISTRIBUTION PANEL' TO MATCH EXISTING BY JBT AEROTECH. PROVIDE ALL CIRCUIT BREAKERS AND WIRING FOR PCA, GPU AND GATE CONTROL POWER. PROVIDE NEW WIRING FOR PCA AND REUSE EXISTING WIRING FOR GPU AND GATE CONTROL PANEL. REFER TO WIRING DIAGRAM ON E5.03 FOR DETAILS. PROVIDE NEW WIRING FROM EXISTING LIGHTING AND GATE CONTROLS TO NEW MCP.
- 4 NOT USED.
- 5 PROVIDE AND INSTALL 20/C #16 JETWAY RATED CABLE ROUTED FROM PCA UNIT TO CONTROL STATION. PROVIDE SUFFICIENT SLACK IN CABLE AND SUPPORT CABLE ACCORDINGLY.
- 6 INSTALL CONTROL STATION PROVIDED WITH PCA UNIT TO LEG OF JET BRIDGE IN SAME LOCATION AS DEMOLISHED.
- 7 PROVIDE AND INSTALL NEW CABLE AND RACEWAY TO STAND MOUNTED PCA. CABLE AND RACEWAY SHALL BE SIZED SAME AS CABLE FROM GATE PANELBOARD TO MCP. PROVIDE FLEXIBLE CONNECTION TO PCA. PROVIDE J-BOX WITH TERMINATIONS ABOVE MCP FOR CONNECTING JET WAY 'SO' CABLE TO MCP AND CABLE TO PCA.
- 8 NEW PCA SHALL BE RELOCATED FROM GATE B30/B32B.

