

**NORTH METRO RAIL LINE AND NATIONAL WESTERN CENTER
INTERGOVERNMENTAL AGREEMENT**

(DENVER-RTD)

THIS INTERGOVERNMENTAL AGREEMENT (this “Agreement” or “IGA”) is made and entered, effective as of the date of the last date on signature blocks for this IGA (“Effective Date”), between the **CITY AND COUNTY OF DENVER**, a home rule municipal corporation of the State of Colorado, organized pursuant to Article XX of the Colorado Constitution (“Denver”), and the **REGIONAL TRANSPORTATION DISTRICT**, a political subdivision of the State of Colorado organized pursuant to the Regional Transportation District Act, C.R.S. § 32-9-101, et seq. (“RTD”). Denver and RTD are sometimes individually referred to as a “Party” and jointly as the “Parties.”

WITNESSETH:

WHEREAS, Denver and RTD have entered into the North Metro Rail Line Intergovernmental Agreement (Denver-RTD) dated December 20, 2013 (the “North Metro IGA”) to implement the North Metro Line consistent with the terms of the Light Rail System Master Agreement dated March 25, 1993, as amended (the “Light Rail Master Agreement”); and

WHEREAS, RTD is constructing the North Metro Rail Line consisting of commuter rail transit connecting Denver Union Station in downtown Denver and 124th Avenue in Thornton (the “RTD Project”), which RTD Project includes the construction of the 48th & Brighton at National Western Center Station (the “Station”); and

WHEREAS, Denver is constructing the National Western Center (the “Denver Project”), which includes reconstruction of Brighton Boulevard from approximately 46th Avenue north to Race Court, new transportation connections, including pedestrian and multi-modal connections to the Station; and

WHEREAS, Denver and RTD have agreed in the North Metro IGA to certain funding obligations to enable the construction within Denver boundaries and to cooperate regarding certain infrastructure improvements related to the development of the North Metro Rail Line; and

WHEREAS, Denver’s Mayor’s Office of the National Western Center (“NWCO”) is developing a 250-acre campus (the “National Western Center”) that includes land to the east and west of RTD’s North Metro Rail Line through this area; and

WHEREAS, RTD is building the North Metro Rail Line's Station adjacent to the National Western Center; and

WHEREAS, the Parties desire through this Agreement to further cooperate regarding the funding of mutually beneficial infrastructure projects and provide real property for the Denver Project and the RTD Project.

NOW, THEREFORE, in consideration of the foregoing premises and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties agree as follows:

1. SCOPE OF AGREEMENT.

- a. **General.** This Agreement provides, among other things, a framework for the further cooperation between the Parties related to the funding of mutually beneficial infrastructure projects and the transfer of real property for the Denver Project and the RTD Project.
- b. **Exhibits.**
 - i. Exhibit A - Marion Underpass to Interim Condition Project
 - ii. Exhibit B - Station Plaza

2. DEFINITIONS.

a. ***Enhancement*** is defined in the North Metro IGA as any element of work that is not included in the Base Scope of Work, as defined in the North Metro IGA, that may have been requested by Denver or a third party, where the Parties agree that the value added benefits both Denver and RTD. The Parties agreed in the North Metro IGA to share proportionately in the costs for any Enhancement as agreed to by the Parties.

b. ***Marion Underpass to Interim Condition Project*** is the construction of a roadway lowering and certain bridges over the roadway lowering, all as depicted in Exhibit A attached hereto.

c. ***Marion Underpass to Permanent Condition Project*** consists of work to be defined by the City to improve by widening and, if needed, deepening the underpass at the intersection of future Bettie Cram Drive and the rail corridor at the site of the National Western Center.

d. ***North Metro Rail Line Project***, also referred to in the North Metro IGA as the "Project," means the RTD FasTracks Program project known as the North Metro Rail Line, consisting of

the Commuter Rail line and the design, construction, ownership, operation and maintenance of the Project within Denver's boundaries. The North Metro Rail Line located within Denver's boundaries is generally depicted in Exhibit C of the North Metro IGA.

e. **Station Plaza** is the area adjacent to the Station as generally depicted in Exhibit B attached hereto.

f. **Station Pedestrian Bridge** is a planned pedestrian bridge connecting the east side of the National Western Center site to the west side of the National Western site, otherwise divided by the rail corridor, to be located in the vicinity of the Station.

g. **Project Costs**, as defined in the North Metro IGA, means all costs and fees necessitated or required by the Base Scope of Work, as defined in the North Metro IGA, along with all necessary costs and fees required to design, locate and construct the Project including: planning; design (including value engineering); design review and approval; plan review and approval; permit and inspection fees and costs; property acquisition, easements, and relocation costs associated with property acquisition; all costs associated with changes to Denver Property (as defined in the North Metro IGA) of the types specified in Article 10 of the Light Rail Master Agreement or resulting from 4(f) or 6(f) mitigation; construction; construction inspection; utility relocation, including but not limited to Denver utility and infrastructure; utility upgrades required by law; traffic control during construction; traffic signal modification; such other infrastructure changes or improvements as identified in section 7.B of the North Metro IGA; and all other costs allocable to RTD or reimbursable to Denver under the Light Rail Master Agreement.

3. **STATION REDESIGN COSTS:** The Parties have cooperated and collaborated regarding Denver's master plan for the area adjacent to the Station, including the Brighton Boulevard reconstruction and re-design of the Station to allow for Brighton Boulevard improvements and to eliminate transit parking designed for the Station. The Parties' collaborations have resulted in the need to re-design and change construction plans for the Station. Denver agrees to pay to RTD an amount of One Hundred Seventy-eight Thousand, Seven Hundred and Six Dollars and Eighty-four Cents (\$178,706.84) within [90 days] of the execution of this Agreement.

4. **PARKING MITIGATION STUDIES:** Both parties agree that work contemplated in Section 8.B. of the North Metro IGA regarding parking studies has been sufficiently completed.

5. **MARION UNDERPASS TO INTERIM CONDITION PROJECT:** Denver agrees to pay RTD Three Million Three Hundred Fifty Thousand Dollars (\$3,350,000) within ninety (90) days

of the execution of this Agreement for the Marion Underpass to Interim Condition Project undertaken by RTD. Denver agrees to accept the Marion Underpass to Interim Condition Project as-is in the current condition at the execution of this Agreement. The contribution by Denver is an Enhancement. The costs paid by RTD are Project Costs. The Marion Underpass shall be a private road until such time as Denver accepts title to and dedicates the underpass as a public street.

6. **MARION UNDERPASS TO PERMANENT CONDITION PROJECT:** RTD agrees to provide the support, cooperation, and coordination necessary for the completion of the Marion Underpass To Permanent Condition Project by the City, its contractors or its development partner. The Marion Underpass To Permanent Condition Project shall enable the underpass to function as a public street upon completion.

7. **STATION PLAZA:** The Parties intend to continue to work together toward the shared purpose of creating a public transit plaza at the Station that integrates the National Western Center with the Station.

8. **STATION PEDESTRIAN BRIDGE:** The Parties intend to continue to work together toward the shared purpose of creating a pedestrian bridge at the Station that integrates the National Western Center campus west of the North Metro Rail Line with the Station. The parties will cooperate regarding the landing of the pedestrian bridge adjacent to the station on land owned by the City. The City will pay for any design and construction costs related to the pedestrian bridge. RTD agrees to review and approve the pedestrian bridge design in a timely fashion. RTD shall not charge the City for any easement and related rights necessary for the construction, maintenance, and use of the Station Pedestrian Bridge, including any aerial easement but not including the landing of the bridge, which will be accomplished on City-owned land

9. **TERM OF AGREEMENT:** The term of this Agreement shall commence as of the Effective Date of this Agreement and expire on the same date in the year 2043 or at such time that the parties have completed their obligations under this Agreement, whichever is earlier (the “Term”).

10. **TERMINATION OF AGREEMENT:** This Agreement may not be terminated prior to the expiration of its Term unless by mutual written consent of both Denver and RTD or unless a final judgment of competent jurisdiction, upon completion of appeals or the lapse of all applicable appeal periods, that the Agreement is invalid, ineffective, or otherwise terminated.

11. **NOTICES:** Any notices, bills, invoices, claims, demand or reports required by this Agreement shall be sufficiently delivered if sent by the Parties in the United State mail, postage prepaid, to the Parties at the following addresses:

Denver: City and County of Denver
Executive Director of the Mayor’s Office of the National Western Center
201 W. Colfax Avenue, Dept.
Denver, Colorado 80202

City Attorney’s Office
Municipal Operations
201 W. Colfax Avenue, Dept. 1201
Denver, Colorado 80202

RTD: North Metro Rail Line Project Manager
Regional Transportation District
1560 Broadway, Ste. 700
Denver, Colorado 80202

RTD General Counsel
Regional Transportation District
1660 Blake Street
Denver, Colorado 80202

12. **STATUS OF PARTIES:** The Parties agree that the status of each Party shall be that of an independent entity, and it is not intended, nor shall it be construed, that one Part of any officer, employee, agent, or contractor of such Party is an employee, officer, or agent of the other Party for purposes of unemployment compensation, workers’ compensation, or for any purpose whatsoever.

13. **WHEN RIGHTS AND REMEDIES NOT WAIVED:** In no event shall any performance by a Party hereunder constitute or be construed to be a waiver by that Party of any breach of term, covenant, or condition or any default which may then exist on the part of the other Party, and the tender of any such performance when any such breach or default shall exist shall not impair or prejudice any right or remedy available to a Party with respect to such breach or default; and no assent, expressed or implied, to any breach of any one or more terms, covenants, or conditions of the Agreement shall be construed as a waiver of any succeeding or other breach.

14. **EXAMINATION OF RECORDS:** The Parties agree that any duly authorized representative of Denver or RTD, including the City Auditor, or any internal or external auditor of RTD shall, until the expiration of three (3) years after the final reconciliation or payment, as applicable, under

this Agreement, have access to and the right to examine any books, documents, paper, and records, involving transactions related to this Agreement at the cost of the auditing Party.

15. **ASSIGNMENT AND SUBCONTRACTING:** A Contractor or Contractors (as defined in the North Metro IGA) may perform any or all of RTD's obligations under this Agreement including, without limitation, the design and construction of the RTD Project; coordination with Denver for exchange and approval of design plans, specifications, design criteria, and traffic control plans; interfacing of construction schedules with Denver, as necessary; application for applicable Denver permits; coordination of Denver construction inspections; coordination of relocation of any Denver-owned utilities in conflict with the RTD Project; and operation and maintenance of the RTD Project. Subject to the foregoing, the Parties agree that they will not otherwise assign or transfer any of their rights or obligations under this Agreement without first obtaining the prior written consent of the other Party. If this Agreement is lawfully assigned, all covenants and agreements contained in this Agreement shall bind upon and inure to the benefit of the successors and assigns of the respective Parties.

16. **LIABILITY:** As between the Parties, and without either Party waiving any of their rights, immunities or protections as against third parties under the Colorado Governmental Immunity Act, C.R.S. §§24-10-101 to -120, each Party shall be responsible for its own negligence and that of its agents, employees and contractors in the performance of this Agreement. If either Party is given notice of claim or suit against or involving the other arising from this Agreement, it agrees to give the other Party prompt written notice of such claim or suit.

17. **CONFLICT OF INTEREST:** The Parties agree that no employee of either Party shall have any personal or beneficial interest whatsoever in the services or property described herein and RTD further agrees not to hire, or contract for services with, any employee or officer of Denver which would be in violation of Denver's Code of Ethics, D.R.M.C. §2-51, et seq., or the Charter §§1.2.8, 1.2.9, and 1.2.12. no officer, employee or agent of RTD, nor any member of the RTD Board, nor any member of Congress, nor any other public official or employee of the governing body of the locality or localities included within the district, during his or her tenure, or for one (1) year thereafter, shall have any personal pecuniary or property interest, direct or indirect, in this Agreement or the proceeds hereof.

18. **APPROPRIATIONS:** The obligations of the Parties under this Agreement or any renewal shall extend only to monies appropriated for the purpose of this Agreement (a) by Denver's City Council, paid into the Denver Treasury, and encumbered for the purposes of this Agreement, or (b) by RTD's Board of Directors and paid into RTD's Treasury for the purposes of this Agreement. The Parties

acknowledge that (i) they do not by this Agreement irrevocably pledge present cash reserves for payments in future fiscal years, and (ii) this Agreement is not intended to create a multiple-fiscal year direct or indirect debt or financial obligation of either of the Parties.

19. **TAXES, CHARGES, AND PENALTIES:** The Parties shall not pay or be liable for any claimed interest, late charges, taxes or penalties of any nature, except as required by Denver Revised Municipal Code.

20. **GOVERNING LAW; VENUE:** Each and every term, provision, condition, of this Agreement is subject to the provisions of Colorado law, the Charter of the City and County of Denver and the ordinances and regulations enacted pursuant thereto. The RTD Project design and construction shall comply with state and federal law, including Federal Railroad Administration (“FRA”) Track Safety Standards, and will incorporate any mitigations described in the applicable environmental decision document. Venue for any action arising hereunder shall be in the District Court for the City and County of Denver, Colorado.

21. **SEVERABILITY:** The Parties expressly agree that if any part, term, or provision of this Agreement is by the courts held to be illegal or in conflict with any law of the State of Colorado, the validity of the remaining portions or provisions shall not be affected, and the rights and obligations of the Parties shall be construed and enforced as if the Agreement did not contain the particular part, term, or provision held to be invalid.

22. **NO DISCRIMINATION IN EMPLOYMENT:** In connection with the performance of this Agreement, the Parties agree 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, marital status, or physical or mental disability.

23. **COMPLETE INTEGRATION; AMENDMENTS:** This Agreement is intended as the complete integration of all understandings between the Parties with respect to the North Metro Rail Line Project. No prior or contemporaneous understanding, addition, deletion, or other amendment hereto shall have any force or effect whatsoever unless embodied herein by writing. No subsequent notation, renewal, addition, deletion or other amendment hereto shall have any force or effect unless embodied in a written amendment to this Agreement or in a separate intergovernmental agreement executed by the Parties.

24. **THIRD PARTY BENEFICIARIES:** It is the intent of the Parties that no third-party beneficiary interest is created in this Agreement. The Parties are not presently aware of any actions by them or any of their authorized representatives which would form the basis for interpretation construing a different intent, and in any even expressly disclaim any such acts or actions, particularly in view of the integration of this Agreement.

25. **NO MERGER:** The terms and conditions of this Agreement shall survive performance of any land transaction under this Agreement and shall not merge with any Deeds or other title instruments issued under this Agreement and thereby terminate.

26. **LEGAL AUTHORITY:** The Parties represent and assure that each possesses the legal authority, pursuant to any proper, appropriate, and official motion, resolution, or action necessary to enter into this Agreement. The person or persons signing and executing this Agreement on behalf of both Parties, represent that he/she has been fully authorized to execute this Agreement on behalf of their jurisdiction and to validly and legally bind their jurisdiction to all the terms, performances and provisions herein set forth.

27. **PARAGRAPH HEADINGS:** The captions and headings set forth in this Agreement are for convenience of reference only and shall not be construed so as to define or limit its terms and provisions.

28. **EXECUTION OF AGREEMENT:** This Agreement shall not take effect until approved by Denver City Council and signed by all appropriate RTD and Denver officials.

29. **COUNTERPARTS:** This Agreement shall be executed in two counterparts, each of which when so executed and delivered shall be an original, but all of which shall together constitute one and the same instrument.

30. **ELECTRONIC SIGNATURES AND ELECTRONIC RECORDS:** RTD consents to the use of electronic signatures by Denver. The Agreement, and any other documents requiring a signature hereunder, may be signed electronically by Denver in the manner specified by Denver. The Parties agree not to deny the legal effect or enforceability of the Agreement 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 Agreement in the form of an electronic record, or a paper copy of an electronic record, or a paper copy of a document bearing an electronic signature, on the ground that it is an electronic record or electronic signature or that it is not in its original form or is not an original.

Contract Control Number: DOTI-202057174-00
Contractor Name: THE REGIONAL TRANSPORTATION DISTRICT

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:

Attorney for the City and County of Denver

By:

By:

By:

Contract Control Number:
Contractor Name:

DOTI-202057174-00
THE REGIONAL TRANSPORTATION DISTRICT

By: 
063246AE3CEC46F...

Name: Henry Stopplecamp
(please print)

Title: AGM Capital Programs RTD
(please print)

ATTEST: [if required]

By: 
4552A02C1DC2448...

Name: Aimee Beckwith
(please print)

Title: Associate General Counsel
(please print)



Marion Structures and Roadway
RELEASE FOR CONSTRUCTION (RFC)

Revision 03 - DCN-000143

Structure Sheets

CDRL ID No. 03-039.07E.05

July 2, 2019

Prepared by:

Regional Rail Partners

For:

North Metro Rail Line Project

RTD CONTRACT No. 13DH008

Having checked this item of Contract Data, I hereby certify that it conforms to the requirements of the Agreement in all respects, except as specifically indicated and approve Tracey Williams to stamp these documents as Release for Construction.

David Trent, RRP Project Director





NORTH METRO RAIL LINE PROJECT

QA CERTIFICATION OF CONFORMANCE

DESIGN SUBMITTAL

DP07E NM Bridge over Marion

Issued for Construction

Audit Certificate No. 00161

QA STATEMENT

Upon examination of the documents of this submittal, I find that:

The Quality Assurance process was completed and meets the requirements identified in the Design Quality Management Plan.

Design QA Manager

October 8, 2015

Date

Quality Assurance Manager

October 8, 2015.

Date

RTD- FASTRACKS NORTH METRO PROJECT CONTRACT NO. 13DH008 DESIGN PACKAGE DP07E NORTH METRO OVER MARION STREET ISSUED FOR CONSTRUCTION

STRUCTURAL

SI-077 INDEX OF DRAWINGS

INDEX OF DRAWINGS; RETAINING WALLS

- SW-501 GENERAL INFORMATION
- SW-502 MARION ST NORTH WALL LAYOUT
- SW-503 MARION ST SOUTH WALL LAYOUT
- SW-503A GEOMETRIC CONTROL MARION ST WALLS
- SW-504 MARION ST NORTH WALL LAYOUT
- SW-504A DETAIL A
- SW-505 MARION ST SOUTH WALL LAYOUT
- SW-505A DETAIL B
- SW-506 NORTH SOIL NAIL WALL TYPICAL SECTION
- SW-507 SOUTH SOIL NAIL WALL TYPICAL SECTION
- SW-508 NORTH SOIL NAIL WALL AT ABUTMENT TYPICAL SECTION
- SW-508A NORTH SOIL NAIL WALL (STA 10+66.24)
- SW-508B NORTH SOIL NAIL WALL (STA 10+81.24)
- SW-508C NORTH SOIL NAIL WALL (STA 10+96.24)
- SW-509 SOUTH SOIL NAIL WALL AT ABUTMENT TYPICAL SECTION
- SW-509A SOUTH SOIL NAIL WALL (STA 11+17.72)
- SW-509B SOUTH SOIL NAIL WALL (STA 11+32.72)
- SW-509C SOUTH SOIL NAIL WALL (STA 11+47.72)
- SW-510 SOIL NAIL DETAILS
- SW-511 SOIL NAIL TESTING
- SW-512 SOIL NAIL DETAILS
- SW-513 CIP FACING DETAILS
- SW-513A CIP FACING MISC DETAILS
- SW-514 CIP CANTILEVER WALL DETAILS
- SW-515 SACRIFICIAL BEAM WALL CONNECTION DETAILS

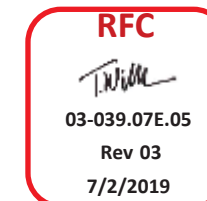


REFERENCE OF STRUCTURAL STANDARD DRAWINGS; NORTH METRO OVER MARION STREET

- SS-100 FENCE CHAIN LINK (SPECIAL) (36 AND 42 INCH)
- SS-110 APPROACH SLAB DETAILS (SINGLE TRACK-SQUARE END)

INDEX OF DRAWINGS; NORTH METRO OVER MARION STREET

- SB-950 GENERAL INFORMATION (SHEET 1 OF 2)
- SB-951 GENERAL INFORMATION (SHEET 2 OF 2)
- SB-952 GENERAL LAYOUT
- SB-953 TYPICAL SECTIONS
- SB-954 ENGINEERING GEOLOGY
- SB-955 CONSTRUCTION LAYOUT / PILING LAYOUT
- SB-956 ABUTMENT DETAILS (SHEET 1 OF 3)
- SB-957 ABUTMENT DETAILS (SHEET 2 OF 3)
- SB-958 ABUTMENT DETAILS (SHEET 3 OF 3)
- SB-959 BENT 2 DETAILS
- SB-960 DOUBLE BOX BEAM DETAILS (SHEET 1 OF 2)
- SB-961 DOUBLE BOX BEAM DETAILS (SHEET 2 OF 2)
- SB-962 SACRIFICIAL BEAM DETAILS
- SB-963 MISC. DETAILS (SHEET 1 OF 2)
- SB-964 MISC. DETAILS (SHEET 2 OF 2)
- SB-965 DECK WATERPROOFING DETAILS
- SB-966 FENCE DETAILS



RTD BRIDGE NO. NM 2.63

USER: fhdalago 4/11/2019 12:29:26 PM NM-S-SB-SI-077-Index of Drawings.dgn

NO.	REVISIONS	BY	DATE
△	NMC-DCN-000143; MARION REDESIGN	JEB	04/11/2019
△	NMC-DCN-000158; SACRIFICIAL BEAM WALL CONNECTION	TAR	08/17/2018
△	DCN000016-REVISED SOIL NAIL WALL	DWC	06/22/2016
0	ISSUED FOR CONSTRUCTION	DWC	09/29/2015

DESIGNED BY: TJW DATE: 02/27/2015	CHECKED BY: JEB DATE: 11/30/2018
DRAWN BY: SWF DATE: 02/27/2015	APPROVED BY: JEB DATE: 04/11/2019

	2000 SOUTH COLORADO BOULEVARD SUITE 2-300 DENVER, COLORADO 80222 (303) 758-4058
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REGIONAL TRANSPORTATION DISTRICT 1600 BLAKE STREET DENVER, COLORADO 80202 (303) 628-9000

NORTH METRO RAIL LINE
STRUCTURAL INDEX OF DRAWINGS NORTH METRO OVER MARION STREET

DWG No. SI-077

SOIL NAIL WALL GENERAL NOTES

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE STABILITY OF STRUCTURES AND EXCAVATIONS DURING CONSTRUCTION.

ALL REINFORCING STEEL SHALL BE EPOXY-COATED UNLESS OTHERWISE NOTED. (N) DENOTES NON-COATED REINFORCING STEEL.

SOIL NAIL WALL DESIGN DATA

- THE SOIL NAIL WALL HAS BEEN DESIGNED IN GENERAL ACCORDANCE WITH PROCEDURES CONTAINED IN THE FWHA "GEOTECHNICAL ENGINEERING CIRCULAR NO. 7 SOIL NAIL WALL" REPORT NO. FHWA-HF-03-017, MARCH 2003, "MANUAL FOR DESIGN AND CONSTRUCTION MONITORING OF SOIL NAIL WALLS", REPORT NO. FHWA-SA-96-069R, REVISED OCTOBER 1998, USING ALLOWABLE STRESS DESIGN, AND "AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION (AREMA) MANUAL FOR RAILWAY ENGINEERING", 2014 EDITION.
- THE CONTRACTOR SHALL VERIFY ALL DEPENDENT DIMENSIONS IN THE FIELD BEFORE ORDERING OR FABRICATING ANY MATERIAL.
- THE INFORMATION SHOWN ON THESE PLANS CONCERNING THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AND EXISTING NEARBY STRUCTURES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATION AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AND STRUCTURES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO AND AVOID STRUCTURES. THE CONTRACTOR SHALL CONTACT THE UTILITY NOTIFICATION CENTER OF COLORADO AT 811 AT LEAST 3 BUSINESS DAYS (NOT INCLUDING THE DAY OF NOTIFICATION) PRIOR TO ANY EXCAVATION OR OTHER EARTHWORK.

SOIL NAIL WALLS

- SOIL NAILS - GRADE 75 THREADBAR OR EQUIVALENT IN ACCORDANCE WITH ASTM A615 AND EPOXY COATED IN ACCORDANCE WITH ASTM A775 OR ASTM A934, Fy=75,000 PSI
- GROUT SHALL BE NEAT-CEMENT OR WITH SAND, WITH TYPE II CEMENT IN ACCORDANCE WITH ASTM C150. WATER-CEMENT RATIO SHALL BE BETWEEN 0.4 AND 0.6 AND SHALL DEVELOP THE FOLLOWING STRENGTH AT THE SPECIFIED CURE PERIODS.
F'c=1,500 PSI (MINIMUM 3-DAY STRENGTH)
F'c=3,000 PSI (MINIMUM 7 DAY STRENGTH)
- END HARDWARE - NUTS AND WASHERS SHALL BE IN ACCORDANCE WITH SOIL NAIL MANUFACTURER'S RECOMMENDATIONS. BEARING PLATE SHALL BE IN ACCORDANCE WITH ASTM A36, GRADE 36. NUTS AND WASHERS TO BE GALVANIZED AS SHOWN ON THE PLANS.
- HEADED STUDS SHALL BE IN ACCORDANCE WITH ASTM A106.
Fy=60,000 PSI
- SHOTCRETE MIX SHALL CONSIST OF TYPE II CEMENT IN ACCORDANCE WITH ASTM C150, POTABLE WATER AND NORMAL WEIGHT AGGREGATE IN ACCORDANCE WITH ASTM C33. ADMIXTURES, IF USED, SHALL BE NON-CORROSIVE TO STEEL.
F'c=2,000 PSI (3-DAY STRENGTH)
F'c=4,500 PSI (28-DAY STRENGTH)
- UNLESS OTHERWISE NOTED ON THE PLANS, MINIMUM COVER OF SHOTCRETE REINFORCEMENT SHALL BE AS FOLLOWS:
FACE EXPOSED TO WEATHER - 2 INCHES
FACE EXPOSED TO SOIL - 3 INCHES
- WELDED WIRE MESH SHALL BE IN ACCORDANCE WITH ASTM A1064.
Fy=65,000 PSI
- WALERS AND VERTICAL BEARING BARS SHALL BE IN ACCORDANCE WITH ASTM A615.
Fy=60,000 PSI.
- CENTRALIZERS SHALL BE PLASTIC AND ATTACHED TO THE NAILS IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- STRIP DRAINS SHALL CONSIST OF 12" WIDE DIMPLED CORES WRAPPED IN GEOTEXTILE.

SOIL NAIL WALL CONSTRUCTION SEQUENCE

- INSTALL AND TEST PRE-PRODUCTION VERIFICATION TEST NAILS.
- EXCAVATE/INSTALL ONE LIFT AT A TIME TO A MAXIMUM DEPTH OF SIX (6) FEET. IN THE EVENT THE CUT HAS ALREADY BEEN EXCAVATED, EXCAVATION DEPTH REQUIREMENTS DO NOT APPLY. IF SLOUGHING GROUND CONDITIONS ARE ENCOUNTERED, SOIL NAILS MAY BE DRILLED AND INSTALLED THROUGH A TEMPORARY STABILIZING BERM AND/OR PLACEMENT OF A SACRIFICIAL REINFORCED SHOTCRETE FLASH COAT MAY BE USED TO TEMPORARILY STABILIZE EXCAVATION PRIOR TO DRILLING SOIL NAILS. CARE SHALL BE TAKEN DURING INSTALLATION THAT NO GROUND IS LOST FROM BEHIND THE EXISTING SHOTCRETE.
- INSTALL SOIL NAILS AT THE SPACINGS AND TO THE LENGTHS SHOWN ON THE PLANS. THE TOP ROW OF SOIL NAILS SHALL BE WITHIN 3 FEET OF THE TOP OF THE WALL. THE BOTTOM ROW OF NAILS SHALL BE WITHIN 3 FEET OF THE BOTTOM OF THE WALL. THE TOLERANCE FOR SOIL NAIL LOCATIONS SHALL BE 6 INCHES. THE GROUT SHALL BE TREMIED FROM THE BOTTOM OF THE HOLE UP.

SOIL NAIL WALL CONSTRUCTION SEQUENCE con't

- INSTALL STRIP DRAINS, WELDED WIRE MESH, WALERS AND VERTICAL BEARING BARS AS SHOWN ON THE PLANS. USE PLASTIC CHAIRS TO HOLD THE WELDED WIRE MESH AWAY FROM THE SOIL AS NECESSARY.
- INSTALL SHOTCRETE TO THE MINIMUM THICKNESS SHOWN ON THE PLANS AND TO ATTAIN THE MINIMUM COVERAGE'S SPECIFIED HEREIN. GIVE SPECIAL ATTENTION TO FILLING THE VOID IN THE BORE HOLE ABOVE THE GROUT LINE UP TO THE SHOTCRETE LINE. COLD WEATHER PROTECTION MEASURES MAY BE NECESSARY.
- INSTALL THE SOIL NAIL END HARDWARE AFTER THE INITIAL LAYER OF SHOTCRETE HAS BEEN INSTALLED. WHILE THE SHOTCRETE IS STILL WET, EMBED THE PLATE INTO THE SHOTCRETE SURFACE UNTIL THERE IS NO VOID BEHIND THE PLATE. HAND TIGHTEN THE NUT. APPLY ADDITIONAL SHOTCRETE LAYER TO ATTAIN MINIMUM COVERAGE FOR THE SOIL NAIL AND END HARDWARE AS INDICATED IN THESE NOTES. TWO INCHES MINIMUM COVER ON ALL REINFORCING EXPOSED TO AIR, THREE INCHES MINIMUM COVER ON ALL REINFORCING EXPOSED TO SOIL. EPOXY COAT THE EXPOSED END OF CUT STEEL BAR.
- ONCE THE GROUT AND SHOTCRETE OF THE CURRENT LIFT HAVE ATTAINED 50% OF THEIR SPECIFIED STRENGTHS, REPEAT CONSTRUCTION SEQUENCE TO THE BOTTOM OF THE WALL.
- PERFORM NAIL PROOF TESTS PER SPECIFICATIONS AFTER SHOTCRETE AND NAIL GROUT HAVE ATTAINED THEIR SPECIFIED STRENGTHS.

SOIL NAIL WALL DESIGN PARAMETERS

1. THE FOLLOWING STRENGTH PARAMETERS WERE ASSUMED FOR THE SUBSOILS BASED ON ESTIMATED VALUES FROM FIELD STRENGTH DATA. SEE YEH FINAL GEOTECHNICAL ENGINEERING REPORT BNSF BRIDGE OVER MARION STREET DESIGN PACKAGE DP07E, DATED 4/29/2014 AND YEH FINAL GEOTECHNICAL ENGINEERING REPORT, CRT BRIDGES OVER 46TH AVENUE, MARION STREET AND RACE COURT, DESIGN PACKAGE DP07 DATED 7/29/2015 FOR MORE INFORMATION.

	Ø (DEG)	c (PSF)	γ (PCF)	Qd (lb/ft)	ka
SANDY, CLAY, SILT	28	100	120	678	0.32
GRAVEL, SAND	30	50	120	678	0.30

- FACTORS OF SAFETY: BEARING CAPACITY - FS=2.5
OVERTURNING - ECCENTRICITY <=B/6
GLOBAL STABILITY - FS=1.5
PULLOUT - FS=2.0
SLIDING - FS=1.5
TENDON YIELD REDUCTION FACTOR - γ=0.55
FACING FLEXURE FACTOR - f=0.67
FACING PUNCHING FACTOR - f=0.67
HEADED-STUD TENSILE FRACTURE FACTOR - f=0.50
- LIVE LOADS: NMRL = 700 PSF
BNSF RAILWAY = 1800 PSF
NWSS PARKING LOT = 250 PSF
- Ø ANGLE OF INTERNAL FRICTION
c COHESION
γ UNIT WEIGHT
Qd DESIGN SHEAR RESISTANCE
BOND STRESS (ALLOWABLE)

SOIL NAIL WALL SPECIAL NOTES

- THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING SLOPE STABILITY ABOVE AND BELOW THE SOIL NAIL WALL DURING CONSTRUCTION.
- THE CONTRACTOR IS RESPONSIBLE FOR FIELD LOCATING ALL NEARBY STRUCTURES AND UTILITIES. CONFLICTING STRUCTURES AND UTILITIES MAY REQUIRE SOIL NAIL WALL REDESIGN, AT ENGINEER'S DISCRETION.
- TEMPORARY DEWATERING MAY BE REQUIRED. THE CONTRACTOR IS RESPONSIBLE FOR THE GROUND WATER CONTROL SYSTEM AND SLOPE STABILIZATION.
- ANALYSIS PERFORMED AND PLANS PROVIDED DO NOT ADDRESS THE STABILITY OF THE ENTIRE NATURAL SLOPE. THE AREAS ANALYZED ARE IN THE IMMEDIATE AREA OF THE SOIL NAIL WALL.
- THE BOND STRENGTHS (Qd) SHOWN ON THE PLANS ARE THE MINIMUM ASSUMED FOR DESIGN.
- SOIL NAIL LENGTHS SHOWN ON THE PLANS ARE THE MINIMUM LENGTHS REQUIRED.
- PRIOR TO BEGINNING EXCAVATION FOR THE SOIL NAIL WALL, THE CONTRACTOR SHALL:
 - SURVEY THE LAYOUT LINE AND TOP OF WALL LINE;
 - CONFIRM THE LINES, GRADES, AND EXCAVATION LIMITS SHOWN ON THE PLANS AND
 - MODIFY THE PLAN WALL PROFILES USING THE FIELD SURVEY INFORMATION AND SUBMIT TO THE ENGINEER FOR REVIEW AND APPROVAL.
- YEH AND ASSOCIATES IS NOT RESPONSIBLE FOR QUALITY CONTROL, QUALITY ASSURANCE, CHANGED CONDITIONS, PROBLEMS RESULTING FROM IMPROPER CONSTRUCTION TECHNIQUES, OR CONSTRUCTION SITE SAFETY.
- YEH AND ASSOCIATES IS NOT RESPONSIBLE FOR WALL LAYOUT OR WALL DIMENSIONS.

CAST-IN-PLACE RETAINING WALL GENERAL NOTES

ALL WORK REQUIREMENTS SHOWN ON THESE DRAWINGS SHALL BE ACCOMPLISHED AS SPECIFIED IN THE PROJECT SPECIFICATIONS WITH ASSOCIATED SPECIAL PROVISIONS.

CONSTRUCT ALL WALLS ON UNDISTURBED NATIVE MATERIAL OR PROPERLY COMPACTED FILL. FILL FOUNDATION SOILS SHALL BE COMPACTED TO 95% OF MAXIMUM STANDARD DENSITY (ASTM D-698 / AASHTO T-180).

RETAINING WALL BACKFILL SHALL BE STRUCTURE BACKFILL (CLASS I) COMPACTED TO A DENSITY OF NO LESS THAN 95% OF MAXIMUM DENSITY DETERMINED IN ACCORDANCE WITH AASHTO T 180 WITHIN THE LIMITS SHOWN ON THE BACKFILL DETAIL.

THE INFORMATION SHOWN ON THESE PLANS CONCERNING THE TYPE AND LOCATION OF EXISTING UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATION AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO. THE CONTRACTOR SHALL CONTACT THE UTILITY NOTIFICATION CENTER OF COLORADO AT 1-800-922-1987 AT LEAST 3 BUSINESS DAYS (NOT INCLUDING THE DAY OF NOTIFICATION) PRIOR TO ANY EXCAVATION OR OTHER EARTHWORK.

STATIONS, EXISTING ELEVATIONS AND DIMENSIONS CONTAINED IN THESE PLANS ARE CALCULATED FROM A RECENT FIELD SURVEY. THE CONTRACTOR SHALL VERIFY ALL DEPENDENT DIMENSIONS IN THE FIELD BEFORE ORDERING OR FABRICATING ANY MATERIAL.

ALL PLAN DIMENSIONS ARE TRUE HORIZONTAL. THE CONTRACTOR AND/OR FABRICATOR IS RESPONSIBLE FOR INCORPORATING CAMBER AND CROSS-SLOPE AND OTHER EFFECTS THAT MAY IMPACT THE FINAL DIMENSIONS AND/OR DETAILING.

WALL LAYOUT LINES FOR RETAINING WALLS REPRESENT THE EXPOSED FACE OF THE RETAINING WALL (SEE STRUCTURAL DETAILS FOR EXACT LOCATION).

PATTERN: FRACTURED FIN *
COLOR: FEDERAL STANDARD 595B COLOR 36300

* CONTRACTOR TO VERIFY PRIOR TO ERECTING FORMS.

CAST-IN-PLACE WALL CONCRETE

ALL CONCRETE MATERIAL, PLACEMENT AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.

ALL CONCRETE SHALL BE CDOT CLASS D.

FOR CONCRETE COMPONENTS IN DIRECT CONTACT WITH EARTH, FOR ALL WALLS PROVIDE STRUCTURAL CONCRETE WITH CEMENTOUS MATERIALS MEETING THE SULFATE RESISTANCE REQUIREMENTS OF CLASS 2 AS DESCRIBED IN THE PROJECT SPECIFICATIONS AND SPECIAL PROVISIONS.

EXPANSION JOINT MATERIAL SHALL MEET AASHTO SPECIFICATION M-213.

CHAMFER ALL EXPOSED EDGES OF CONCRETE 3/4" UNLESS NOTED OTHERWISE. UNLESS OTHERWISE NOTED, ALL CONSTRUCTION JOINTS SHALL BE INTENTIONALLY ROUGHENED TO 1/4" AMPLITUDE.

CAST-IN-PLACE WALL REINFORCING STEEL

REINFORCING DIMENSIONS SHOWN IN THESE PLANS INDICATE CENTER-TO-CENTER SPACING DIMENSIONS UNLESS NOTED OTHERWISE.

REINFORCING STEEL SHALL BE DEFORMED, NEW BILLET BARS PER CURRENT ASTM A615 SPECIFICATIONS. GRADE 60 REINFORCING STEEL IS REQUIRED.

ALL REINFORCING SHALL BE BLACK (UNCOATED) UNLESS OTHERWISE NOTED. (E) DENOTES EPOXY COATED REINFORCING.

BAR BENDING DIAGRAM WHERE SHOWN ON THESE PLANS INDICATE OUT-TO-OUT DIMENSIONS OF THE NOMINAL BAR DIAMETER.

ALL REINFORCING SHALL HAVE A CLEAR COVERAGE OF 2 INCHES UNLESS SHOWN OTHERWISE ON THE PLANS. CLEAR COVERAGE IS MEASURED FROM THE CONCRETE SURFACE TO THE OUTSIDE OF THE REINFORCEMENT. REINFORCING BAR LAP SPLICES SHALL BE AS DETAILED ON THE PLANS.

WHEN THE CONTRACTOR ELECTS TO SUBSTITUTE EPOXY COATED REINFORCING BARS FOR BLACK REINFORCING BARS, THE REQUIRED MINIMUM LAP SPlice LENGTHS SHALL BE THOSE FOR EPOXY COATED BARS. LOCATIONS OF SUBSTITUTIONS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL.

FIELD BENDING OF REINFORCING STEEL SHALL BE PER CDOT SPECIFICATIONS (SECTION 602.05).

CAST-IN-PLACE WALL DESIGN DATA

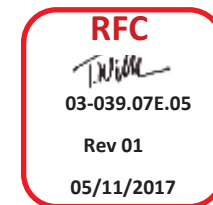
SEE YEH FINAL GEOTECHNICAL ENGINEERING REPORT, CRT BRIDGES OVER 46TH AVENUE, MARION STREET AND RACE COURT, DESIGN PACKAGE DP07 DATED 7/29/2015 FOR LABORATORY DATA AND SOIL CHARACTERISTICS.

DESIGN METHOD: SERVICE LOAD DESIGN METHOD

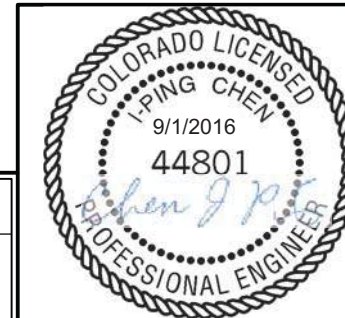
ACTIVE SOIL PRESSURE:
SOIL UNIT WEIGHT = 135 PCF
Ka = 0.28

SOIL PROPERTIES USED IN DESIGN:
ALLOWABLE BEARING PRESSURE: REFER TO GEOTECHNICAL REPORT
COEFFICIENT OF SLIDING FRICTION: 0.53

REINFORCED CONCRETE:
CLASS D CONCRETE: F'c = 4,500 PSI
REINFORCING STEEL: Fy = 60,000 PSI



811
Know what's below. Call before you dig.
CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987 or 811
CALL 3-BUSINESS DAYS (NOT INCLUDING INITIAL DAY OF CONTACT) IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.



USER: Mike Walz 7/14/2016 10:14:52 AM NM-S-SW-501.dgn

Yeh and Associates, Inc. Consulting Engineers & Scientists	
DESIGNED BY: IPC	DATE: 05/15/2015
DRAWN BY: MJW	DATE: 05/15/2015
CHECKED BY: MLK	DATE: 05/15/2015
APPROVED BY: TR	DATE: 09/04/2015
HORZ. SCALE:	
VERT. SCALE:	
NO.	REVISIONS
BY	DATE

REGIONAL RAIL PARTNERS
Balfour Beatty / GRAHAM JOINT VENTURE

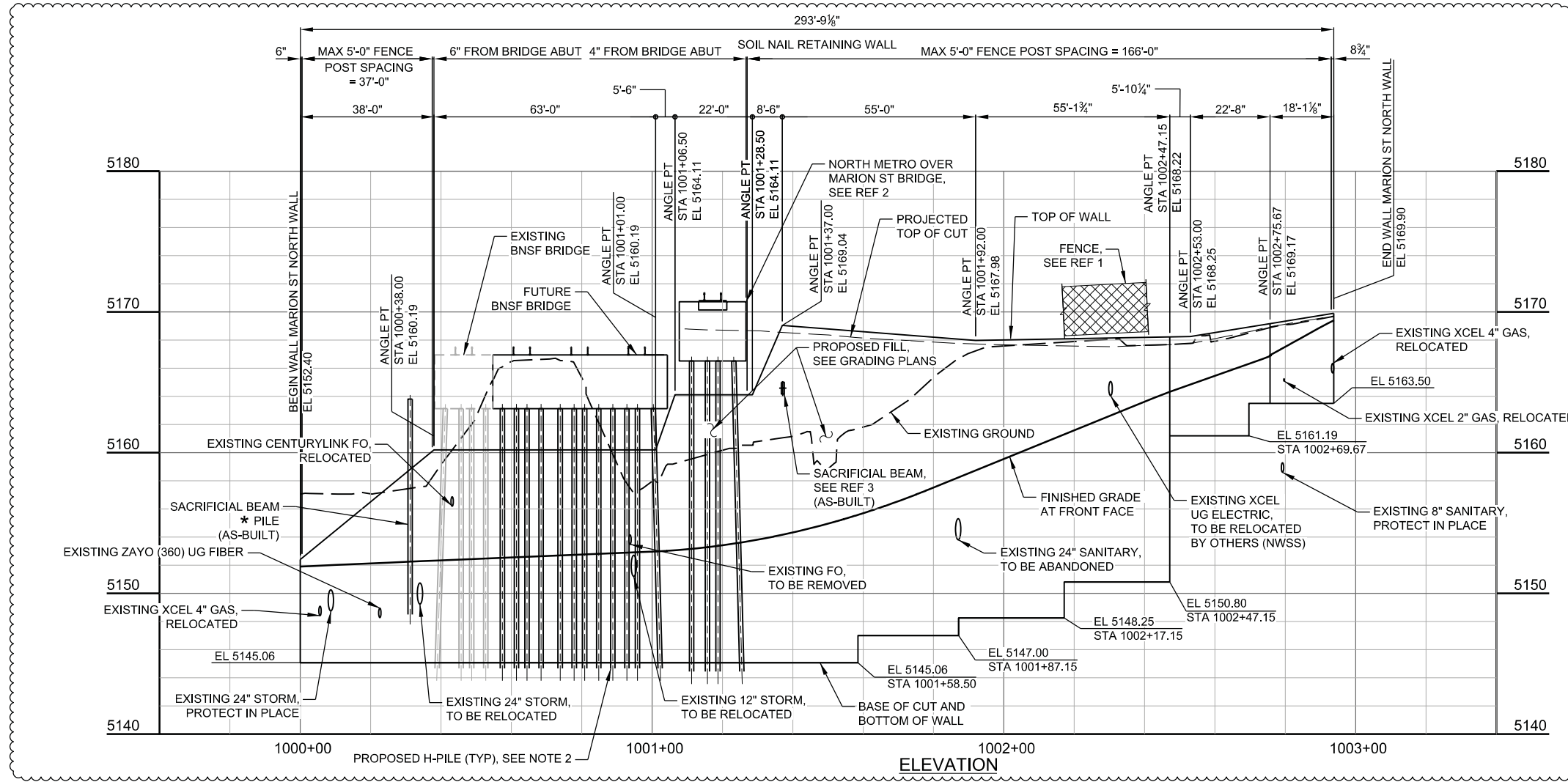
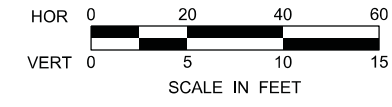
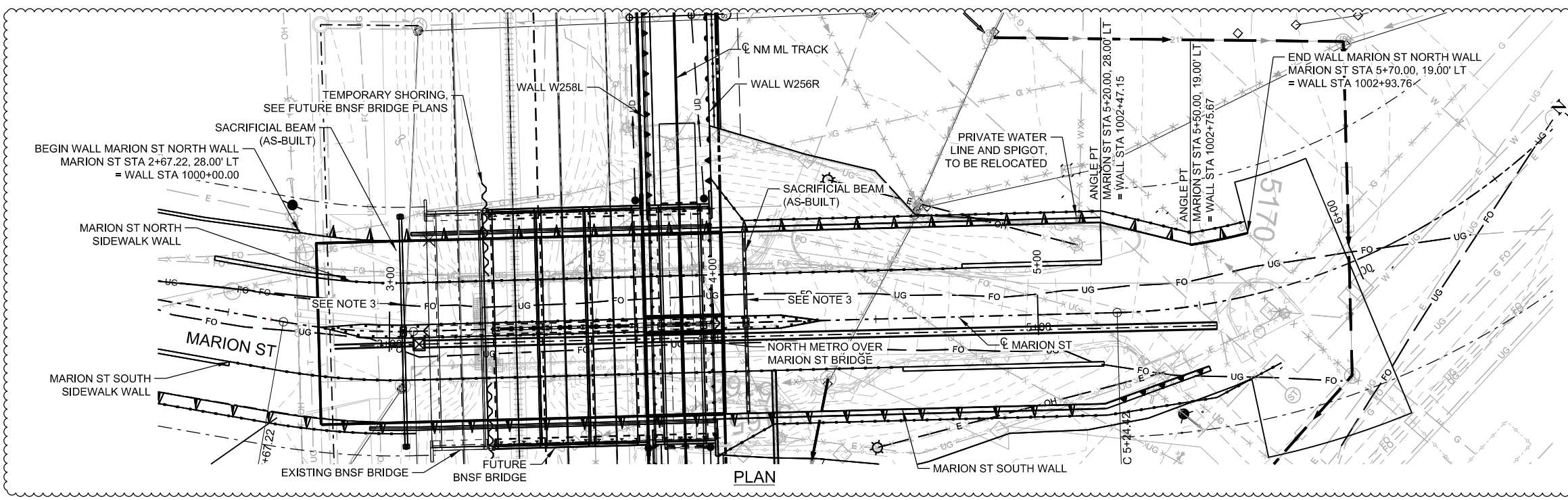
Stantec
2000 SOUTH COLORADO BOULEVARD
SUITE 2-300
DENVER, COLORADO 80222
(303) 758-4058

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North Metro Rail Line
REGIONAL TRANSPORTATION DISTRICT
1600 BLAKE STREET
DENVER, COLORADO 80202
(303) 628-9000

NORTH METRO RAIL LINE

STRUCTURAL RETAINING WALLS GENERAL INFORMATION

DWG No. SW-501



- NOTES:**
- UTILITIES SHOWN ARE FOR REFERENCE ONLY. SEE UTILITY PLANS FOR MORE INFORMATION ON UTILITY OWNERS, REMOVAL AND RELOCATIONS.
 - H-PILE SHALL BE INSTALLED PRIOR TO SOIL NAIL CONSTRUCTION.
 - RESET SACRIFICIAL BEAM WHEN MARION STREET IS LOWERED IN THE FUTURE. SET BOTTOM OF BEAM AT AN ELEVATION THAT PROVIDES A VERTICAL CLEARANCE ABOVE MARION STREET THAT EQUALS 2" LESS THAN OCCURS UNDER THE LOWEST OF THE ADJACENT BNSF BRIDGES.
- * SACRIFICIAL BEAM PILE LOCATED 18'-0" FROM CL OF EXISTING BNSF TRACK PER BNSF OVER MARION ST AS-BUILT PLANS.

REFERENCES LEGEND:

IDENTIFIER	SHEET NAME
1	FENCE CHAIN LINK (SPECIAL) (42 INCH)
2	NM OVER MARION ST BRIDGE PLANS
3	SACRIFICIAL BEAM WALL CONNECTION DETAILS

RFC
03-039.07E.05
Rev 02
7/2/2019



USER: fhidalgo 4/11/2019 12:03:51 PM NM-S-SW-502.dgn

NO.	REVISIONS	BY	DATE
1	NMC-DCN-000143; MARION REDESIGN	JEB	04/11/2019
2	NMC-DCN-000016-REVISED SOIL NAIL WALL	TAR	01/20/2017
3	ISSUED FOR CONSTRUCTION	TAR	09/04/2015

DESIGNED BY: FAH	DATE: 04/10/2015	CHECKED BY: MTW	DATE: 04/11/2019	HORZ. SCALE: 1" = 40'
DRAWN BY: FAH	DATE: 04/10/2015	APPROVED BY: JEB	DATE: 04/11/2019	VERT. SCALE: 1" = 10'

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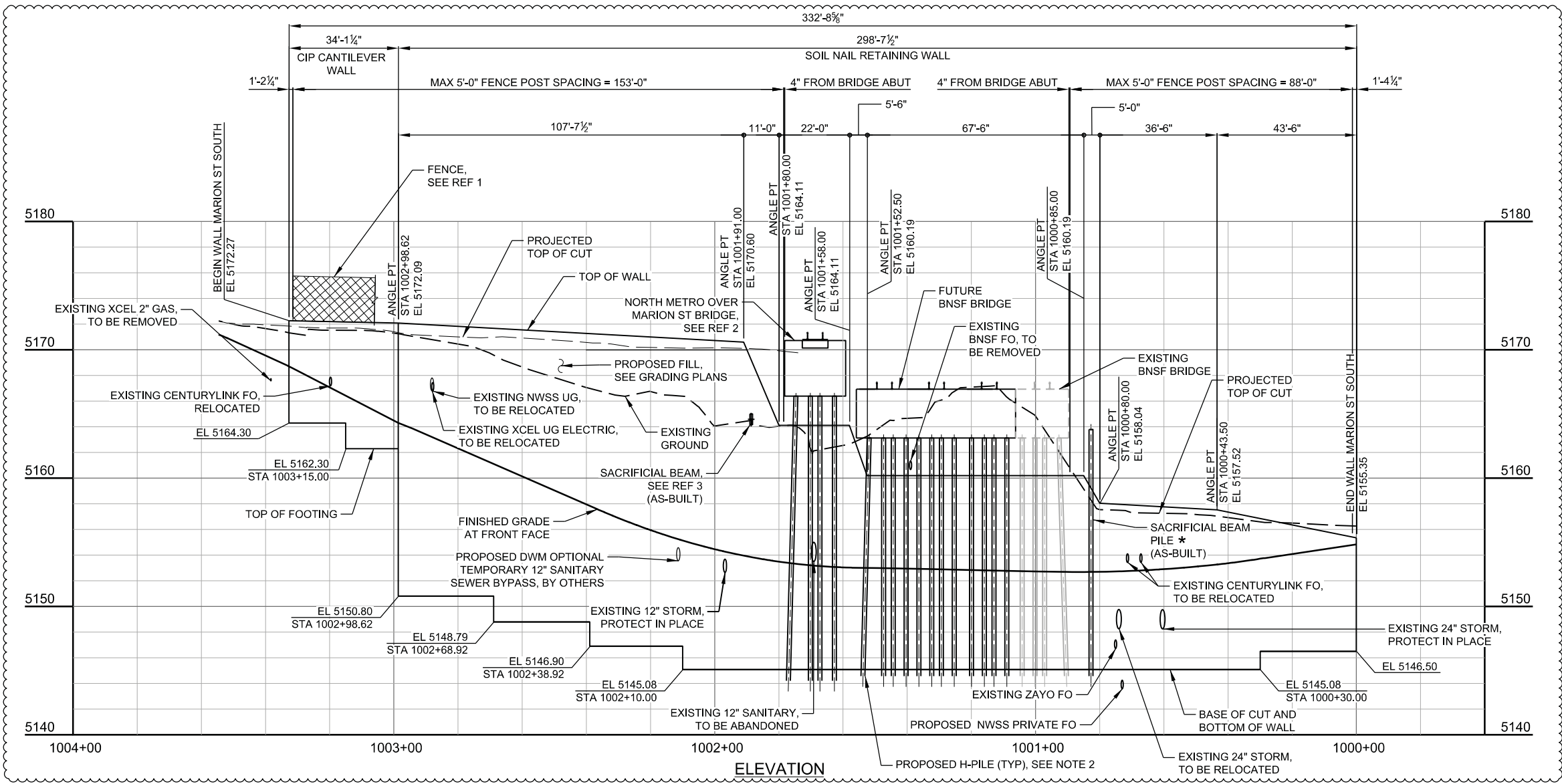
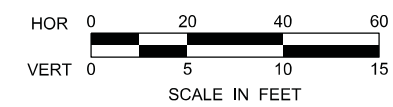
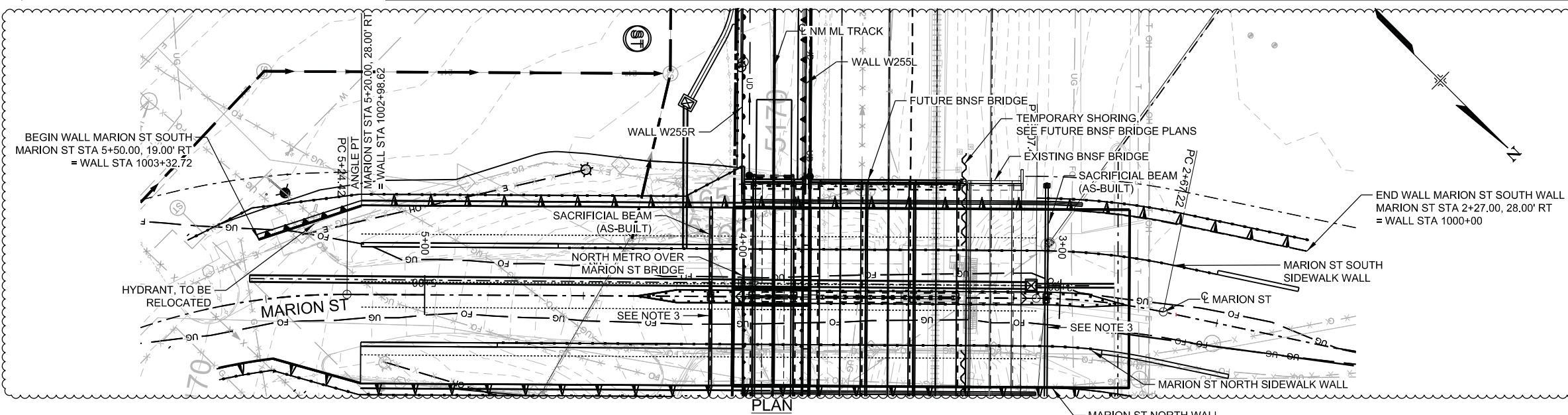
Stantec
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(303) 758-4058

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STRUCTURAL RETAINING WALLS
MARION ST NORTH WALL LAYOUT

DWG No. SW-502



RFC
T.W.
 03-039.07E.05
 Rev 02
 7/2/2019

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REFERENCES LEGEND:

IDENTIFIER	SHEET NAME
1	FENCE CHAIN LINK (SPECIAL) (42 INCH)
2	NM OVER MARION ST BRIDGE PLANS
3	SACRIFICIAL BEAM WALL CONNECTION DETAILS

USER: fhidalgo
 4/11/2019 11:57:15 AM
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NO.	REVISIONS	BY	DATE
1	NMC-DCN-000143; MARION REDESIGN	JEB	04/11/2019
2	NMC-DCN-000016-REVISED SOIL NAIL WALL	TAR	01/20/2017
0	ISSUED FOR CONSTRUCTION	TAR	09/04/2015

DESIGNED BY: FAH	DATE: 04/10/2015	CHECKED BY: MTW	DATE: 04/11/2019	HORZ. SCALE: 1" = 40'
DRAWN BY: FAH	DATE: 04/10/2015	APPROVED BY: JEB	DATE: 04/11/2019	VERT. SCALE: 1" = 10'

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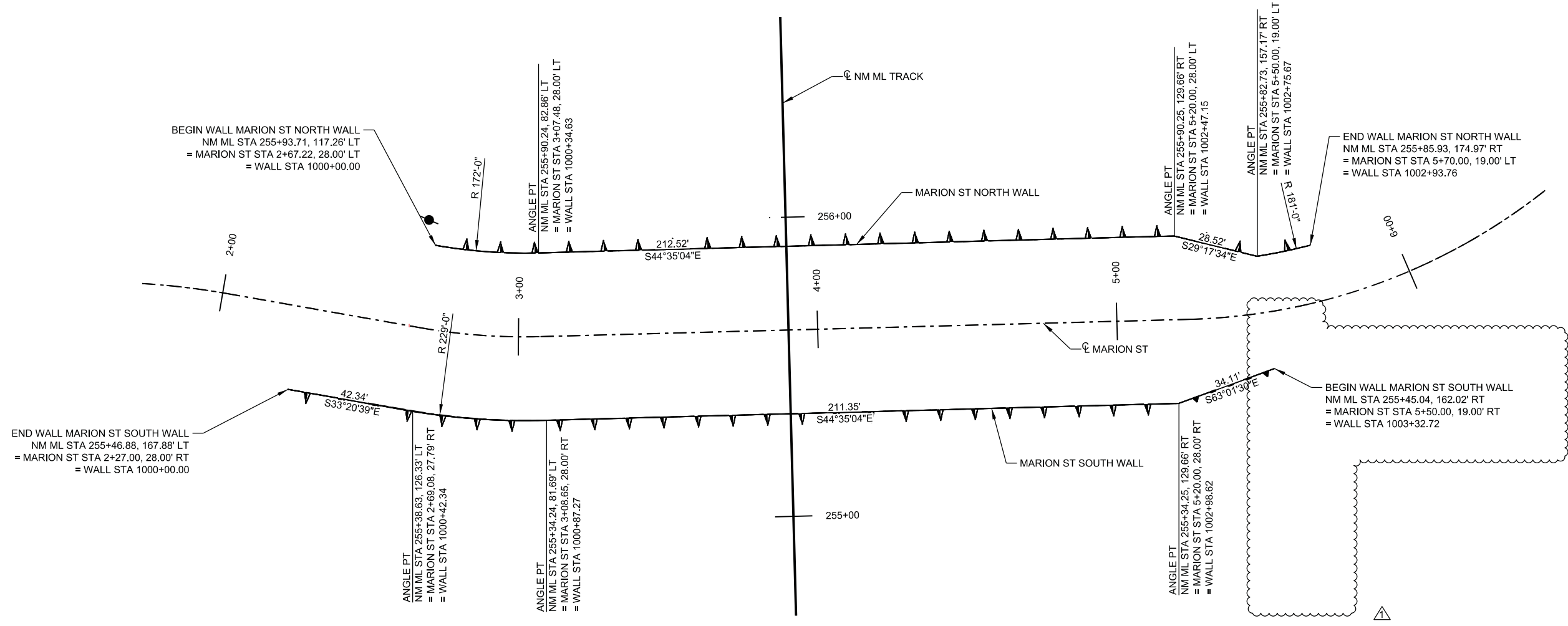
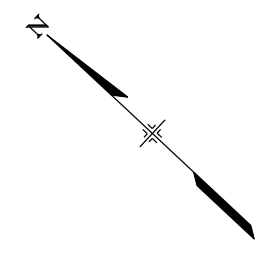
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 Rail Line

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 1600 BLAKE STREET
 DENVER, COLORADO 80202
 (303) 628-9000

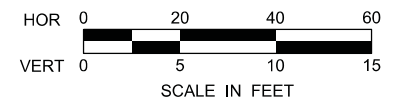
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 MARION ST SOUTH WALL LAYOUT

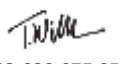
COLORADO LICENSED
 JAMES E. BADER
 04/11/2019
49037
 PROFESSIONAL ENGINEER

DWG No. SW-503



PLAN



RFC

 03-039.07E.05
 Rev 01
 7/2/2019




DWG No. SW-503A

USER: fhidalgo 4/11/2019 12:10:16 PM NM-S-SW-503A.dgn

NO.	REVISIONS	BY	DATE
1	NMC-DCN-000143; MARION REDESIGN	JEB	04/11/2019
0	ISSUED FOR CONSTRUCTION	TAR	09/04/2015

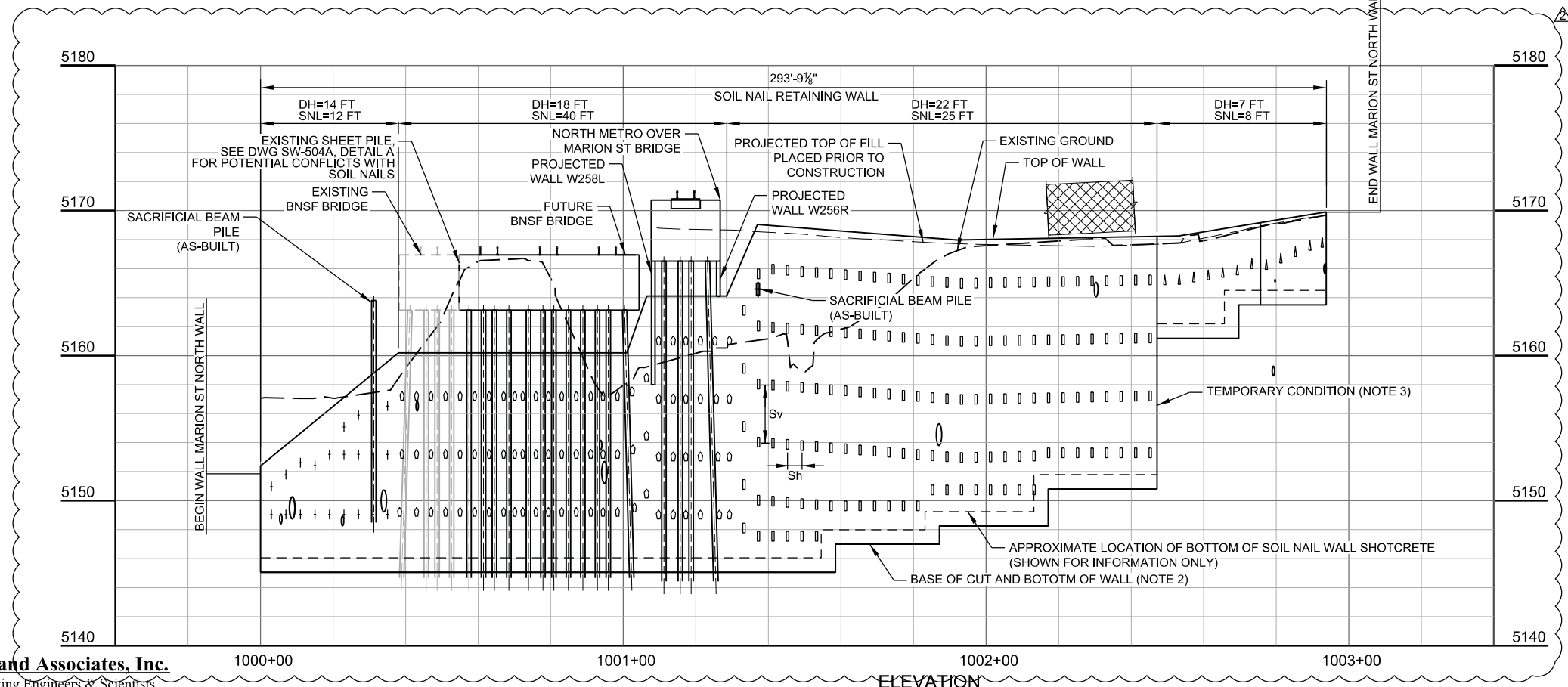
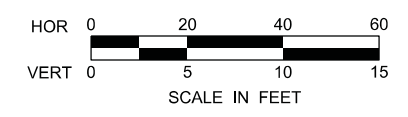
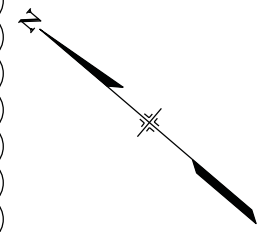
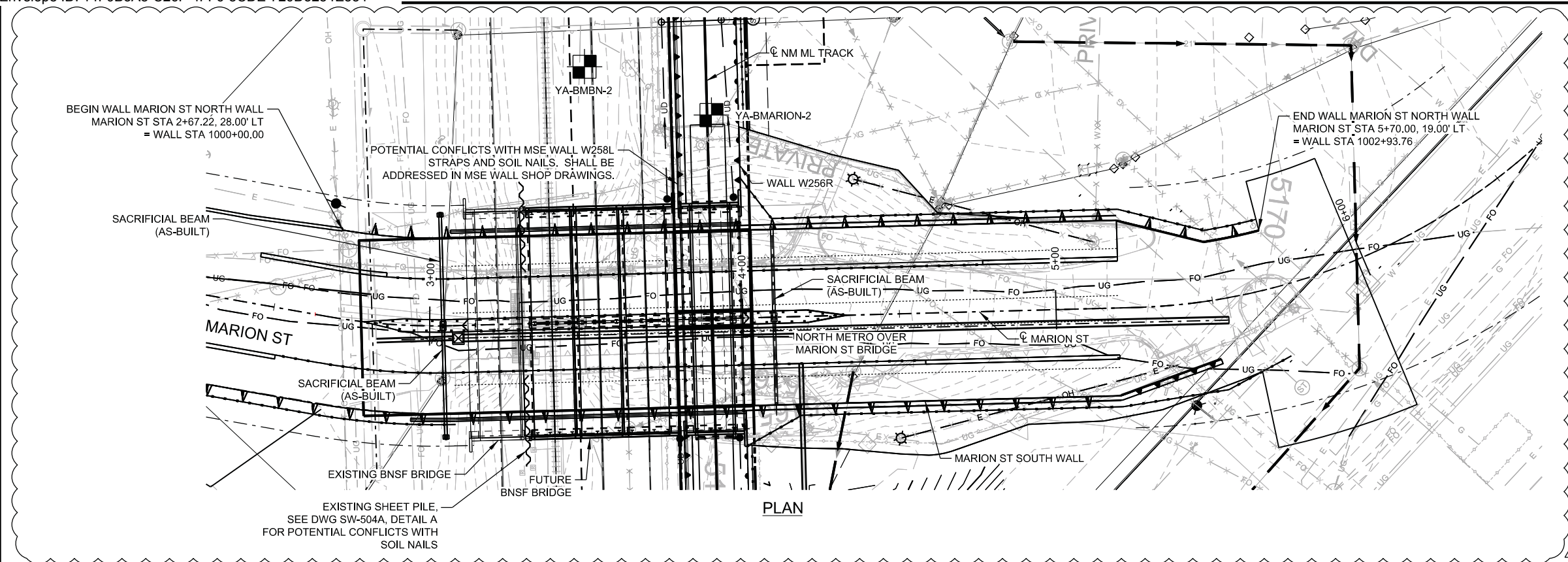
DESIGNED BY: FAH DATE: 04/10/2015
 DRAWN BY: FAH DATE: 04/10/2015


CHECKED BY: JEB DATE: 11/30/2018
 APPROVED BY: JEB DATE: 04/11/2019


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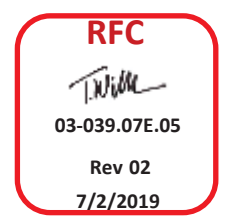
NORTH METRO RAIL LINE
 STRUCTURAL
 RETAINING WALLS
 GEOMETRIC CONTROL MARION ST WALLS



- NOTES:
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 - BASE OF CUT AND BOTTOM OF WALL SHALL BE CONTROLLED BY MARION STREET ROADWAY PLANS.
 - TEMPORARY CONDITION SHALL BE ACCOUNTED FOR DURING CONSTRUCTION AND SHALL BE ADDRESSED IN SHOP DRAWINGS.
 - MINIMUM REQUIRED SOIL NAILS SHALL BE ADDRESSED IN SHOP DRAWINGS.
 - SACRIFICIAL BEAM PILE LOCATED 18'-0" FROM C OF EXISTING BNSF TRACK PER BNSF OVER MARION ST AS-BUILT PLANS.

8 FT SOIL NAIL
 12 FT SOIL NAIL
 25 FT SOIL NAIL
 40 FT SOIL NAIL

 Sv = 4'
 Sh = 4'
 DH = DESIGN HEIGHT
 SNL = SOIL NAIL LENGTH
 Sv = SPACING VERTICAL
 Sh = SPACING HORIZONTAL



NOTE: THE EXTENT AND COMPACTION REQUIREMENTS FOR THE FILL THAT WILL BE PLACED BEFORE SOIL NAIL WALL CONSTRUCTION ARE SHOWN ON THE GRADING PLAN (DWG NO. CG-1101 AND CG-1102)

USER: mwalz 4/12/2019 10:56:48 AM NM-S-SW-504.dgn

Yeh and Associates, Inc.
Consulting Engineers & Scientists

NO.	REVISIONS	BY	DATE
1	DCN000143: MARION REDESIGN	IPC	04/12/2019
2	DCN000016-REVISED SOIL NAIL WALL	IPC	06/22/2016
3	ISSUED FOR CONSTRUCTION	TAR	09/04/2015

DESIGNED BY: IPC	DATE: 04/11/2019	CHECKED BY: MLK	DATE: 04/12/2019	HORZ. SCALE: 1" = 40'
DRAWN BY: MJW	DATE: 04/11/2019	APPROVED BY: JEB	DATE: 04/12/2019	VERT. SCALE: 1" = 10'

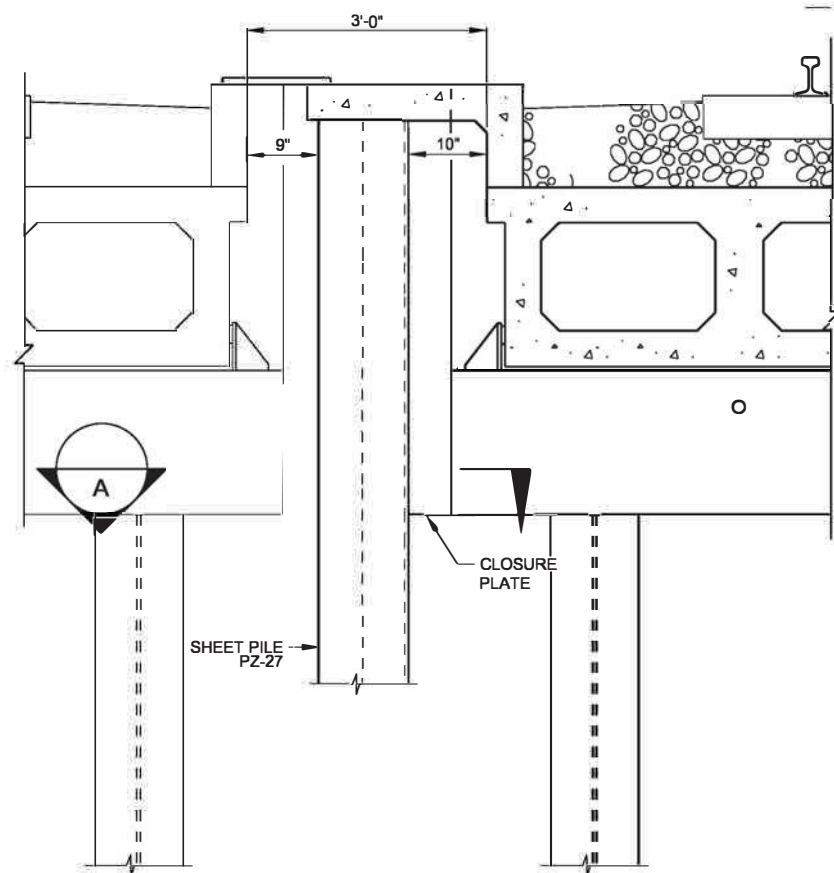
PARSONS BRINCKERHOFF
 555 17TH STREET
 SUITE 500
 DENVER, CO 80202 (303) 832-9091

RTD Fastracks
 North Metro Rail Line
 REGIONAL TRANSPORTATION DISTRICT
 1600 BLAKE STREET
 DENVER, COLORADO 80202
 (303) 628-9000

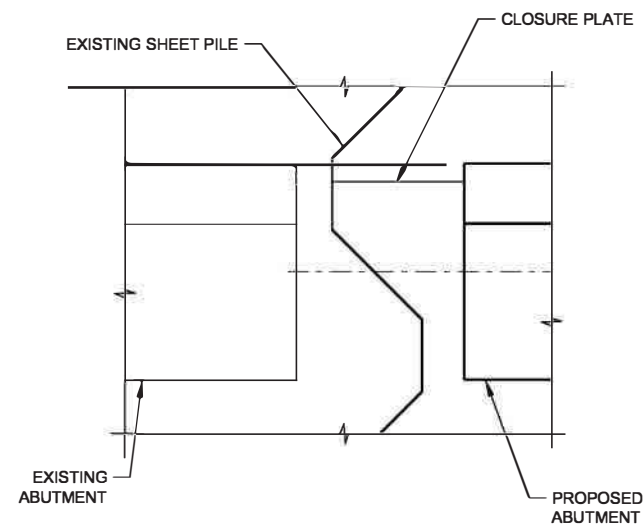
NORTH METRO RAIL LINE
 STRUCTURAL RETAINING WALLS
 MARION ST NORTH SOIL NAIL LAYOUT

COLORADO LICENSED PROFESSIONAL ENGINEER
 PING CHEN
 4-12-2019
 44801
 Rev 02
 7/2/2019
 DWG No. SW-504

SHEET PILE USED - PZ-27
PLEASE NOTE THAT SHEET PILE
INSTALLED EXACTLY PARALLEL
TO TRACK.



DETAIL A



SECTION A

RFC
T. Williams
03-039.07E.05
Rev 00
05/11/2017

COLORADO REGISTERED
THOMAS J. WESTERLIND
43057
8/30/2016
PROFESSIONAL ENGINEER
Thomas J. Westerland

8/30/2016

DWG No. SW-504A

USER: sfoj 6/21/2016 5:15:46 PM NM-S-SB-CLOSURE PLATE-NORTH.dgn

NO.	REVISIONS	BY	DATE
0	DCN000016-REVISED SOIL NAIL WALL	IPC	06/22/2016

DESIGNED BY: TJW	DATE: 12/19/2014	CHECKED BY: BM	DATE: 02/09/2015
DRAWN BY: ALF	DATE: 12/23/2014	APPROVED BY:	DATE:

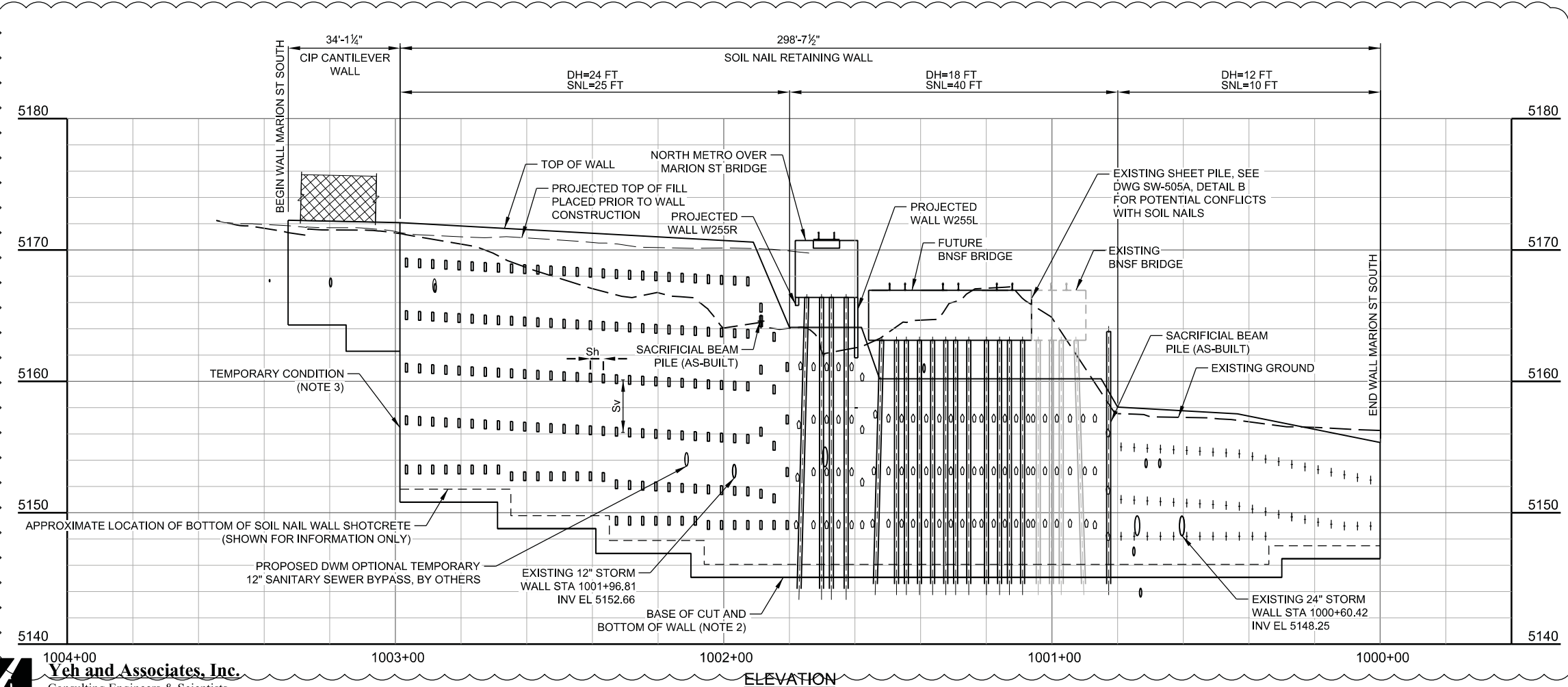
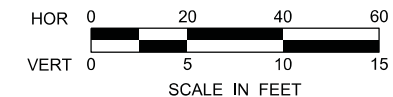
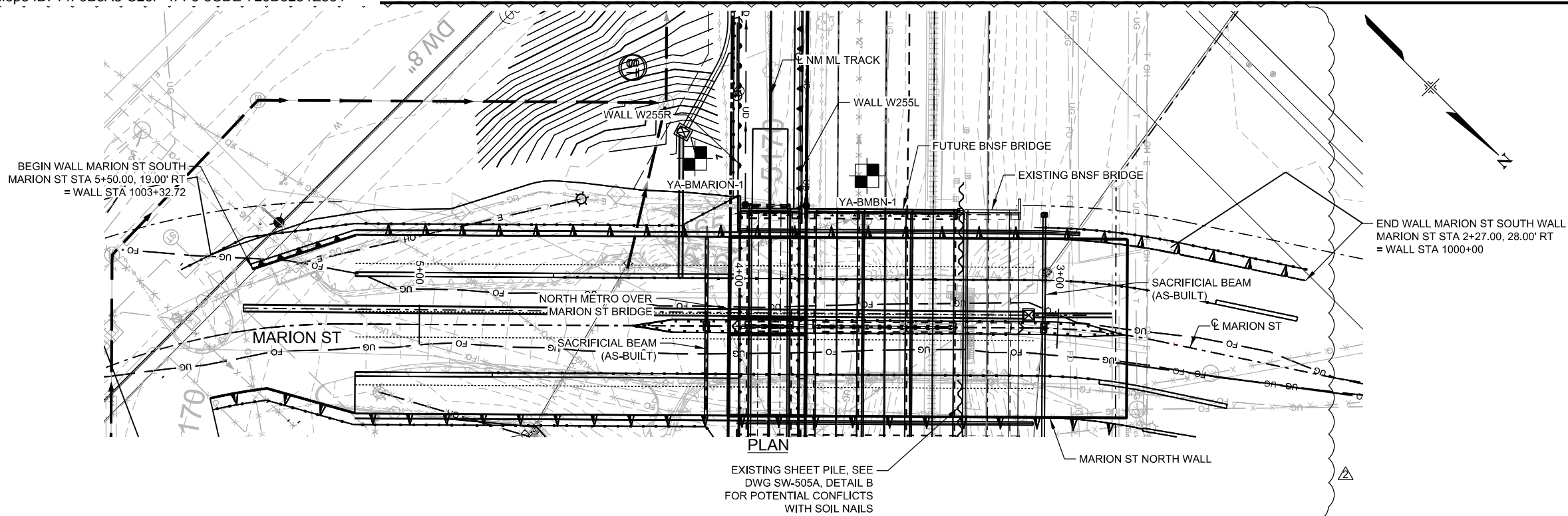
HORZ. SCALE: NTS
VERT. SCALE: NTS



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SUITE 2-300
DENVER, COLORADO 80222
(303) 758-4058

RTD FasTracks
North Metro
Rail Line
REGIONAL TRANSPORTATION DISTRICT
1600 BLAKE STREET
DENVER, COLORADO 80202
(303) 628-9000

NORTH METRO RAIL LINE
STRUCTURAL
DETAIL A
NORTH SOIL NAIL WALL



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 - TEMPORARY CONDITION SHALL BE ACCOUNTED FOR DURING CONSTRUCTION AND SHALL BE ADDRESSED IN SHOP DRAWINGS.
 - MINIMUM REQUIRED SOIL NAILS SHALL BE ADDRESSED IN SHOP DRAWINGS.
 - SACRIFICIAL BEAM PILE LOCATED 18'-0" FROM L OF EXISTING BNSF TRACK PER BNSF OVER MARION ST AS-BUILT PLANS.

⊥ = 10 FT SOIL NAIL
⊥ = 25 FT SOIL NAIL
⊥ = 40 FT SOIL NAIL

Sv = 4'
Sh = 4'

DH = DESIGN HEIGHT
SNL = SOIL NAIL LENGTH
Sv = SPACING VERTICAL
Sh = SPACING HORIZONTAL

RFC

[Signature]

03-039.07E.05

Rev 02

7/2/2019

NOTE:
THE EXTENT AND COMPACTION REQUIREMENTS FOR THE FILL THAT WILL BE PLACED BEFORE SOIL NAIL WALL CONSTRUCTION ARE SHOWN ON THE GRADING PLAN (DWG NO. CG-1101 AND CG-1102)



USER: mwalz 4/12/2019 10:47:52 AM NM-S-SW-505.dgn

1004+00
Yeh and Associates, Inc.
Consulting Engineers & Scientists

NO.	REVISIONS	BY	DATE
1	DCN000143: MARION REDESIGN	IPC	04/11/2019
2	DCN000016-REVISED SOIL NAIL WALL	IPC	06/22/2016
3	ISSUED FOR CONSTRUCTION	TAR	09/04/2015

DESIGNED BY: IPC	DATE: 04/11/2019	CHECKED BY: MLK	DATE: 04/12/2019	HORZ. SCALE: 1" = 40'
DRAWN BY: MJW	DATE: 04/11/2019	APPROVED BY: JEB	DATE: 04/12/2019	VERT. SCALE: 1" = 10'

REGIONAL RAIL PARTNERS
Balfour Beatty / GRAHAM JOINT VENTURE

PARSONS BRINCKERHOFF
555 17TH STREET
SUITE 500
DENVER, CO 80202 (303) 832-9091

RTD FasTracks
North Metro Rail Line

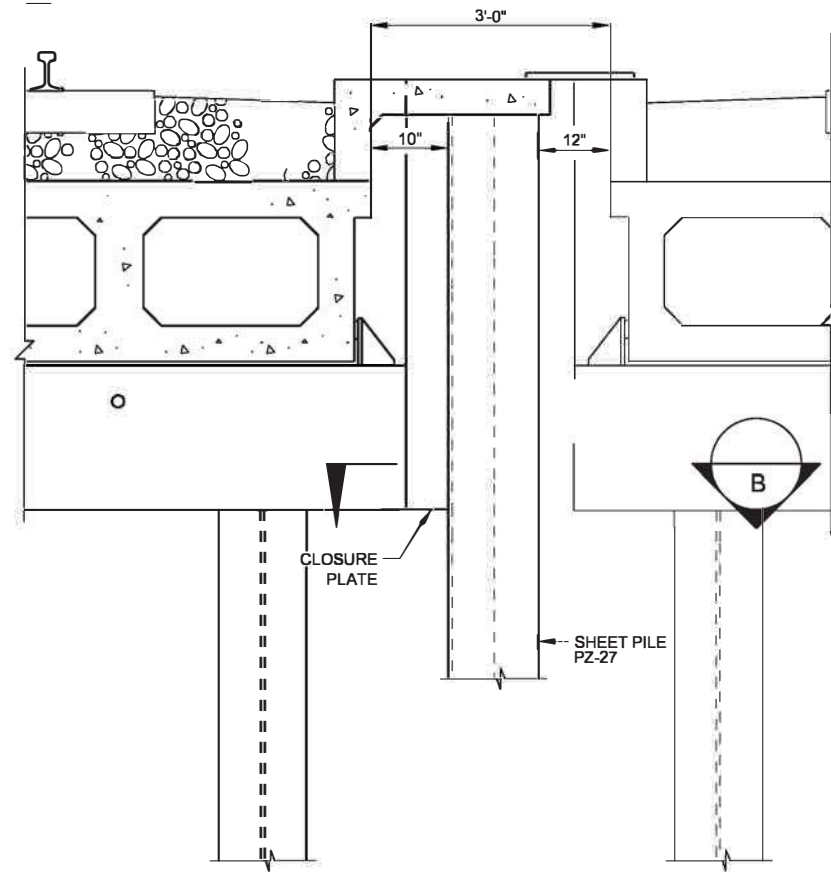
REGIONAL TRANSPORTATION DISTRICT
1600 BLAKE STREET
DENVER, COLORADO 80202
(303) 628-9000

NORTH METRO RAIL LINE

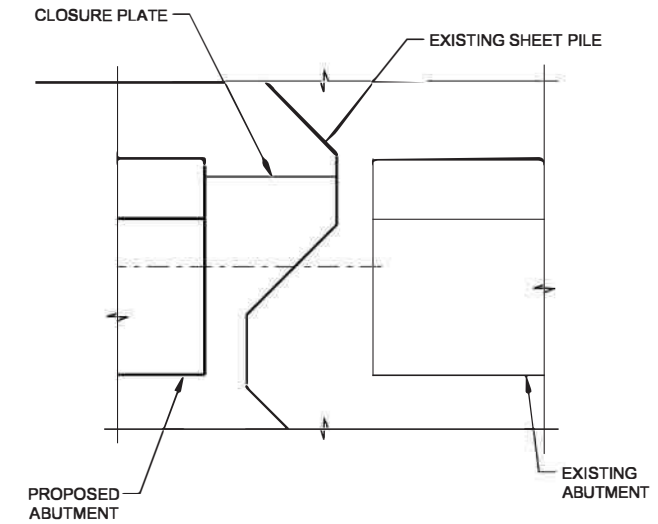
STRUCTURAL RETAINING WALLS
MARION ST SOUTH SOIL NAIL LAYOUT

DWG No. SW-505

SHEET PILE USED - PZ-27
PLEASE NOTE THAT SHEET PILE
INSTALLED EXACTLY PARALLEL
TO TRACK.



DETAIL B



SECTION B

RFC
T. Williams
03-039.07E.05
Rev 00
05/11/2017

COLORADO REGISTERED
ENGINEER
THOMAS J. WESTERMAN
43063
8/30/2016
PROFESSIONAL ENGINEER

8/30/2016

DWG No. SW-505A

NM-S-SB-CLOSURE PLATE-SOUTH.dgn

5:13:15 PM

6/21/2016

USER: sfly

NO.	REVISIONS	BY	DATE
0	DCN000016-REVISED SOIL NAIL WALL	IPC	06/22/2016

DESIGNED BY: TJW	DATE: 12/19/2014	CHECKED BY: BM	DATE: 02/09/2015	HORIZ SCALE: NTS
DRAWN BY: ALF	DATE: 12/23/2014	APPROVED BY:	DATE:	VERT. SCALE: NTS

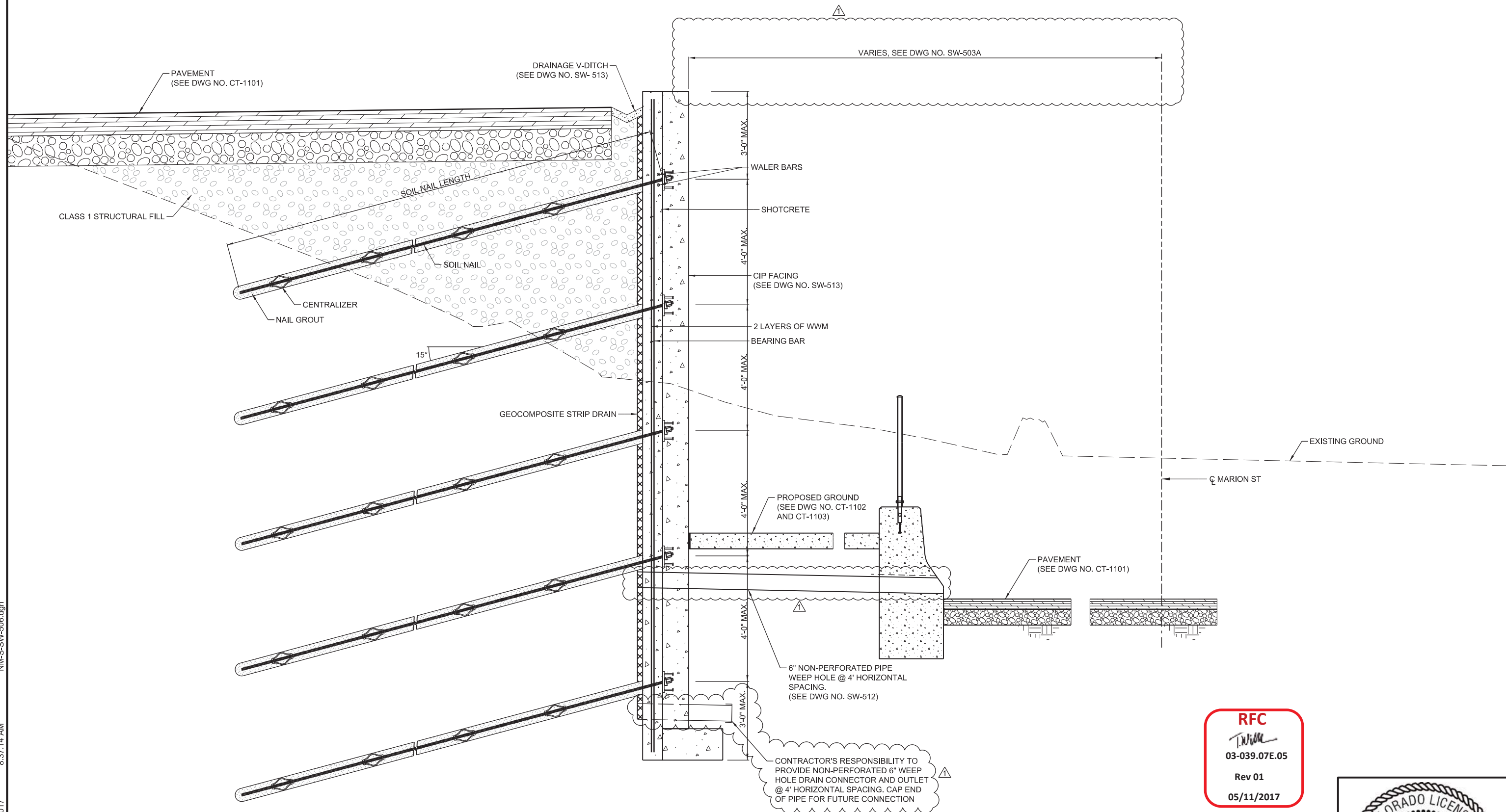


2000 SOUTH COLORADO BOULEVARD
SUITE 2-300
DENVER, COLORADO 80222
(303) 758-4058

RTD FasTracks
North Metro
Rail Line
REGIONAL TRANSPORTATION DISTRICT
1600 BLAKE STREET
DENVER, COLORADO 80202
(303) 678-9000

NORTH METRO RAIL LINE

**STRUCTURAL
DETAIL B
SOUTH SOIL NAIL WALL**



NORTH SOIL NAIL WALL TYPICAL SECTION

RFC
T. Mike
 03-039.07E.05
 Rev 01
 05/11/2017



Yeh and Associates, Inc.
 Consulting Engineers & Scientists

NO.	REVISIONS	BY	DATE
1	DCN000016-REVISED SOIL NAIL WALL	TAR	01/06/2017
0	ISSUED FOR CONSTRUCTION	TAR	09/04/2015

DESIGNED BY: IPC	DATE: 05/15/2015	CHECKED BY: MLK	DATE: 05/15/2015	HORIZ. SCALE: NTS
DRAWN BY: MJW	DATE: 05/15/2015	APPROVED BY: TR	DATE: 09/04/2015	VERT. SCALE:

REGIONAL RAIL PARTNERS
 Balfour Beatty / GRAHAM JOINT VENTURE

2000 SOUTH COLORADO BOULEVARD
 SUITE 2-300
 DENVER, COLORADO 80222
 (303) 758-4058

RTD FasTracks
 North Metro
 Rail Line
 REGIONAL TRANSPORTATION DISTRICT
 1600 BLAKE STREET
 DENVER, COLORADO 80202
 (303) 628-9000