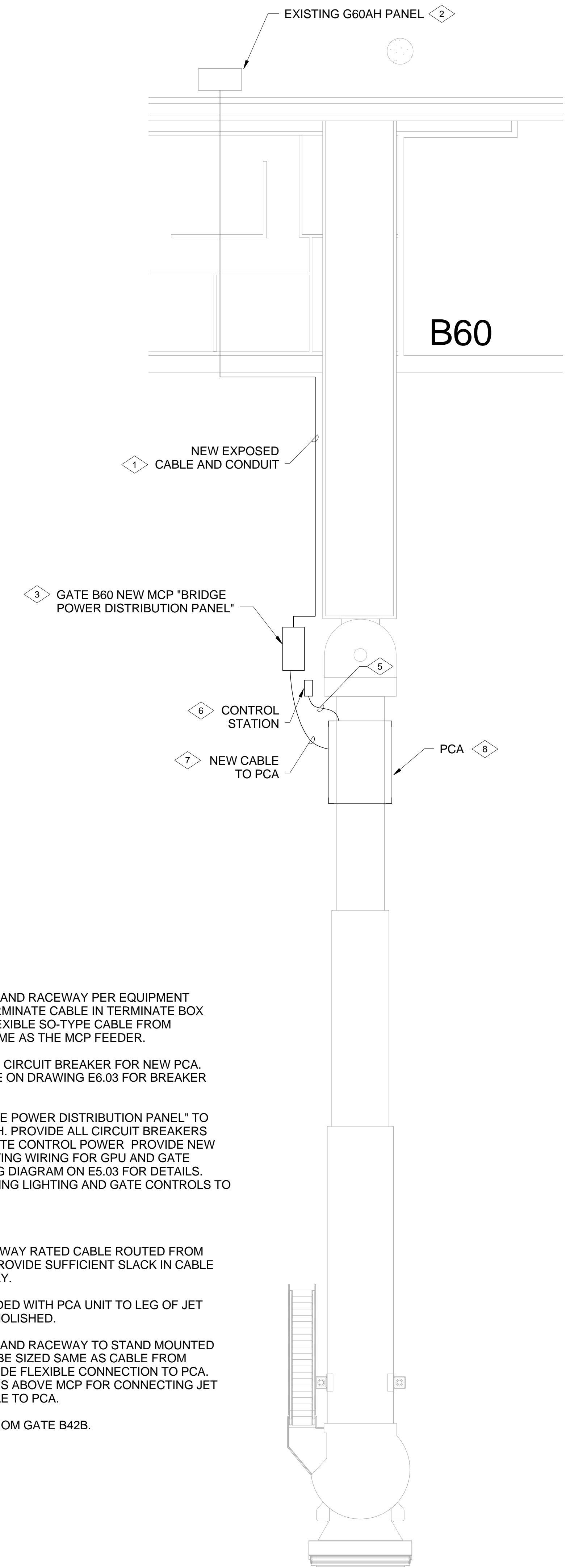
1  
E3.02 E4.06

ENLARGED PLAN B52  
1/8" = 1'-0"



NOTES:

- 1. REFER TO DRAWING E6.01 FOR ALL CABLE AND CONDUIT SIZE AND AIC RATINGS.
- 2. REFER TO DRAWINGS E3.01 AND E3.02 FOR OVERALL GATE LAYOUT LOCATIONS.

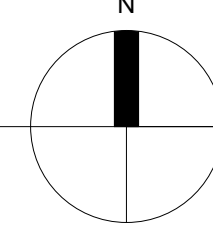


KEYED NOTES:

- 1 PROVIDE AND INSTALL NEW CABLE AND RACEWAY PER EQUIPMENT SCHEDULE ON DRAWING E6.01. TERMINATE CABLE IN TERMINATE BOX ABOVE MCP AND PROVIDE NEW FLEXIBLE SO-TYPE CABLE FROM TERMINATE BOX TO MCP, SIZED SAME AS THE MCP FEEDER.
- 2 PROVIDE AND INSTALL NEW 3-POLE CIRCUIT BREAKER FOR NEW PCA. REFER TO PANELBOARD SCHEDULE ON DRAWING E6.03 FOR BREAKER SIZE.
- 3 PROVIDE AND INSTALL NEW 'BRIDGE POWER DISTRIBUTION PANEL' TO MATCH EXISTING BY JBT AEROTECH. PROVIDE ALL CIRCUIT BREAKERS AND WIRING FOR PCA, GPU AND GATE CONTROL POWER. PROVIDE NEW WIRING FOR PCA AND REUSE EXISTING WIRING FOR GPU AND GATE CONTROL PANEL. REFER TO WIRING DIAGRAM ON E5.03 FOR DETAILS. PROVIDE NEW WIRING FROM EXISTING LIGHTING AND GATE CONTROLS TO NEW MCP.
- 4 NOT USED.
- 5 PROVIDE AND INSTALL 20/C #16 JETWAY RATED CABLE ROUTED FROM PCA UNIT TO CONTROL STATION. PROVIDE SUFFICIENT SLACK IN CABLE AND SUPPORT CABLE ACCORDINGLY.
- 6 INSTALL CONTROL STATION PROVIDED WITH PCA UNIT TO LEG OF JET BRIDGE IN SAME LOCATION AS DEMOLISHED.
- 7 PROVIDE AND INSTALL NEW CABLE AND RACEWAY TO STAND MOUNTED PCA. CABLE AND RACEWAY SHALL BE SIZED SAME AS CABLE FROM GATE PANELBOARD TO MCP. PROVIDE FLEXIBLE CONNECTION TO PCA. PROVIDE J-BOX WITH TERMINATIONS ABOVE MCP FOR CONNECTING JET WAY 'SO' CABLE TO MCP AND CABLE TO PCA.
- 8 NEW PCA SHALL BE RELOCATED FROM GATE B42B.

2  
E3.02 E4.06

ENLARGED PLAN B60  
1/8" = 1'-0"



ISSUE RECORD

NO.	BY	PURPOSE	DATE	CHKD
1	MM	IFC	MM/YY	MM

SCALE: 1/8" = 1'-0"

DATE: 03/26/14

DRAWN BY: A. SCHNECKLOTH

CHECKED BY: M. MCNUITT

FAA AIP NO:

WORK BREAKDOWN NO:

DESIGN CONTRACT NO:

CONST. CONTRACT NO:

VOLUME NO:

SHEET TITLE

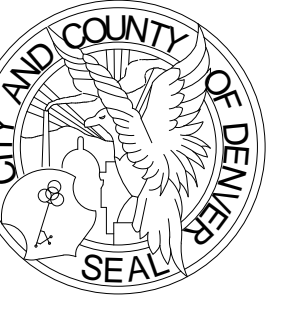
ENLARGED ELEC. GATES B52, B56, B60

SHEET NO. E4.06

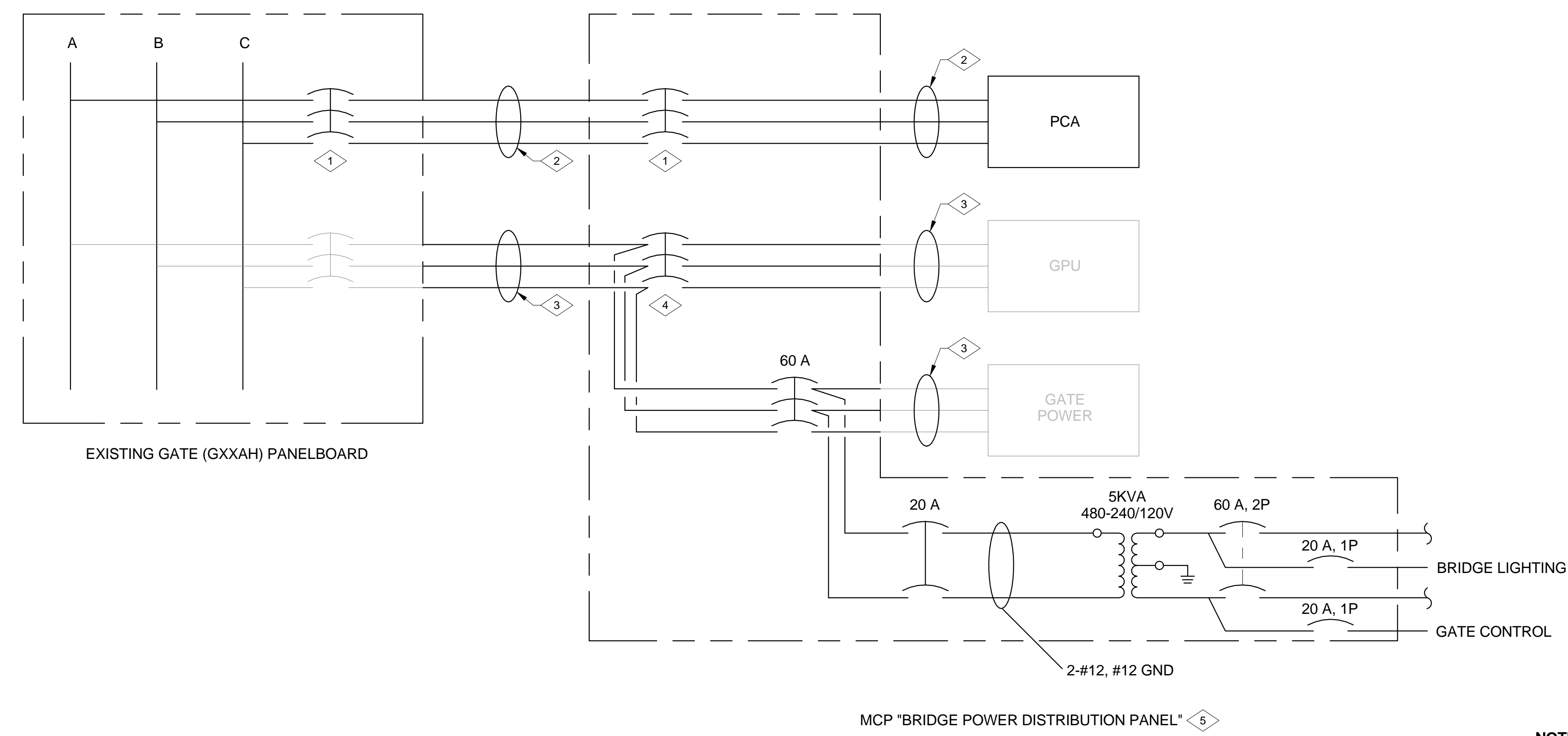








CONCOURSE B PCA EQUIPMENT  
REPLACEMENT



CONTROL PANEL (MCP)  
"BRIDGE POWER DISTRIBUTION PANEL"  
WIRING DIAGRAM  
N.T.S.