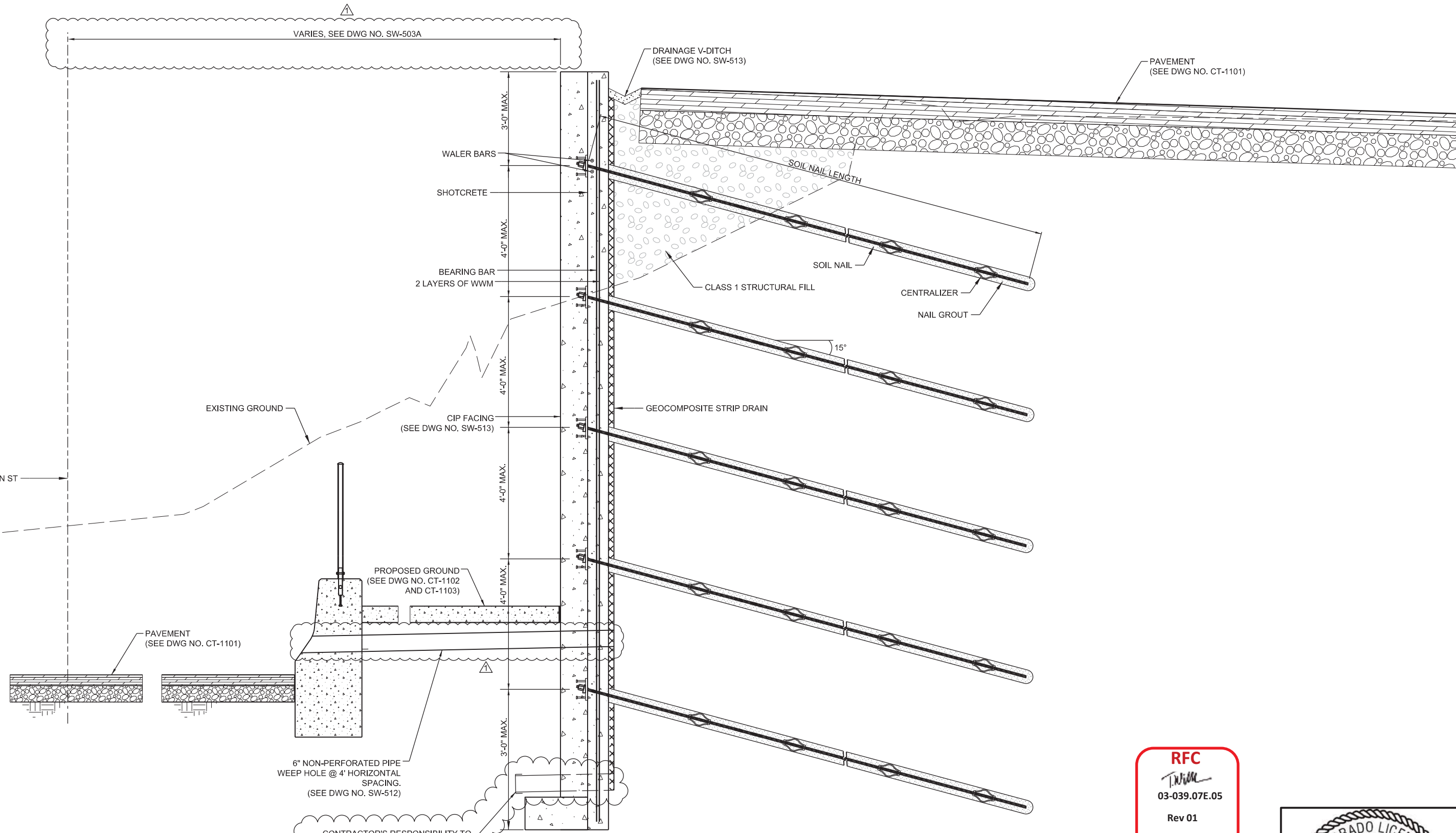
NORTH METRO RAIL LINE

**STRUCTURAL
 RETAINING WALLS**

NORTH SOIL NAIL WALL TYPICAL SECTION

DWG No. SW-506

USER: Mike Walz
 1/20/2017 8:37:14 AM
 NIM-S-SW-506.dgn



CONTRACTOR'S RESPONSIBILITY TO PROVIDE NON-PERFORATED 6\"/>

RFC
T. Miller
 03-039.07E.05
 Rev 01
 05/11/2017

SOUTH SOIL NAIL WALL TYPICAL SECTION

Yeh and Associates, Inc.
 Consulting Engineers & Scientists

NO.	REVISIONS	BY	DATE
0	ISSUED FOR CONSTRUCTION	TAR	09/04/2015
1	DCN000016-REVISED SOIL NAIL WALL	TAR	01/06/2017

DESIGNED BY: IPC DATE: 05/15/2015
 DRAWN BY: MJW DATE: 05/15/2015

REGIONAL RAIL PARTNERS
 Balfour Beatty / GRAHAM JOINT VENTURE

CHECKED BY: MLK DATE: 05/15/2015
 APPROVED BY: TR DATE: 09/04/2015

2000 SOUTH COLORADO BOULEVARD
 SUITE 2-300
 DENVER, COLORADO 80222
 (303) 758-4058

RTD FasTracks
 North Metro Rail Line

REGIONAL TRANSPORTATION DISTRICT
 1600 BLAKE STREET
 DENVER, COLORADO 80202
 (303) 628-9000

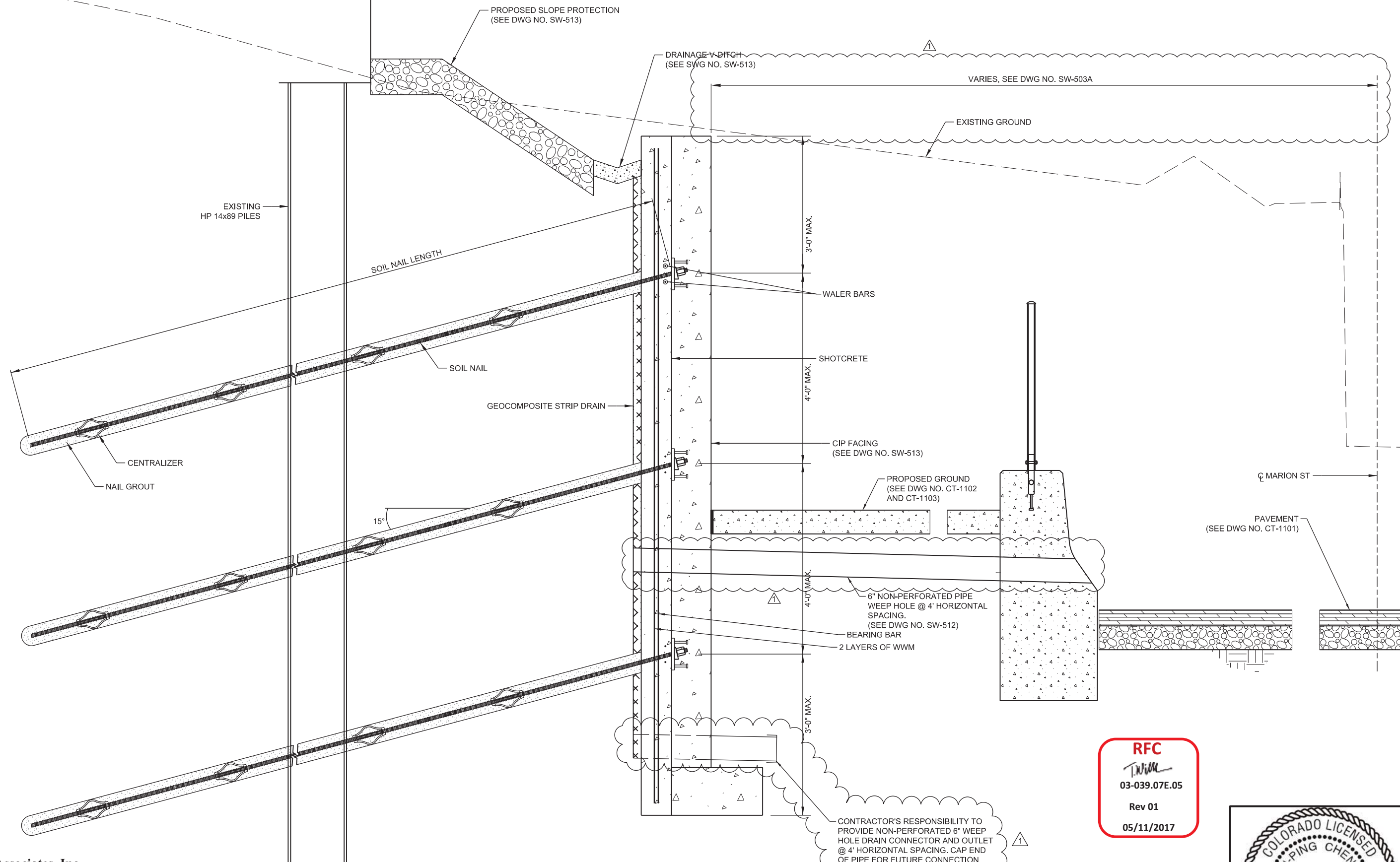
NORTH METRO RAIL LINE

STRUCTURAL RETAINING WALLS

SOUTH SOIL NAIL WALL TYPICAL SECTION

DWG No. SW-507

USER: Mike Walz
 1/20/2017 1:59:01 PM
 NIM-S-SW-507.dgn



NORTH SOIL NAIL WALL AT ABUTMENT TYPICAL SECTION

RFC
T.W.M.
 03-039.07E.05
 Rev 01
 05/11/2017



Yeh and Associates, Inc.
 Consulting Engineers & Scientists

NO.	REVISIONS	BY	DATE
1	DCN000016-REVISED SOIL NAIL WALL	TAR	01/06/2017
0	ISSUED FOR CONSTRUCTION	TAR	09/04/2015

DESIGNED BY: IPC	DATE: 05/15/2015	CHECKED BY: MLK	DATE: 05/15/2015	HORIZ. SCALE: NTS
DRAWN BY: MJW	DATE: 05/15/2015	APPROVED BY: TR	DATE: 09/04/2015	VERT. SCALE:

REGIONAL RAIL PARTNERS
 Balfour Beatty / GRAHAM JOINT VENTURE

Stantec
 2000 SOUTH COLORADO BOULEVARD
 SUITE 2-300
 DENVER, COLORADO 80222
 (303) 758-4058

RTD FasTracks
 North Metro Rail Line

REGIONAL TRANSPORTATION DISTRICT
 1600 BLAKE STREET
 DENVER, COLORADO 80202
 (303) 628-9000

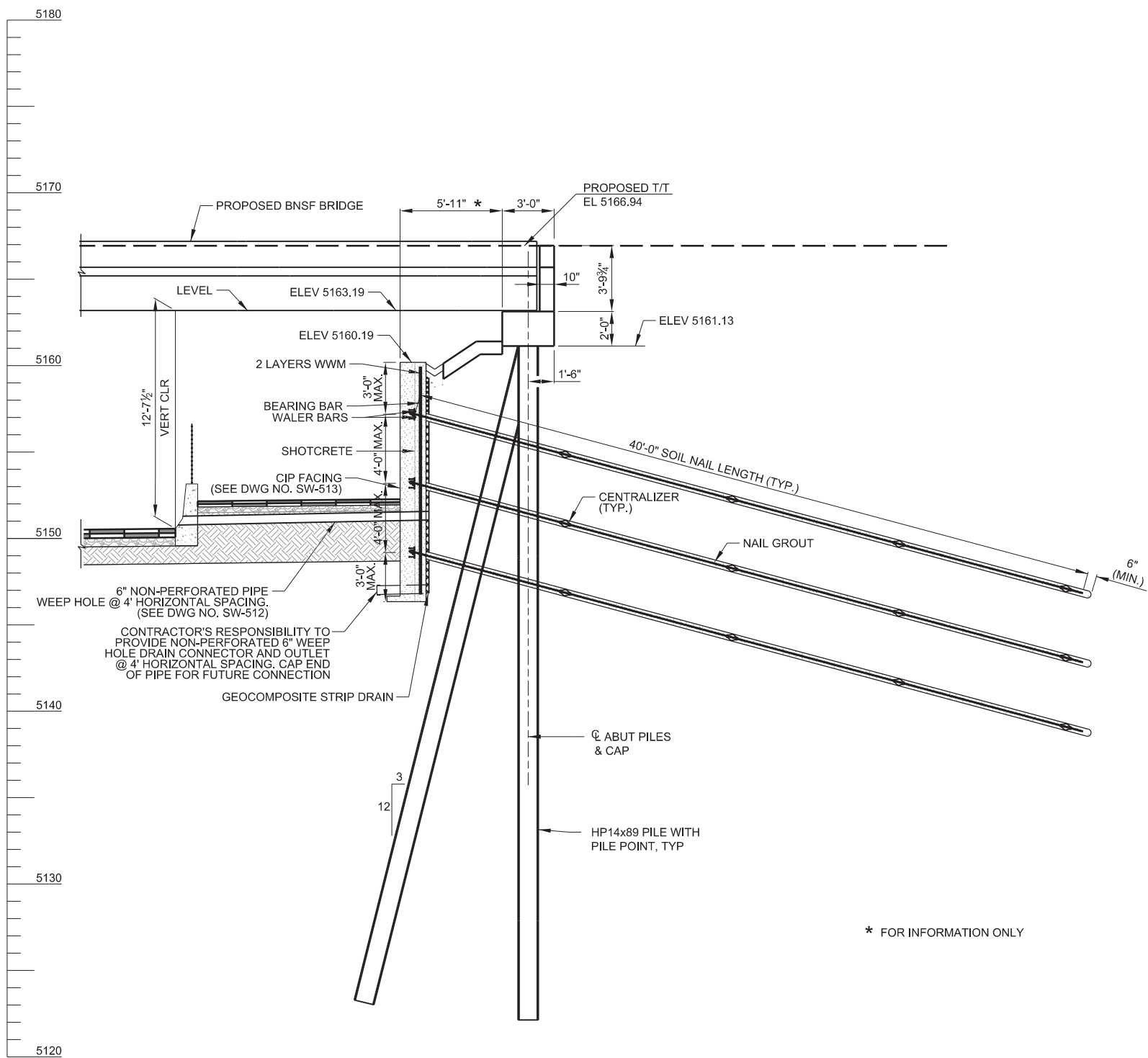
NORTH METRO RAIL LINE

STRUCTURAL RETAINING WALLS

NORTH SOIL NAIL WALL AT ABUTMENT TYPICAL SECTION

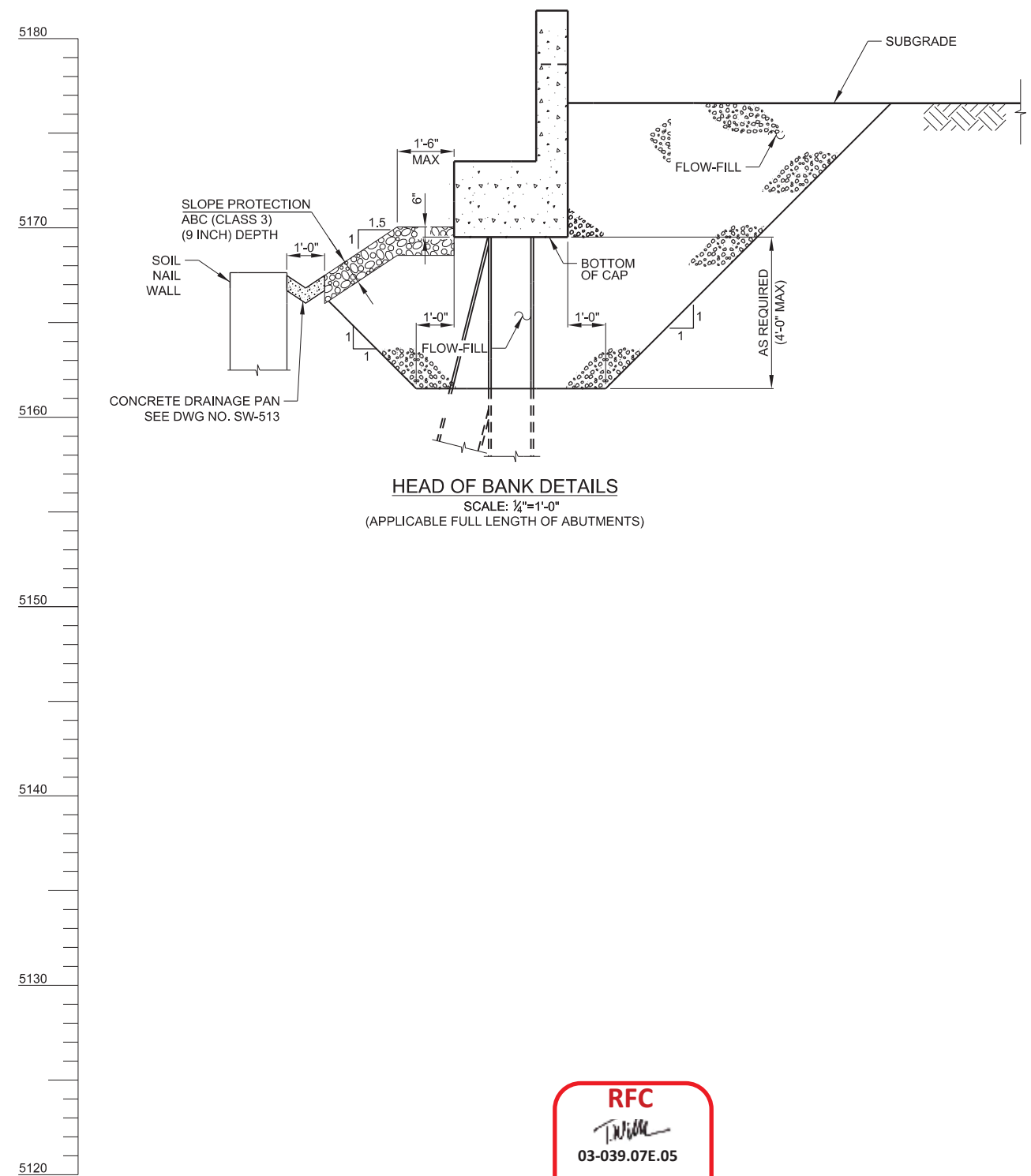
DWG No. SW-508

USER: Mike Walz
 1/20/2017 1:51:25 PM
 NIM-S-SW-508.dgn



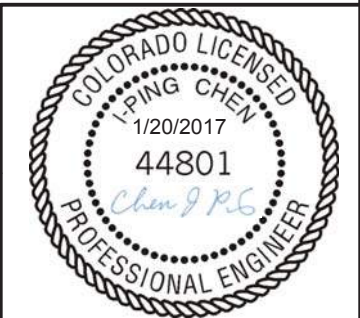
WALL STATION=10+66.24
MARION ST. STATION= 3+39.10

* FOR INFORMATION ONLY



HEAD OF BANK DETAILS
SCALE: 1/4"=1'-0"
(APPLICABLE FULL LENGTH OF ABUTMENTS)

RFC
[Signature]
03-039.07E.05
Rev 00
05/11/2017

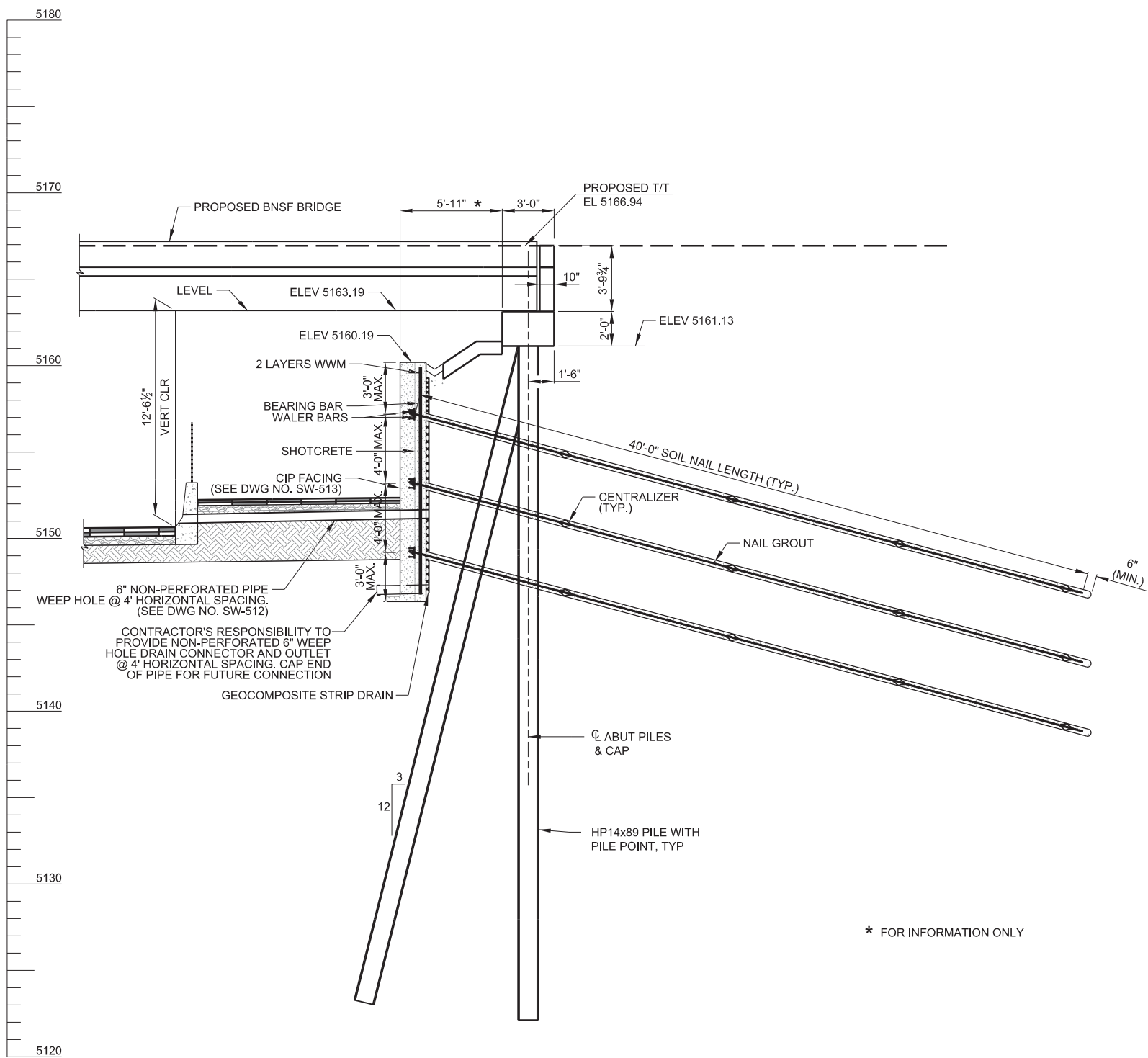


USER: Mike Walz 1/20/2017 8:40:18 AM NM-S-SW-508A.dgn

Yeh and Associates, Inc. Consulting Engineers & Scientists	
DESIGNED BY: IPC	DATE: 06/20/2016
DRAWN BY: MJW	DATE: 06/20/2016
CHECKED BY: MLK	DATE: 06/20/2016
APPROVED BY: MLK	DATE: 06/20/2016
2000 SOUTH COLORADO BOULEVARD SUITE 2-300 DENVER, COLORADO 80222 (303) 758-4058	
REGIONAL TRANSPORTATION DISTRICT 1600 BLAKE STREET DENVER, COLORADO 80202 (303) 628-9000	
NORTH METRO RAIL LINE STRUCTURAL RETAINING WALLS NORTH SOIL NAIL WALL (STA 10+66.24)	
DWG No. SW-508A	

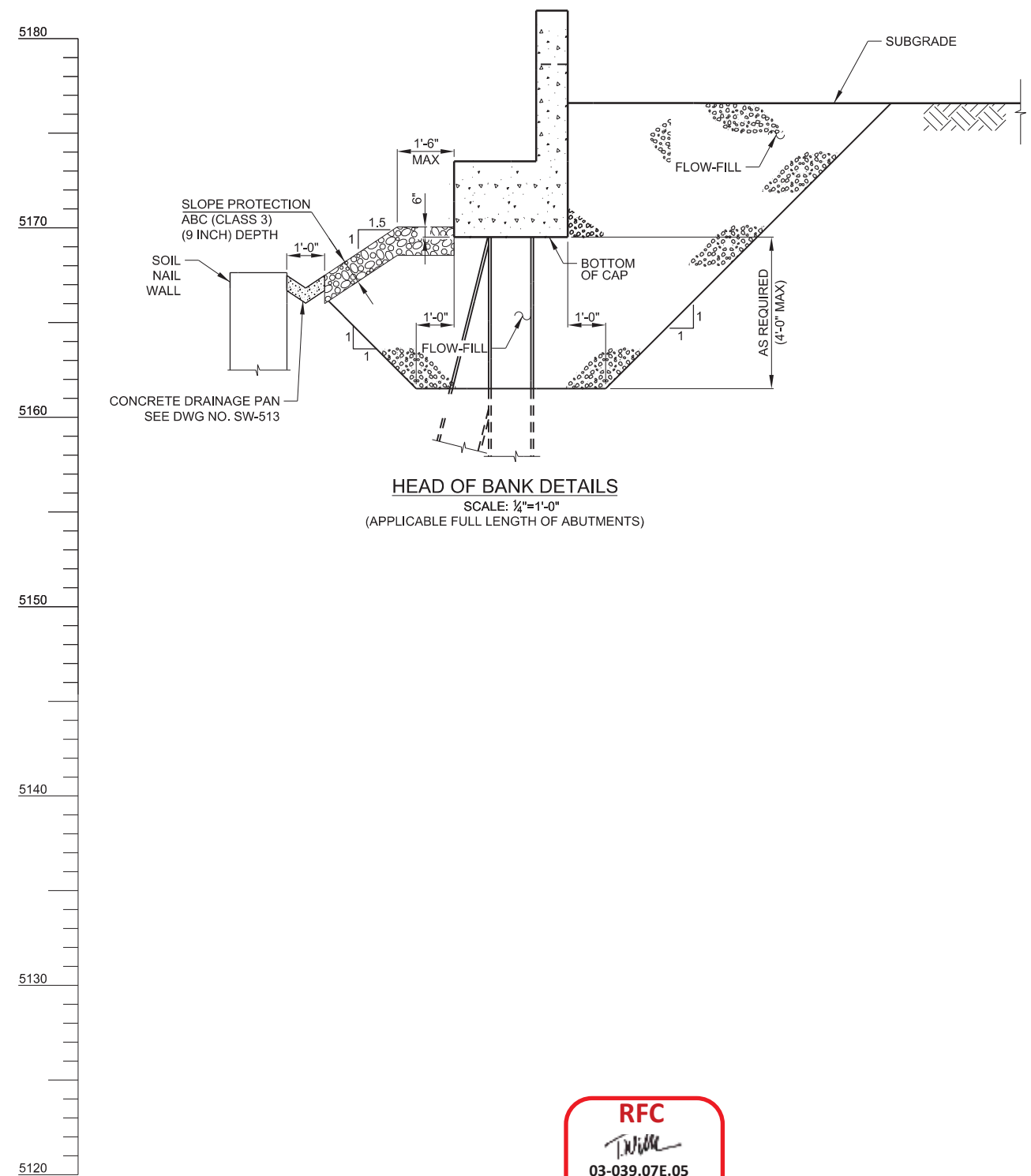
DESIGNED BY: IPC	DATE: 06/20/2016	CHECKED BY: MLK	DATE: 06/20/2016	HORZ. SCALE: 1/8"=1'
DRAWN BY: MJW	DATE: 06/20/2016	APPROVED BY: MLK	DATE: 06/20/2016	VERT. SCALE: 1/8"=1'
0 NMC-DCN000016, ISSUED FOR CONSTRUCTION TAR 08/28/2015		2000 SOUTH COLORADO BOULEVARD SUITE 2-300 DENVER, COLORADO 80222 (303) 758-4058		
NO. REVISIONS BY DATE		REGIONAL TRANSPORTATION DISTRICT 1600 BLAKE STREET DENVER, COLORADO 80202 (303) 628-9000		

NORTH METRO RAIL LINE STRUCTURAL RETAINING WALLS NORTH SOIL NAIL WALL (STA 10+66.24)	
DWG No. SW-508A	



WALL STATION=10+81.24
MARION ST. STATION= 3+54.10

* FOR INFORMATION ONLY



HEAD OF BANK DETAILS
SCALE: 1/4"=1'-0"
(APPLICABLE FULL LENGTH OF ABUTMENTS)

RFC
T.W.
03-039.07E.05
Rev 00
05/11/2017



USER: Mike Walz 1/20/2017 8:41:30 AM NM-S-SW-508B.dgn

Yeh and Associates, Inc. Consulting Engineers & Scientists	
DESIGNED BY: IPC DRAWN BY: MJW	DATE: 06/20/2016 DATE: 06/20/2016
CHECKED BY: MLK APPROVED BY: MLK	DATE: 06/20/2016 DATE: 06/20/2016
HORIZ. SCALE: 1/8"=1' VERT. SCALE: 1/8"=1'	
0	NMC-DCN000016, ISSUED FOR CONSTRUCTION
TAR	08/28/2015
NO.	REVISIONS
BY	DATE

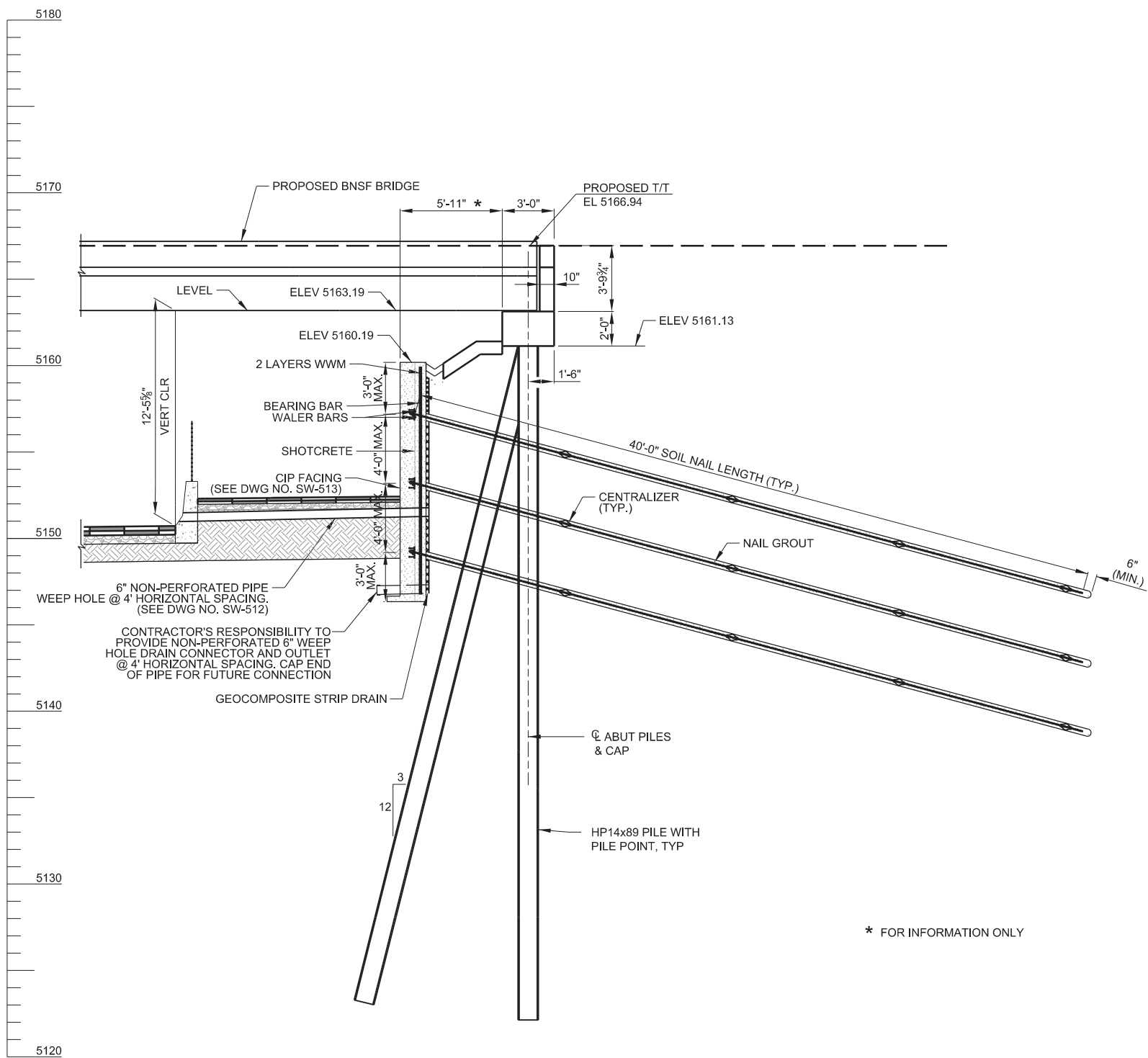
REGIONAL RAIL PARTNERS
Balfour Beatty / GRAHAM JOINT VENTURE

Stantec
2000 SOUTH COLORADO BOULEVARD
SUITE 2-300
DENVER, COLORADO 80222
(303) 758-4058

RTD FasTracks
North Metro
Rail Line
REGIONAL TRANSPORTATION DISTRICT
1600 BLAKE STREET
DENVER, COLORADO 80202
(303) 628-9000

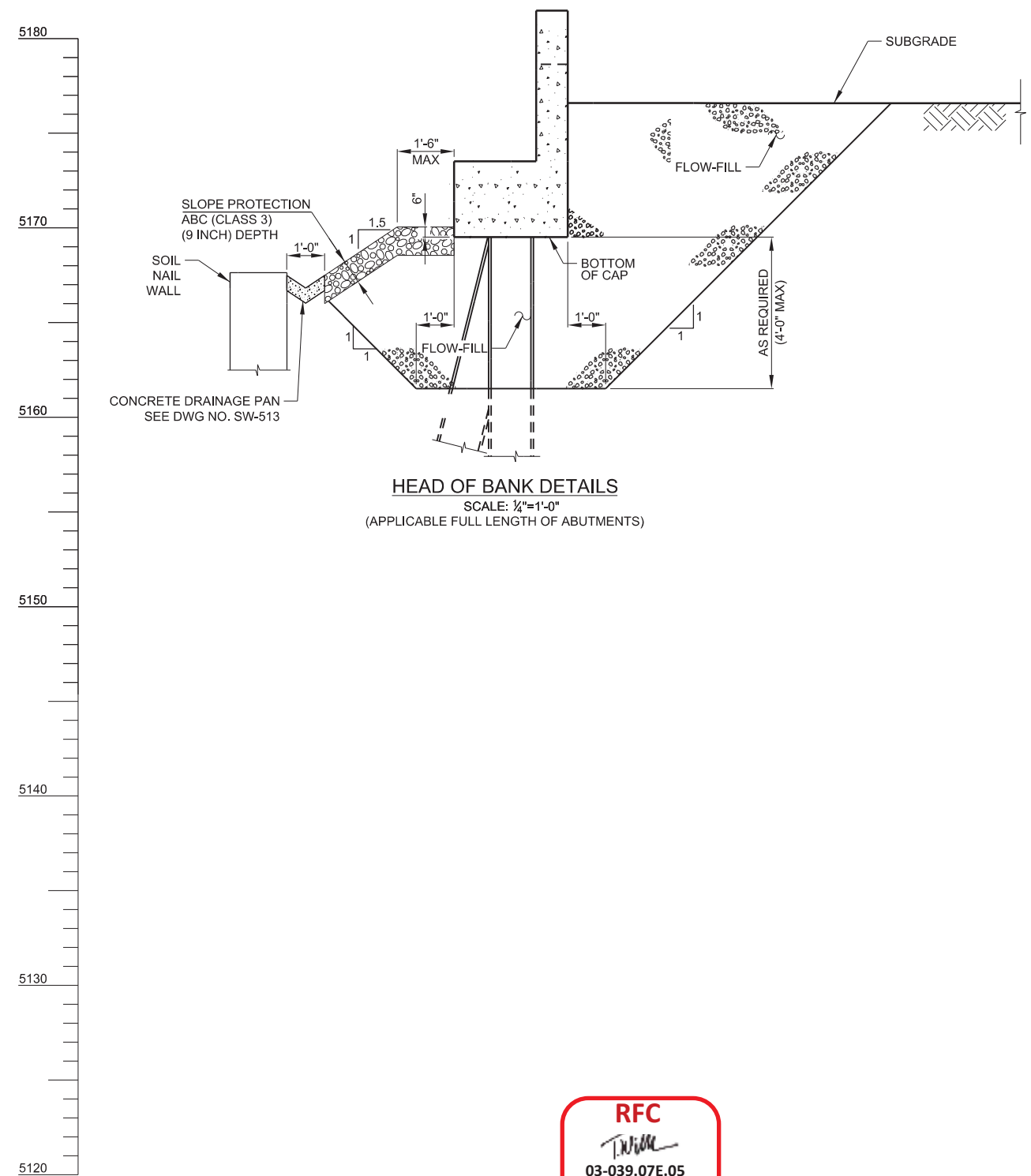
NORTH METRO RAIL LINE
STRUCTURAL
RETAINING WALLS
NORTH SOIL NAIL WALL (STA 10+81.24)

DWG No. SW-508B



WALL STATION=10+96.24
MARION ST. STATION= 3+69.10

* FOR INFORMATION ONLY



HEAD OF BANK DETAILS
SCALE: 1/4"=1'-0"
(APPLICABLE FULL LENGTH OF ABUTMENTS)

USER: Mike Walz 1/20/2017 8:42:40 AM NM-S-SW-508C.dgn

Yeh and Associates, Inc.
Consulting Engineers & Scientists

NO.	REVISIONS	BY	DATE
0	NMC-DCN000016, ISSUED FOR CONSTRUCTION	TAR	08/28/2015

DESIGNED BY: IPC DATE: 06/20/2016
DRAWN BY: MJW DATE: 06/20/2016

CHECKED BY: MLK DATE: 06/20/2016
APPROVED BY: MLK DATE: 06/20/2016

HORZ. SCALE: 1/8"=1'
VERT. SCALE: 1/8"=1'

RTD FasTracks
North Metro Rail Line

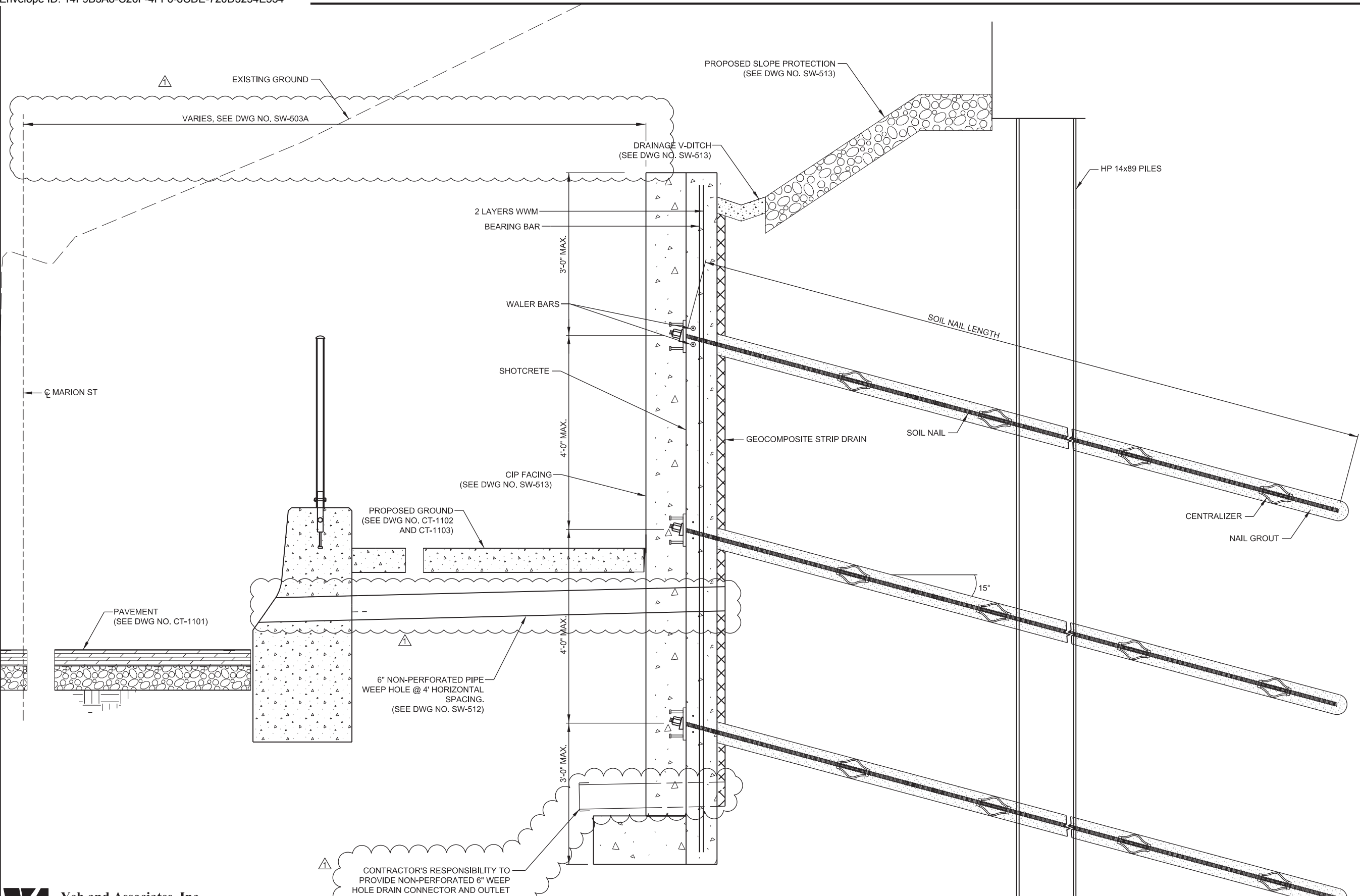
REGIONAL TRANSPORTATION DISTRICT
1600 BLAKE STREET
DENVER, COLORADO 80202
(303) 758-9000

NORTH METRO RAIL LINE

STRUCTURAL RETAINING WALLS
NORTH SOIL NAIL WALL (STA 10+96.24)

RFC
[Signature]
03-039.07E.05
Rev 00
05/11/2017

DWG No. SW-508C



CONTRACTOR'S RESPONSIBILITY TO PROVIDE NON-PERFORATED 6" WEEP HOLE DRAIN CONNECTOR AND OUTLET @ 4' HORIZONTAL SPACING. CAP END OF PIPE FOR FUTURE CONNECTION

SOUTH SOIL NAIL WALL AT ABUTMENT TYPICAL SECTION

RFC
[Signature]
 03-039.07E.05
 Rev 01
 05/11/2017



Yeh and Associates, Inc.
 Consulting Engineers & Scientists

NO.	REVISIONS	BY	DATE
1	DCN000016-REVISED SOIL NAIL WALL	TAR	01/06/2017
0	ISSUED FOR CONSTRUCTION	TAR	09/04/2015

DESIGNED BY: IPC DATE: 05/15/2015
 DRAWN BY: MJW DATE: 05/15/2015
 CHECKED BY: MLK DATE: 05/15/2015
 APPROVED BY: DATE:

HORZ. SCALE: NTS
 VERT. SCALE:

RTD FasTracks
 North Metro Rail Line

REGIONAL TRANSPORTATION DISTRICT
 1600 BLAKE STREET
 DENVER, COLORADO 80222
 (303) 628-9000

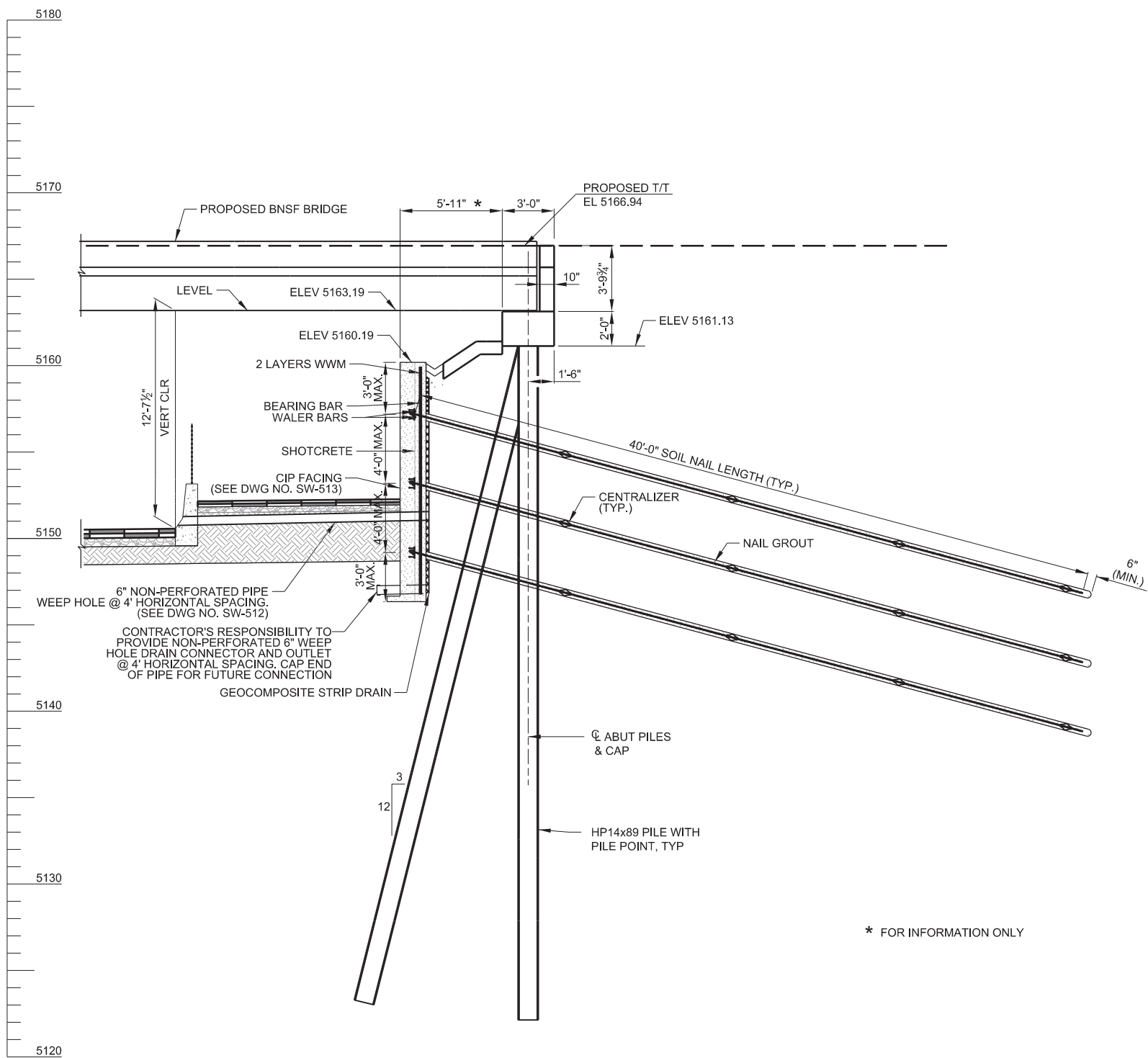
NORTH METRO RAIL LINE

STRUCTURAL RETAINING WALLS

SOUTH SOIL NAIL WALL AT ABUTMENT TYPICAL SECTION

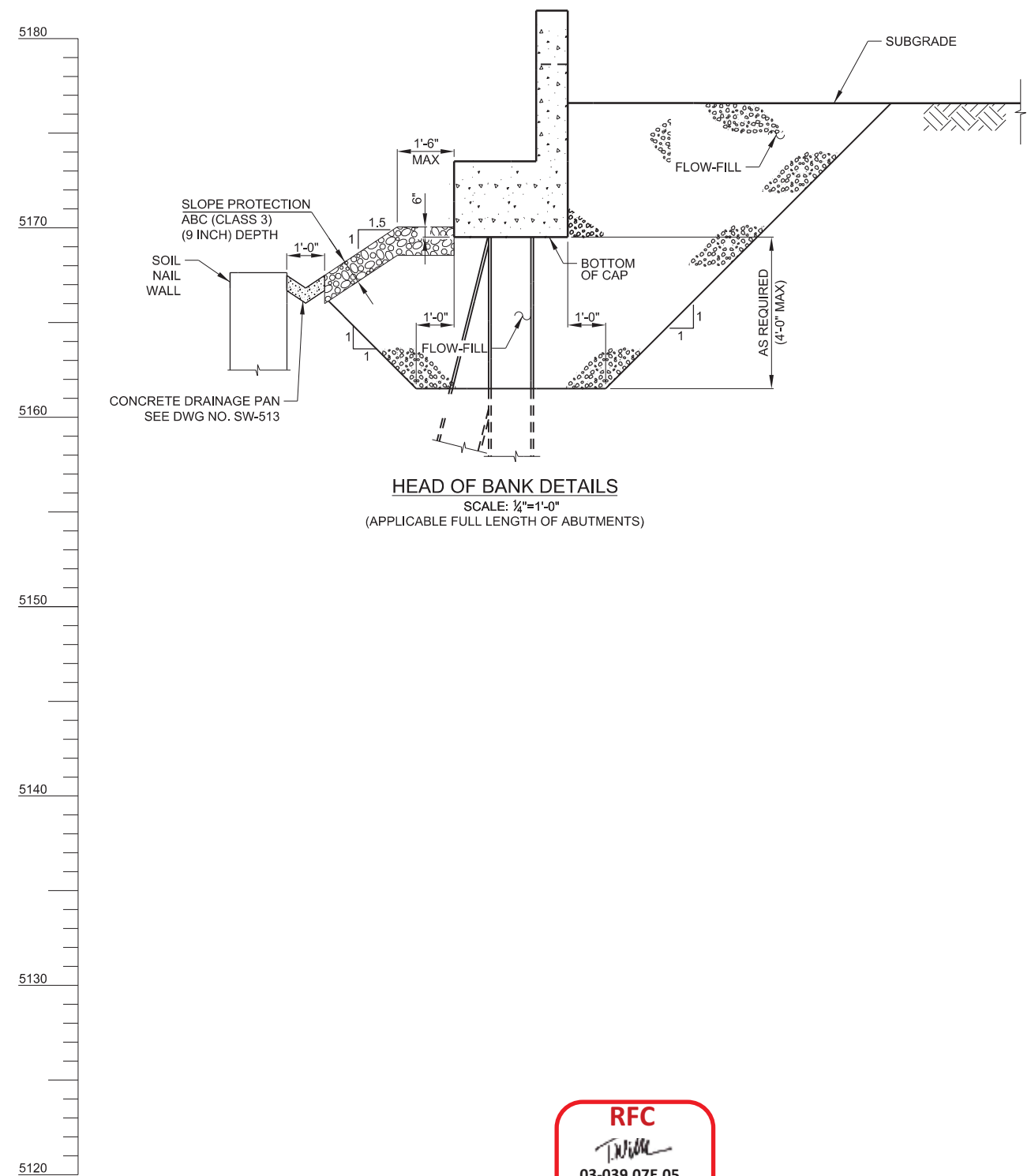
DWG No. SW-509

USER: Mike Walz
 1/20/2017 8:43:32 AM
 NIM-S-SW-509.dgn



WALL STATION=11+17.72
MARION ST. STATION= 3+39.10

* FOR INFORMATION ONLY





HEAD OF BANK DETAILS
SCALE: 1/4"=1'-0"
(APPLICABLE FULL LENGTH OF ABUTMENTS)

USER: Mike Walz 1/20/2017 1:53:17 PM NM-S-SW-509A.dgn

Yeh and Associates, Inc.
Consulting Engineers & Scientists

NO.	REVISIONS	BY	DATE
0	NMC-DCN000016, ISSUED FOR CONSTRUCTION	TAR	08/28/2015

DESIGNED BY: IPC	DATE: 06/20/2016	CHECKED BY: MLK	DATE: 06/20/2016	HORZ. SCALE: 1/8"=1'
DRAWN BY: MJW	DATE: 06/20/2016	APPROVED BY: MLK	DATE: 06/20/2016	VERT. SCALE: 1/8"=1'

2000 SOUTH COLORADO BOULEVARD
SUITE 2-300
DENVER, COLORADO 80222
(303) 758-4058

RTD FasTracks
North Metro
Rail Line

REGIONAL TRANSPORTATION DISTRICT
1600 BLAKE STREET
DENVER, COLORADO 80202
(303) 628-9000

NORTH METRO RAIL LINE

**STRUCTURAL
RETAINING WALLS**

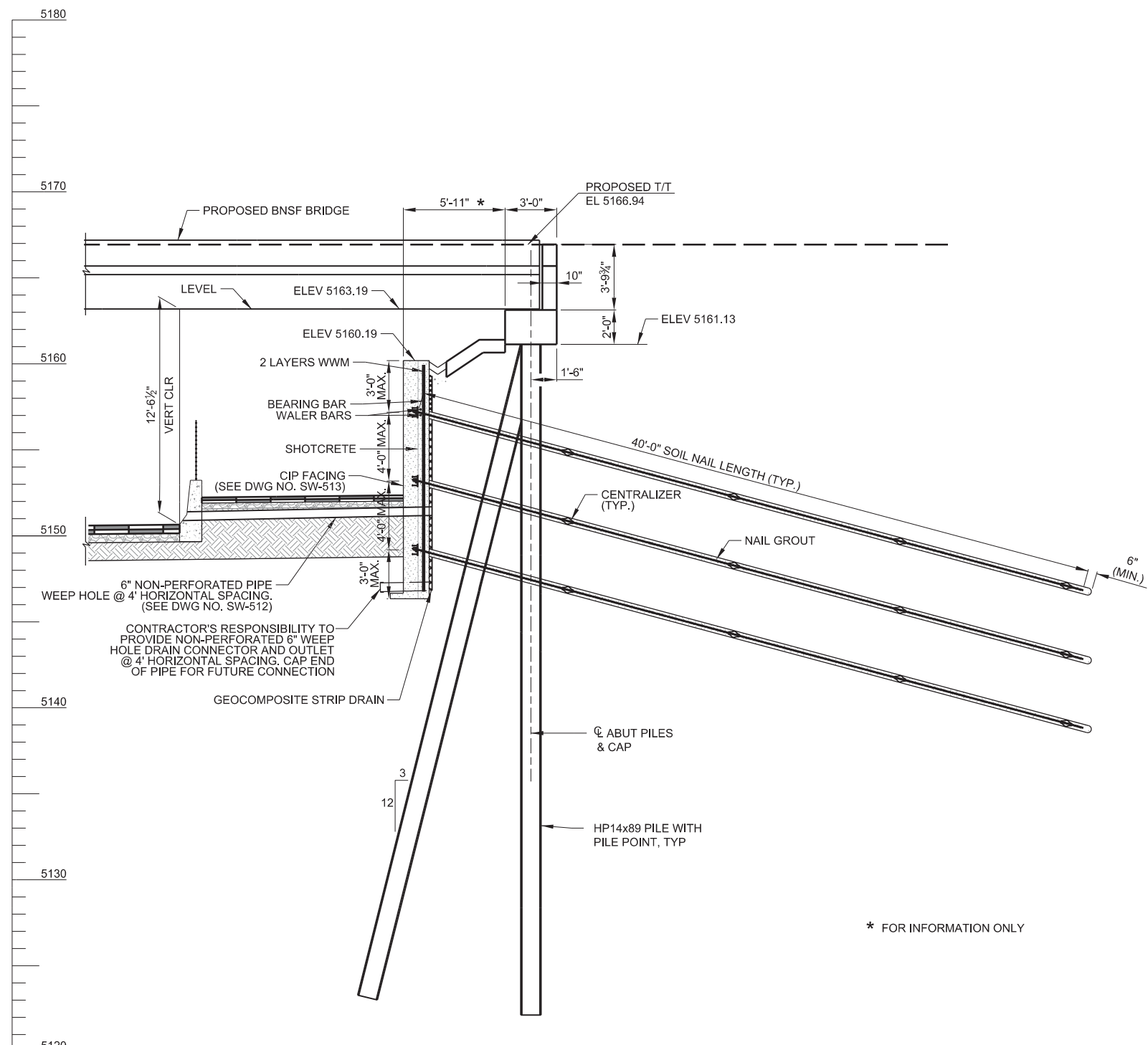
SOUTH SOIL NAIL WALL (STA 11+17.72)

RFC

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 Rev 00
 05/11/2017

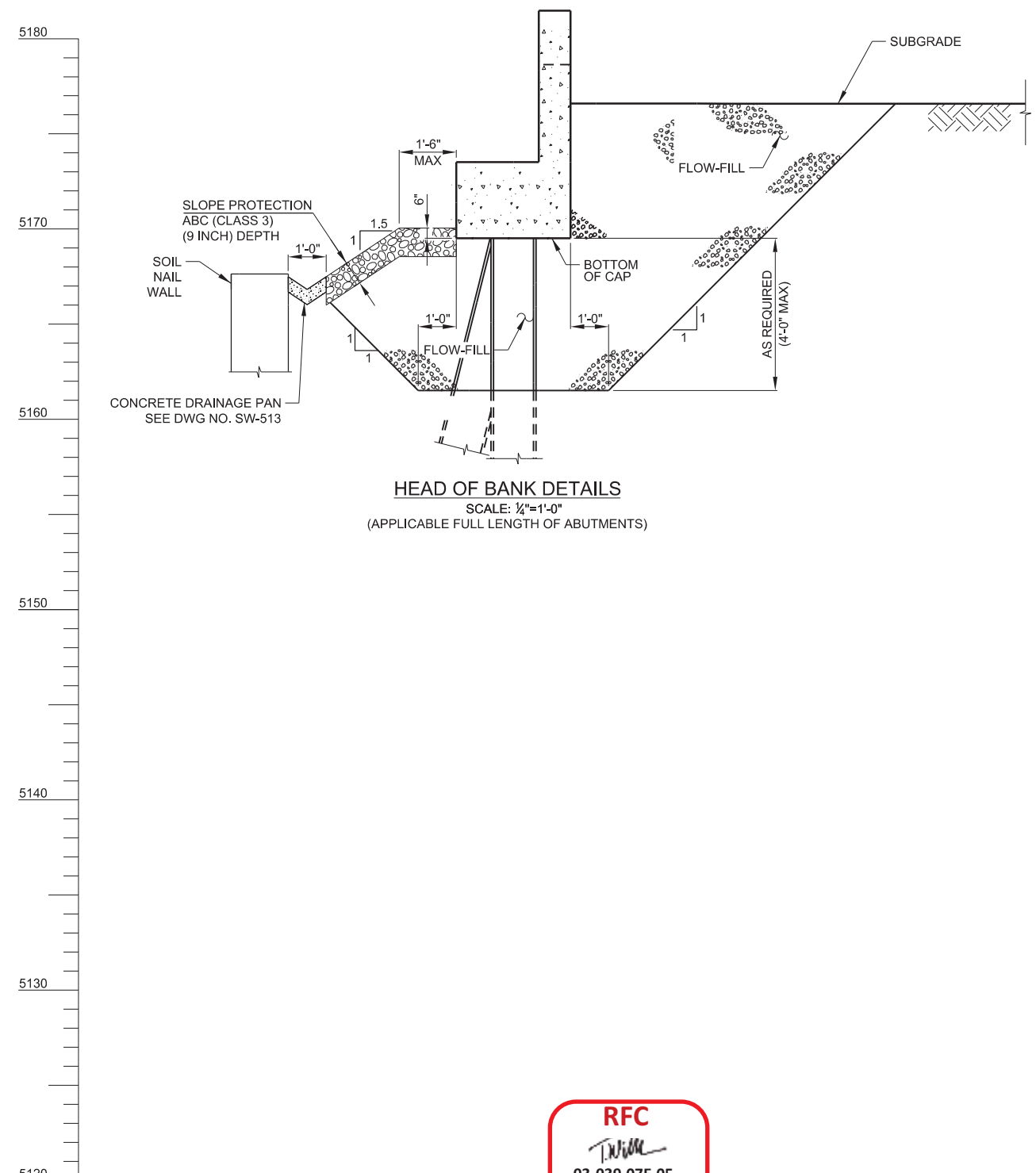
COLORADO LICENSED
I-PING CHEN
1/20/2017
44801
Chen I.P.C.
PROFESSIONAL ENGINEER

DWG No. SW-509A



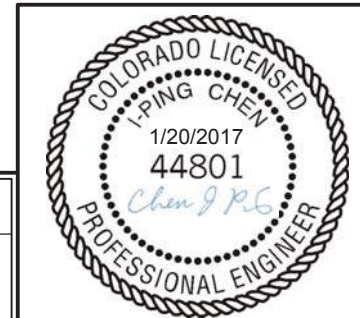
WALL STATION=11+32.72
MARION ST. STATION= 3+54.10

* FOR INFORMATION ONLY



HEAD OF BANK DETAILS
SCALE: 1/4"=1'-0"
(APPLICABLE FULL LENGTH OF ABUTMENTS)

RFC
[Signature]
03-039.07E.05
Rev 00
05/11/2017

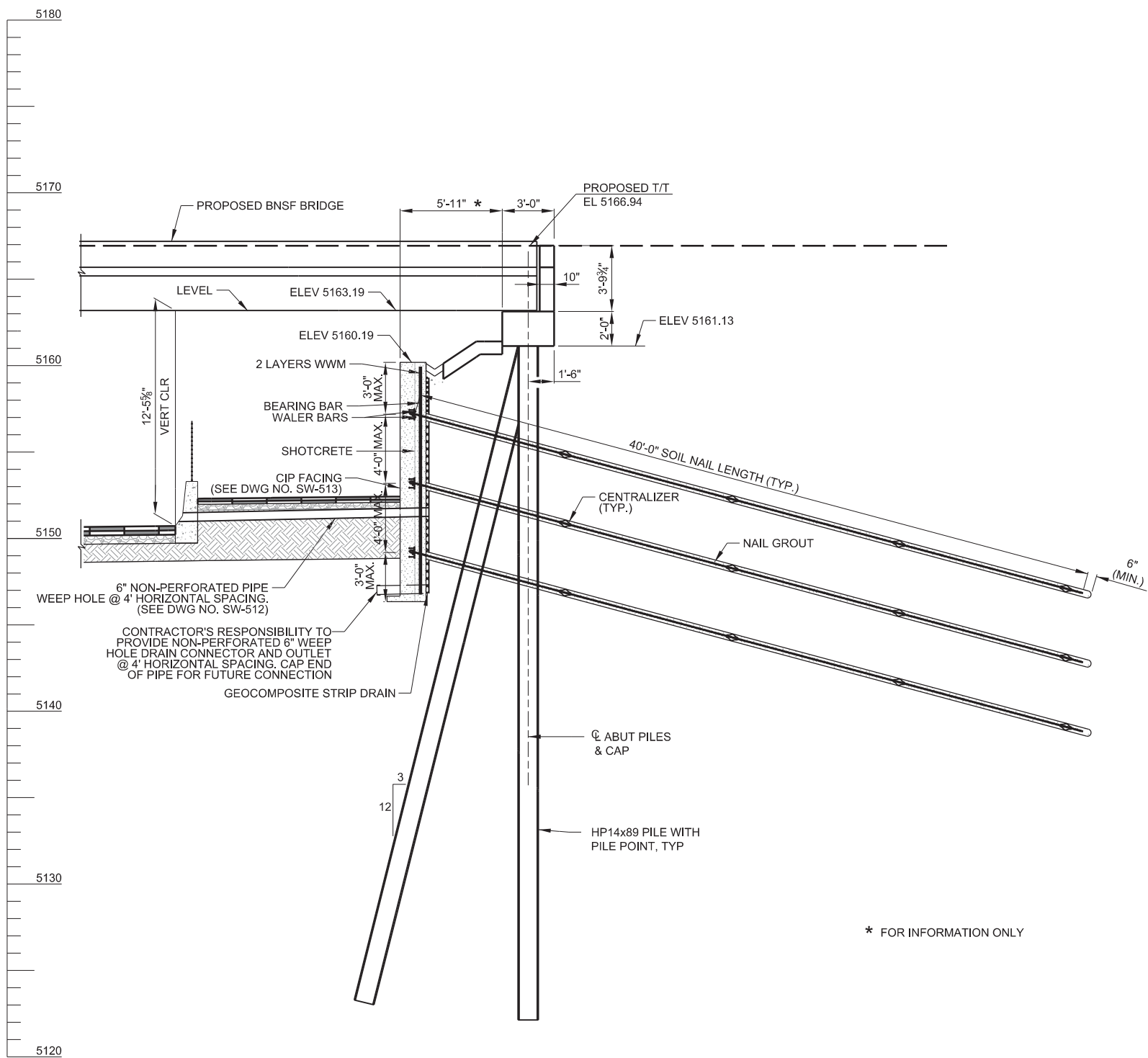


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Yeh and Associates, Inc. Consulting Engineers & Scientists	
DESIGNED BY: IPC DATE: 06/20/2016	CHECKED BY: MLK DATE: 06/20/2016
DRAWN BY: MJW DATE: 06/20/2016	APPROVED BY: MLK DATE: 06/20/2016
2000 SOUTH COLORADO BOULEVARD SUITE 2-300 DENVER, COLORADO 80222 (303) 758-4058	
REGIONAL TRANSPORTATION DISTRICT 1600 BLAKE STREET DENVER, COLORADO 80202 (303) 628-9000	
NORTH METRO RAIL LINE STRUCTURAL RETAINING WALLS SOUTH SOIL NAIL WALL (STA 11+32.72)	
DWG No. SW-509B	

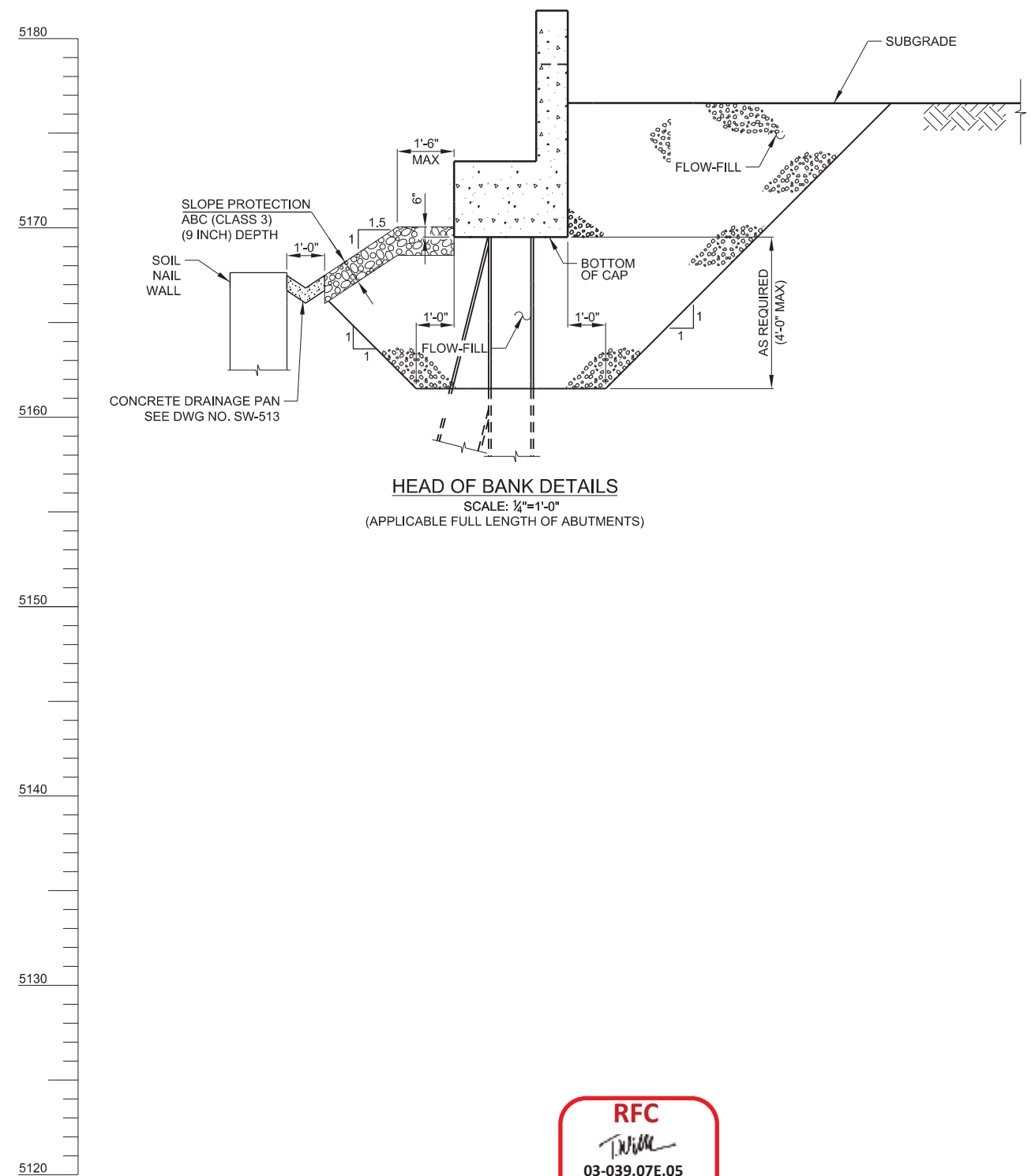
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DRAWN BY: MJW DATE: 06/20/2016	APPROVED BY: MLK DATE: 06/20/2016	VERT. SCALE: 1/8"=1'
0 NMC-DCN000016, ISSUED FOR CONSTRUCTION TAR 08/28/2015		
REVISIONS BY DATE		

2000 SOUTH COLORADO BOULEVARD SUITE 2-300 DENVER, COLORADO 80222 (303) 758-4058	
REGIONAL TRANSPORTATION DISTRICT 1600 BLAKE STREET DENVER, COLORADO 80202 (303) 628-9000	
NORTH METRO RAIL LINE STRUCTURAL RETAINING WALLS SOUTH SOIL NAIL WALL (STA 11+32.72)	
DWG No. SW-509B	



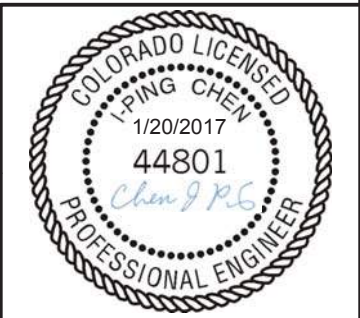
WALL STATION=11+47.72
MARION ST. STATION= 3+69.10

* FOR INFORMATION ONLY



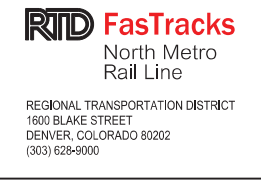
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SCALE: 1/4"=1'-0"
(APPLICABLE FULL LENGTH OF ABUTMENTS)

RFC
T. Miller
03-039.07E.05
Rev 00
05/11/2017



USER: Mike Walz 1/20/2017 1:56:19 PM NM-S-SW-509C.dgn

Yeh and Associates, Inc. Consulting Engineers & Scientists			
DESIGNED BY: IPC	DATE: 06/20/2016		
DRAWN BY: MJW	DATE: 06/20/2016		
CHECKED BY: MLK	DATE: 06/20/2016		
APPROVED BY: MLK	DATE: 06/20/2016		
HORIZ. SCALE: 1/8"=1'			
VERT. SCALE: 1/8"=1'			
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NO.	REVISIONS	BY	DATE

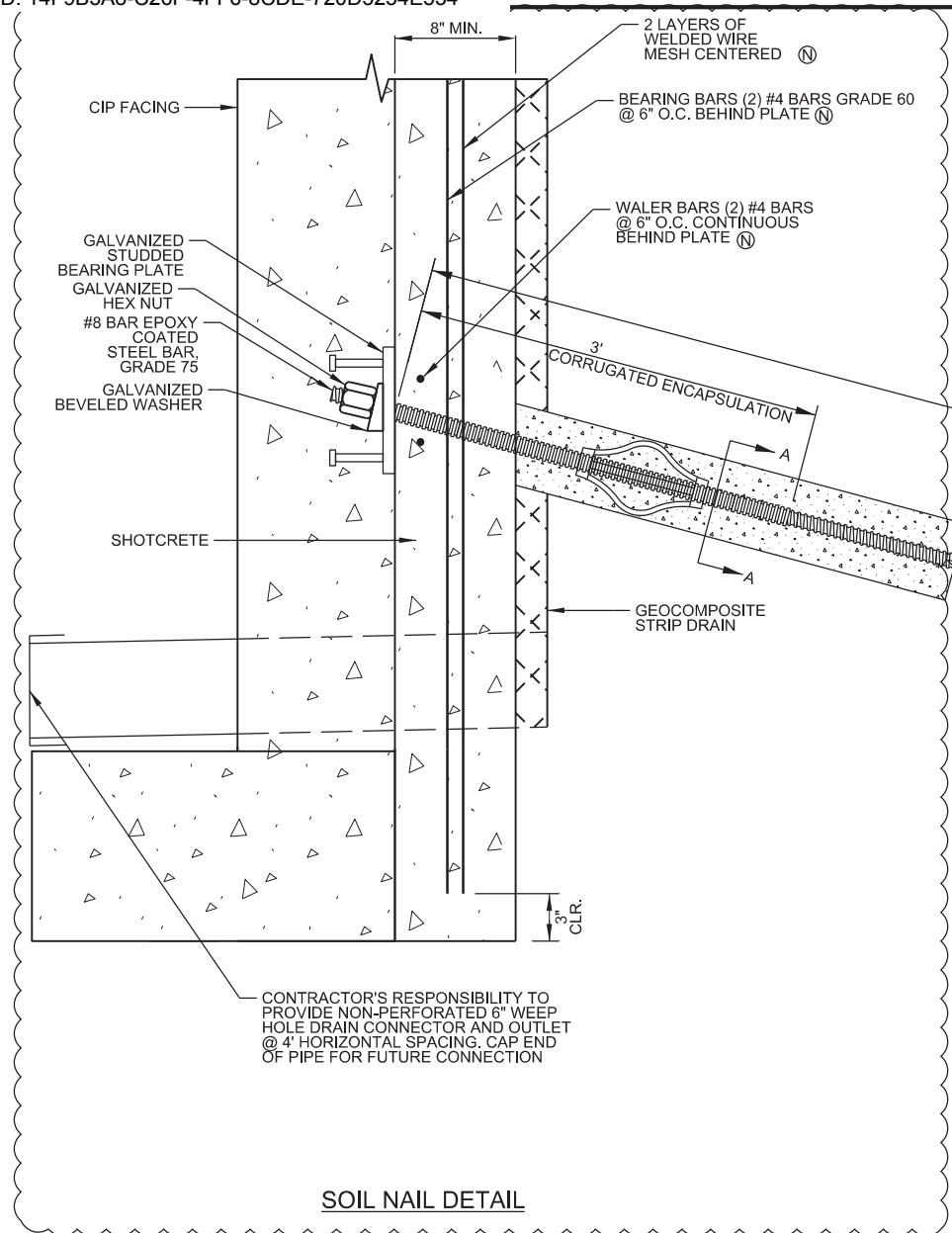


NORTH METRO RAIL LINE

STRUCTURAL RETAINING WALLS

SOUTH SOIL NAIL WALL (STA 11+47.72)

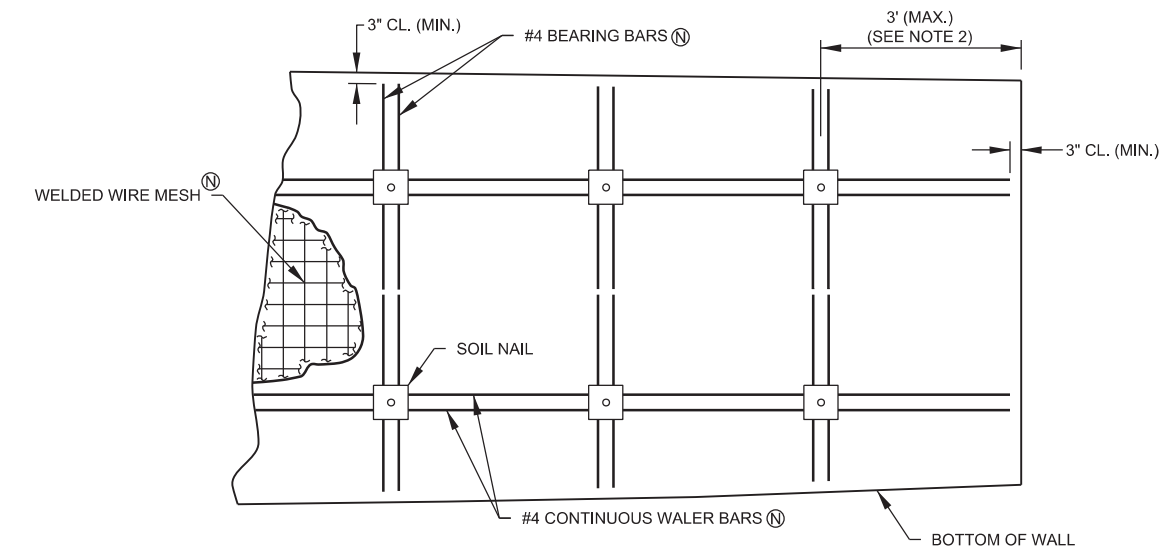
DWG No. SW-509C



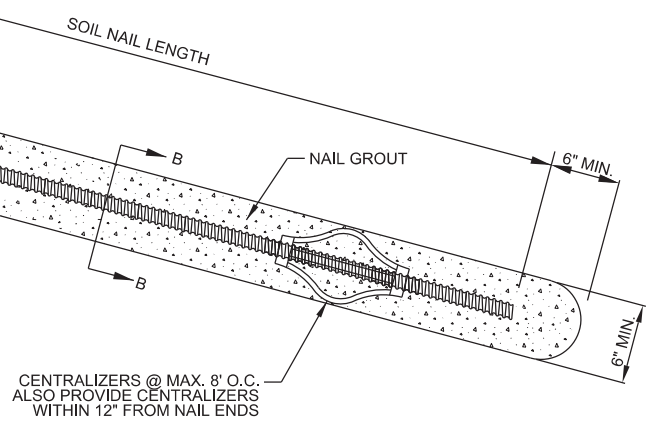
CONTRACTOR'S RESPONSIBILITY TO PROVIDE NON-PERFORATED 6\"/>

SOIL NAIL DETAIL

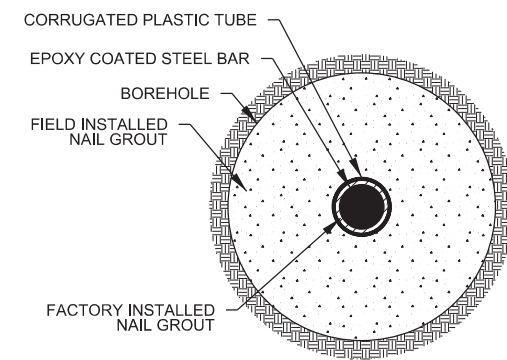
- NOTES:
1. REINFORCEMENT OF THE SHOTCRETE FACING SHALL BE INSTALLED THROUGHOUT THE ENTIRE SHOTCRETE FACING, INCLUDING THE FACING BEYOND THE SOIL NAILS.
 2. MAXIMUM EDGE DISTANCE OF 3 FT FOR EACH ROW OF SOIL NAILS AT END OF WALL.
 3. THE MINIMUM SHOTCRETE THICKNESS IS 8 IN. FOR WALL FACE.
 4. (N) DENOTES NON-COATED REINFORCING STEEL.
 5. 2\"/>
 6. 3\"/>



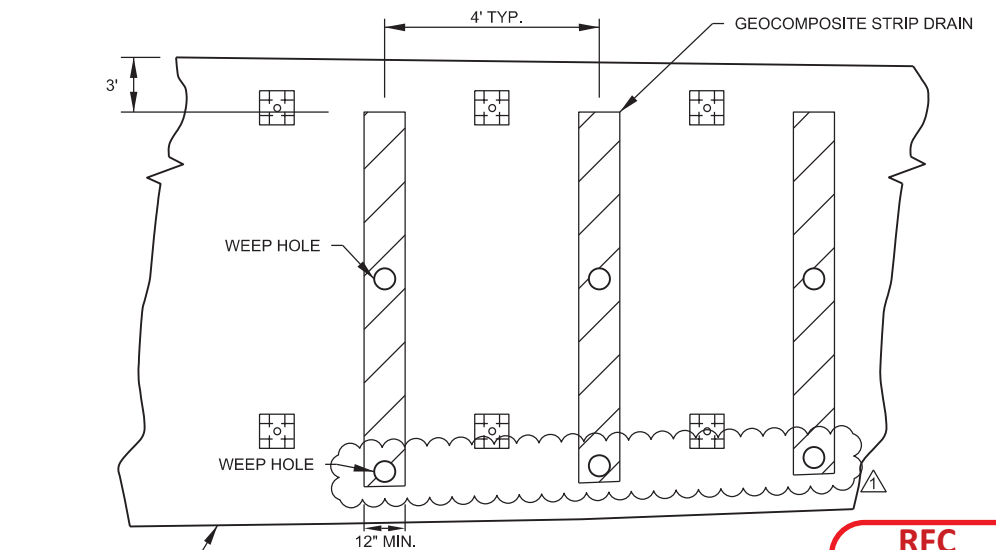
TYPICAL CONSTRUCTION SHOTCRETE FACING REINFORCEMENT - END OF WALL (NOTE 1)



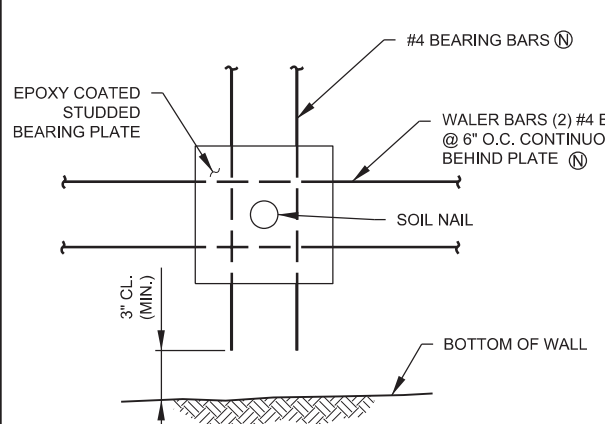
CENTRALIZERS @ MAX. 8\"/>



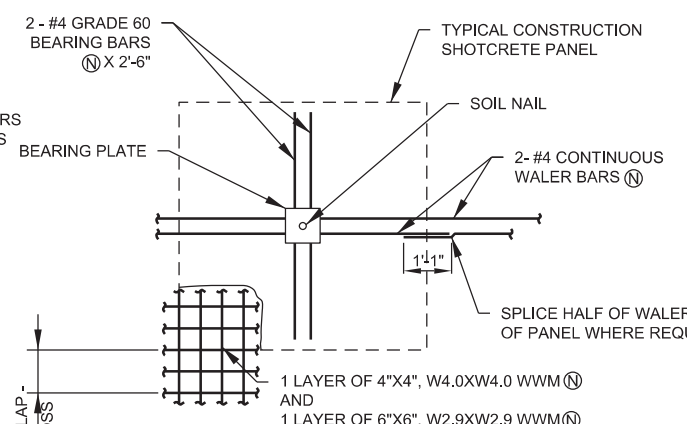
SECTION A-A



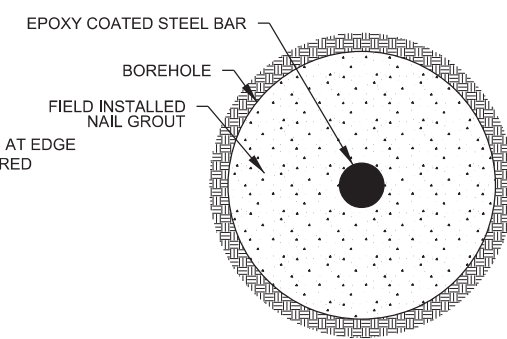
TYPICAL GEOCOMPOSITE STRIP DRAIN DETAIL



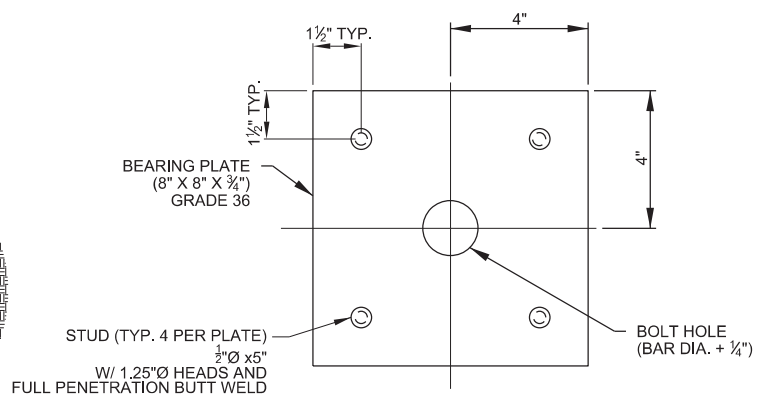
TYPICAL REINFORCEMENT BOTTOM ROW OF SOIL NAILS



TYPICAL CONSTRUCTION SHOTCRETE FACING PANEL REINFORCEMENT



SECTION B-B



STUDED BEARING PLATE DETAIL (FOLLOW AMERICAN WELDING SOCIETY STANDARDS)

RFC
Mike
 03-039.07E.05
 Rev 01
 05/11/2017

USER: Mike Walz 1/27/2017 10:26:57 AM NIM-S-SW-510.dgn

Yeh and Associates, Inc.
 Consulting Engineers & Scientists

NO.	REVISIONS	BY	DATE
1	DCN000016-REVISED SOIL NAIL WALL	TAR	01/06/2017
0	ISSUED FOR CONSTRUCTION	TAR	09/04/2015

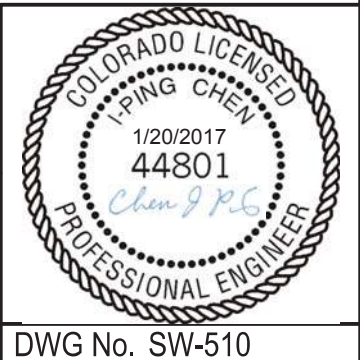
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DRAWN BY: MJW	DATE: 05/15/2015	APPROVED BY: TR	DATE: 09/04/2015	VERT. SCALE:



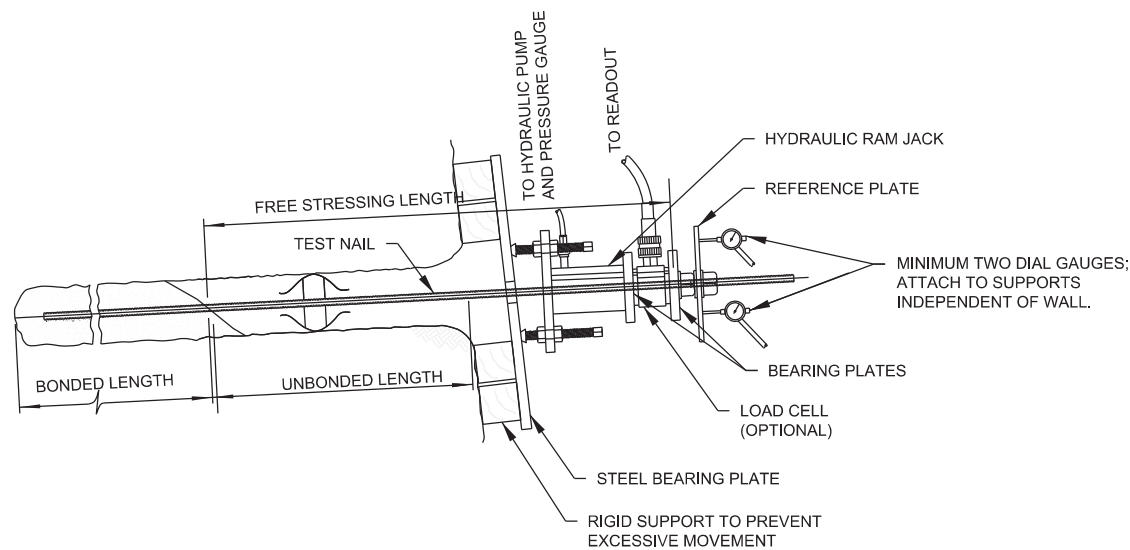
Stantec
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 SUITE 2-300
 DENVER, COLORADO 80222
 (303) 758-4058

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 REGIONAL TRANSPORTATION DISTRICT
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NORTH METRO RAIL LINE
STRUCTURAL RETAINING WALLS SOIL NAIL DETAILS



DWG No. SW-510



TYPICAL SOIL NAIL TEST SETUP

SOIL NAIL TESTING NOTES:

1. SEE SPECIFICATIONS FOR VERIFICATION AND PROOF TEST NAIL REQUIREMENTS.
2. REQUIRED GROUND NAIL ALLOWABLE PULLOUT RESISTANCE,
 $Q_p = 678 \text{ LBS/FT OF BONDED LENGTH FOR SOIL}$
3. PROVIDE SUFFICIENT TEST SUPPORT SYSTEM (EG. CRIBBING, CHAIRS, BEARING PLATES, ETC.) TO COMPLETE THE TESTING WITHOUT EXCESSIVE DEFLECTION OR BEARING FAILURE.
4. A MINIMUM OF 2 VERIFICATION TESTS ARE REQUIRED PER SOIL NAIL WALL. ADDITIONAL VERIFICATION TESTS MAY BE REQUIRED BY THE ENGINEER IF GROUND CONDITIONS OR CONSTRUCTION METHODS CHANGE.
5. A MINIMUM OF 5% OF THE PRODUCTION SOIL NAILS SHALL BE PROOF-TESTED IN EACH NAIL ROW OR MINIMUM OF 1 PER ROW.

NM-S-SW-511.dgn

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9/4/2015

USER: Mike Walz



Yeh and Associates, Inc.
Consulting Engineers & Scientists

DESIGNED BY: IPC	DATE: 05/15/2015	CHECKED BY: MLK	DATE: 05/15/2015	HORZ. SCALE: NTS
DRAWN BY: MJW	DATE: 05/15/2015	APPROVED BY: TR	DATE: 09/04/2015	VERT. SCALE:
0	ISSUED FOR CONSTRUCTION	TAR	09/04/2015	
NO.	REVISIONS	BY	DATE	

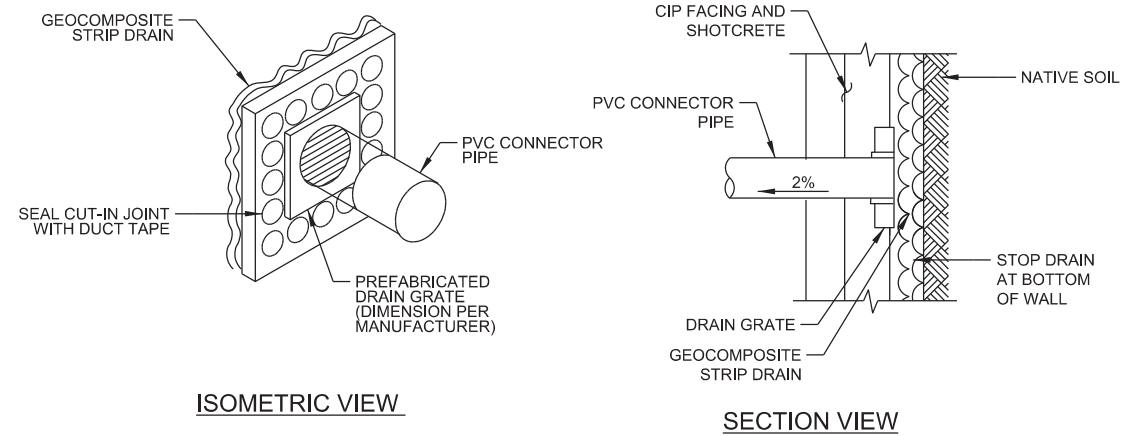
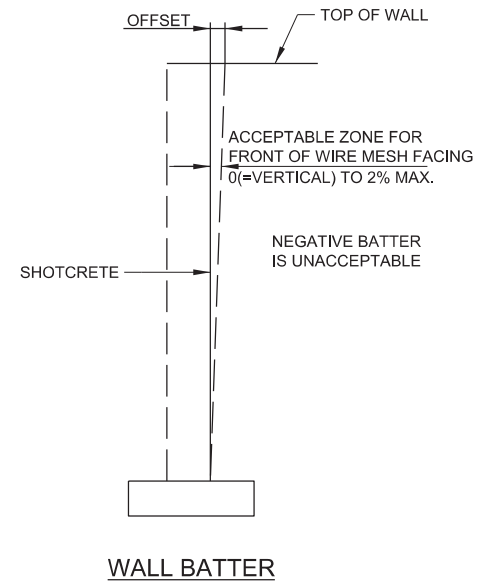


NORTH METRO RAIL LINE

STRUCTURAL
RETAINING WALLS
SOIL NAIL TESTING



DWG No. SW-511



WEEP HOLE DRAIN DETAILS
DRAIN GRATE INSTALLATION SHALL NOT DISRUPT PREFABRICATED GEOCOMPOSITE STRIP DRAIN

RFC
[Signature]
03-039.07E.05
10/20/2015

COLORADO LICENSED
I-PING CHEN
44801
[Signature]
10/6/2015
PROFESSIONAL ENGINEER

Yeh and Associates, Inc.
Consulting Engineers & Scientists

DESIGNED BY: IPC	DATE: 05/15/2015	CHECKED BY: MLK	DATE: 05/15/2015	HORZ. SCALE: NTS
DRAWN BY: MJW	DATE: 05/15/2015	APPROVED BY: TR	DATE: 09/04/2015	VERT. SCALE:
0	ISSUED FOR CONSTRUCTION	TAR	09/04/2015	
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NORTH METRO RAIL LINE

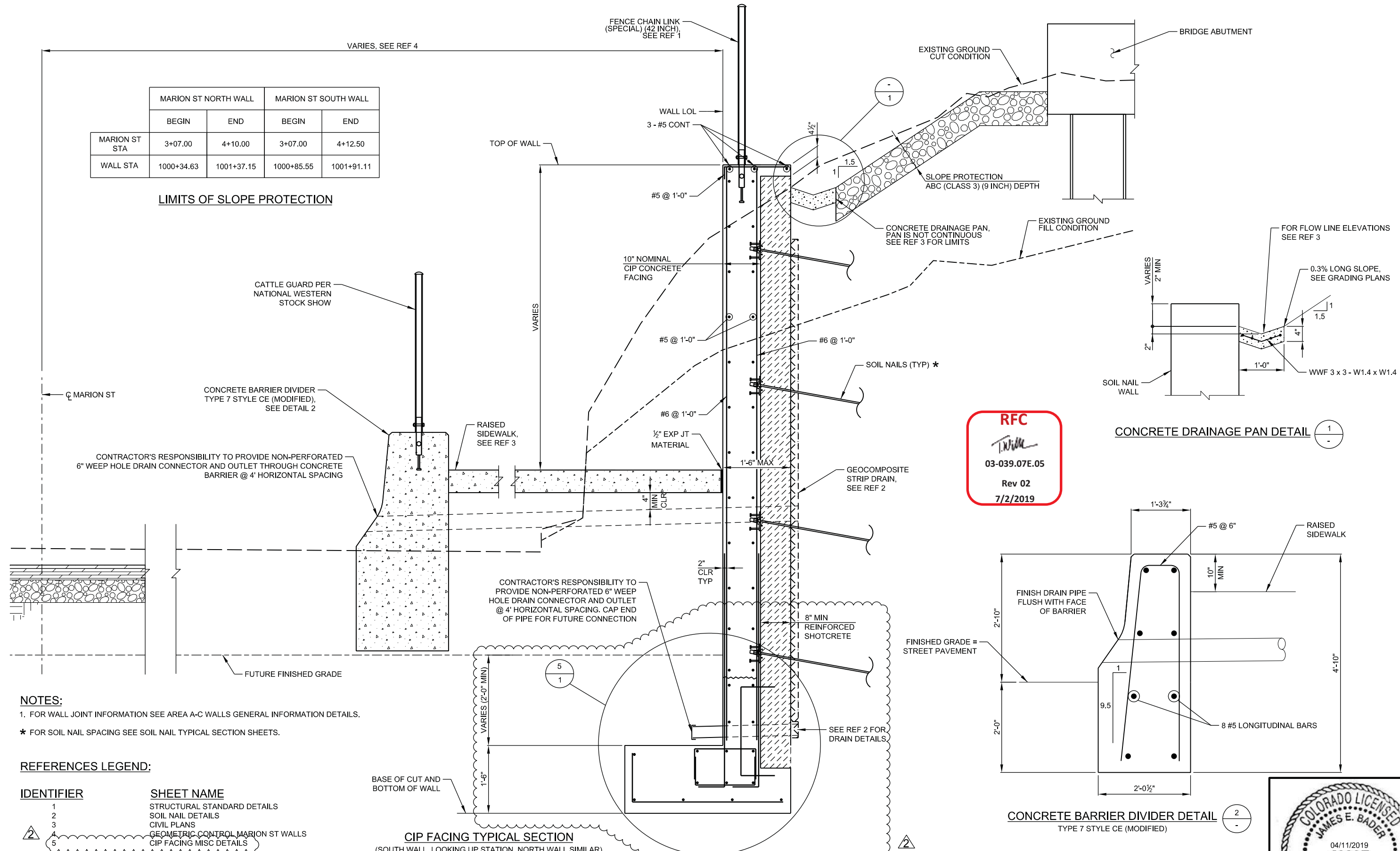
STRUCTURAL
RETAINING WALLS
SOIL NAIL DETAILS

DWG No. SW-512

USER: Mike Walz 9/4/2015 1:29:05 PM NM-S-SW-512.dgn

	MARION ST NORTH WALL		MARION ST SOUTH WALL	
	BEGIN	END	BEGIN	END
MARION ST STA	3+07.00	4+10.00	3+07.00	4+12.50
WALL STA	1000+34.63	1001+37.15	1000+85.55	1001+91.11

LIMITS OF SLOPE PROTECTION



RFC

 03-039.07E.05
 Rev 02
 7/2/2019

NOTES:
 1. FOR WALL JOINT INFORMATION SEE AREA A-C WALLS GENERAL INFORMATION DETAILS.
 * FOR SOIL NAIL SPACING SEE SOIL NAIL TYPICAL SECTION SHEETS.

REFERENCES LEGEND:

IDENTIFIER	SHEET NAME
1	STRUCTURAL STANDARD DETAILS
2	SOIL NAIL DETAILS
3	CIVIL PLANS
4	GEOMETRIC CONTROL MARION ST WALLS
5	CIP FACING MISC DETAILS

USER: fhidalgo 4/11/2019 12:14:52 PM NM-S-SW-513.dgn

NO.	REVISIONS	BY	DATE
1	NMC-DCN-000143; MARION REDESIGN	JEB	04/11/2019
2	NMC-DCN-000016-REVISED SOIL NAIL WALL	TAR	01/20/2017
3	ISSUED FOR CONSTRUCTION	TAR	09/04/2015

DESIGNED BY: FAH	DATE: 04/10/2015	CHECKED BY: JEB	DATE: 11/30/2018	HORIZ SCALE: 1/2"=1'-0"
DRAWN BY: FAH	DATE: 04/10/2015	APPROVED BY: JEB	DATE: 04/11/2019	VERT. SCALE: 1/2"=1'-0"

REGIONAL RAIL PARTNERS
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Stantec
2000 SOUTH COLORADO BOULEVARD
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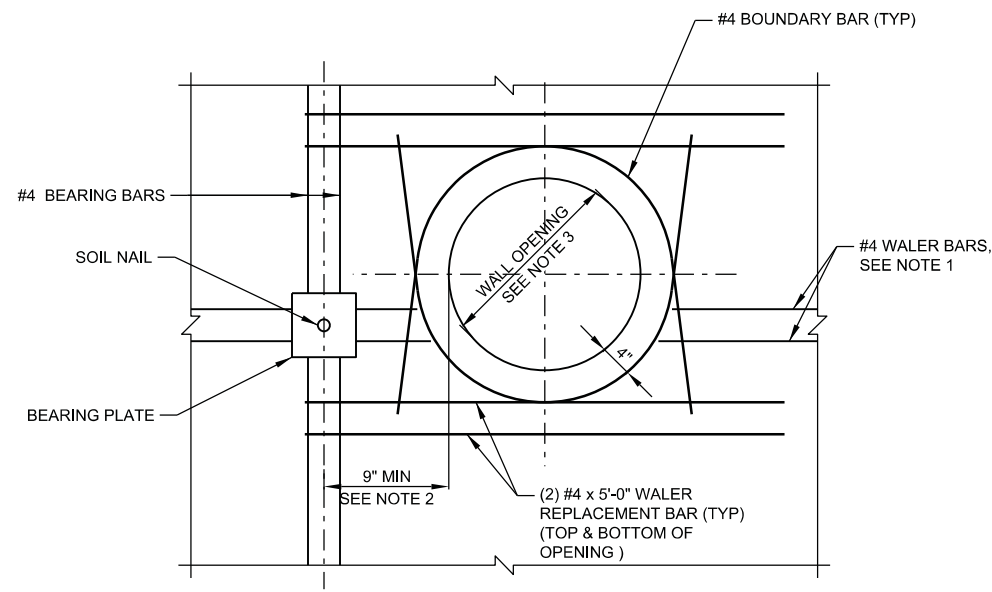
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NORTH METRO RAIL LINE

STRUCTURAL RETAINING WALL DETAILS
CIP FACING DETAILS

COLORADO LICENSED
 JAMES E. BADER
 04/11/2019
49037
 PROFESSIONAL ENGINEER

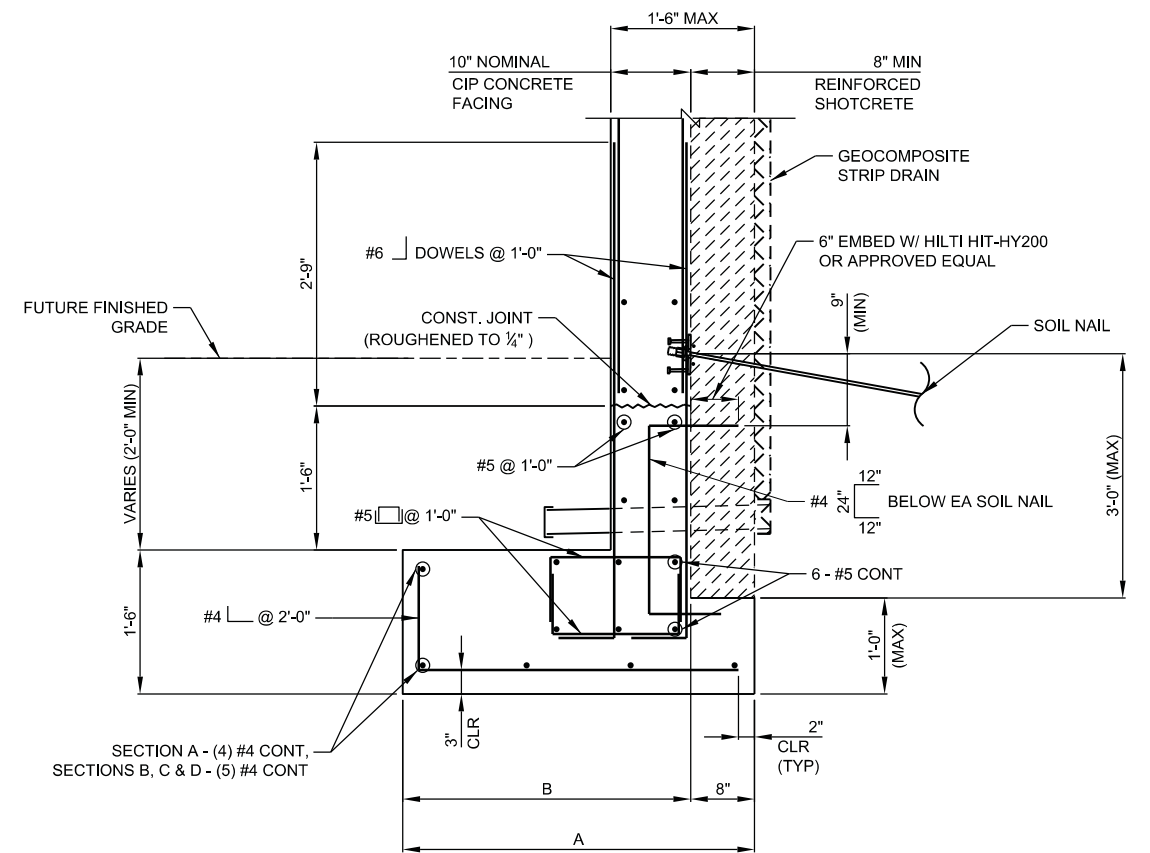
DWG No. SW-513



WALL BLOCKOUT DETAIL

NOTE:

- CUT BARS 4" FROM WALL OPENING.
- ADJUST SOIL NAIL LOCATION BY NO MORE THAN 6" TO ACHIEVE CLEARANCE. ADDITIONAL NAILS SHOULD BE INSTALLED IF DESIGNED LAYOUT AND SOIL NAIL LOCATIONS CANNOT BE MET WITHIN THE SPECIFIED TOLERANCES.
- FOR OPENING DIAMETERS OR SQUARE SHAPES OF 6" TO 24", SHAPE THE BOUNDARY BARS TO MATCH OPENING SHAPE.
- FORM THE EDGE OF OPENING IF A SNUG FIT IS FEASIBLE AND SEAL WITH 25-YEAR SILICONE SEALANT. LEAVE EDGE OF OPENING ROUGH IF MORE WORK/PLACEMENT SPACE IS NECESSARY AND SEAL OPENING WITH CEMENTITIOUS REPAIR MORTAR (SIKA REPAIR SHA OR SIMILAR), AND A 1"x1/4" DEEP BED OF 25 YEAR SILICONE AGAINST THE PENETRATING ELEMENT.
- CUT WELDED WIRE MESH IN A PATTERN AROUND THE BLOCKOUT WITH 4" CLEARANCE.
- BLOCKOUT DETAILS IS SIMILAR FOR CIP CONCRETE FACING.