**NOTES:**

1. XX ON PANELBOARD NAME DENOTES GATE NUMBER.

**KEYED NOTES:**

- 1 SEE PANELBOARD SCHEDULE OR EQUIPMENT SCHEDULE ON DRAWING E6.01, E6.02 AND E6.03 FOR CIRCUIT BREAKER SIZE.
- 2 SEE EQUIPMENT SCHEDULE FOR CABLE SIZE ON DRAWING E6.01.
- 3 REUSE EXISTING CABLE.
- 4 MATCH EXISTING CIRCUIT BREAKER SIZE IN GATE PANELBOARD.
- 5 MATCH WIRING IN EXISTING MCP.



ISSUE RECORD				
NO.	BY	PURPOSE	DATE	CHKD
0	MEM	IFC	20/01/14	SDK

SCALE: NONE

DATE: 03/28/14

DRAWN BY: A. SCHNECKLOTH

CHECKED BY: M. MCNUITT

FAA AIP NO:

WORK BREAKDOWN NO:

DESIGN CONTRACT NO. CE-03024-05

CONST. CONTRACT NO:

VOLUME NO. 01

SHEET TITLE  
PARTIAL ONE-LINE  
DIAGRAMS 3

SHEET NO.  
E5.03











PANELBOARD		GXXAH (E)		400A MAIN BUS			350A MAIN BREAKER						
VOLTS		480 V		3 PHASE			SEE DWG E6.01 SYM. A.I.C. MINIMUM ENCLOSURE						
		4 WIRE		GROUND MOUNTED									
POLE NO.	TRIP AMP	NO. POLE	WIRE	LOAD SERVED	LOAD - KVA			POLE NO.	TRIP AMP	NO. POLE	WIRE	LOAD SERVED	
					A	B	C						
1					44.3			2					
3	200	3	3/0	EXISTING LOCAL PCA UNIT (60 TONS)	1.6	44.3		4	25	3	-	EXISTING PNL GXXAL VIA T-GXX	
5						1.6	44.3	6					
7					0.0			8					
9	200	3	-	NEW SPARE	1.2	0.0		10	30	3	-	EXISTING AIRCRAFT PARTS DIST. SYSTEM	
11						1.2	0.0	12					
13					0.0			14					
15	100	3	-	EXISTING SPARE	0.0	0.0		16	200	3	-	EXISTING SPARE	
17						0.0		18					
19					66.5			20		1		SPACE	
21	300	3	350	NEW LOCAL PCA UNIT (90 TONS)	0.0	66.5		22		1		SPACE	
23						0.0	66.5	24		1		SPACE	
TOTAL PER PHASE LOAD (INCLUDING EXISTING)					113.6	113.6	113.6	DEMAND FACTOR					51.2%
TOTAL CONNECTED LOAD								EST. DEMAND LOAD					
341 KVA					410 A			175 KVA					210 A