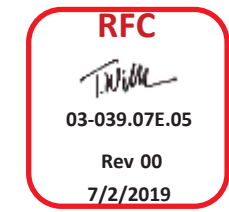


BOTTOM OF CIP FACING DETAIL

	WALL H	A	B	MARION ST NORTH WALL		MARION ST SOUTH WALL	
				*BEGIN STA	*END STA	*BEGIN STA	*END STA
SECTION A	12'-0" MAX	2'-8"	2'-0"	1002+47.15	1002+93.76	-	-
SECTION B	17'-0" MAX	3'-8"	3'-0"	1000+00.00	1000+64.00	1000+00.00	1001+20.00
SECTION C	21'-0" MAX	3'-8"	3'-0"	1000+64.00	1001+28.50	1001+20.00	1001+80.00
SECTION D	24'-10" MAX	3'-8"	3'-0"	1001+87.15	1002+47.15	-	-
				1001+28.50	1001+87.15	1001+80.00	1002+98.62

* WALL STATIONING

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NO.	REVISIONS	BY	DATE
0	NMC-DCN-000143; MARION REDESIGN	JEB	04/11/2019

DESIGNED BY: FAH	DATE: 11/29/2018	CHECKED BY: JEB	DATE: 11/30/2018	HORIZ. SCALE: 1/2"=1'-0"
DRAWN BY: FAH	DATE: 11/29/2018	APPROVED BY: JEB	DATE: 04/11/2019	VERT. SCALE: 1/2"=1'-0"

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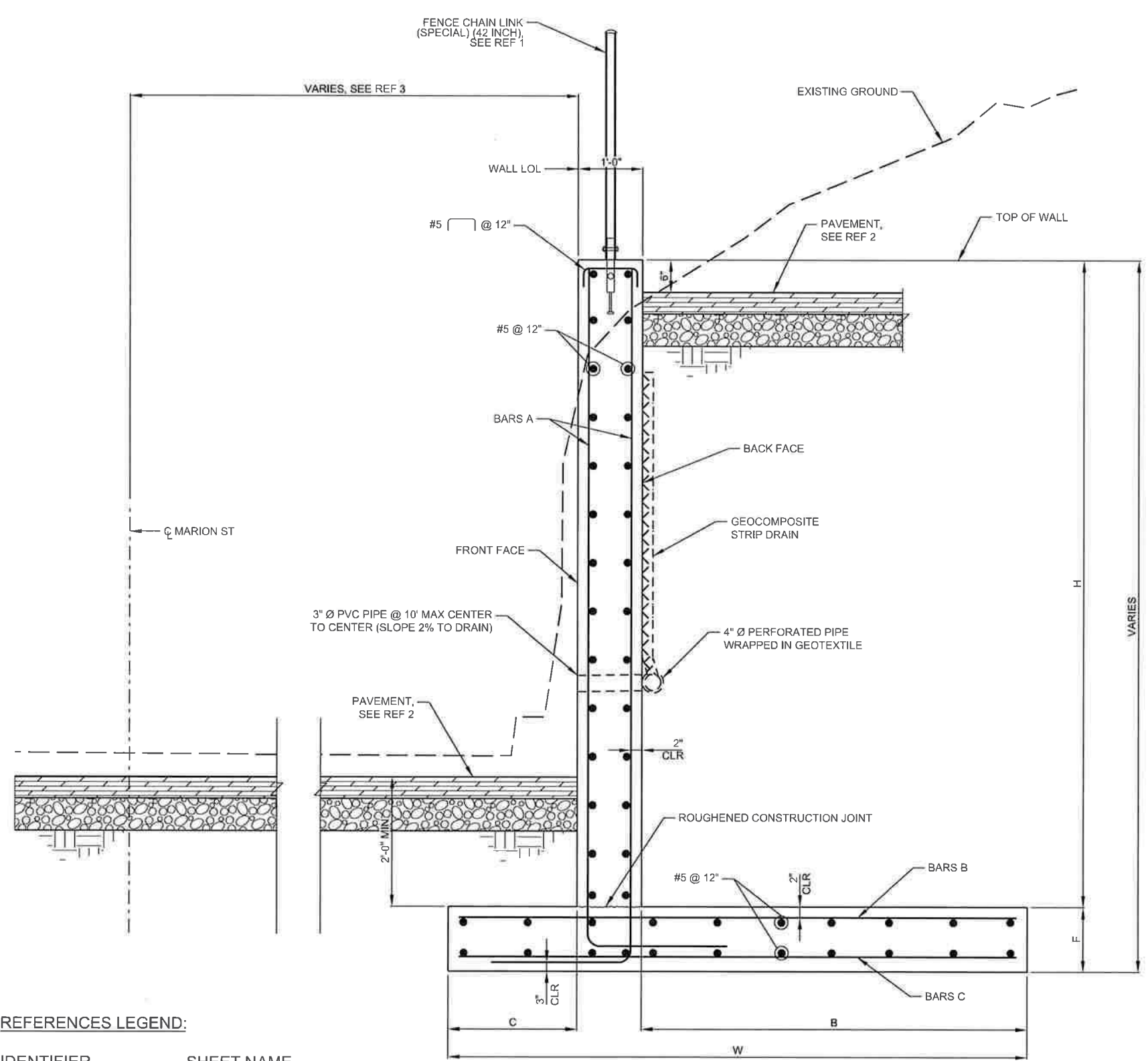
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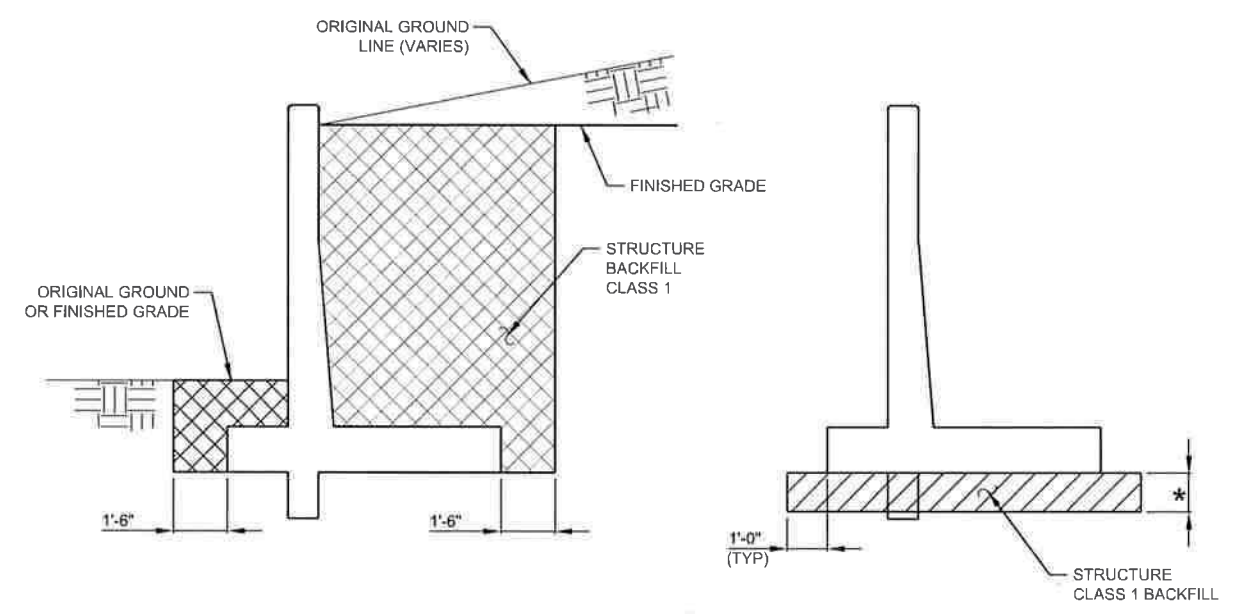
STRUCTURAL
RETAINING WALL DETAILS
CIP FACING MISC DETAILS

DWG No. SW-513A

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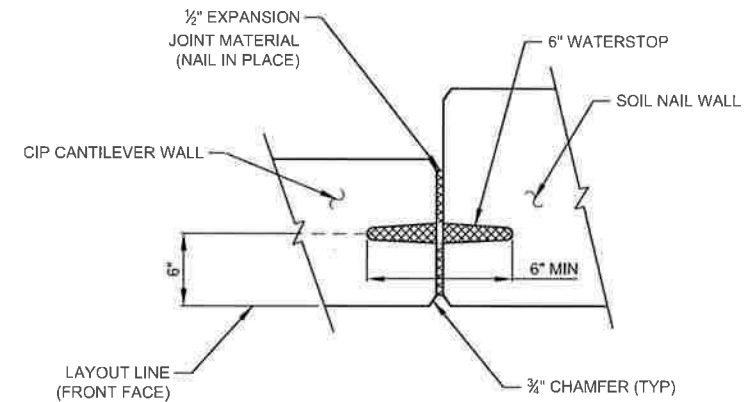


CIP CANTILEVER WALL TYPICAL SECTION



CIP WALL BACKFILL AND FOUNDATION LIMITS

NOTES:
 * SEE DESIGN DATA AND SUBJECT TO RECOMMENDATIONS OF THE PROJECT GEOTECHNICAL ENGINEER IN THE FIELD



CIP CANTILEVER WALL/SOIL NAIL EXPANSION JOINT

CIP RETAINING WALL-TYPE C

DESIGN H	W	B	C	F	H-VARIES		BARS A	BARS B	BARS C
					FROM	TO			
4'-0"	6'-0"	2'-0"	3'-0"	1'-0"	4'-6"	5'-0"	#5@12"	#9@12"	#5@12"
6'-0"	7'-6"	4'-6"	2'-0"	1'-0"	5'-0"	7'-0"	#5@12"	#9@12"	#5@12"
7'-6"	9'-0"	6'-0"	2'-0"	1'-0"	7'-0"	8'-6"	#5@12"	#10@12"	#5@12"
9'-0"	9'-0"	6'-0"	2'-0"	1'-6"	8'-6"	10'-6"	#5@12"	#10@12"	#5@12"
10'-0"	9'-0"	6'-0"	2'-0"	1'-6"	10'-6"	11'-6"	#6@12"	#10@12"	#5@12"

REFERENCES LEGEND:

IDENTIFIER	SHEET NAME
1	STRUCTURAL STANDARD DETAILS
2	CIVIL PLANS
3	GEOMETRIC CONTROL MARION ST WALLS

NO.	REVISIONS	BY	DATE
0	ISSUED FOR CONSTRUCTION	TAR	09/04/2015

DESIGNED BY: FAH	DATE: 06/20/2015	CHECKED BY: TAR	DATE: 08/27/2015	HORZ. SCALE: 1/2"=1'-0"
DRAWN BY: FAH	DATE: 06/20/2015	APPROVED BY: TR	DATE: 09/04/2015	VERT. SCALE: 1/2"=1'-0"

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(303) 758-4058

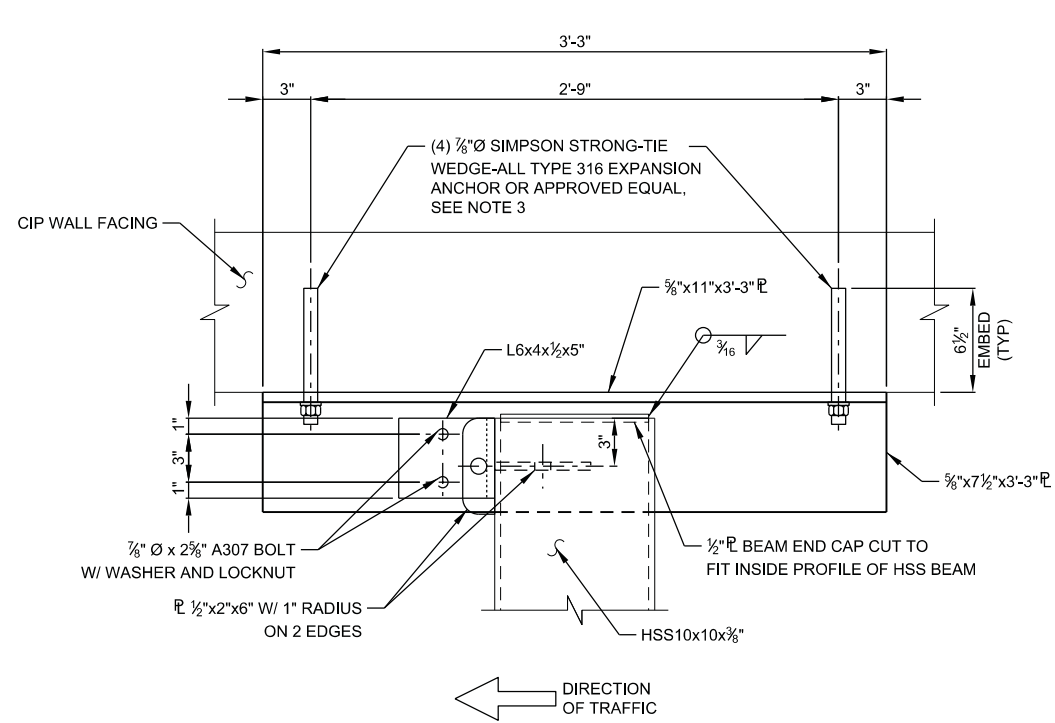
Stantec

RTD FasTracks
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 1600 BLAKE STREET
 DENVER, COLORADO 80202
 (303) 628-9000

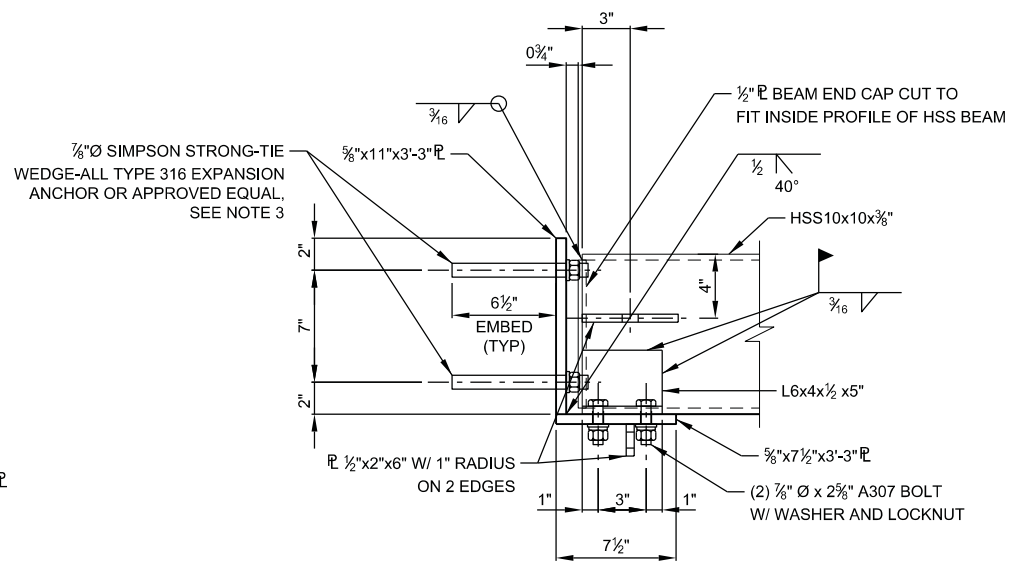
NORTH METRO RAIL LINE
 STRUCTURAL
 RETAINING WALL DETAILS
 CIP CANTILEVER WALL DETAILS

RFC
T. Williams
 10/20/2015

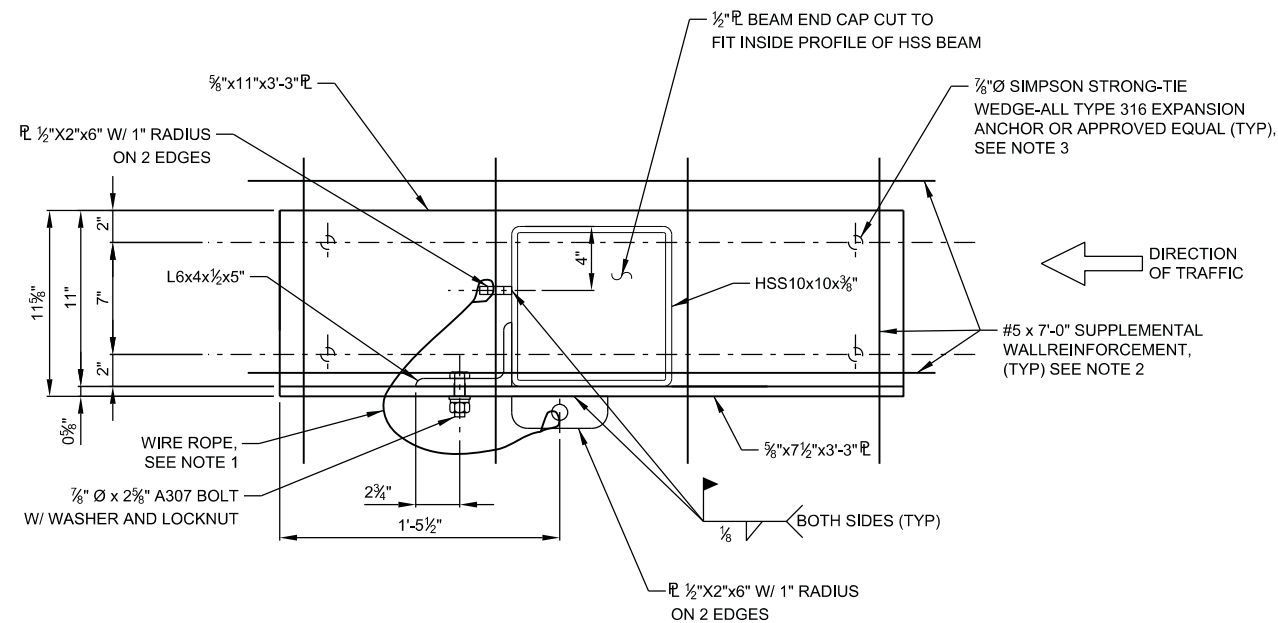
COLORADO REGISTERED
GARY OBERLING
 25076
 PROFESSIONAL ENGINEER
 DWG No. SW-514



PLAN



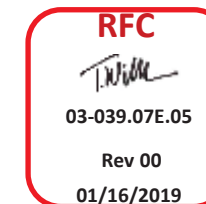
ELEVATION



SECTION

NOTES:

1. FOR WIRE ROPE INSTALLATION SEE "SACRIFICIAL BEAM CONNECTION DETAIL ON SHEET SB-962.
2. ADD MATCHING SUPPLEMENTAL REINFORCING BARS TO CIP WALL FACING @ 6" O.C. FOR A 7'-0" x 7'-0" AREA CENTERED AT WALL SACRIFICIAL BEAM CONNECTION. ALL BARS TO BE 7'-0" LONG.
3. FOLLOW ALL MANUFACTURE'S INSTALLATION REQUIREMENTS. THE SPECIFIED ANCHOR SHALL BE SHIMMED AS NECESSARY USING STAINLESS STEEL WASHERS TO LIMIT THE EMBEDMENT DEPTH TO 6.5".



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10:02:47 AM

12/12/2018

USER: fhidalgo

NO.	REVISIONS	BY	DATE
0	NMC-DCN-000158: SACRIFICIAL BEAM WALL CONNECTION	TAR	08/17/2018

DESIGNED BY: FAH DATE: 08/16/2018
 DRAWN BY: FAH DATE: 08/16/2018

REGIONAL RAIL PARTNERS
 Balfour Beatty / GRAHAM JOINT VENTURE

CHECKED BY: TAR DATE: 08/16/2018
 APPROVED BY: REP DATE: 12/12/2018

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HORZ. SCALE: 1/2"=1'-0"
 VERT. SCALE: 1/2"=1'-0"

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NORTH METRO RAIL LINE

STRUCTURAL
 RETAINING WALL DETAILS
 SACRIFICIAL BEAM WALL CONNECTION DETAILS

NORTH METRO RAIL LINE

STRUCTURAL
 RETAINING WALL DETAILS
 SACRIFICIAL BEAM WALL CONNECTION DETAILS

DWG No. SW-515

GENERAL NOTES:

WORKMANSHIP:

ALL WORK REQUIREMENTS SHOWN ON THESE DRAWINGS SHALL BE ACCOMPLISHED AS SPECIFIED IN THE PROJECT SPECIFICATIONS WITH ASSOCIATED SPECIAL PROVISIONS.

THE INFORMATION SHOWN ON THESE PLANS CONCERNING THE TYPE AND LOCATION OF EXISTING UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATION AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO. THE CONTRACTOR SHALL CONTACT THE UTILITY NOTIFICATION CENTER OF COLORADO AT 1-800-922-1987 AT LEAST 3 DAYS (NOT INCLUDING THE DAY OF NOTIFICATION) PRIOR TO ANY EXCAVATION OR OTHER EARTHWORK.

STATIONS, EXISTING ELEVATIONS AND DIMENSIONS CONTAINED IN THESE PLANS ARE CALCULATED FROM A RECENT FIELD SURVEY. THE CONTRACTOR SHALL VERIFY ALL DEPENDENT DIMENSIONS IN THE FIELD BEFORE ORDERING OR FABRICATING ANY MATERIAL.

ALL PLAN DIMENSIONS ARE TRUE HORIZONTAL. THE CONTRACTOR AND/OR FABRICATOR IS RESPONSIBLE FOR INCORPORATING CAMBER AND CROSS-SLOPE AND OTHER EFFECTS THAT MAY IMPACT THE FINAL DIMENSIONS AND/OR DETAILING.

CAST-IN-PLACE AND PRECAST CONCRETE:

ALL CONCRETE MATERIAL, PLACEMENT AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS WITH ASSOCIATED SPECIAL PROVISIONS.

STRUCTURAL CONCRETE SHALL BE PLACED AS FOLLOWS BY CLASS:

ELEMENT	CLASS
SUBSTRUCTURE	D (f'c = 4500 PSI)
APPROACH SLABS	D (f'c = 4500 PSI)
PRESTRESSED DOUBLE BOX BEAMS	PS (SEE PLANS)

FOR CONCRETE COMPONENTS IN DIRECT CONTACT WITH EARTH (ABUTMENTS AND APPROACH SLABS), PROVIDE STRUCTURAL CONCRETE WITH CEMENTITIOUS MATERIALS MEETING THE SULFATE RESISTANCE REQUIREMENTS OF CLASS 0 AS DESCRIBED IN THE PROJECT SPECIFICATIONS WITH ASSOCIATED SPECIAL PROVISIONS. ALL OTHER CONCRETE SHALL MEET THE SULFATE RESISTANCE REQUIREMENTS OF CLASS 0.

MATERIALS, FABRICATION REQUIREMENTS AND DIMENSIONAL TOLERANCES FOR THE MANUFACTURE OF PRECAST OR PRETENSIONED CONCRETE MEMBERS SHALL BE IN ACCORDANCE WITH PROJECT SPECIFICATIONS WITH ASSOCIATED SPECIAL PROVISIONS.

BEFORE CONCRETE SURFACES AT ABUTMENTS AND BENT 2 ARE BACKFILLED WITH SOIL, DAMPPROOFING SHALL BE PROVIDED. DAMPPROOFING SHALL BE AN ASPHALTIC PRIMER MEETING THE REQUIREMENTS OF ASTM D41 OR A COAL TAR PRIMER (FOR USE WITH COAL-TAR PITCH) MEETING THE REQUIREMENTS OF ASTM D43.

CHAMFER ALL EXPOSED EDGES OF CONCRETE 3/4" UNLESS NOTED OTHERWISE.

ALL CONSTRUCTION JOINTS SHALL BE INTENTIONALLY ROUGHENED TO 1/4" AMPLITUDE UNLESS NOTED OTHERWISE.

A COLORED STRUCTURAL CONCRETE COATING FINISH WILL BE REQUIRED, AS SHOWN ON THE PLANS, ON EXPOSED CONCRETE SURFACES. COLORS ARE TO BE DETERMINED AND SHALL BE VERIFIED AND FINAL SELECTION MADE FROM TEST PANELS PROVIDED BY THE CONTRACTOR.

REPAIR OF GALVANIZED SURFACES:

DAMAGED GALVANIZED SURFACES SHALL BE THOROUGHLY CLEANED TO REMOVE ALL CONTAMINANTS INCLUDING WELD SLAG, WELD SPLATTER, AND RUST, AND SHALL THEN BE PAINTED WITH TWO COATS OF ZINC DUST ZINC OXIDE, TYPE 1, LINSEED OIL PAINT MEETING FEDERAL SPECIFICATION TT-P-641.

CHAIN LINK FENCE

FENCE MOUNTED TO CURB AND WALKWAY SHALL BE ERECTED PLUMB AND IN-LINE.

REINFORCING STEEL:

REINFORCING DIMENSIONS SHOWN IN THESE PLANS INDICATE CENTER-TO-CENTER SPACING DIMENSIONS UNLESS NOTED OTHERWISE.

REINFORCING STEEL SHALL BE DEFORMED, NEW BILLET BARS PER CURRENT ASTM A615 SPECIFICATIONS. GRADE 60 REINFORCING STEEL IS REQUIRED.

ALL REINFORCING SHALL BE BLACK (UNCOATED) UNLESS OTHERWISE NOTED. (E) DENOTES EPOXY COATED REINFORCING.

BAR BENDING DIAGRAM WHERE SHOWN ON THESE PLANS INDICATE OUT-TO-OUT DIMENSIONS OF THE NOMINAL BAR DIAMETER.

ALL REINFORCING SHALL HAVE A CLEAR COVERAGE OF 2 INCHES UNLESS SHOWN OTHERWISE ON THE PLANS. CLEAR COVERAGE IS MEASURED FROM THE CONCRETE SURFACE TO THE OUTSIDE OF THE REINFORCEMENT.

REINFORCING BAR LAP SPLICES SHALL BE AS DETAILED ON THE PLANS. WHERE SPLICE LENGTHS ARE NOT PROVIDED, SEE STRUCTURAL STANDARD DETAILS.

FIELD BENDING OF REINFORCING STEEL SHALL BE PER PROJECT SPECIFICATIONS

MISCELLANEOUS:

THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE DURING CONSTRUCTION.

EXPANSION JOINT MATERIAL SHALL MEET THE REQUIREMENTS OF AASHTO M213.

ELECTRICAL CONDUITS SHALL HAVE EXPANSION COUPLINGS WITH AN INTERNAL BONDING JUMPER AT ALL EXPANSION JOINTS.

ELASTOMERIC BEARING PADS

REINFORCED ELASTOMERIC BEARINGS AND ELASTOMERIC PADS SHALL BE CUT OR MOLDED FROM AASHTO ELASTOMER GRADE 3, 4 OR 5 AS DESCRIBED IN THE PROJECT SPECIFICATIONS WITH ASSOCIATED SPECIAL PROVISIONS. PROVIDE AN ELASTOMER WITH A DUROMETER (SHORE "A") HARDNESS OF 70.

STRUCTURAL STEEL:

ALL STRUCTURAL STEEL MATERIALS, FABRICATION AND ERECTION SHALL BE IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS WITH ASSOCIATED SPECIAL PROVISIONS.

MATERIAL SHALL CONFORM TO THE FOLLOWING REQUIREMENTS FOR STEEL BRIDGES; UNLESS NOTED OTHERWISE:

MISC. STEEL PLATE AND SHAPES	ASTM A709 GR. 36
DRAIN PIPE	ASTM A53 GR. B
SACRIFICIAL BEAM (HSS)	ASTM A500, GR. B
ANCHOR RODS	ASTM F1554, GR. 36
STEEL PILING	ASTM A709 GR. 50

ALL WELDING SHALL CONFORM TO THE CURRENT EDITION OF AWS D1.5, BRIDGE WELDING CODE. AND CHAPTER 15, PART 3 OF THE CURRENT AREMA MANUAL FOR RAILWAY ENGINEERING, WHERE APPLICABLE.

NO FIELD WELDING OF ANY KIND WILL BE PERMITTED UNLESS SPECIFICALLY CALLED FOR IN THE PLANS OR APPROVED BY THE ENGINEER.

ANCHOR BOLTS SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A153.

PAINTING SACRIFICIAL BEAM

THE SACRIFICIAL BEAM AND STEEL H-PILES THAT SUPPORT THE SACRIFICIAL BEAM SHALL BE PREPARED AND PAINTED WITH THE SAME PAINT SYSTEM AND LIMITS ON THE H-PILES AS STATED IN THE PILE NOTES.

PILE NOTES:

PILES SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS. PILE SPACINGS SHOWN ARE AT PILE CUTOFF ELEVATIONS. PILES SHALL BE DRIVEN TO REFUSAL, IN BEDROCK AS DEFINED IN SECTION 31.62.17 OF THE PROJECT SPECIFICATIONS. A PILE DRIVING ANALYZER (PDA) IS REQUIRED FOR DRIVEN STEEL PILES. SEE PROJECT SPECIAL PROVISIONS FOR FREQUENCY OF TESTING AND SPECIFIC TEST REQUIREMENTS.

PILE PENETRATION SHALL BE PERMANENTLY MARKED ON EACH PILE AS DIRECTED BY THE ENGINEER.

AFTER PILES ARE DRIVEN THEY SHALL BE ADJUSTED LATERALLY BY PULLING AND/OR TUGGING IF NECESSARY AND HELD IN THE PROPER LOCATION AND CUT OFF AT THE PROPER ELEVATION. THEY SHALL CONTINUE BEING HELD UNTIL THE PRECAST CAPS HAVE BEEN SET AND WELDED TO STEEL BEARING PILES.

SYMBOL X : 12 DENOTES DIRECTION AND AMOUNT OF PILE BATTER.

PAINTING:

AT BENT 2, THE EXPOSED PORTIONS OF PILE PLATES, THE EXPOSED PORTION OF PILING BETWEEN BOTTOM OF BENT 2 CAP AND ONE (1) FOOT BELOW TOP OF ROADWAY BARRIER, AND THE CHANNEL BRACING SHALL BE PAINTED WITH ONE (1) FIELD COAT OF CHEMICAL MASTIC CM-15, METALLIC ALUMINUM COLOR, APPLIED TO A DRY FILM THICKNESS OF 8 MILS, CORRESPONDING TO A WET FILM THICKNESS OF 10 MILS.

INFORMATION PERTAINING TO CHEMICAL MASTIC CM-15 MAY BE OBTAINED FROM THE MANUFACTURER: GULF COAST PAINT MANUFACTURING, INC., 30075 COUNTY ROAD 49, LOXLEY, AL 36551, PHONE (251) 964-7911.

ALL AREAS TO BE PAINTED SHALL HAVE A "COMMERCIAL BLAST CLEANING" IN ACCORDANCE WITH THE STEEL STRUCTURES PAINTING COUNCIL SURFACE PREPARATION SPECIFICATION SSPC-SP6. PAINT APPLICATION SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

PLACING PRECAST CAPS ON STEEL H-PILES

PRECAST CAPS SHALL BE PLACED IN THE PROPER LOCATION AND THE PILES SHALL BE WELDED TO THE PILE PLATES. CHANNEL BRACING SHALL THEN BE WELDED TO THE PILES.

HANDLING NOTES:

PRESTRESSED CONCRETE BEAMS SHOULD ALWAYS BE LIFTED BY THE DEVICES CAST INTO THEM BY THE FABRICATOR. IF BEAMS ARE NOT GOING TO BE PLACED IN SERVICE IMMEDIATELY UPON RECEIPT IN THE FIELD, THEY MUST BE PLACED ON BLOCKING WHICH SUPPORTS THEM AT THE VERY ENDS. IN ADDITION, IF THEY ARE GOING TO BE STORED ON BLOCKING OR FALSEWORK FOR ANY AMOUNT OF TIME AS DETERMINED BY THE ENGINEER, THEY MUST BE LOADED WITH SOME HEAVY MATERIAL OR DUNNAGE TO ASSURE THAT CRACKING DOES NOT OCCUR.

ERECTION OF BEAMS:

BEAMS SHALL BE SET IN THE PROPER LOCATION USING CARE NOT TO DAMAGE CONCRETE MEMBERS. AFTER BEAMS ARE SET, BURN OFF LIFTING LOOPS TWO (2) INCHES ABOVE CONCRETE SURFACE. REMAINING PORTION OF LIFTING LOOPS ARE TO BE COATED WITH PAINT. PATCH RECESSES, IF NECESSARY, AROUND LIFTING LOOPS WITH EPOXY MORTAR AS USED FOR SETTING BEAMS.

PATCHING OF PRECAST CONCRETE MEMBERS

PATCHING OR REPAIR OF SPALLED OR CHIPPED PRECAST CONCRETE MEMBERS SHALL BE DONE USING CONPATCH V/O MORTAR, MIXED AND INSTALLED IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS. (CONSPEK MARKETING & MANUFACTURING CO., INC., 4226 KANSAS AVE, KANSAS CITY, KS 66106. (877) 416-3439).

MORTAR FOR SETTING BEAMS:

BEAMS SHALL HAVE FULL AND EVEN BEARING UPON THE BRIDGE SEAT AREAS. IF NEEDED, MORTAR CONSISTING OF EQUAL PARTS BY VOLUME OF CLASS B EPOXY AND DRY SILICA SAND, MIXED IN ACCORDANCE WITH MANUFACTURER'S DIRECTIONS, SHALL BE SPREAD ON TOP OF BEARING PADS TO OBTAIN UNIFORM BEARING. SCRAPE EXCESS MORTAR FROM AROUND BEARING PADS AFTER BEAMS ARE SET.

DECK PLATES:

THE DECK PLATES SHALL BE ADJUSTED AS NECESSARY TO ENSURE THE PLATES FIT TIGHT AGAINST THE BEAMS AND CURBS.

INDEX OF DRAWINGS:

SI-077	INDEX OF DRAWINGS
SB-950	GENERAL INFORMATION (SHEET 1 OF 2)
SB-951	GENERAL INFORMATION (SHEET 2 OF 2)
SB-952	GENERAL LAYOUT
SB-953	TYPICAL SECTIONS
SB-954	ENGINEERING GEOLOGY
SB-955	CONSTRUCTION LAYOUT / PILING LAYOUT
SB-956	ABUTMENT DETAILS (SHEET 1 OF 3)
SB-957	ABUTMENT DETAILS (SHEET 2 OF 3)
SB-958	ABUTMENT DETAILS (SHEET 3 OF 3)
SB-959	BENT 2 DETAILS
SB-960	DOUBLE BOX BEAM DETAILS (SHEET 1 OF 2)
SB-961	DOUBLE BOX BEAM DETAILS (SHEET 2 OF 2)
SB-962	SACRIFICIAL BEAM DETAILS
SB-963	MISC. DETAILS (SHEET 1 OF 2)
SB-964	MISC. DETAILS (SHEET 2 OF 2)
SB-965	DECK WATERPROOFING DETAILS
SB-966	FENCE DETAILS

REFERENCE OF STRUCTURAL STANDARD DRAWINGS:

SS-100	FENCE CHAIN LINK (SPECIAL) (36 AND 42 INCH)
SS-110	APPROACH SLAB DETAILS (SINGLE TRACK-SQUARE END)

BRIDGE DESCRIPTION

2 SPAN BRIDGE (35'-10", 35'-10").
PRESTRESSED CONCRETE DOUBLE BOX BEAM.
SINGLE TRACK BALLAST DECK COMMUTER RAIL
OVER MARION STREET



811
Know what's below.
Call before you dig.

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987 or 811

CALL 3-BUSINESS DAYS (NOT INCLUDING INITIAL DAY OF CONTACT) IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

RTD BRIDGE NO. NM 2.63

DESIGNED BY: TJW	DATE: 02/27/2015	CHECKED BY: DWC	DATE: 06/03/2015	HORIZ. SCALE: NTS
DRAWN BY: SWF	DATE: 02/27/2015	APPROVED BY: TR	DATE: 09/29/2015	VERT. SCALE: NTS
0	ISSUED FOR CONSTRUCTION	DWC	09/29/2015	
NO.	REVISIONS	BY	DATE	

REGIONAL RAIL PARTNERS
Balfour Beatty / GRAHAM JOINT VENTURE

2000 SOUTH COLORADO BOULEVARD
SUITE 2-300
DENVER, COLORADO 80222
(303) 758-4058

North Metro Rail Line
REGIONAL TRANSPORTATION DISTRICT
1600 BLAKE STREET
DENVER, COLORADO 80202
(303) 628-9000

NORTH METRO RAIL LINE

STRUCTURAL
GENERAL INFORMATION (SHEET 1 OF 2)
NORTH METRO OVER MARION STREET

0049193
09/29/2015
PROFESSIONAL ENGINEER

DWG No. SB-950

NM-SB-950-GI-01.dgn

8:47:47 AM

9/29/2015

USER: sfoj

DESIGN DATA:

SPECIFICATIONS:

DESIGN IN ACCORDANCE WITH NORTH METRO RAIL LINE PROJECT DESIGN BASIS MANUAL AND THE AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION (AREMA) MANUAL FOR RAILWAY ENGINEERING (MRE) 2014

DESIGN METHOD:

LOAD FACTOR DESIGN (SUPERSTRUCTURES AND SUBSTRUCTURES)
 SERVICE LOAD DESIGN (FOUNDATIONS)
 SERVICE LOAD DESIGN WITH CHECK FOR ULTIMATE STRENGTH (PRESTRESSED CONCRETE BOX BEAMS)

DEAD LOADS USED IN DESIGN:

200 LB PER FOOT PER TRACK FOR RAIL, GUARDRAIL AND FASTENERS
 195 LB PER FOOT FOR BALLAST (BASED ON BALLAST DEPTH OF 30" MAX, 12" MIN UNDER TIES)
 305 LB PER FOOT FOR CURB & WALK
 523 LB PER FOOT FOR CURB & WALK (w/ ELECTRICAL CONDUIT)
 100 LB PER FOOT PER TRACK FOR FUTURE UTILITIES
 25 LB PER FOOT FOR EACH FENCE

LIVE LOADS USED IN DESIGN:

CRT ELECTRICAL MULTIPLE UNIT: 185.50 KIPS PER CAR AS SHOWN BELOW
 PEDESTRIAN LOAD:
 CURB & WALK DESIGN: 40 PSF (100 PLF MAX)

LIVE LOAD DEFLECTION CRITERION:

SPAN LENGTH/1000, SPAN/375 FOR CANTILEVERS

DESIGN SPEEDS:

SEE TRACK ALIGNMENT DATA SHEETS

BEAM LIVE LOAD DISTRIBUTION FACTOR:

(INCLUDES HORIZONTAL NOSING EFFECTS)
 MOMENT 0.529
 SHEAR 0.529

LIVE LOAD IMPACT FACTOR:

$$I = \frac{225}{100VL} = 0.382$$

LOAD RATINGS:

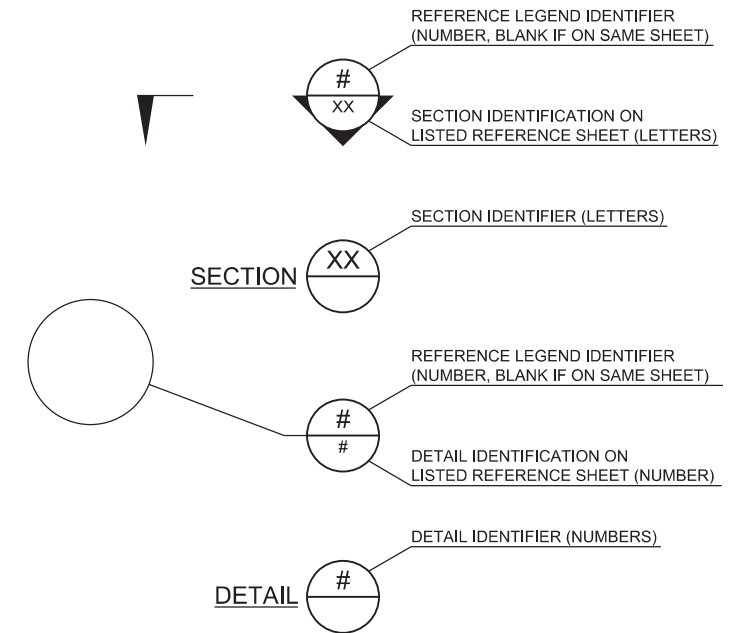
RATING IN ACCORDANCE WITH NORTH METRO RAIL LINE PROJECT DESIGN BASIS MANUAL

CRT ELECTRICAL MULTIPLE UNIT

NORMAL RATING 1.XX
 MAXIMUM RATING 1.XX

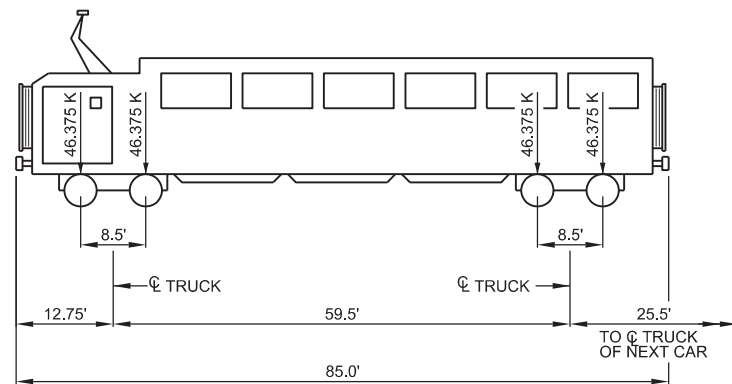
GEOTECHNICAL

SEE GEOTECHNICAL REPORT DATED 07/29/2015 FOR FOUNDATION DESIGN AND INSTALLATION PARAMETERS, LABORATORY DATA AND SOIL CHARACTERISTICS.



REFERENCES LEGEND:

IDENTIFIER	SHEET NAME
X	X



LIVE LOADING DIAGRAM
CRT ELECTRICAL MULTIPLE UNIT (EMU)
 (ONE CAR SHOWN - 8 CARS OPERATING MAXIMUM)



811 CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987 or 811
 Know what's below. Call before you dig.
CALL 3-BUSINESS DAYS (NOT INCLUDING INITIAL DAY OF CONTACT) IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

RTD BRIDGE NO. NM 2.63

NO.	REVISIONS	BY	DATE
0	ISSUED FOR CONSTRUCTION	DWC	09/29/2015

DESIGNED BY: CNG	DATE: 03/10/2015	CHECKED BY: DWC	DATE: 06/03/2015	HORZ. SCALE: NTS
DRAWN BY: SWF	DATE: 03/10/2015	APPROVED BY: TR	DATE: 09/29/2015	VERT. SCALE: NTS

RIP REGIONAL RAIL PARTNERS
 Balfour Beatty / GRAHAM JOINT VENTURE

Stantec
 2000 SOUTH COLORADO BOULEVARD
 SUITE 2-300
 DENVER, COLORADO 80222
 (303) 758-4058

RTD FasTracks
 North Metro Rail Line
 REGIONAL TRANSPORTATION DISTRICT
 1600 BLAKE STREET
 DENVER, COLORADO 80202
 (303) 628-9000

NORTH METRO RAIL LINE

STRUCTURAL
 GENERAL INFORMATION (SHEET 2 OF 2)
 NORTH METRO OVER MARION STREET

COLORADO LICENSED
 CHARL WESLEY CHAPPEL
 0049193
 09/29/2015
 PROFESSIONAL ENGINEER

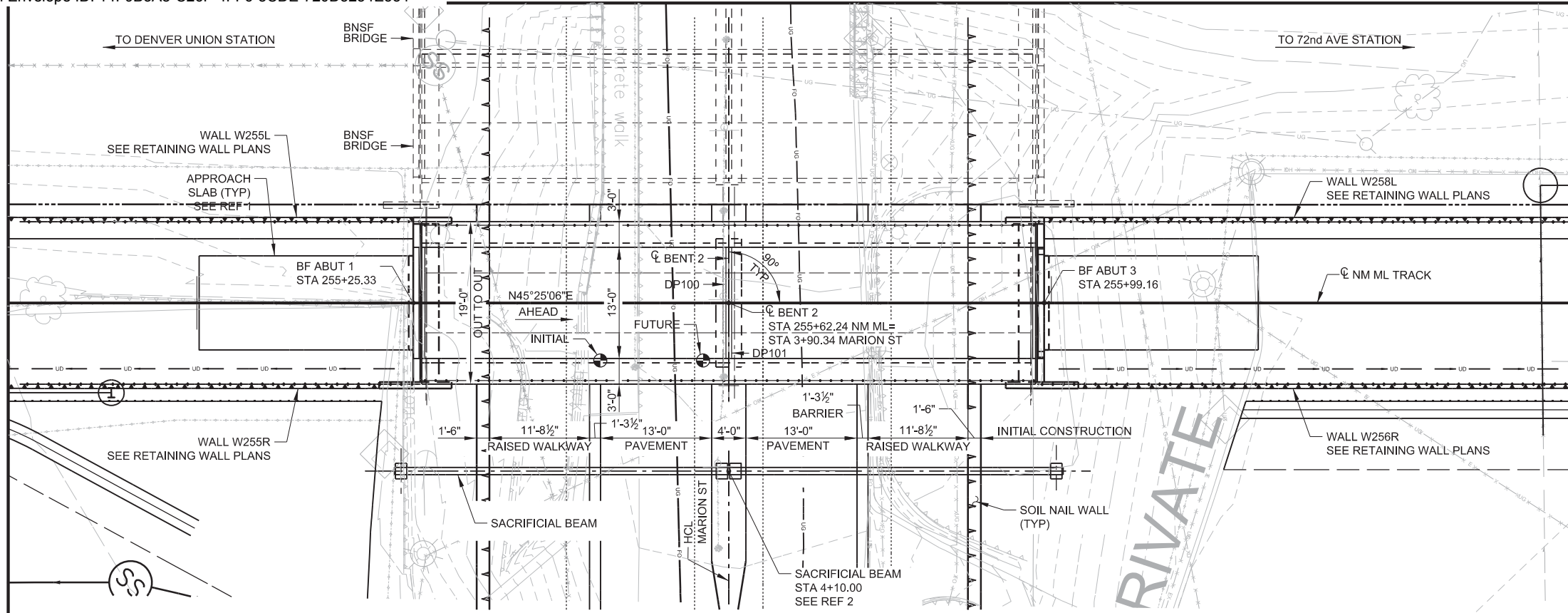
DWG No. SB-951

NM-SB-951-GI-02.dgn

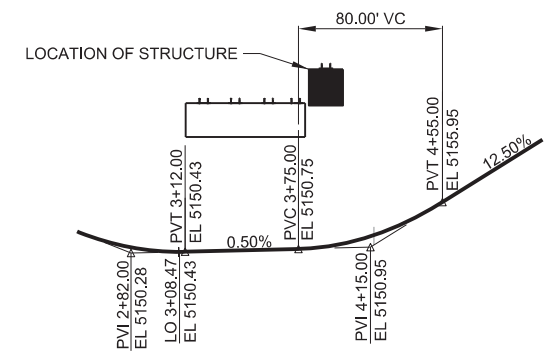
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9/29/2015

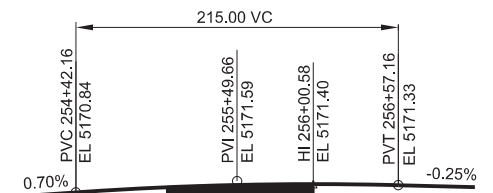
USER: sfoj



INDICATES POINT OF MINIMUM VERTICAL CLEARANCE



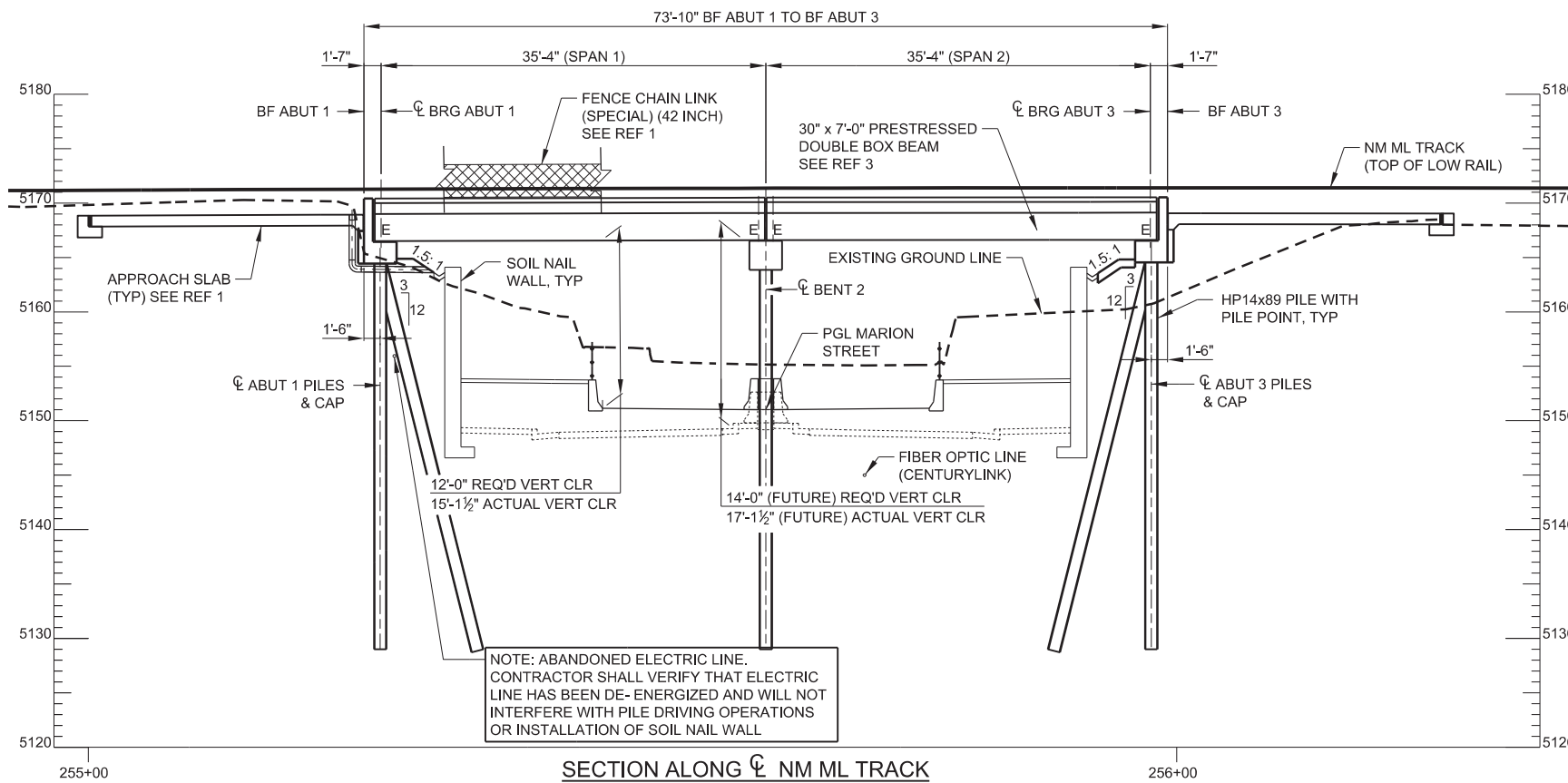
MARION STREET PROFILE GRADE
(INITIAL CONSTRUCTION)
NTS



NM ML TRACK PROFILE GRADE
NTS

ELEVATIONS - TOP OF LOW RAIL

LOCATION	NM ML TRACK
BF ABUT 1	5171.27
CL BENT 2	5171.36
BF ABUT 3	5171.40



REFERENCES LEGEND

IDENTIFIER	SHEET NAME
1	STRUCTURAL STANDARD DRAWINGS
2	SACRIFICIAL BEAM DETAILS
3	DOUBLE BOX BEAM DETAILS



RTD BRIDGE NO. NM 2.63

NO.	REVISIONS	BY	DATE
0	ISSUED FOR CONSTRUCTION	DWC	09/29/2015

DESIGNED BY: TJW DATE: 02/27/2015
 DRAWN BY: ECT DATE: 02/27/2015

CHECKED BY: DWC DATE: 06/03/2015
 APPROVED BY: TR DATE: 09/29/2015

HORZ. SCALE: 1/16"=1'
 VERT. SCALE: 1/16"=1'

RIP REGIONAL RAIL PARTNERS

Stantec

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 SUITE 2-300
 DENVER, COLORADO 80222
 (303) 758-4058

RTD FasTracks
 North Metro Rail Line

REGIONAL TRANSPORTATION DISTRICT
 1600 BLAKE STREET
 DENVER, COLORADO 80202
 (303) 628-9000

NORTH METRO RAIL LINE

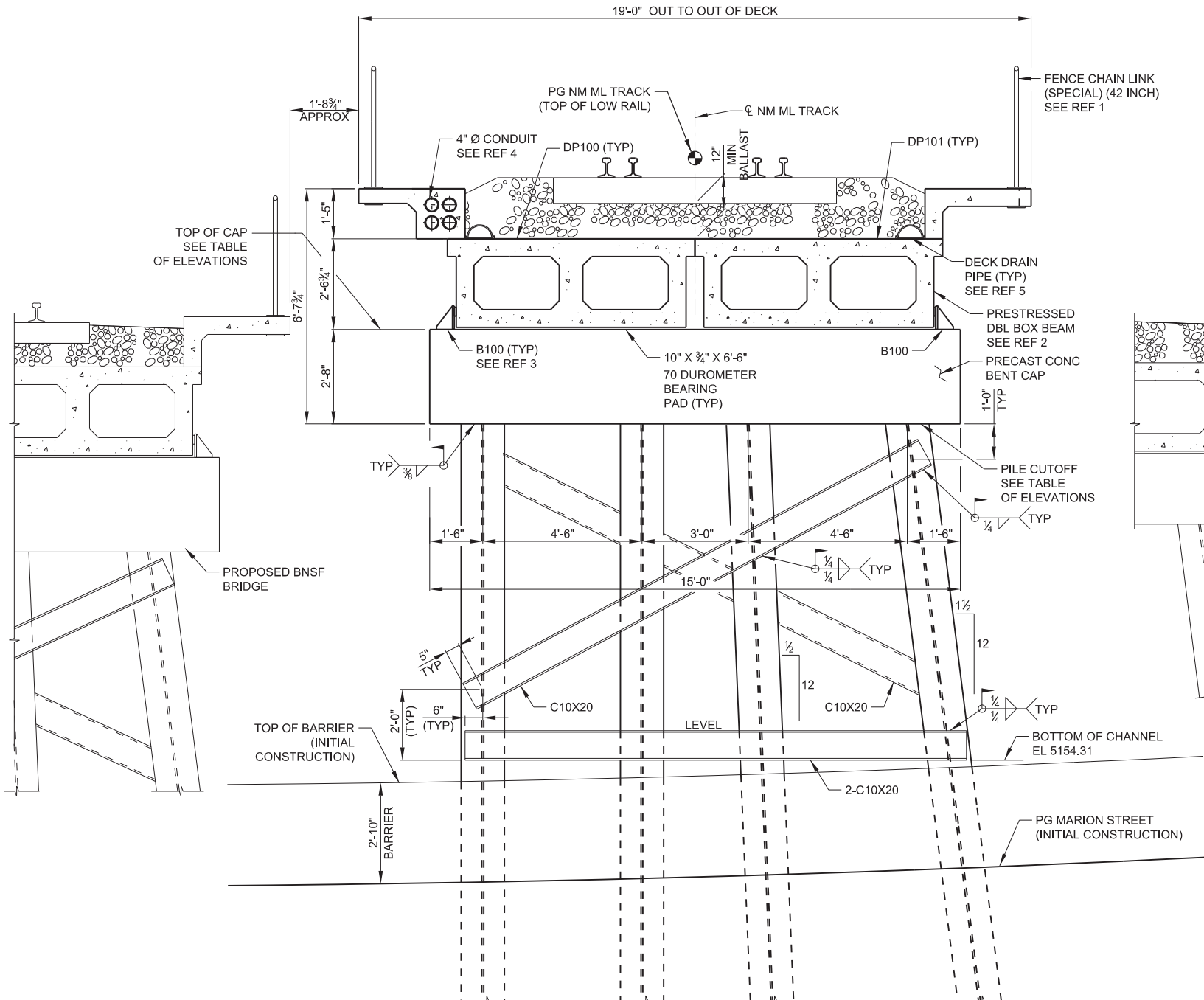
STRUCTURAL GENERAL LAYOUT
 NORTH METRO OVER MARION STREET

RTD BRIDGE NO. NM 2.63

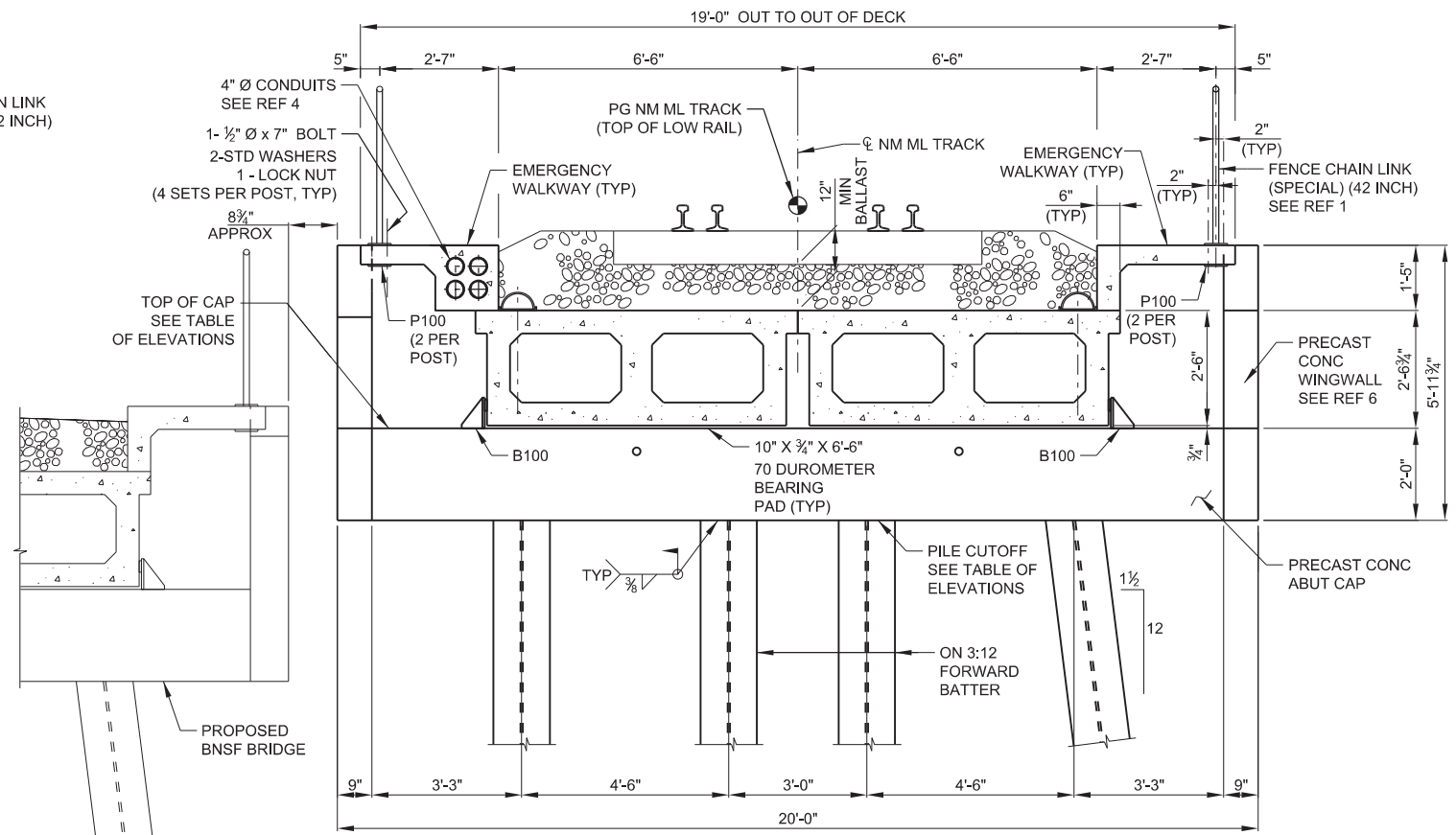
PROFESSIONAL ENGINEER
 T. Williams
 0049193
 09/29/2015

DWG No. SB-952

USER: sfcy 9/29/2015 8:45:02 AM NM-SB-952-PL.dgn



TYPICAL SECTION - BENT 2 - LOOKING AHEAD



TYPICAL SECTION - ABUTMENT 3 - LOOKING AHEAD
ABUTMENT 1 SIMILAR

FENCE FASTENER NOTES:
BOLTS SHALL MEET THE REQUIREMENTS OF ASTM A307.
BOLTS, WASHERS AND NUTS SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153.



REFERENCE LEGEND:

IDENTIFIER	SHEET NAME
1	STRUCTURAL STANDARD DRAWINGS
2	DOUBLE BOX BEAM DETAILS
3	MISCELLANEOUS DETAILS
4	MARION STREET SYSTEMWIDE ELECTRICAL SECTION DETAILS
5	DECK WATERPROOFING DETAILS
6	ABUTMENT DETAILS

TABLE OF ELEVATIONS

LOCATION	TOP OF LOW RAIL	TOP OF CAP	PILE CUTOFF
ABUT 1 - C-CAP & PILES	5171.28	5166.39	5164.39
C BENT 2	5171.36	5166.48	5163.81
ABUT 3 - C-CAP & PILES	5171.40	5166.51	5164.51

USER: sfoj 9/29/2015 8:55:55 AM NM-S-SB-953-XS.dgn

NO.	REVISIONS	BY	DATE
0	ISSUED FOR CONSTRUCTION	DWC	09/29/2015

DESIGNED BY: CNG	DATE: 03/10/2015	CHECKED BY: DWC	DATE: 06/03/2015	HORZ. SCALE: 1/4"=1'
DRAWN BY: SWF	DATE: 03/10/2015	APPROVED BY: TR	DATE: 09/29/2015	VERT. SCALE: 1/4"=1'

Balfour Beatty / GRAHAM JOINT VENTURE

2000 SOUTH COLORADO BOULEVARD
SUITE 2-300
DENVER, COLORADO 80222
(303) 758-4058

RTD FasTracks
North Metro Rail Line

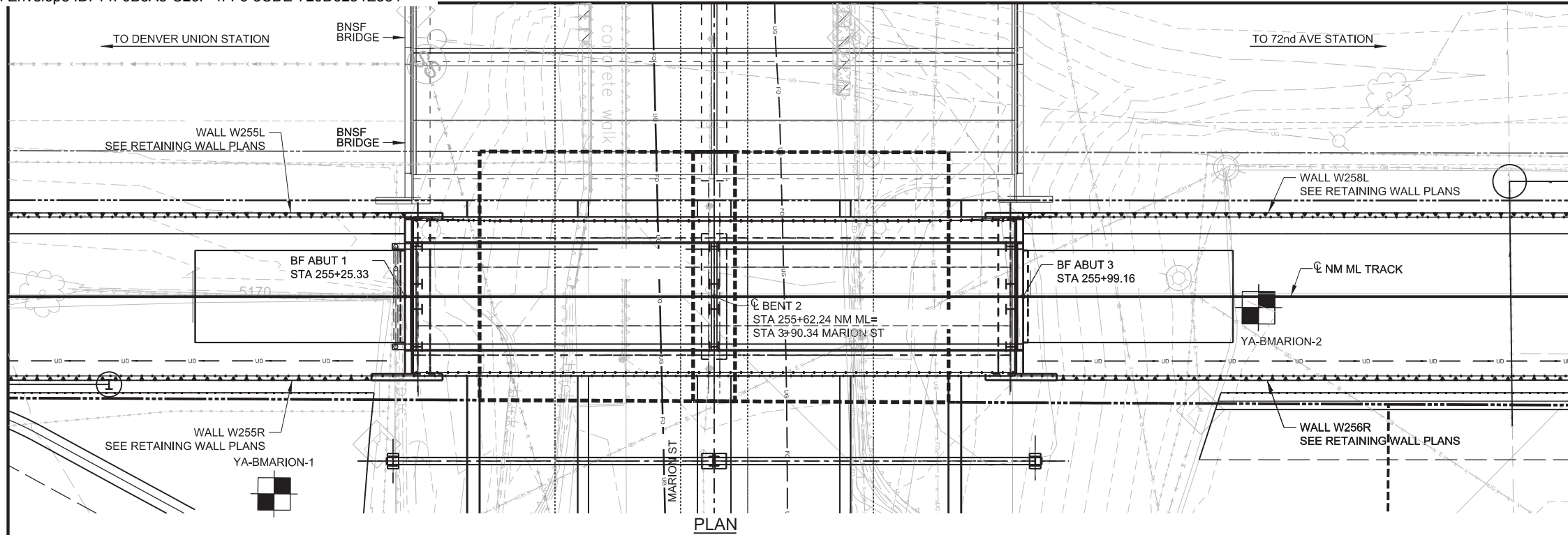
REGIONAL TRANSPORTATION DISTRICT
1600 BLAKE STREET
DENVER, COLORADO 80202
(303) 628-9000

RTD BRIDGE NO. NM 2.63

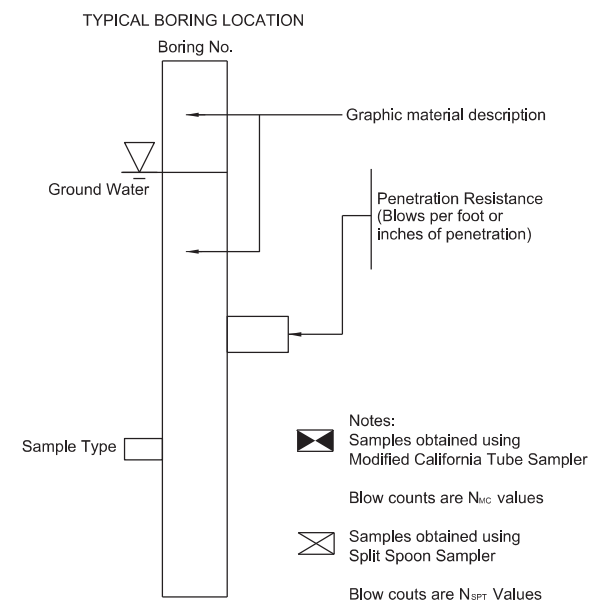
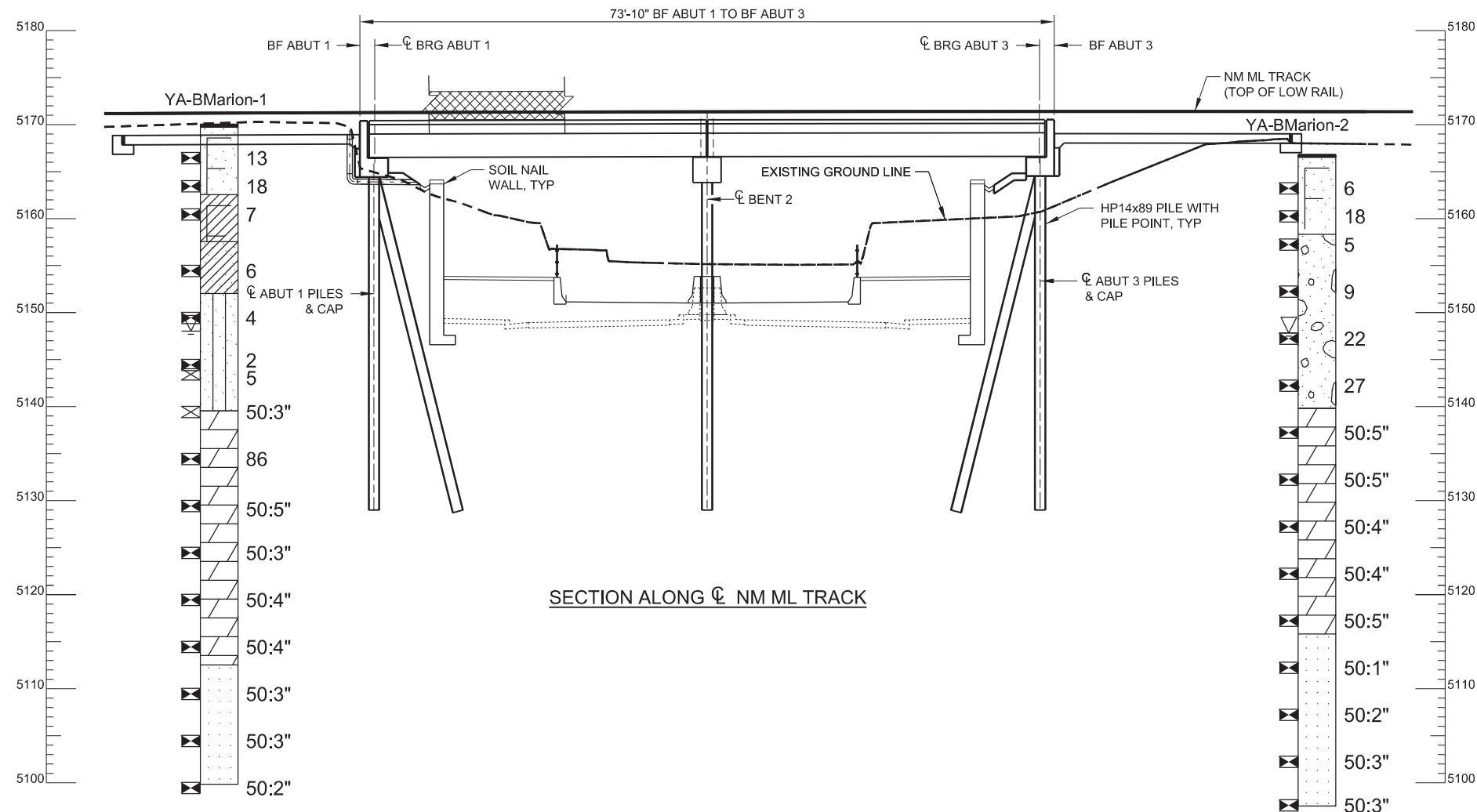
NORTH METRO RAIL LINE

STRUCTURAL
TYPICAL SECTIONS
NORTH METRO OVER MARION STREET

DWG No. SB-953



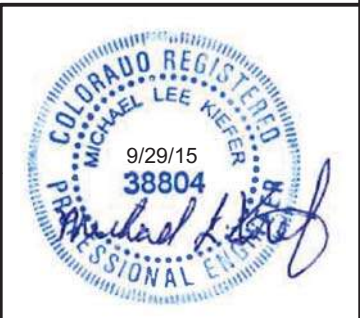
- BORING LOCATION YEH, (2014)
- Asphalt
 - USCS Low Plasticity Sandy Clay
 - Fill with Clay as major soil
 - CLAYSTONE
 - Fill with Sand as major soil
 - USCS Silty Sand
 - Sandstone
 - USCS Poorly-graded Gravelly Sand



See Geotechnical Engineering Report
 CRT Bridges over 46th Avenue, Marion Street and Race Court
 Design Package DP07, dated 7/29/2015
 for laboratory data and soil characteristics

Yeh and Associates, Inc.
 Consulting Engineers & Scientists

RTD BRIDGE NO. NM 2.63



USER: Mike Walz
 9/29/2015 1:17:35 PM
 NM-SB-954-EG.dgn

NO.	REVISIONS	BY	DATE
0	ISSUED FOR CONSTRUCTION	TJW	09/29/2015

DESIGNED BY: IPC	DATE: 02/27/2015	CHECKED BY: MLK	DATE: 05/12/2015	HORZ. SCALE: 1/16"=1'
DRAWN BY: MJW	DATE: 02/27/2015	APPROVED BY: TR	DATE: 09/29/2015	VERT. SCALE: 1/16"=1'

REGIONAL RAIL PARTNERS
 Balfour Beatty / GRAHAM JOINT VENTURE

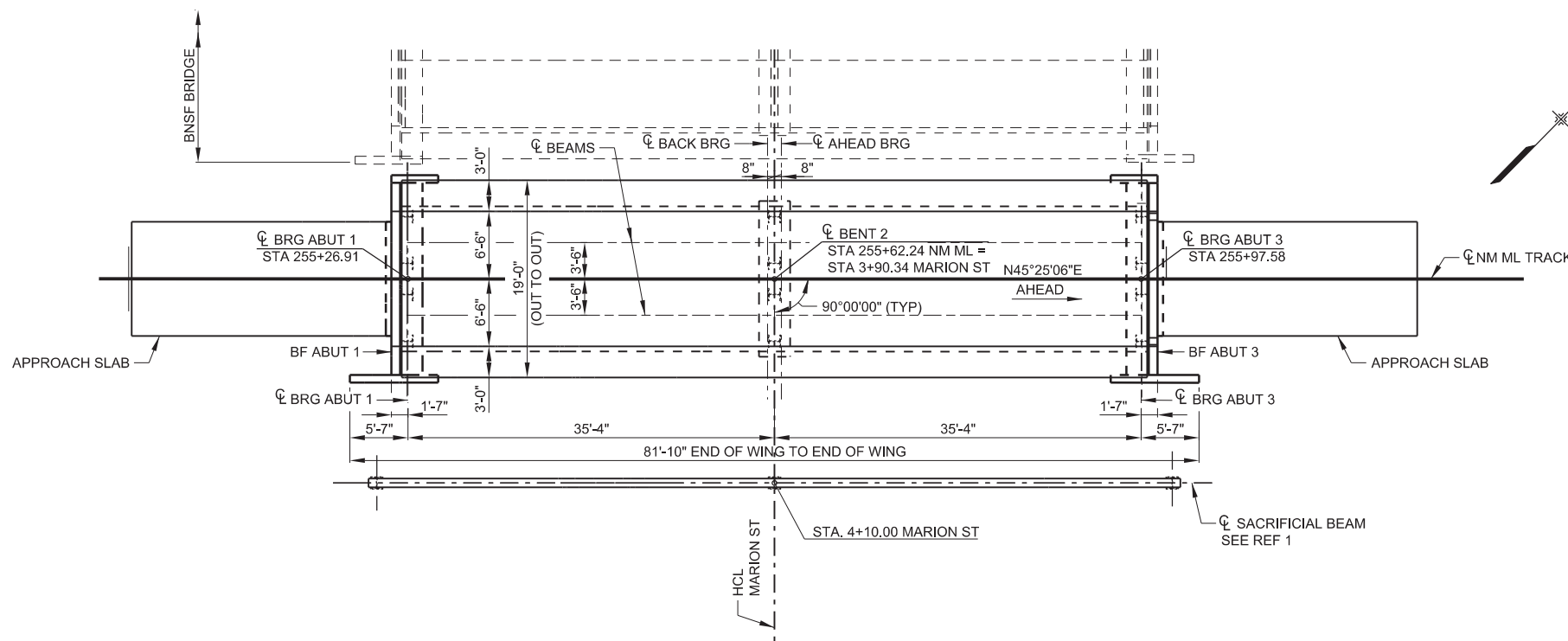
2000 SOUTH COLORADO BOULEVARD
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 DENVER, COLORADO 80222
 (303) 758-4058

North Metro Rail Line
 REGIONAL TRANSPORTATION DISTRICT
 1600 BLAKE STREET
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 (303) 628-9000

NORTH METRO RAIL LINE

STRUCTURAL
 ENGINEERING GEOLOGY
 NORTH METRO OVER MARION STREET

DWG No. SB-954



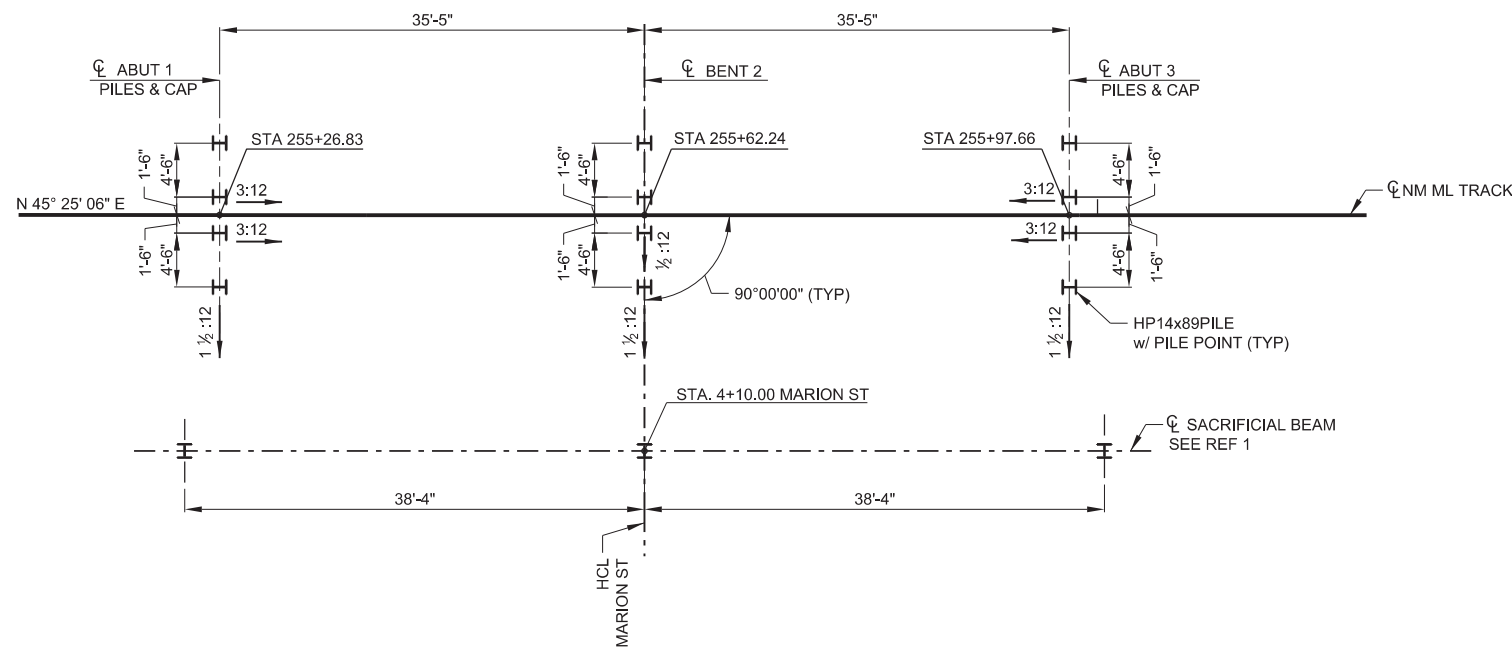
NOTE:
 PILES FOR BNSF BRIDGE ARE IN CLOSE PROXIMITY, BUT ARE NOT SHOWN FOR CLARITY

CONSTRUCTION LAYOUT

NOTES:

1. ALL PILING DIMENSIONS SHOWN ARE AT PILE CUTOFF ELEVATION (BOTTOM OF CONCRETE CAP)
2. ALL PILES ARE END-BEARING PILES DRIVEN TO REFUSAL IN BEDROCK.
3. THE ESTIMATED PILE TIP ELEVATION IS THE ENGINEERS ESTIMATE OF THE FINAL TIP ELEVATION TO ACHIEVE REFUSAL AND IS PROVIDED FOR INFORMATION ONLY. ACTUAL DEPTHS WILL VARY IN THE FIELD. THE MINIMUM PILE TIP ELEVATION IS ESTABLISHED TO ENSURE A MINIMUM PILE PENETRATION BELOW THE ABUTMENTS AND BENT 2 TO RESIST LATERAL LOADS.
4. ALL PILING SHALL BE FITTED WITH A PROTECTIVE COMMERCIAL STEEL PILE TIP. PILE TIPS SHALL BE HARD BITE OR EQUIVALENT.
5. ALL PILES SHALL BE HP14x89 (50ksi)

PILE SUMMARY TABLE					
LOCATION	PILE SIZE	CUT OFF ELEVATION	ESTIMATED TIP ELEVATION	MINIMUM TIP ELEVATION	MAX SERVICE LOAD (TONS)
ABUTMENT 1	HP 14 x 89	5164.39	5129.72	5134.72	62.8
BENT 2	HP 14 x 89	5163.81	5130.17	5135.17	89.7
ABUTMENT 3	HP 14 x 89	5164.51	5130.55	5135.55	62.8



PILING LAYOUT

REFERENCES LEGEND

IDENTIFIER	SHEET NAME
1	SACRIFICIAL BEAM DETAILS



RTD BRIDGE NO. NM 2.63

NO.	REVISIONS	BY	DATE
0	ISSUED FOR CONSTRUCTION	DWC	09/29/2015

DESIGNED BY: TJW DATE: 02/27/2015
 DRAWN BY: SWF DATE: 02/27/2015

CHECKED BY: DWC DATE: 06/03/2015
 APPROVED BY: TR DATE: 09/29/2015

HORZ. SCALE: 1/16"=1'
 VERT. SCALE: 1/16"=1'

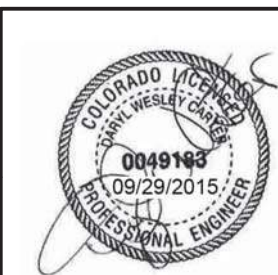
2000 SOUTH COLORADO BOULEVARD
 SUITE 2-300
 DENVER, COLORADO 80222
 (303) 758-4058

REGIONAL TRANSPORTATION DISTRICT
 1600 BLAKE STREET
 DENVER, COLORADO 80202
 (303) 628-9000

NORTH METRO RAIL LINE

STRUCTURAL CONSTRUCTION LAYOUT/PILING LAYOUT

NORTH METRO OVER MARION STREET



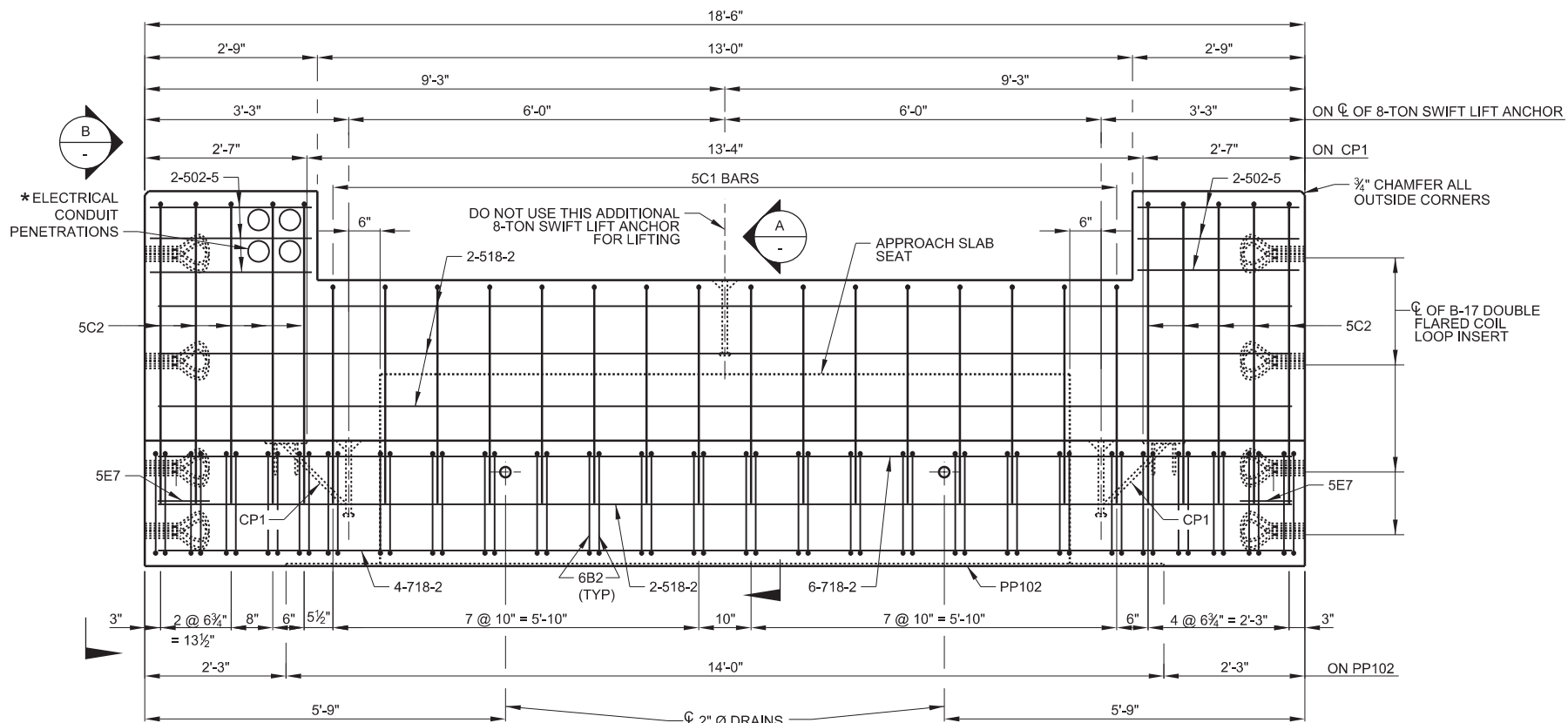
DWG No. SB-955

NM-S-SB-955-CL.dgn

8:59:59 AM

9/29/2015

USER: sfoj



* ADJUST REINF SPACING AS NECESSARY TO ACCOMMODATE ELECTRICAL CONDUIT PENETRATIONS. CONDUIT PENETRATIONS TO MATCH SPACINGS SHOWN ON DWG NO SB-960.

PRECAST CAP ELEVATION
 WT= 26,100 LBS., VOL= 6.15 CU YDS, REINF STEEL = 1,409 LBS
 (ABUTMENT 3 SHOWN, LOOKING AHEAD)

NOTE:
 FOR VIEW C, SEE DWG NO. SB-958

* QUANTITIES ARE SHOWN FOR ONE ABUTMENT (2 REQUIRED)

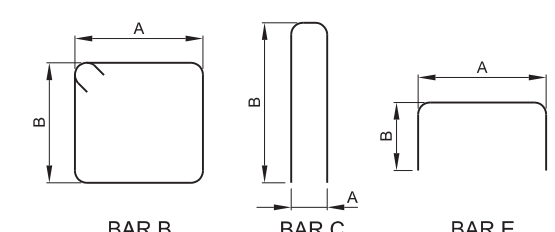


*** BILL OF REINFORCEMENT (ABUTMENT)**

QUAN	MARK	SIZE	TYPE	A	B	LENGTH
CAP						
52	6B2	6	B	1'-8"	1'-8"	8'-0"
16	5C1	5	C	6"	3'-5"	7'-1"
10	5C2	5	C	6"	4'-10"	9'-11"
2	5E7	5	E	2'-6 1/2"	10"	4'-3"
12	502-5	5	STR	-	-	2'-5"
8	518-2	5	STR	-	-	18'-2"
10	718-2	7	STR	-	-	18'-2"

*** STRUCTURAL STEEL**

3	8-TON SWIFT LIFT ANCHOR					
2	PLATE CP1 (SEE DWG NO SB-964)					
1	PILE PLATE PP102 (SEE DWG NO SB-964)					
8	1 1/4" DIA x 12" DAYTON SUPERIOR TYPE B-17 DOUBLE FLARED COIL LOOP INSERT (13,500 LBS. SAFE WORKING LOAD), PLAIN.					
10	5/8" Ø 90° HOOKED DOWEL WITH THREADED END (SEE SHT SB-958)					



REINFORCING STEEL DETAILS
 ALL DIMENSIONS SHOWN ARE OUT TO OUT OF BARS

NOTES:

GENERAL:

ALL MATERIAL AND WORKMANSHIP SHALL BE AS PER THE CURRENT SPECIFICATIONS.

COIL LOOP INSERTS TO BE DOUBLE FLARED TYPE B17 1 1/4" DIA x 12" AS MANUFACTURED BY DAYTON-SUPERIOR AND HAVE A SAFE WORKING LOAD OF 13,500 LBS WITH A 4 TO 1 SAFETY FACTOR. THE INSERTS ARE TO BE COMPLETELY RECESSED WITH 1 1/4" DIA x 13" SPIRAL BOLTS ATTACHED TO THE CAP FOR SHIPMENT.

CONCRETE:

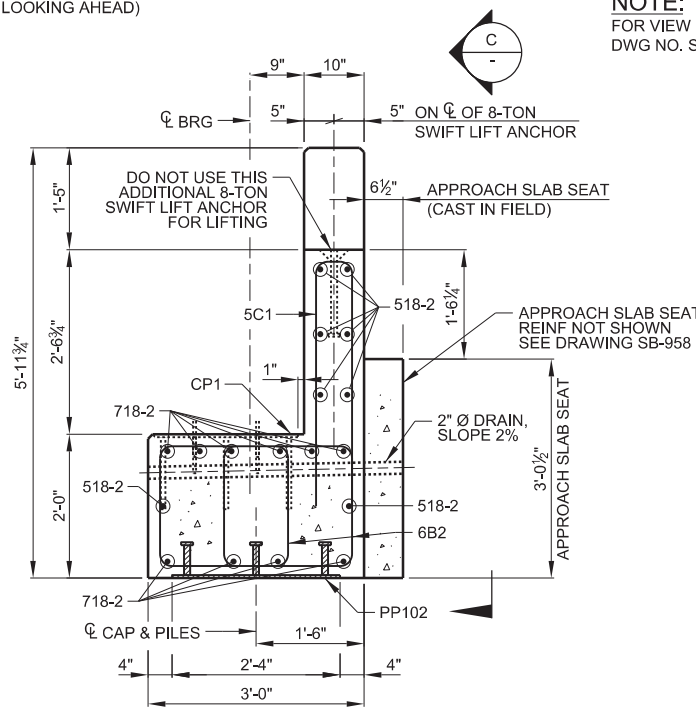
THE ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE SHALL BE NOT LESS THAN 4500 PSI IN 28 DAYS. CONCRETE MEMBERS SHALL NOT BE REMOVED FROM THE CASTING BED BEFORE THE CONCRETE REACHES A STRENGTH OF 2500 PSI.

ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4 INCH.

REINFORCEMENT:

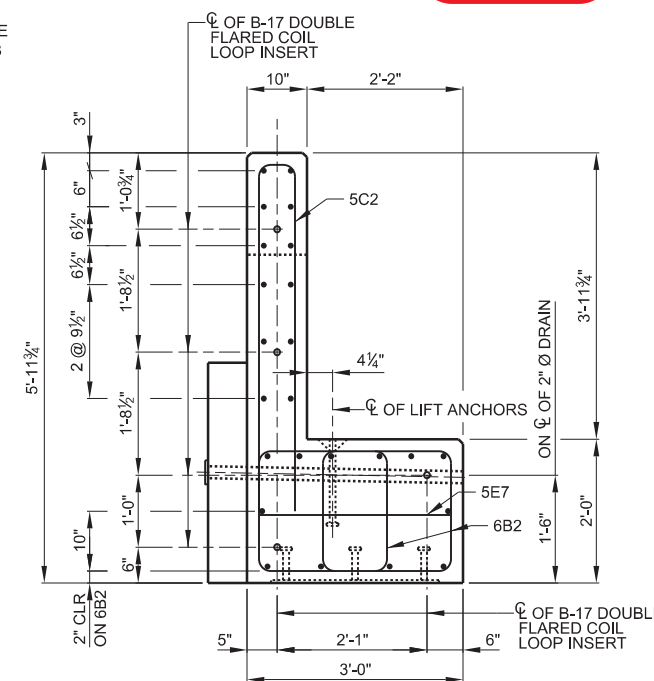
FABRICATION OF REINFORCEMENT SHALL IN ACCORDANCE WITH CHAPTER 7 OF THE CURRENT CRSI MANUAL OF STANDARD PRACTICE.

STEEL REINFORCEMENT MAY BE MOVED SLIGHTLY SO AS TO MISS PP102 OR CP1.



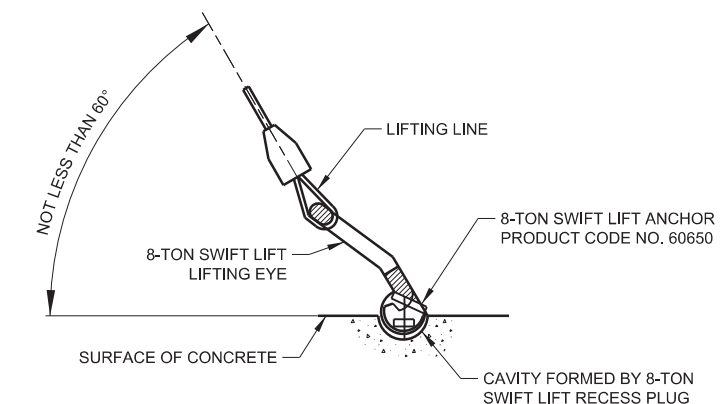
SECTION A

FOR FURTHER DESIGNATION OF HORIZONTAL BARS SEE ELEVATIONS OF PRECAST MEMBERS



VIEW B

FOR FURTHER DESIGNATION OF HORIZONTAL BARS SEE ELEVATIONS OF PRECAST MEMBERS



LIFTING DETAIL
 NTS

8-TON SWIFT LIFT RECESS PLUGS, ANCHORS AND LIFTING EYES ARE AVAILABLE FROM DAYTON/RICHMOND 721 RICHARD ST. MIAMISBURG, OHIO 45342. TELEPHONE (937) 866-0711. THE MATERIALS FOR THIS LIFTING SYSTEM ARE NOT INCLUDED IN THE BILL OF MATERIAL BUT ARE TO BE ORDERED AS REQUIRED.