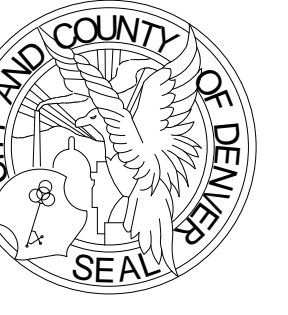
SCHEDULE FOR "CC" TYPE PANEL

PANELBOARD		G4XXAH (E)		800A MAIN BUS			800A MAIN BREAKER						
VOLTS		480 V		3 PHASE			SEE DWG E6.01 SYM. A.I.C. MINIMUM ENCLOSURE						
		4 WIRE		GROUND MOUNTED									
POLE NO.	TRIP AMP	NO. POLE	WIRE	LOAD SERVED	LOAD - KVA			POLE NO.	TRIP AMP	NO. POLE	WIRE	LOAD SERVED	
					A	B	C						
1					44.3			2					
3	200	3	3/0	EXISTING LOCAL PCA UNIT (60 TONS)	73.3	44.3		4	350	3	500	EXISTING 180KVA 400HZ GPU / BRIDGE POWER	
5						73.3	44.3	6					
7					0.0			8					
9	300	3	-	NEW SPARE	73.3	0.0		10	350	3	500	EXISTING 180KVA 400HZ GPU / BRIDGE POWER	
11						73.3	0.0	12					
13					1.2			14					
15	25	3	-	EXISTING PNL GXXAL VIA T-GXX	1.6	1.2		16	30	3	-	EXISTING AIRCRAFT PARTS DIST. SYSTEM	
17						1.6	1.2	18					
19					66.5			20				SPACE	
21	300	3	350	NEW LOCAL PCA UNIT (90 TONS)	0.0	66.5		22		3	-	SPACE	
23						0.0	66.5	24				SPACE	
TOTAL PER PHASE LOAD (INCLUDING EXISTING)					260.2	260.2	260.2	DEMAND FACTOR					57.5%
TOTAL CONNECTED LOAD								EST. DEMAND LOAD					
781 KVA					939 A			449 KVA					540 A

SCHEDULE FOR "CD" TYPE PANEL

PANELBOARD		GXXAH (E)		800A MAIN BUS			800A MAIN BREAKER						
VOLTS		480 V		3 PHASE			SEE DWG E6.01 SYM. A.I.C. MINIMUM ENCLOSURE						
		4 WIRE		GROUND MOUNTED									
POLE NO.	TRIP AMP	NO. POLE	WIRE	LOAD SERVED	LOAD - KVA			POLE NO.	TRIP AMP	NO. POLE	WIRE	LOAD SERVED	
					A	B	C						
1					73.3			2					
3	350	3	500	EXISTING 180KVA 400HZ GPU / BRIDGE POWER	1.6	73.3		4	25	3	-	EXISTING PNL GXXAL VIA T-GXX	
5						1.6	73.3	6					
7					73.3			8					
9	350	3	500	EXISTING 180KVA 400HZ GPU / BRIDGE POWER	1.2	73.3		10	30	3	-	EXISTING AIRCRAFT PARTS DIST. SYSTEM	
11						1.2	73.3	12					
13					44.3			14					
15	200	3	3/0	EXISTING LOCAL PCA UNIT (60 TONS)	0.0	44.3		16	200	3	-	NEW SPARE	
17						0.0	44.3	18					
19					66.5			20		1		SPACE	
21	300	3	350	NEW LOCAL PCA UNIT (90 TONS)	0.0	66.5		22		1		SPACE	
23						0.0	66.5	24		1		SPACE	
TOTAL PER PHASE LOAD (INCLUDING EXISTING)					260.2	260.2	260.2	DEMAND FACTOR					64.6%
TOTAL CONNECTED LOAD								EST. DEMAND LOAD					
781 KVA					939 A			504 KVA					607 A

SCHEDULE FOR "D" TYPE PANEL



CONCOURSE B PCA EQUIPMENT REPLACEMENT



NO.	BY	PURPOSE	DATE	CHKD
0	MEM	IFC	2/24/14	SDK

- NOTES:
- REFER TO DRAWING E6.01 FOR BREAKER AIC RATING.
  - REFER TO 'GATE PANELBOARD LOAD SUMMARY' SCHEDULE ON DRAWING E6.02 FOR PANEL SCHEDULE TYPE.

SCALE: 12" = 1'-0"

DATE: 03/26/14

DRAWN BY: A. SCHNECKLOTH

CHECKED BY: M. MCNUITT

FAA AIP NO: \_\_\_\_\_

WORK BREAKDOWN NO: \_\_\_\_\_

DESIGN CONTRACT NO: \_\_\_\_\_

CONST. CONTRACT NO: \_\_\_\_\_

VOLUME NO: \_\_\_\_\_

SHEET TITLE: PANEL SCHEDULES

SHEET NO: E6.04