USER: sfoj 9/29/2015 9:04:27 AM NIM-S-SB-956-AP.dgn

NO.	REVISIONS	BY	DATE
0	ISSUED FOR CONSTRUCTION	DWC	09/29/2015

DESIGNED BY: CNG	DATE: 03/10/2015	CHECKED BY: DWC	DATE: 06/03/2015	HORIZ. SCALE: 3/8"=1'
DRAWN BY: SWF	DATE: 03/10/2015	APPROVED BY: TR	DATE: 09/29/2015	VERT. SCALE: 3/8"=1'

2000 SOUTH COLORADO BOULEVARD
 SUITE 2-300
 DENVER, COLORADO 80222
 (303) 758-4058

RTD FasTracks
 North Metro Rail Line

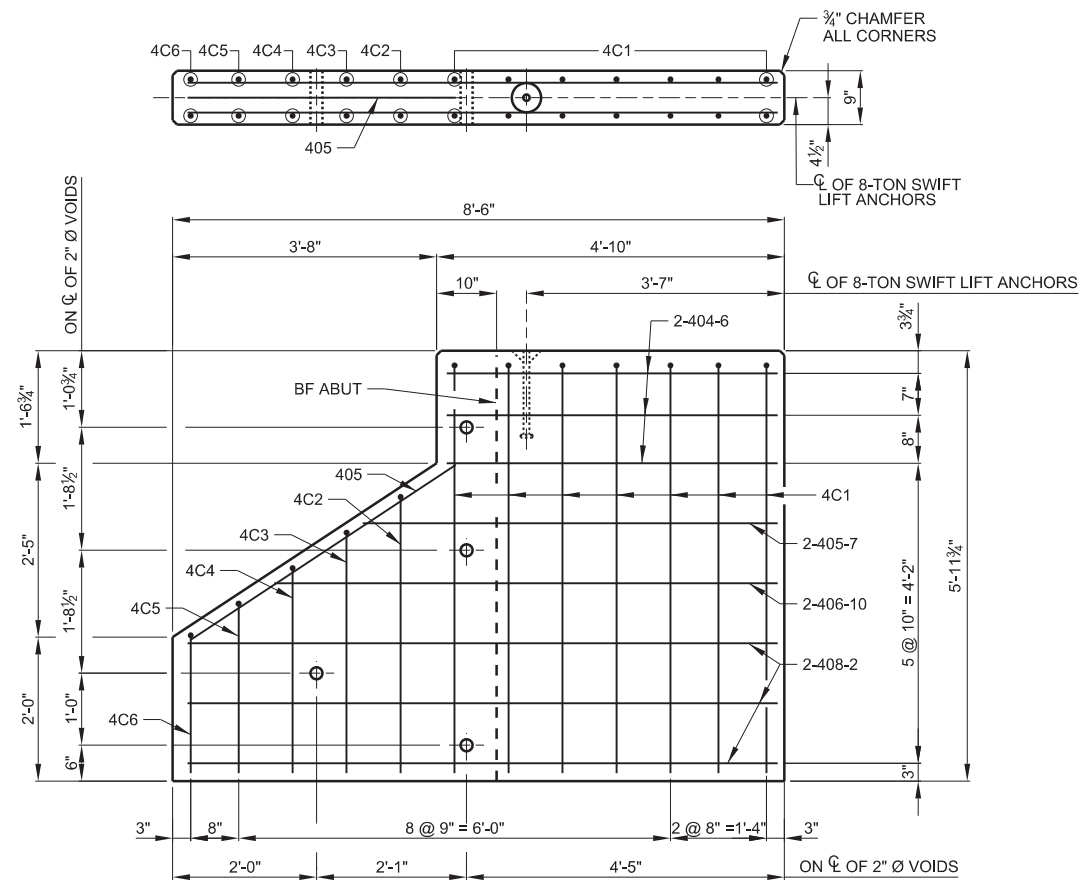
REGIONAL TRANSPORTATION DISTRICT
 1600 BLAKE STREET
 DENVER, COLORADO 80202
 (303) 628-9000

NORTH METRO RAIL LINE

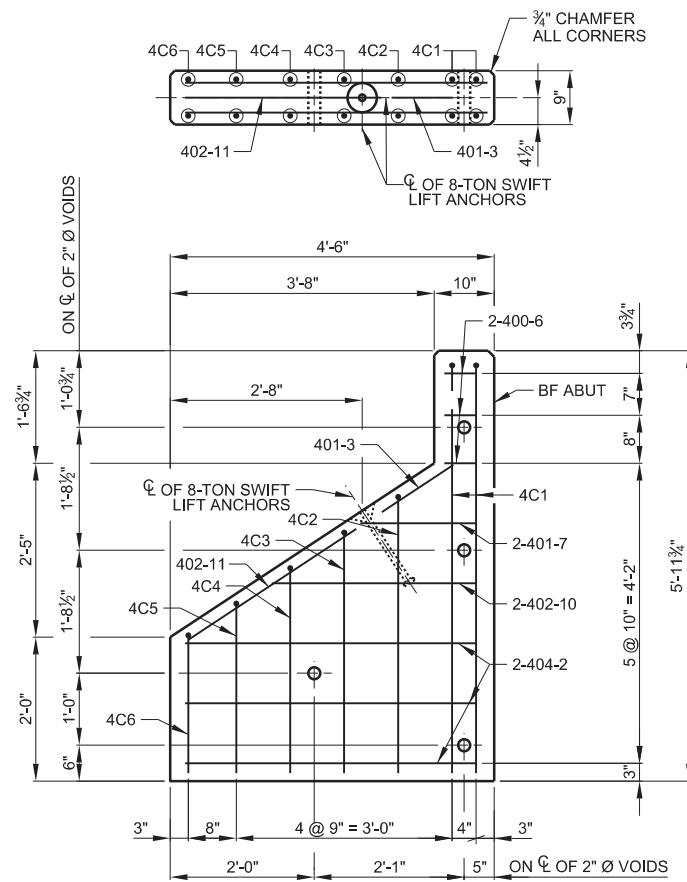
STRUCTURAL
 ABUTMENT DETAILS (SHEET 1 OF 3)
 NORTH METRO OVER MARION STREET

DWG No. SB-956

RTD BRIDGE NO. NM 2.63



EAST PRECAST WINGWALL
 WT= 4,800 LBS., VOL= 1.13 CU YDS, REINF STEEL = 143 LBS

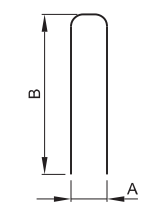


WEST PRECAST WINGWALL
 WT= 1884 LBS., VOL= 0.47 CU YDS, REINF STEEL = 62 LBS

* QUANTITIES ARE SHOWN FOR ONE WINGWALL (2 REQUIRED)

** QUANTITIES ARE SHOWN FOR ONE WINGWALL (2 REQUIRED)

BILL OF REINFORCEMENT (WINGWALLS)						
QUAN	MARK	SIZE	TYPE	A	B	LENGTH
* EAST WINGWALLS						
7	4C1	4	C	5"	5'-7½"	11'-6"
1	4C2	4	C	5"	3'-8½"	7'-8"
1	4C3	4	C	5"	3'-2½"	6'-8"
1	4C4	4	C	5"	2'-8½"	5'-8"
1	4C5	4	C	5"	2'-2½"	4'-8"
1	4C6	4	C	5"	1'-9½"	3'-10"
6	404-6	4	STR	-	-	4'-6"
1	405	4	STR	-	-	5'-0"
2	405-7	4	STR	-	-	5'-7"
2	406-10	4	STR	-	-	6'-10"
6	408-2	4	STR	-	-	8'-2"
** STRUCTURAL STEEL						
1	8-TON SWIFT LIFT ANCHOR					
QUAN	MARK	SIZE	TYPE	A	B	LENGTH
** WEST WINGWALLS						
2	4C1	4	C	5"	5'-7½"	11'-6"
1	4C2	4	C	5"	3'-8½"	7'-8"
1	4C3	4	C	5"	3'-2½"	6'-8"
1	4C4	4	C	5"	2'-8½"	5'-8"
1	4C5	4	C	5"	2'-2½"	4'-8"
1	4C6	4	C	5"	1'-9½"	3'-10"
6	400-6	4	STR	-	-	0'-6"
1	401-3	4	STR	-	-	1'-3"
2	401-7	4	STR	-	-	1'-7"
2	402-10	4	STR	-	-	2'-10"
1	402-11	4	STR	-	-	2'-11"
6	404-2	4	STR	-	-	4'-2"
** STRUCTURAL STEEL						
1	8-TON SWIFT LIFT ANCHOR					

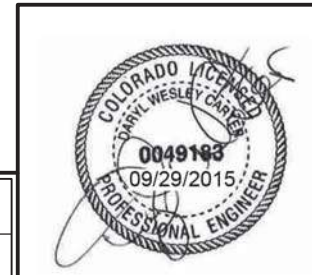


BAR C
REINFORCING STEEL DETAILS
 ALL DIMENSIONS SHOWN ARE OUT TO OUT OF BARS



NOTE:
 FOR NOTES AND LIFTING DETAIL
 SEE DRAWING NO. SB-956

RTD BRIDGE NO. NM 2.63



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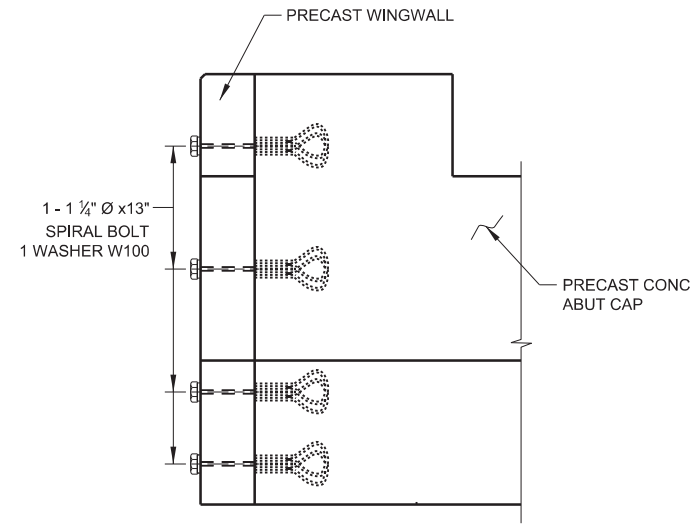
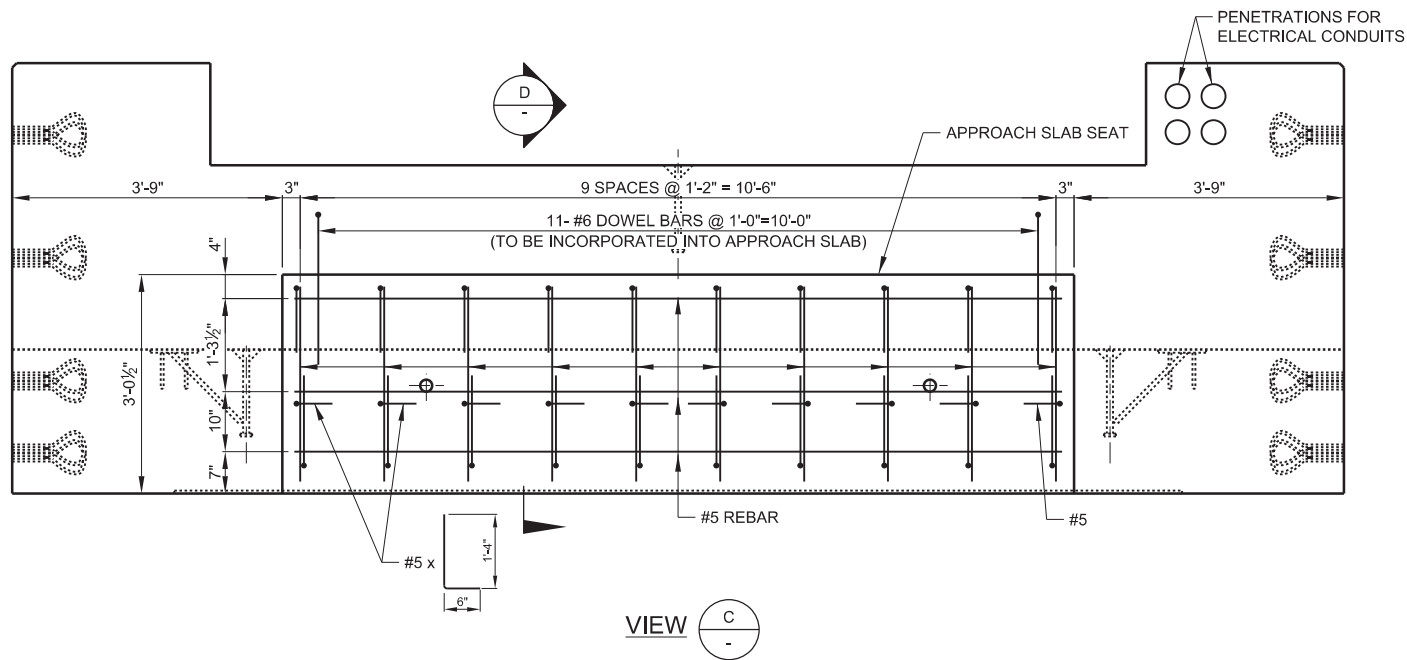
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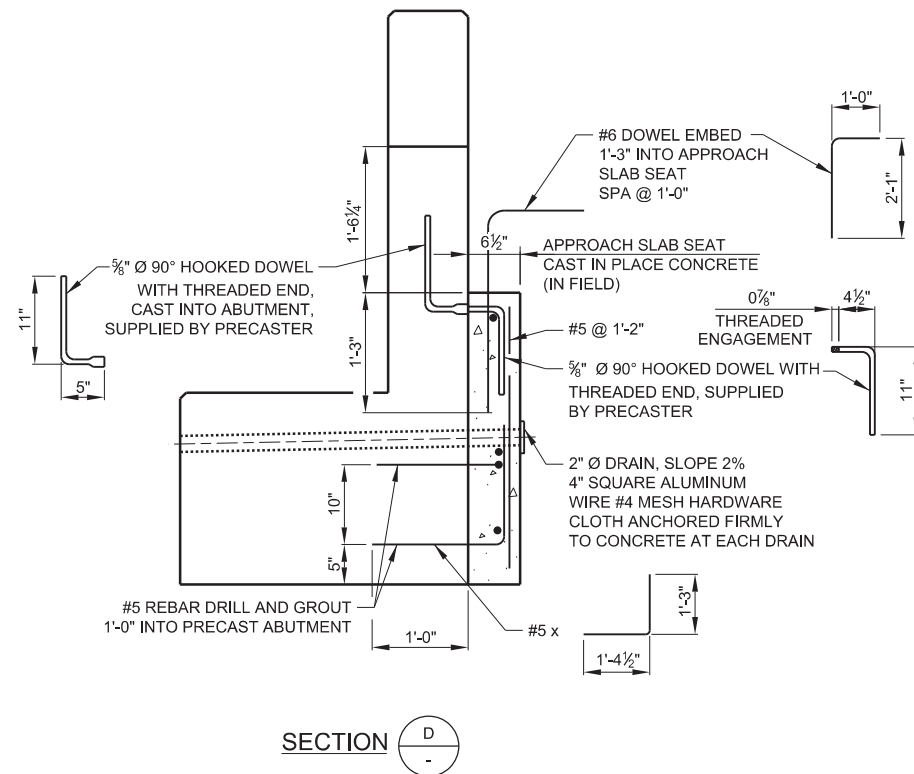
NORTH METRO RAIL LINE

**STRUCTURAL
 ABUTMENT DETAILS (SHEET 2 OF 3)
 NORTH METRO OVER MARION STREET**

DWG No. SB-957



WING WALL TO END CAP DETAIL



SECTION D-D

NOTE:

SURFACE ON PRECAST ABUTMENT THAT WILL BE IN CONTACT WITH APPROACH SLAB SEAT SHALL BE ROUGHENED TO 1/2" AMPLITUDE.



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NORTH METRO RAIL LINE

STRUCTURAL ABUTMENT DETAILS (SHEET 3 OF 3)
NORTH METRO OVER MARION STREET

PROFESSIONAL ENGINEER
T. WILLIAMS
0049193
09/29/2015
COLORADO LICENSED

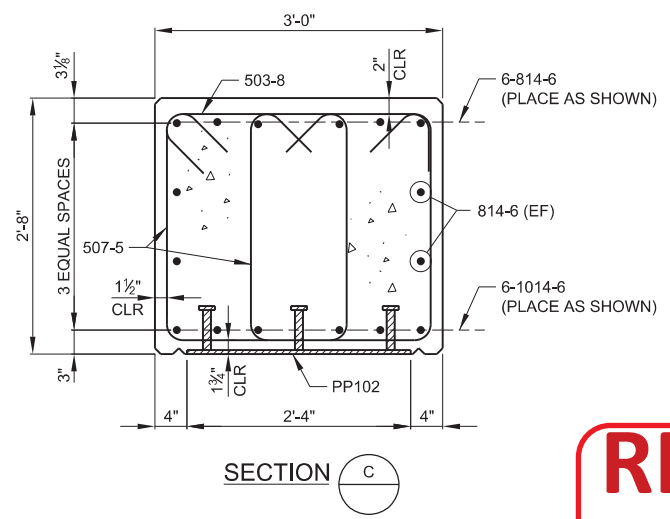
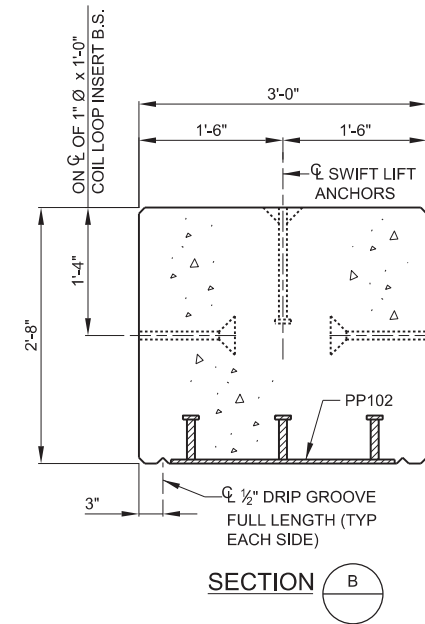
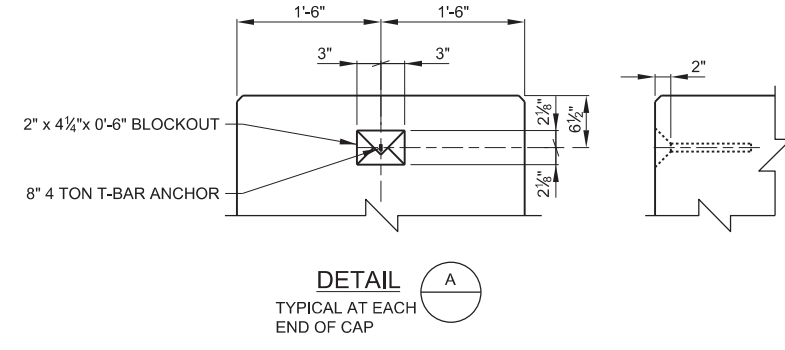
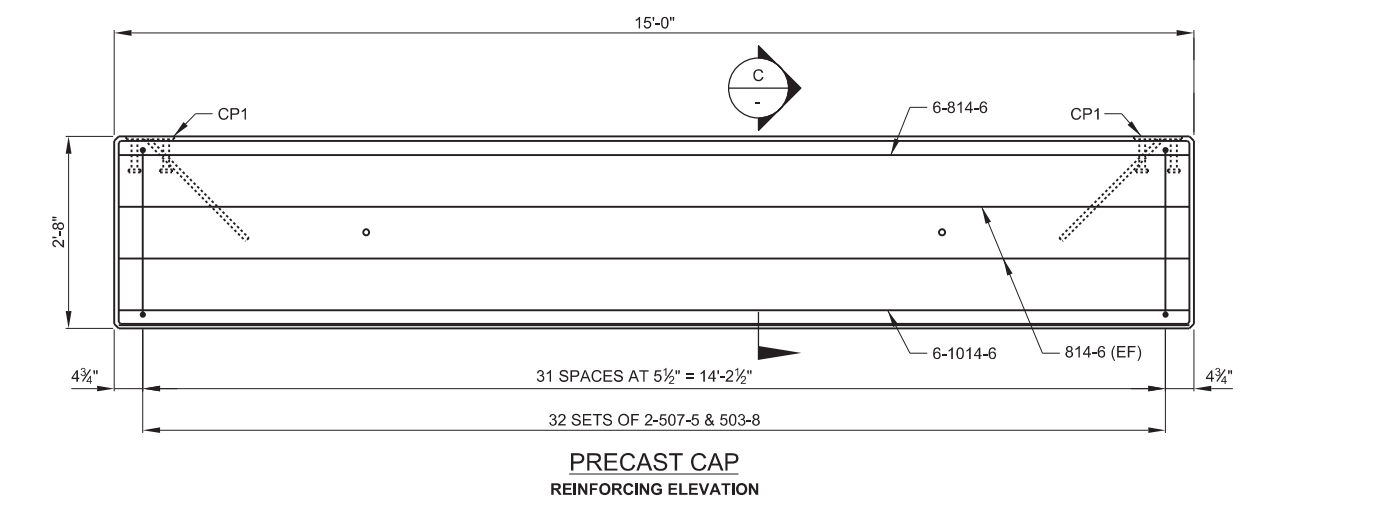
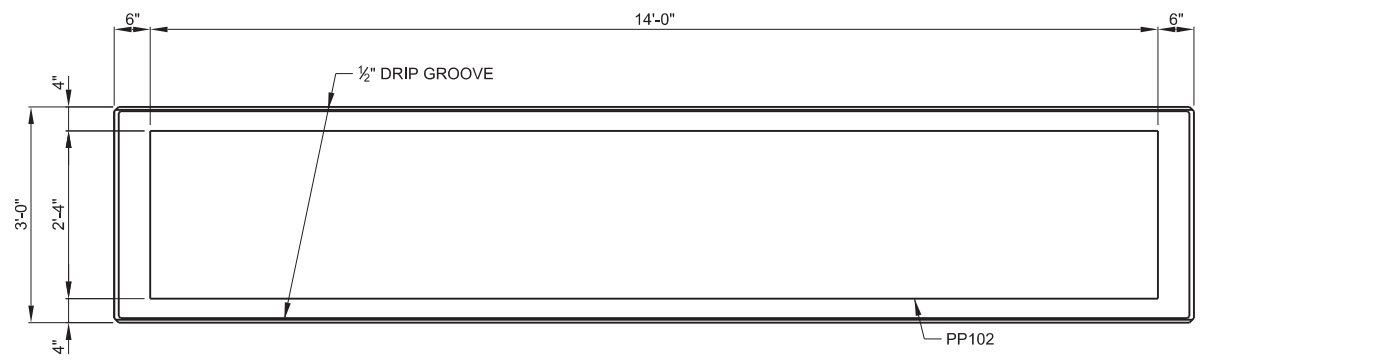
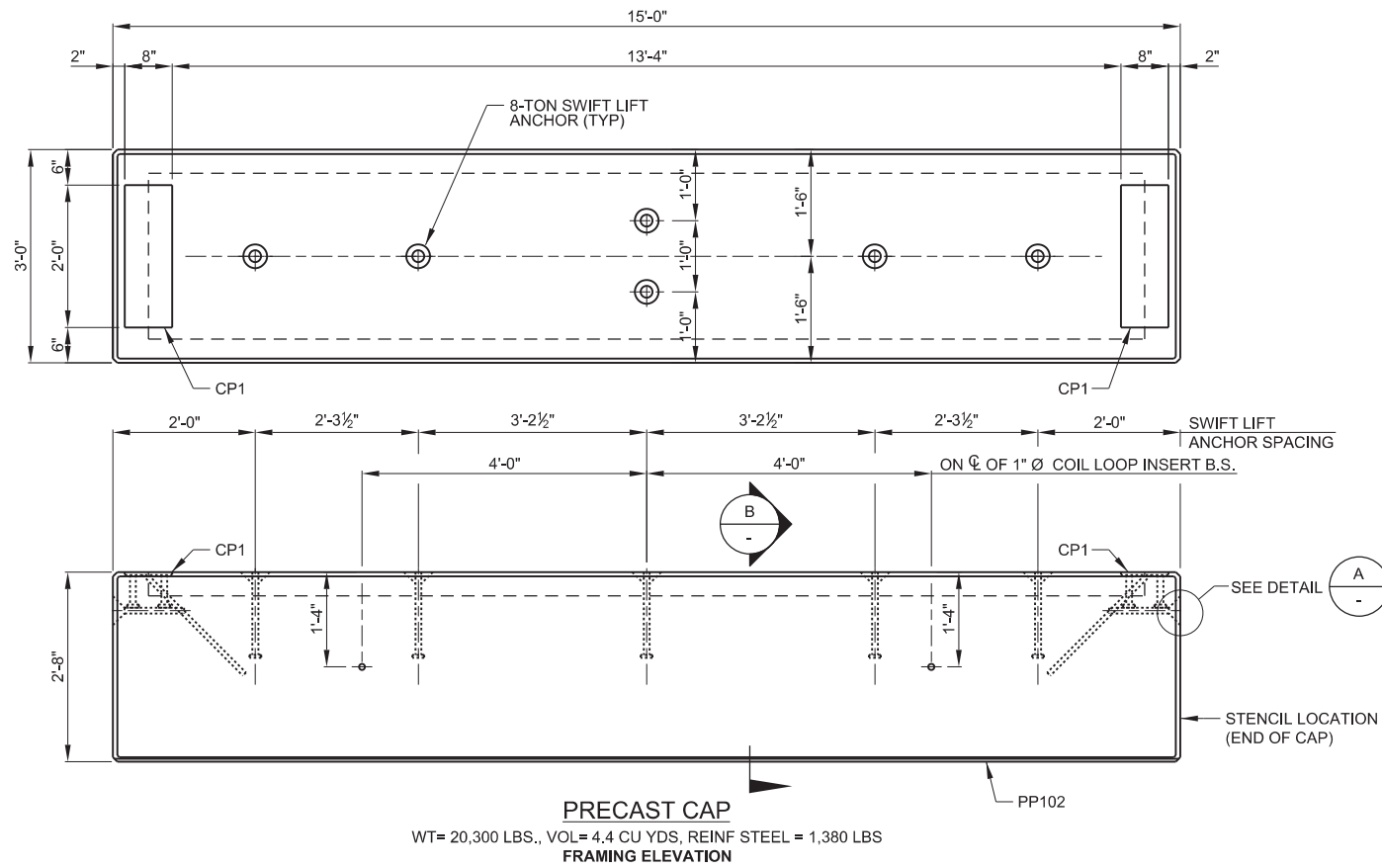
DWG No. SB-958

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BILL OF REINFORCEMENT (BENT 2)						
QUAN	MARK	SIZE	TYPE	A	B	LENGTH
CAP						
32	503-8	5	A	2'-9"	-	3'-8"
64	507-5	5	B	1'-9"	2'-4 1/4"	7'-5"
10	814-6	8	STR	-	-	14'-6"
6	1014-6	10	STR	-	-	14'-6"
STRUCTURAL STEEL						
6	8-TON SWIFT LIFT ANCHOR					
2	PLATE CP1 (SEE DWG NO SB- 964)					
1	PILE PLATE PP102 (SEE DWG NO SB- 964)					
2	8" 4-TON T-BAR ANCHOR					
4	1" Ø x 1'-0" COIL LOOP INSERT, TYPE B-18, SINGLE FLARED					

BAR A

BAR B

REINFORCING STEEL DETAILS
ALL DIMENSIONS SHOWN ARE OUT TO OUT OF BARS

NOTES:

GENERAL:
ALL MATERIAL AND WORKMANSHIP SHALL BE AS PER THE CURRENT SPECIFICATIONS.

COIL LOOP INSERTS TO BE SINGLE FLARED TYPE B-18 1" DIA x 12" AS MANUFACTURED BY DAYTON-SUPERIOR AND HAVE A SAFE WORKING LOAD OF 4,750 LBS WITH A 4 TO 1 SAFETY FACTOR. THE INSERTS ARE TO BE COMPLETELY RECESSED WITH SPIRAL BOLTS FURNISHED IN THE INSERT.

CONCRETE:
THE ULTIMATE COMPRESSIVE STRENGTH OF CONCRETE SHALL BE NOT LESS THAN 4500 PSI IN 28 DAYS. CONCRETE MEMBERS SHALL NOT BE REMOVED FROM THE CASTING BED BEFORE THE CONCRETE REACHES A STRENGTH OF 2500 PSI.

ALL EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4" INCH.

REINFORCEMENT:
FABRICATION OF REINFORCEMENT SHALL IN ACCORDANCE WITH CHAPTER 7 OF THE CURRENT CRSI MANUAL OF STANDARD PRACTICE.

STEEL REINFORCEMENT MAY BE MOVED SLIGHTLY SO AS TO MISS PP102 OR CPI.

FOR LIFTING DETAIL SEE DRAWING NO. SB-956.



RTD BRIDGE NO. NM 2.63

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0	ISSUED FOR CONSTRUCTION	DWC	09/29/2015

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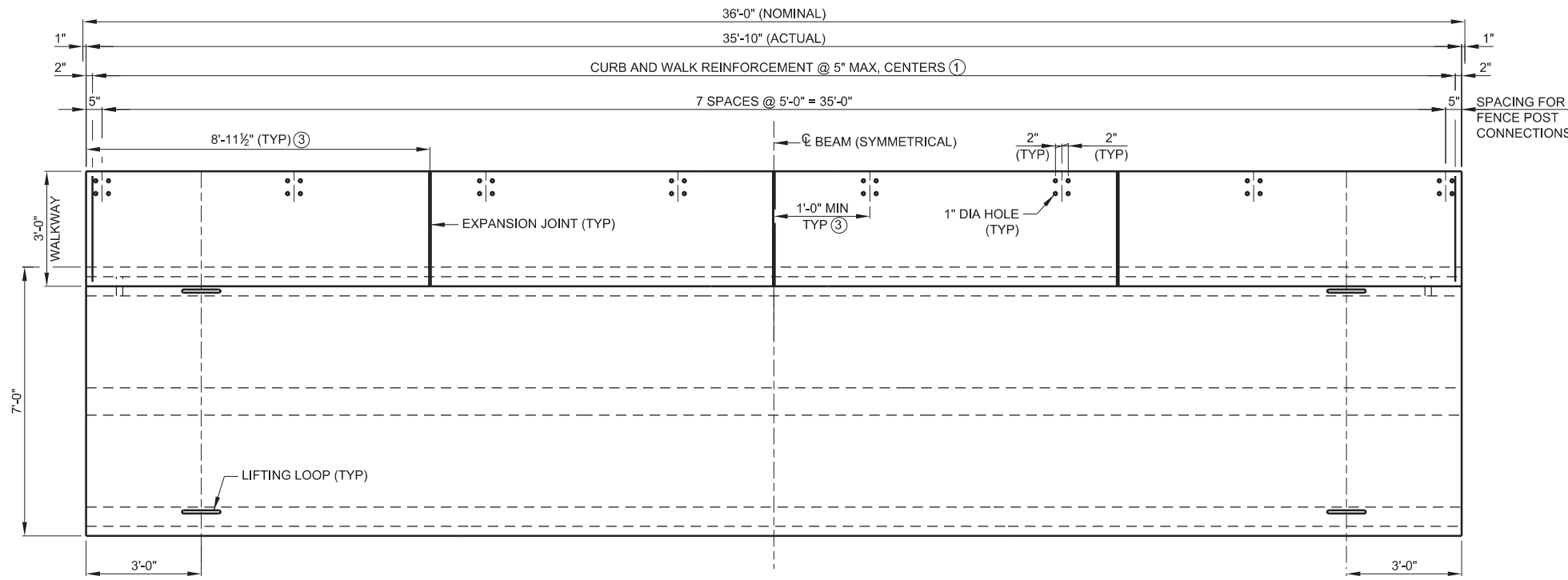
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NORTH METRO RAIL LINE

**STRUCTURAL
BENT 2 DETAILS**

NORTH METRO OVER MARION STREET

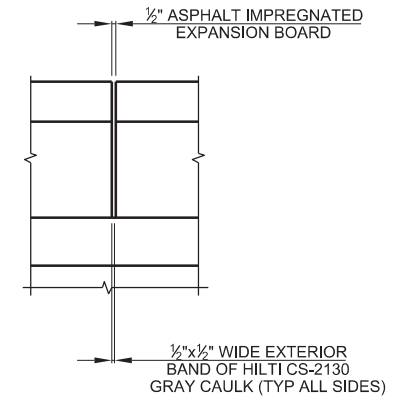
DWG No. SB-959



PLAN

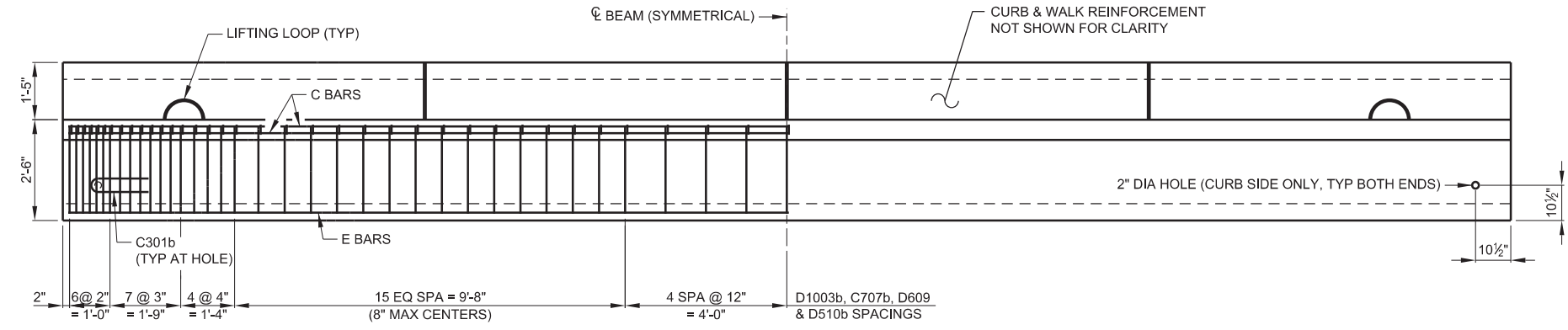
- ① ADJUST AS REQUIRED TO MISS OTHER REINFORCEMENT, FENCE POSTS AND EXPANSION JOINTS.
- ② VOID DIMENSIONS SHOWN ARE MAXIMUM AND MUST NOT BE EXCEEDED AT ANY POINT INCLUDING SPLICES OF VOID FORM.
- ③ CURB TO BE DIVIDED INTO FOUR (4) EQUAL SEGMENTS AS SHOWN. IF CURB JOINTS CANNOT BE EQUALLY SPACED DUE TO CONFLICTS WITH FENCE POST CONNECTIONS, THEN FABRICATOR SHALL ADJUST CURB SEGMENT LENGTHS SO THAT EACH CURB JOINT IS A MINIMUM OF 12" FROM CENTERLINE OF ANY FENCE POST CONNECTION.

NOTE:
DO NOT RUN CURB REINFORCEMENT THROUGH JOINT.

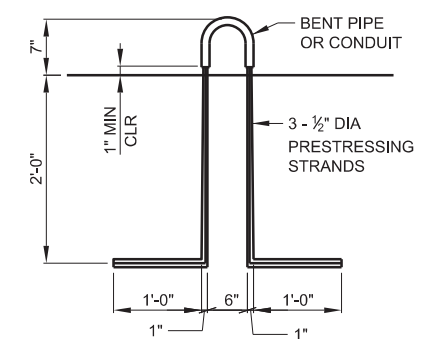


ELECTRICAL CONDUIT IN CURB AND WALK AT 1/2" EXPANSION JOINTS:
INSTALL PVC CONDUITS SUCH THAT BELL END OF CONDUITS TERMINATE AT THE 1/2" EXPANSION JOINTS (THREE LOCATIONS PER SPAN). DO NOT GLUE CONDUITS AT THESE LOCATIONS. SEAL THE EXPANSION JOINT AS SHOWN.

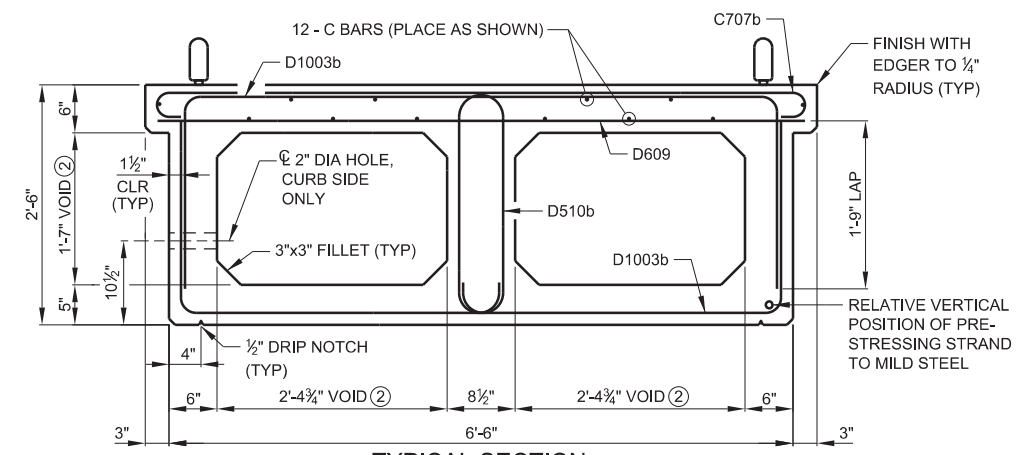
BLOCKING NOTE:
BEAM SHALL BE SUPPORTED BY BLOCKING WITHIN 1'-6" OF ENDS DURING STORAGE AND TRANSPORT. STORE AND TRANSPORT BEAMS IN LEVEL POSITIONS.



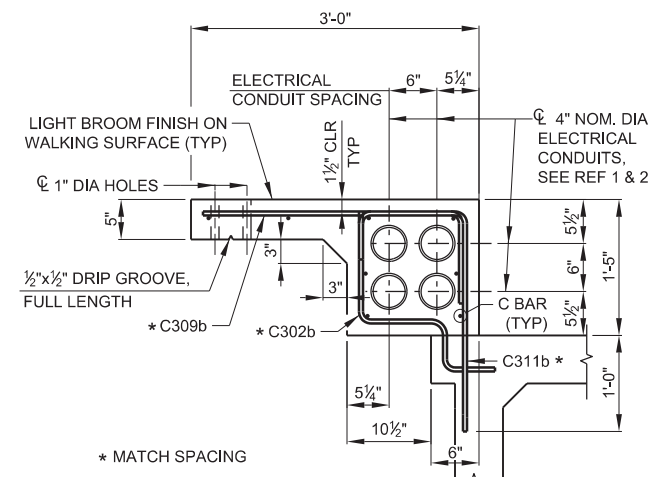
ELEVATION



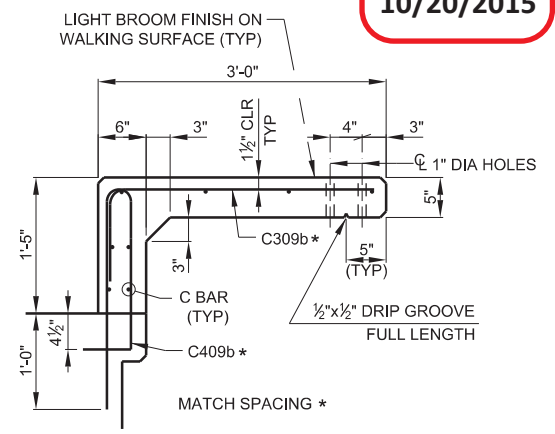
LIFTING LOOP DETAIL
FABRICATOR IS RESPONSIBLE FOR ADEQUACY OF LIFTING LOOPS, SEE NOTE, GIRDER DETAILS (SHEET 2 OF 2).



TYPICAL SECTION
(STRANDS NOT SHOWN)



CURB AND WALK DETAIL-WITH CONDUIT



CURB AND WALK DETAIL

REFERENCE LEGEND

IDENTIFIER	SHEET NAME
1	MARION STREET BRIDGE SYSTEMWIDE ELECTRICAL SECTION DETAILS
2	SYSTEMWIDE ELECTRICAL APPR SLAB & DUCT BANK DETAILS

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0	ISSUED FOR CONSTRUCTION	DWC	09/29/2015

DESIGNED BY: CNG	DATE: 03/10/2015	CHECKED BY: DWC	DATE: 06/03/2015	HORZ. SCALE: 1/4"=1' & 1/2"=1'
DRAWN BY: ECT	DATE: 03/10/2015	APPROVED BY: TR	DATE: 09/29/2015	VERT. SCALE: 1/4"=1' & 1/2"=1'

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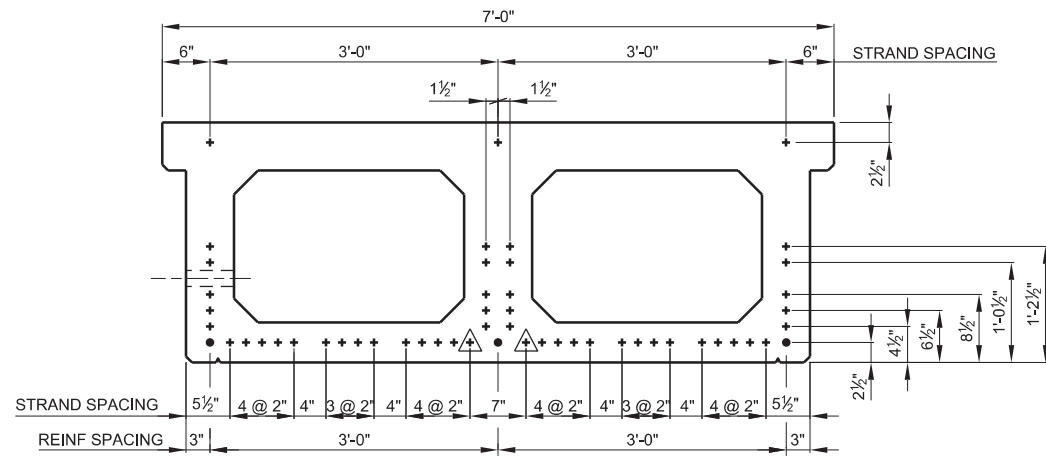
NORTH METRO RAIL LINE

STRUCTURAL
DOUBLE BOX BEAM DETAILS (SHEET 1 OF 2)
NORTH METRO OVER MARION STREET

RTD BRIDGE NO. NM 2.63

DWG No. SB-960

PRECAST DOUBLE BOX BEAM NOTES



TYPICAL SECTION

- INDICATES E BAR (#6) (3 TOTAL)
- △ INDICATES DEBOND STRAND TO 6'-0" FROM EACH END OF BEAM

CONCRETE:
CONCRETE MATERIAL, PLACING AND CURING SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS IN THE SPECIFICATIONS.

THE MINIMUM COMPRESSIVE STRENGTH OF THE BEAM CONCRETE SHALL BE 5,550 PSI AT TRANSFER AND 7,000 PSI AT 28 DAYS. THE MINIMUM COMPRESSIVE STRENGTH OF THE CURB AND WALK CONCRETE SHALL BE 4,500 PSI AT 28 DAYS.

AIR ENTRAINING AGENTS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED IN THE CURRENT EDITION OF ASTM C260. THE TOTAL ENTRAINED AIR CONTENT SHALL BE 6% +/- 1% BY VOLUME OF THE PLASTIC CONCRETE.

CONCRETE AGGREGATE SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED IN THE CURRENT EDITION OF ASTM C33. COARSE AGGREGATE SHALL BE SIZE NO. 67.

PRESTRESSING STRAND:
PRESTRESSING STRAND SHALL BE 0.6 INCH DIAMETER, SEVEN WIRE, UNCOATED, LOW RELAXATION STRAND WHICH IS IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED IN ASTM A416. THE STRAND SHALL HAVE AN ULTIMATE TENSILE STRENGTH OF 270 KSI. THE INITIAL PRESTRESS SHALL BE 43,400 LBS PER STRAND UNLESS NOTED OTHERWISE.

STRAND SHALL BE TESTED IN ACCORDANCE WITH PCI RECOMMENDATIONS (MOUSTAFA METHOD) AND CERTIFIED BY THE FABRICATOR AS HAVING ADEQUATE BOND CHARACTERISTICS TO SATISFY THE PREDICTION EQUATIONS FOR TRANSFER AND DEVELOPMENT LENGTH GIVEN IN THE AREMA MANUAL FOR RAILWAY ENGINEERING.

AN ALTERNATE STRAND PATTERN WHICH HAS THE SAME ECCENTRICITY AS THE PATTERN SHOWN ON THIS PLAN AND IS BETTER SUITED TO THE MANUFACTURER'S FACILITIES WILL BE CONSIDERED. MANUFACTURER MUST SUBMIT PLANS AND COMPUTATIONS FOR APPROVAL PRIOR TO CASTING.

REINFORCING STEEL:
REINFORCING STEEL SHALL BE DEFORMED, BILLET-STEEL BARS CONFORMING TO THE REQUIREMENTS OF THE CURRENT ASTM DESIGNATION A615, GRADE 60. BARS CROSSING THE INTERFACE BETWEEN CURB AND TOP OF BEAM SHALL MEET THE REQUIREMENTS OF ASTM 1035, AND ARE NOTED IN THE BENDING DIAGRAM.

FABRICATION OF REINFORCEMENT SHALL BE IN ACCORDANCE WITH CHAPTER 7 OF THE CURRENT CONCRETE REINFORCING STEEL INSTITUTE (CRSI) MANUAL OF STANDARD PRACTICE. DIMENSIONS OF BENDING DETAILS ARE OUT TO OUT OF BAR.

REINFORCING STEEL IS TO BE BLOCKED TO PROPER LOCATION AND SECURELY WIRED AGAINST DISPLACEMENT. USE PLASTIC PROTECTED REINFORCING SUPPORTS, MEETING CRSI SPECIFICATIONS CHAPTER 3, CLASS 1. TACK WELDING OF REINFORCING IS PROHIBITED. MINIMUM CONCRETE COVER ON REINFORCEMENT SHALL MEET CURRENT AREMA REQUIREMENTS.

MANUFACTURE:
PRODUCTION PROCEDURES AND DIMENSIONAL TOLERANCES FOR THE MANUFACTURE OF PRECAST, PRESTRESSED BEAMS SHALL BE IN ACCORDANCE WITH THE AREMA MANUAL FOR RAILWAY ENGINEERING AND THE PRESTRESSED CONCRETE INSTITUTE'S CURRENT MANUAL MNL 116 FOR QUALITY CONTROL.

TOLERANCE FOR LOCATION OF LIFTING LOOPS SHALL BE +/- 1/2".

THE ENDS OF THE STRANDS SHALL BE BURNED OFF AND RECESSED TO A DEPTH OF 1 INCH. SUCH RECESSES AND MINOR SPALLS MUST BE FILLED AND FINISHED TO THE PLAN DIMENSIONS USING AN EPOXY BONDING COMPOUND AND GROUT.

CURB SHALL BE CAST AFTER BEAM IS REMOVED FROM FORMS AND A CONCRETE BONDING AGENT SHALL BE PLACED ON THE BEAM SURFACE THAT WILL BE IN CONTACT WITH THE CURB PRIOR TO PLACING CONCRETE FOR THE CURB.

SURFACES SHALL BE FORMED IN A MANNER WHICH PRODUCE A SMOOTH AND UNIFORM APPEARANCE WITHOUT RUBBING OR PLASTERING. UNLESS OTHERWISE NOTED, EXPOSED EDGES OF 90-DEGREES OR LESS ARE TO BE CHAMFERED 3/4" x 3/4". UNFORMED SURFACES SHALL HAVE A SMOOTH FINISH FREE OF ALL FLOAT AND TROWEL MARKS.

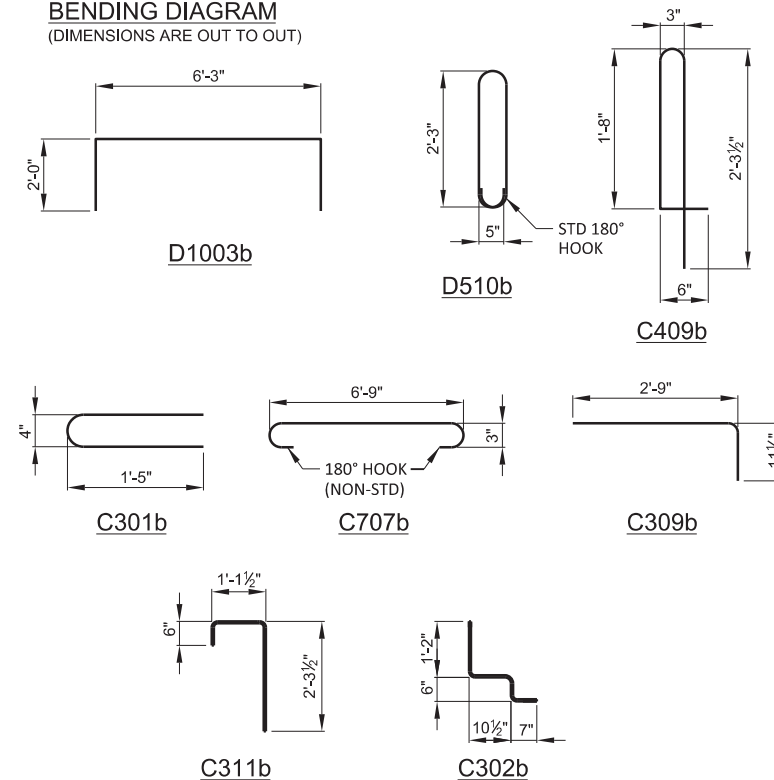
THE AREA AROUND LIFTING LOOPS SHALL NOT BE RECESSED. LIFTING LOOPS ARE TO BE REMOVED IN THE FIELD FLUSH WITH CONCRETE SURFACE.

INSPECTION, LOADING, AND SECURING FOR SHIPMENT REQUIREMENTS ARE NOTED IN THE SPECIFICATIONS.

IF LIFTED WITH SLINGS INSTEAD OF LIFTING LOOPS, SLINGS MUST BE PLACED MORE THAN 3'-0" FROM THE ENDS OF BEAMS.

LIFTING LOOPS:
FABRICATOR IS RESPONSIBLE FOR DEVELOPING LIFTING LOOP ANCHORAGE DETAIL TO PROVIDE SAFETY FACTOR OF 4 ON WORKING LOAD. DETAIL SHALL BE PROOF-TESTED WITH TEST RESULTS KEPT ON FILE BY FABRICATOR AND AVAILABLE FOR INSPECTION.

BENDING DIAGRAM
(DIMENSIONS ARE OUT TO OUT)



BAR DESIGNATIONS CONSIST OF BAR SIZE AND LENGTH FOLLOWED BY THE LETTER "b" IF BENT. BAR SIZES ARE REPRESENTED BY THE LETTERS A THROUGH L CORRESPONDING TO BAR SIZE NUMBERS 2 THROUGH 18. BAR LENGTHS ARE GIVEN IN FEET AND INCHES WITH THE FIRST DIGIT(S) INDICATING FEET AND THE LAST TWO DIGITS INDICATING INCHES.

LETTER	SIZE
B	3
C	4
D	5
E	6

* BAR C409b SHALL BE GRADE 60 AND MEET THE REQUIREMENTS OF ASTM A1035.

NM-SB-961-GD.dgn

9/29/2015 9:37:15 AM

9/29/2015

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0	ISSUED FOR CONSTRUCTION	DWC	09/29/2015

DESIGNED BY: CNG DATE: 03/10/2015
 DRAWN BY: ECT DATE: 03/10/2015

CHECKED BY: DWC DATE: 06/03/2015
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 VERT. SCALE: 1/2"=1'

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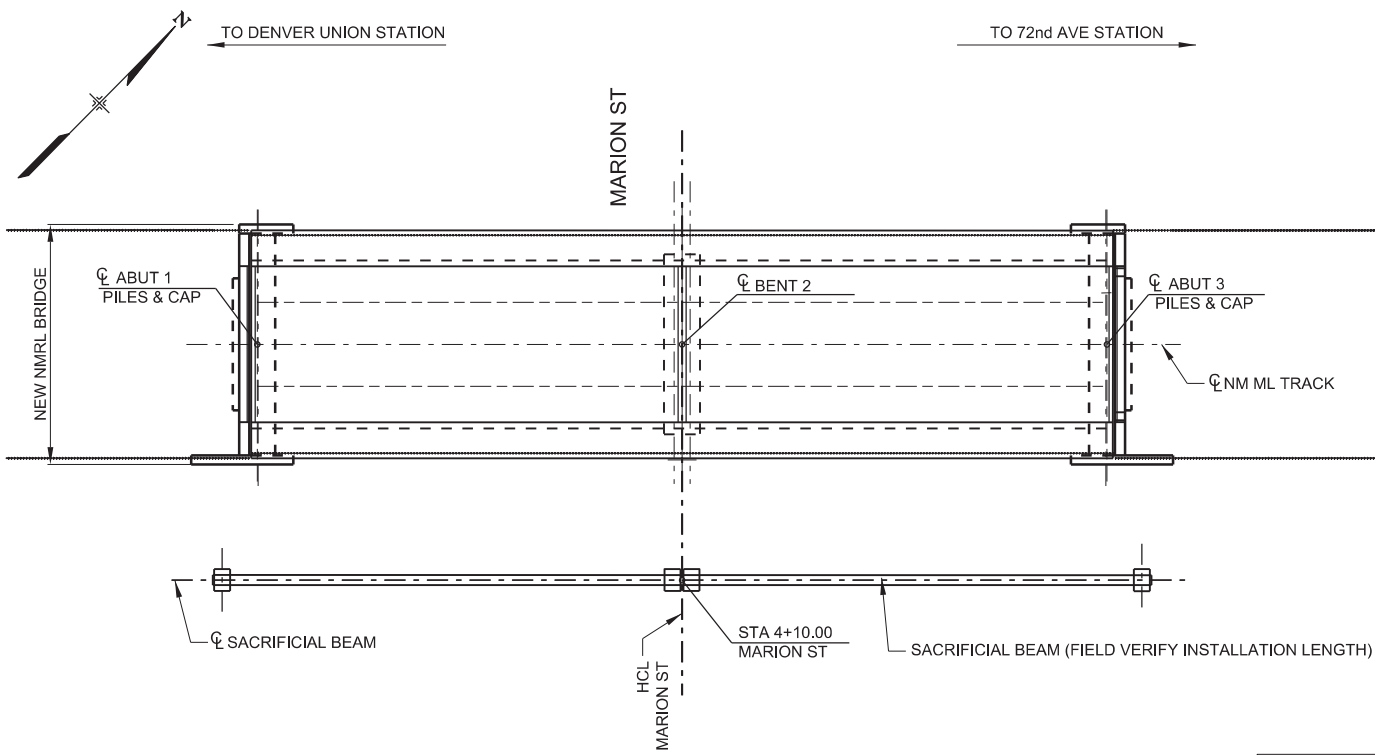
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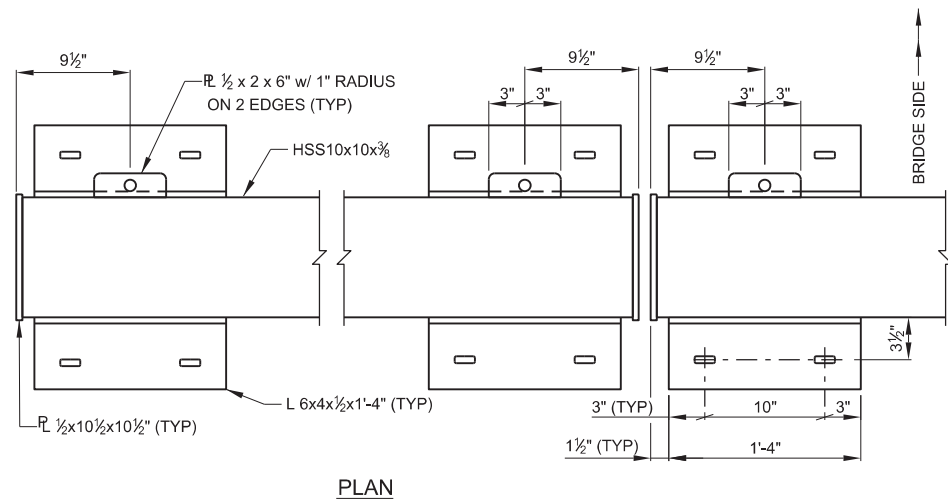
STRUCTURAL
 DOUBLE BOX BEAM DETAILS (SHEET 2 OF 2)
 NORTH METRO OVER MARION STREET

RTD BRIDGE NO. NM 2.63

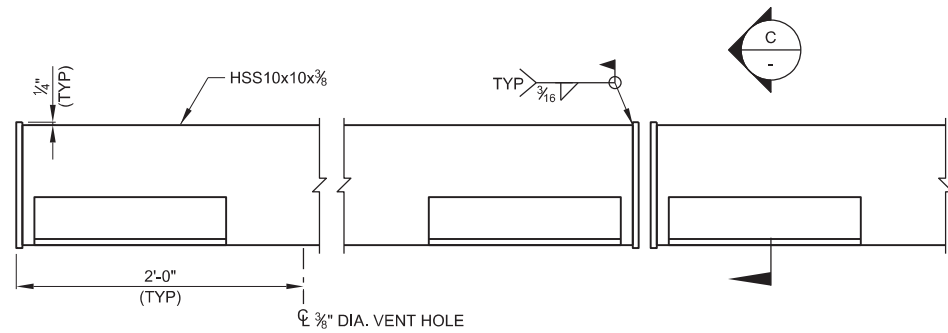
DWG No. SB-961



SACRIFICIAL BEAM LAYOUT

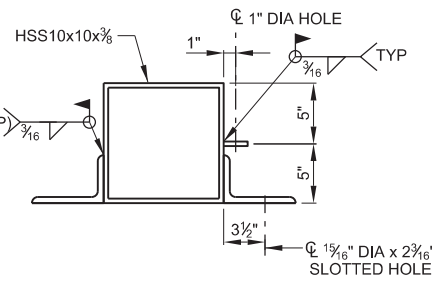


PLAN



ELEVATION

SACRIFICIAL BEAM ASSEMBLY
(SUPPORT PILES AND ATTACHMENT PLATE NOT SHOWN)

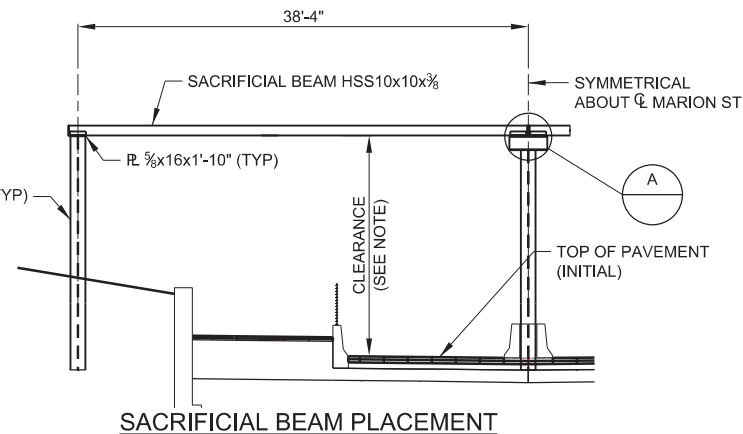


SECTION C

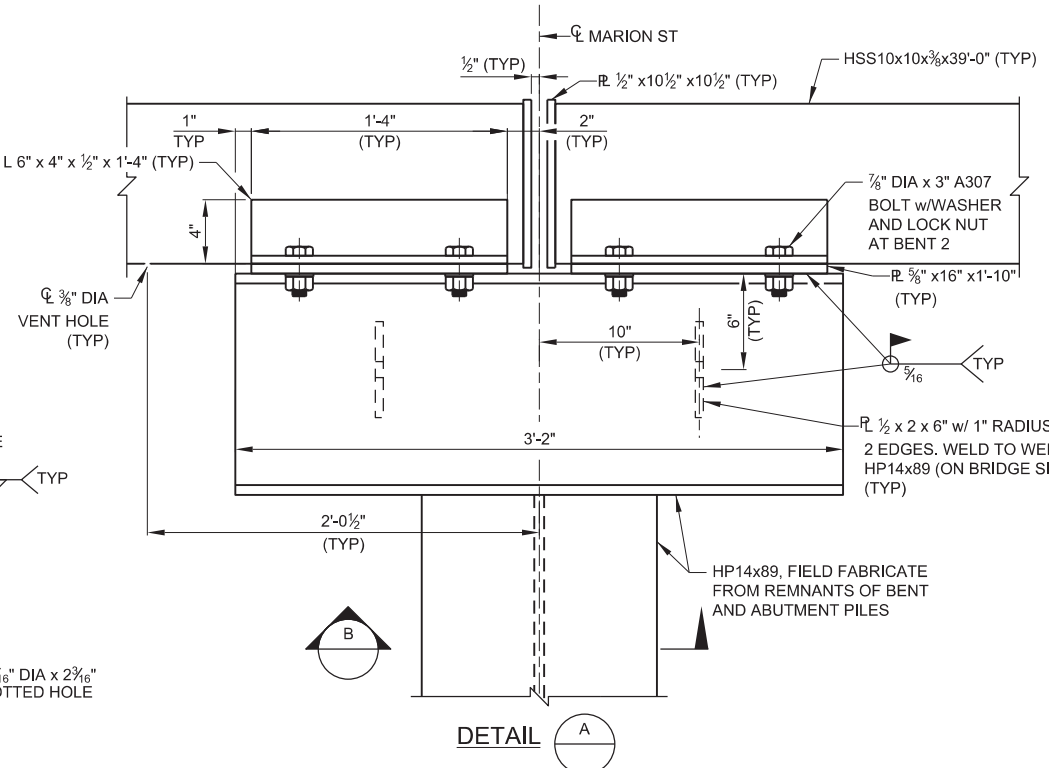


NOTE:
BRIDGE AND SUBSTRUCTURE
NOT SHOWN FOR CLARITY.

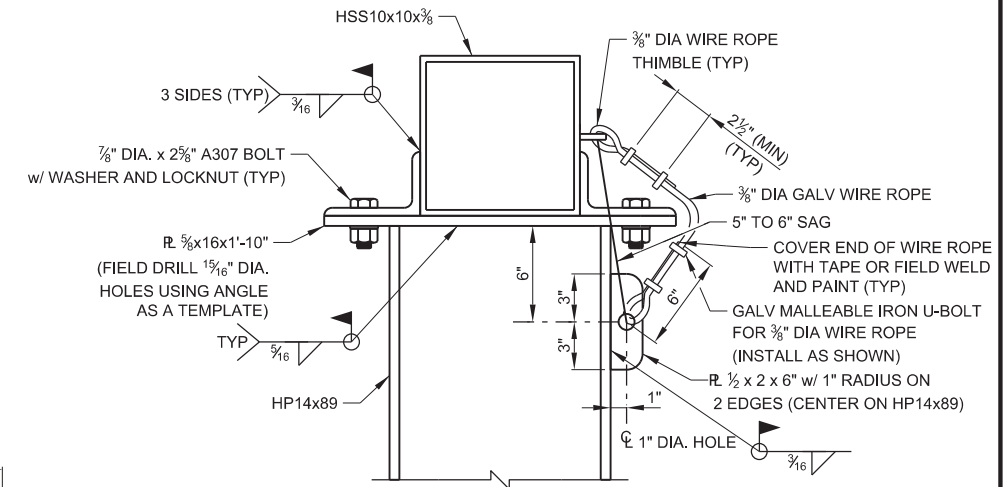
NOTE:
INSTALL WIRE ROPE AND CONNECTION
PLATES ON BRIDGE SIDE



SACRIFICIAL BEAM PLACEMENT



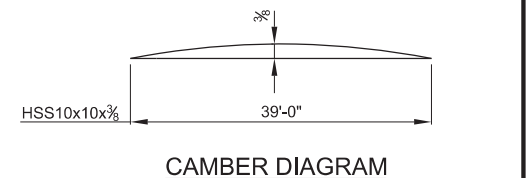
DETAIL A



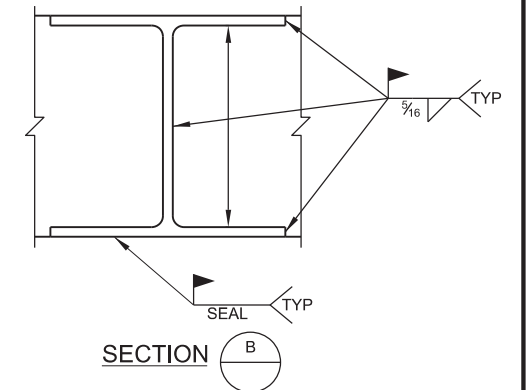
SACRIFICIAL BEAM CONNECTION DETAIL
(SHOWN AT ABUTMENTS, SIMILAR AT BENT 2)

WIRE ROPE INSTALLATION INSTRUCTIONS:

1. THREAD WIRE ROPE THROUGH PL 1/2 x 2 x 6" AND CLIPS AND TIGHTEN THE CLIPS ON HP14x89.
2. STRETCH WIRE ROPE AND THREAD THROUGH PL 1/2 x 2 x 6" AND CLIP ON HSS. LEAVE CLIPS LOOSE.
3. PULL UP ON ROPE BETWEEN CONNECTION POINTS TO REMOVE SAG TO 5-6 INCHES.
4. TIGHTEN CLIPS AT PLATE ATTACHED TO BEAM.



CAMBER DIAGRAM



SECTION B

NOTES:
 1. FOR MATERIAL SPECIFICATIONS, SEE NOTES, DWG NO. SB-950.
 2. SET BOTTOM OF SACRIFICIAL BEAM AT AN ELEVATION THAT PROVIDES A VERTICAL CLEARANCE ABOVE MARION STREET THAT EQUALS 2" LESS THAN OCCURS UNDER THE LOWEST OF THE ADJACENT BNSF BRIDGES.

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NO.	REVISIONS	BY	DATE
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DESIGNED BY: TJW	DATE: 02/27/2015	CHECKED BY: DWC	DATE: 06/03/2015	HORZ. SCALE: VARIES
DRAWN BY: SWF	DATE: 02/27/2015	APPROVED BY: TR	DATE: 09/29/2015	VERT. SCALE: VARIES

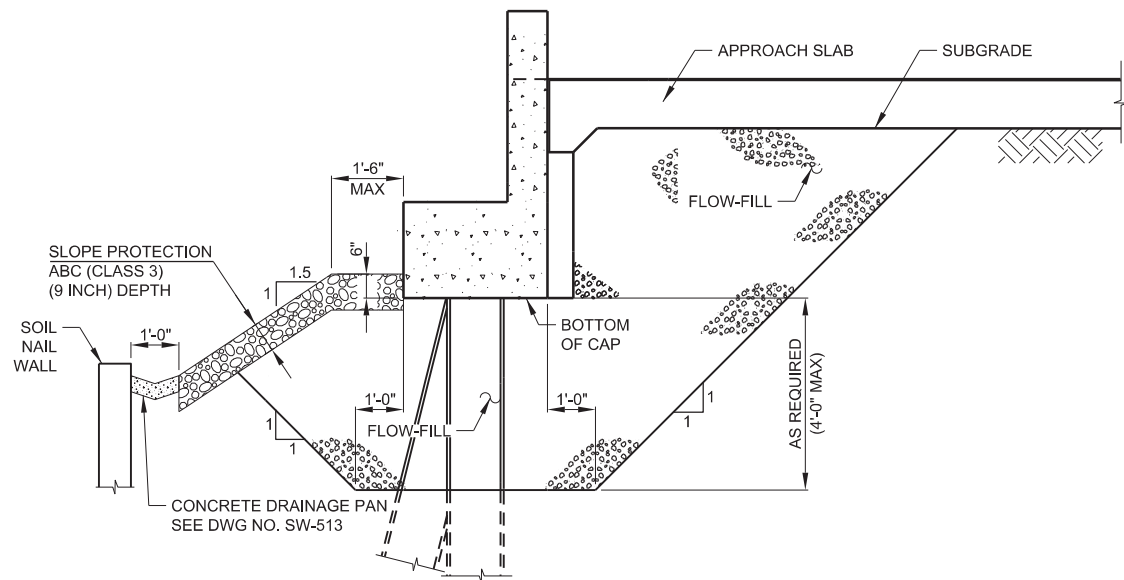
2000 SOUTH COLORADO BOULEVARD
 SUITE 2-300
 DENVER, COLORADO 80222
 (303) 758-4058

North Metro
 Rail Line
 REGIONAL TRANSPORTATION DISTRICT
 1600 BLAKE STREET
 DENVER, COLORADO 80202
 (303) 628-9000

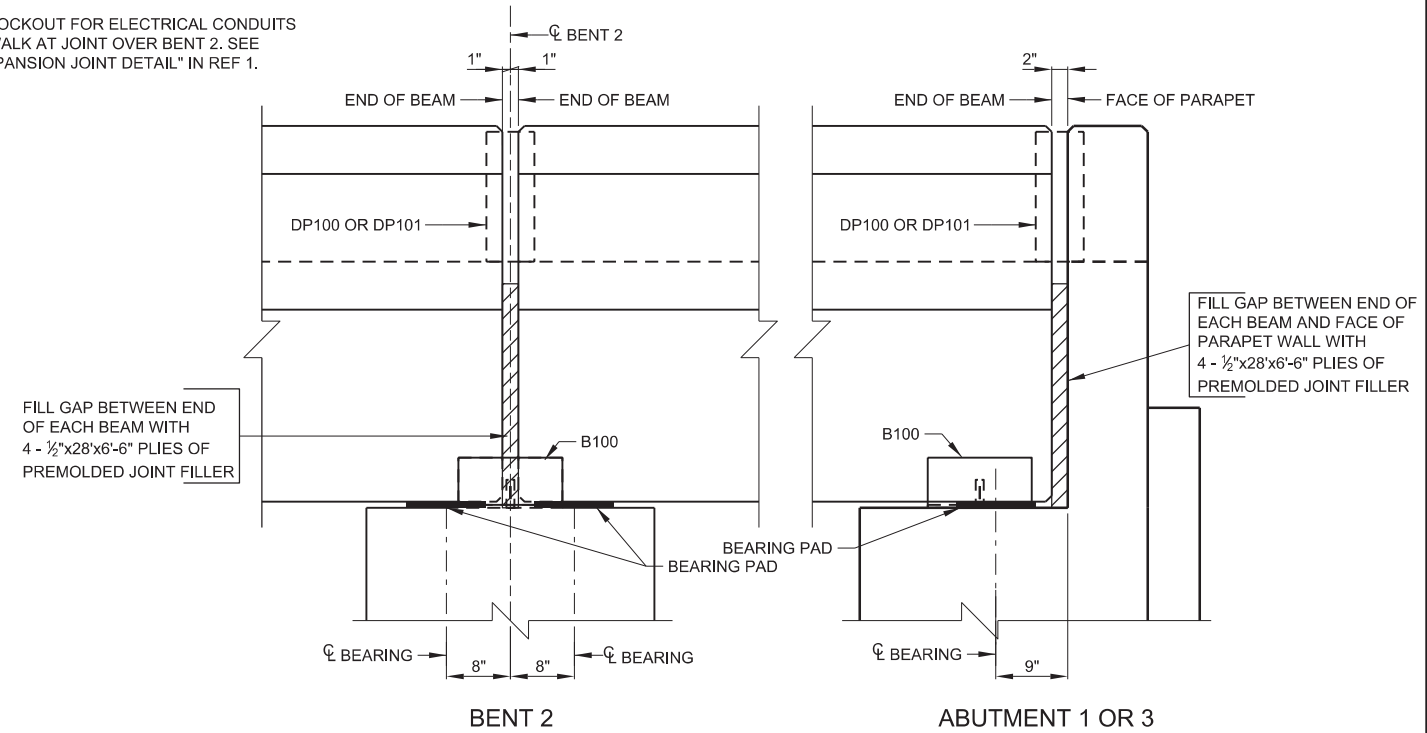
NORTH METRO RAIL LINE
 STRUCTURAL
 SACRIFICIAL BEAM DETAILS
 NORTH METRO OVER MARION STREET

DWG No. SB-962

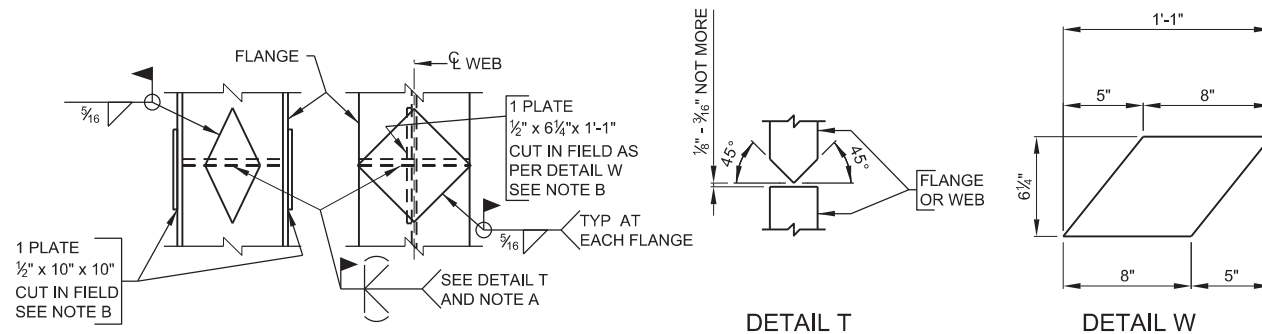
NOTE:
 PROVIDE BLOCKOUT FOR ELECTRICAL CONDUITS
 IN CURB & WALK AT JOINT OVER BENT 2. SEE
 "BRIDGE EXPANSION JOINT DETAIL" IN REF 1.



HEAD OF BANK DETAILS
 (ABUTMENT 3 SHOWN, ABUTMENT 1 SIMILAR)
 (APPLICABLE FULL LENGTH OF ABUTMENTS)



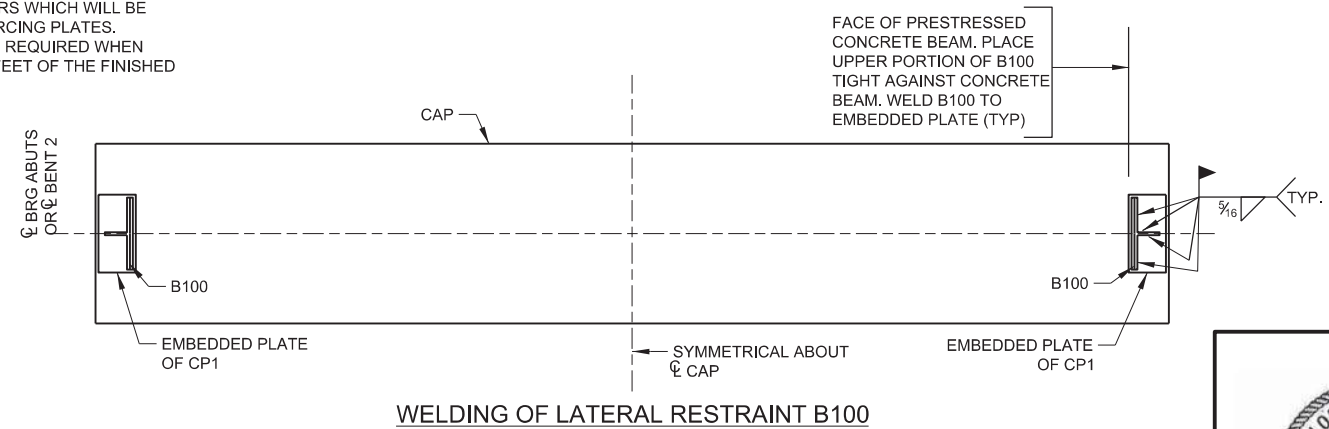
BEARING DETAILS



PILE SPLICE DETAIL

NOTE A: BEFORE REINFORCING PLATES ARE INSTALLED, GRIND THE WELD CONTOURS WHICH WILL BE COVERED BY THE REINFORCING PLATES.
NOTE B: REINFORCING PLATES ARE REQUIRED WHEN PILE SPLICE IS WITHIN 15 FEET OF THE FINISHED GROUNDLINE.

REFERENCE LEGEND	
IDENTIFIER	SHEET NAME
1	SYSTEMWIDE ELECTRICAL APPR SLAB & DUCT BANK DETAILS



WELDING OF LATERAL RESTRAINT B100

RTD BRIDGE NO. NM 2.63



USER: sfoj 9/29/2015 9:43:54 AM NM-SB-963-MD.dgn

NO.	REVISIONS	BY	DATE
0	ISSUED FOR CONSTRUCTION	DWC	09/29/2015

DESIGNED BY: TJW	DATE: 02/27/2015	CHECKED BY: DWC	DATE: 06/03/2015	HORZ. SCALE: NTS
DRAWN BY: ECT	DATE: 02/27/2015	APPROVED BY: TR	DATE: 09/29/2015	VERT. SCALE: NTS

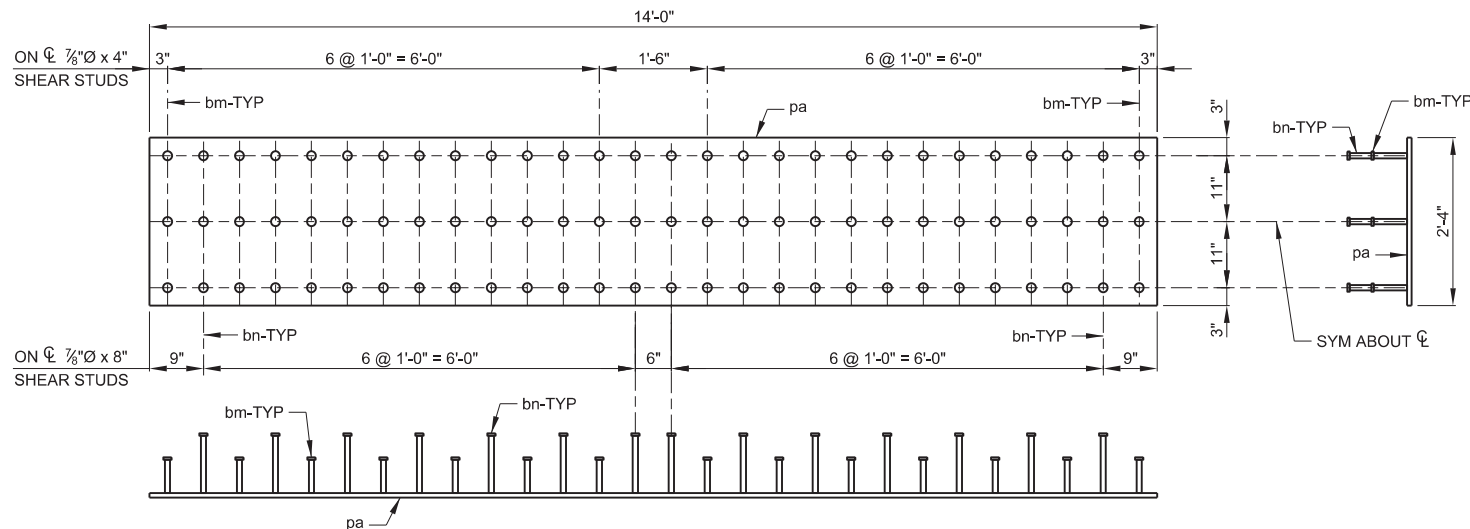
2000 SOUTH COLORADO BOULEVARD
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 DENVER, COLORADO 80222
 (303) 758-4058

RTD FasTracks
 North Metro
 Rail Line

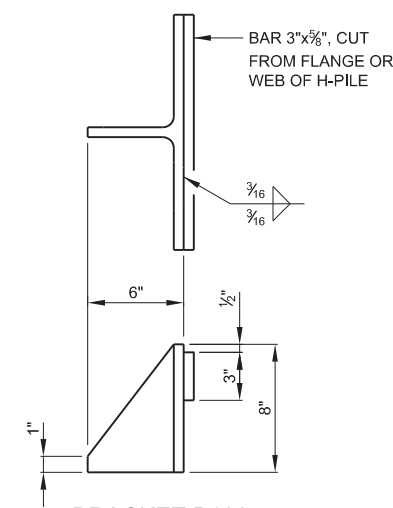
REGIONAL TRANSPORTATION DISTRICT
 1600 BLAKE STREET
 DENVER, COLORADO 80202
 (303) 628-9000

NORTH METRO RAIL LINE
STRUCTURAL
MISCELLANEOUS DETAILS (SHEET 1 OF 2)
NORTH METRO OVER MARION STREET

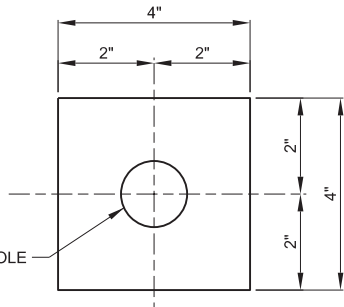
DWG No. SB-963



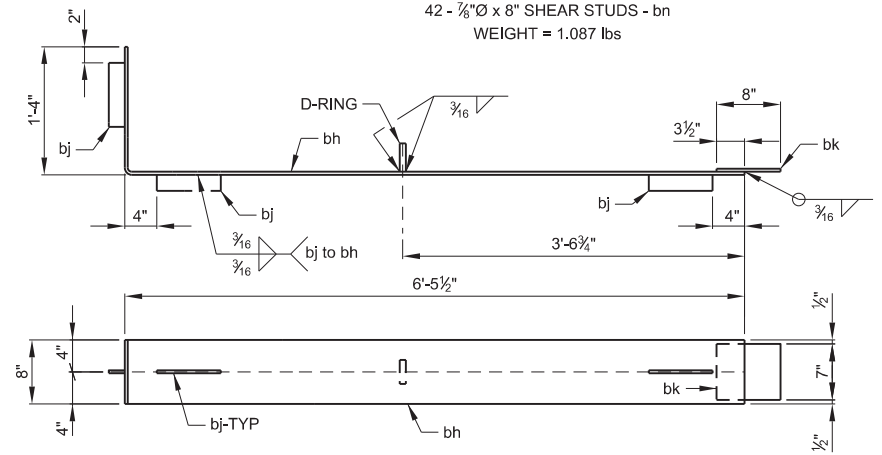
PILE PLATE PP102
 1 - PLATE 3/4" x 28" x 14'-0" - pa
 42 - 7/8" x 4" SHEAR STUDS - bm
 42 - 7/8" x 8" SHEAR STUDS - bn
 WEIGHT = 1.087 lbs



BRACKET B100
 CUT FROM HP14x89 PILE
 WEIGHT = 30 lbs



WASHER W100
 1 - PLATE 3/4" x 4" x 4"
 WEIGHT = 3.4 lbs
 GALVANIZE AFTER FABRICATION



DECK PLATE DP100
 1 - PLATE 3/8" x 8" x 7'-9 1/2" (BENT) - bh
 3 - PLATES 3/8" x 2" x 8" - bj
 1 - PLATE 3/8" x 7" x 8" - bk
 1 - D-RING
 WEIGHT = 93 lbs
 GALVANIZE AFTER FABRICATION

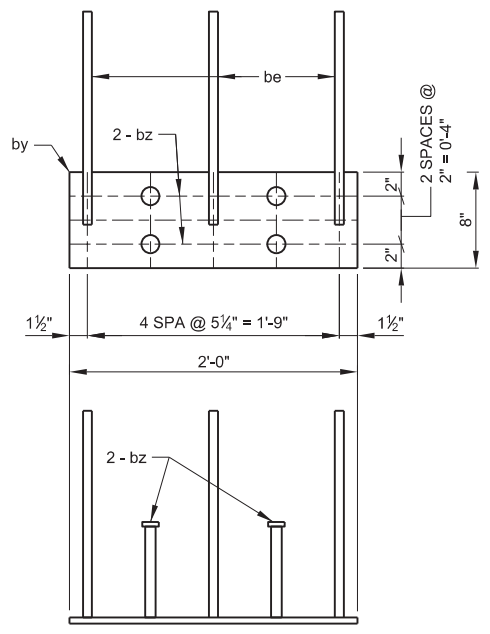
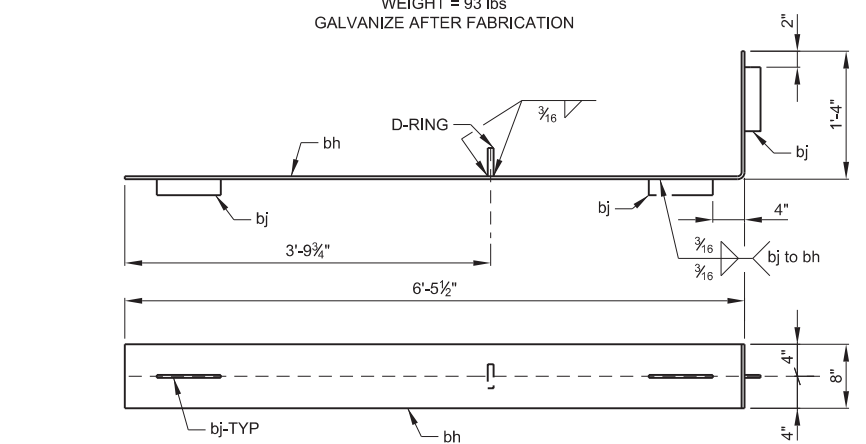


PLATE CP1
 1 - PLATE 1/2" x 8" x 2'-0" - by
 3 - BARS #6x2'-0" (A706) - be
 4 - 1/2" x 6" SHEAR STUDS - bz
 WEIGHT = 40 lbs



DECK PLATE DP101
 1 - PLATE 3/8" x 8" x 7'-9 1/2" (BENT) - bh
 3 - PLATES 3/8" x 2" x 8" - bj
 1 - D-RING
 WEIGHT = 87 lbs
 GALVANIZE AFTER FABRICATION

GENERAL NOTES:

- MATERIAL:**
 STRUCTURAL STEEL PLATES AND BARS SHALL MEET THE REQUIREMENTS OF ASTM A709 GR.36.
- SHEAR CONNECTOR STUDS SHALL MEET THE REQUIREMENTS OF SECTION 7 OF THE CURRENT AWS STRUCTURAL WELDING CODE D1.1 FOR GRADE 1020 SOLID FLUX FILLED HEADED STUDS.
- D-RINGS SHALL BE 3" I.D., MADE OF STEEL FOR HEAVY-DUTY USE, PROVIDED WITH WELD-ON BRACKET, AND HAVE A MIN. SAFE WORKING LOAD OF 1,000 LBS.
- FABRICATION NOTES:**
 FABRICATION AND ARC WELDING OF STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH CHAPTER 15, PART 3 OF THE CURRENT AREMA MANUAL FOR RAILWAY ENGINEERING.
 OPEN HOLES: AS NOTED. SHOP PAINT: NONE.
- DEFORMED BILLET REINFORCING BARS THAT ARE WELDED TO THE STEEL PLATES SHALL CONFORM TO ASTM A706, GR. 60.
- SHEAR CONNECTOR STUDS SHALL BE AUTOMATICALLY END WELDED WITH COMPLETE FUSION IN ACCORDANCE WITH SECTION 7 OF THE CURRENT AWS STRUCTURAL WELDING CODE D1.1.
- GALVANIZING: DP100, DP101 AND W100 SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH THE CURRENT ASTM DESIGNATION A123. AFTER GALVANIZING, ALL ELEMENTS SHALL BE FREE OF FINIS, ABRASIONS, ROUGH OR SHARP EDGES AND OTHER SURFACE DEFECTS.



RTD BRIDGE NO. NM 2.63

USER: sfoj 9/29/2015 9:47:22 AM NM-SB-964-MD.dgn

DESIGNED BY: TJW	DATE: 02/27/2015	CHECKED BY: DWC	DATE: 06/03/2015	HORZ. SCALE: VARIES
DRAWN BY: ECT	DATE: 02/27/2015	APPROVED BY: TR	DATE: 09/29/2015	VERT. SCALE: VARIES
0	ISSUED FOR CONSTRUCTION	DWC	09/29/2015	
NO.	REVISIONS	BY	DATE	

REGIONAL RAIL PARTNERS
 Balfour Beatty / GRAHAM JOINT VENTURE

2000 SOUTH COLORADO BOULEVARD
 SUITE 2-300
 DENVER, COLORADO 80222
 (303) 758-4058

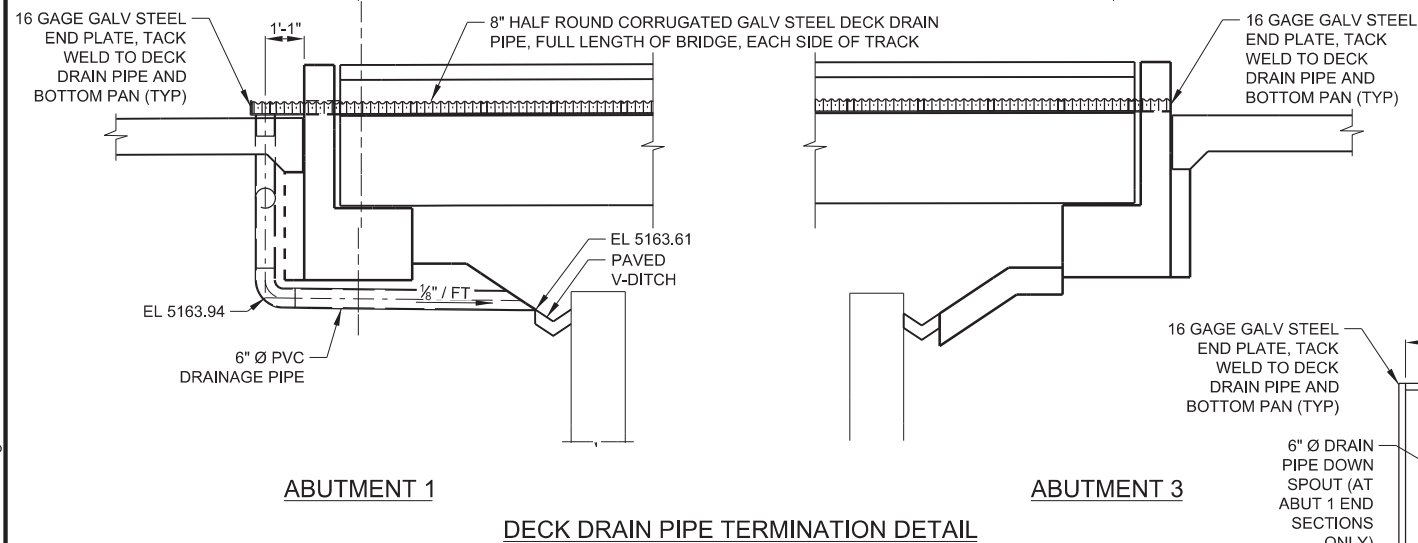
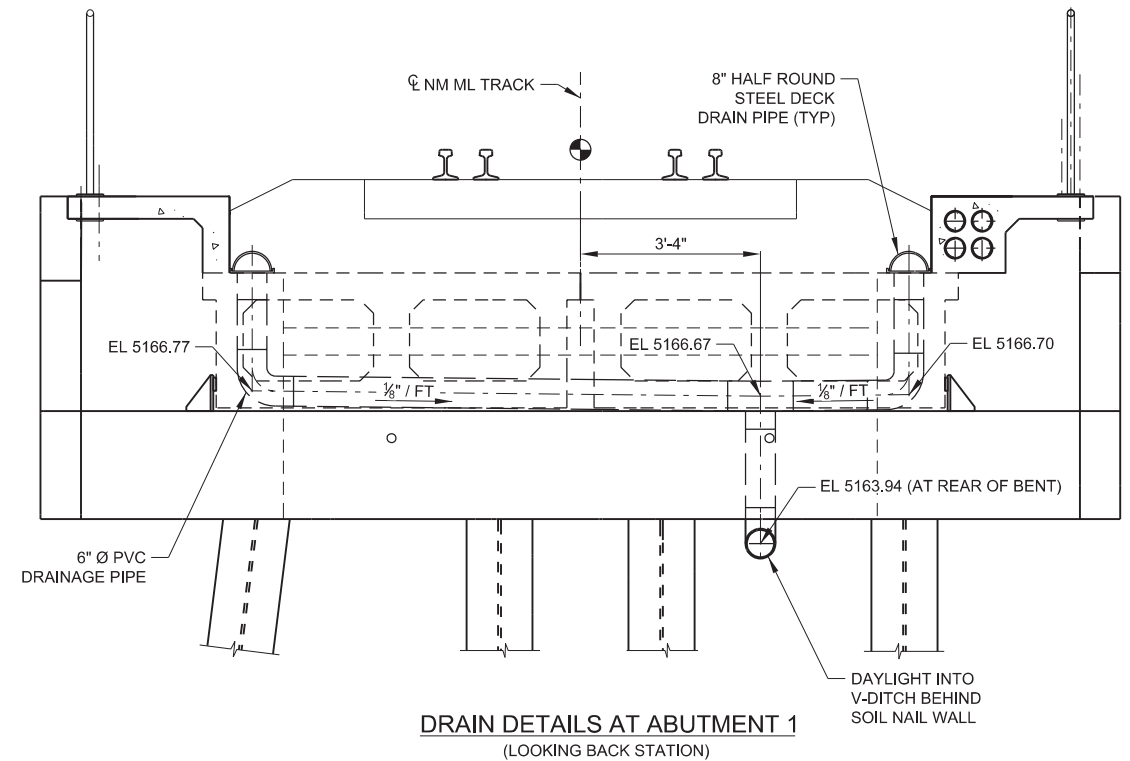
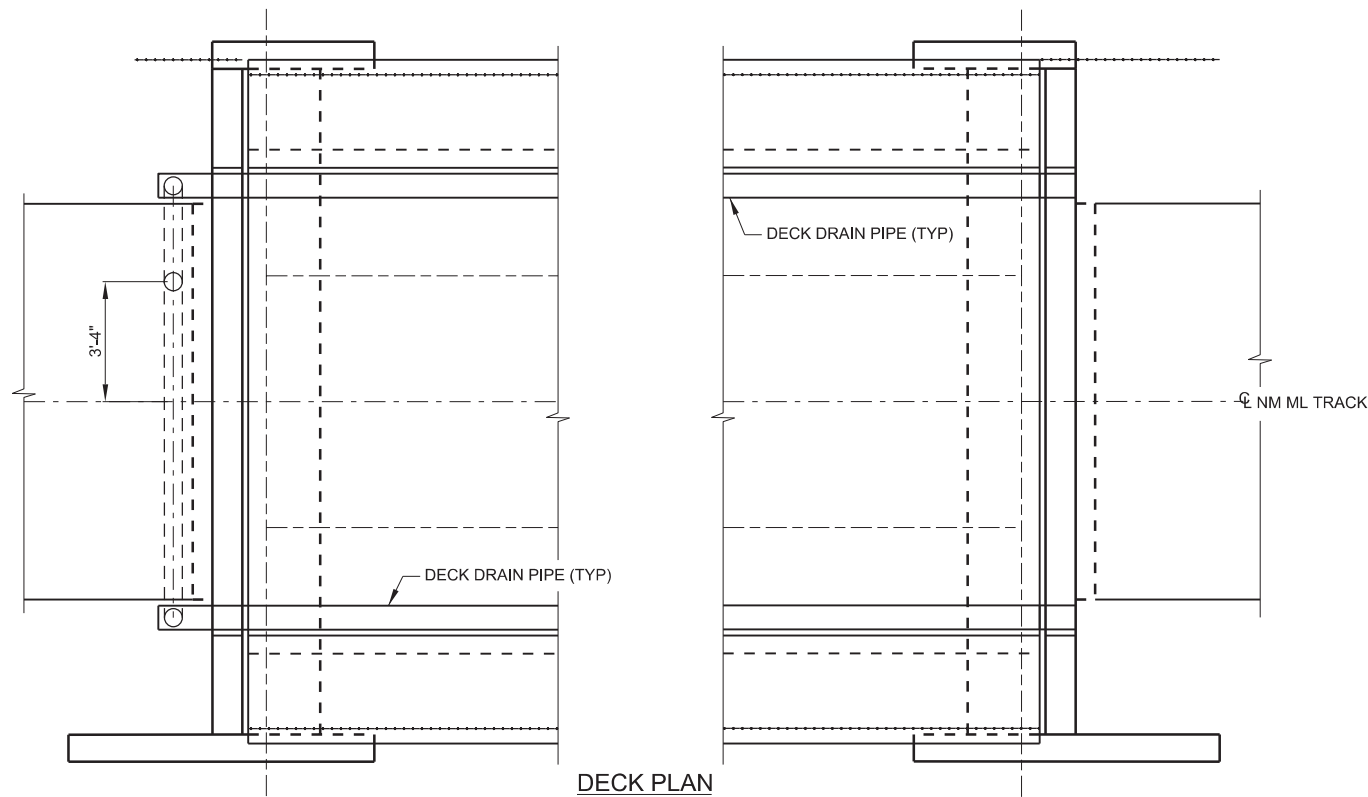
North Metro Rail Line
 REGIONAL TRANSPORTATION DISTRICT
 1600 BLAKE STREET
 DENVER, COLORADO 80202
 (303) 628-9000

NORTH METRO RAIL LINE

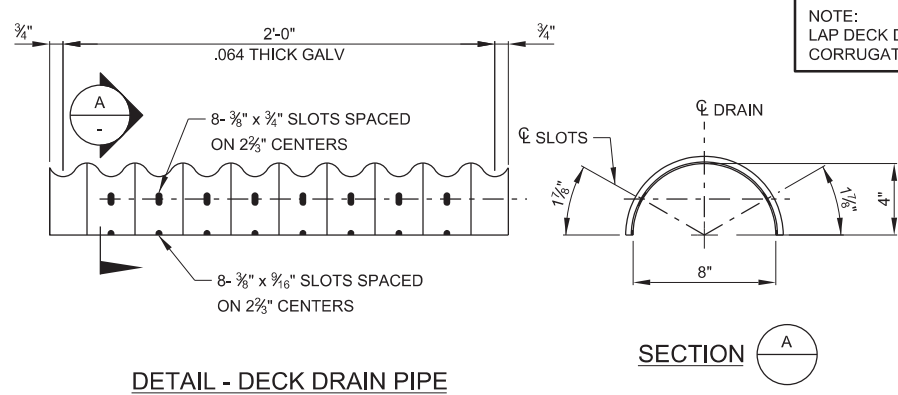
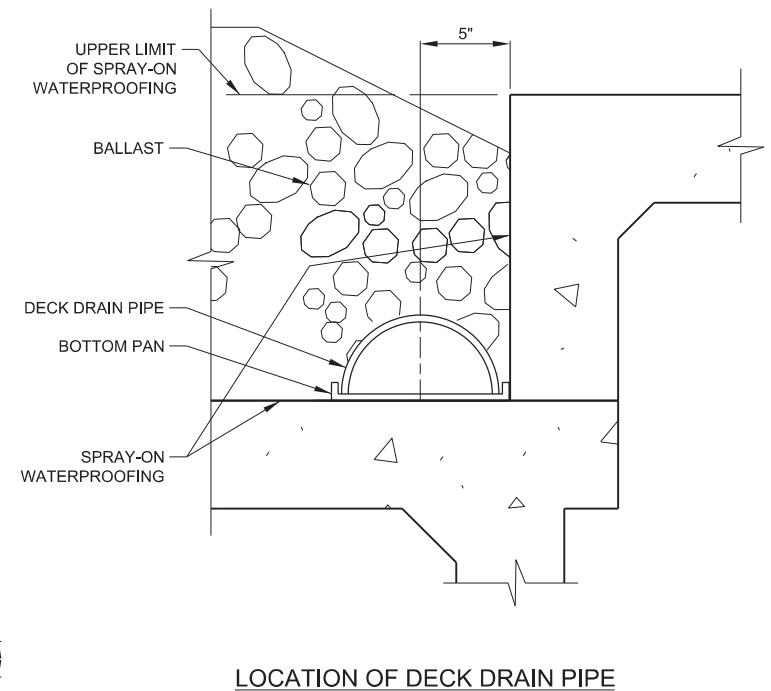
STRUCTURAL
 MISCELLANEOUS DETAILS (SHEET 2 OF 2)
 NORTH METRO OVER MARION STREET

0049193
 09/29/2015
 PROFESSIONAL ENGINEER

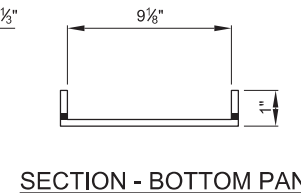
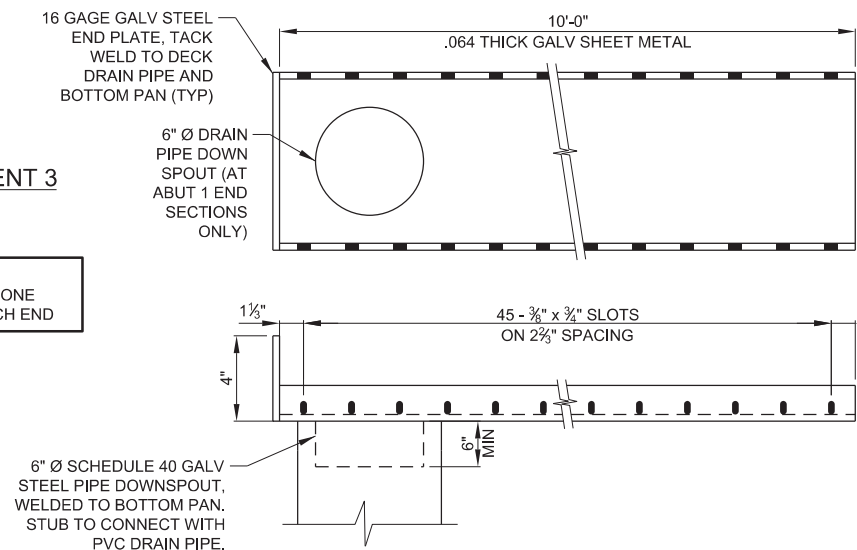
DWG No. SB-964



NOTE:
WATERPROOFING SHALL CONFORM TO SECTION 07.13.15 OF THE PROJECT SPECIFICATIONS FOR "WATERPROOFING MEMBRANE FOR BRIDGES".



NOTE:
LAP DECK DRAIN PIPE ONE CORRUGATION AT EACH END



RTD BRIDGE NO. NM 2.63

NO.	REVISIONS	BY	DATE
0	ISSUED FOR CONSTRUCTION	DWC	09/29/2015

DESIGNED BY: TJW	DATE: 02/27/2015	CHECKED BY: DWC	DATE: 06/03/2015	HORZ. SCALE: 3/16"=1'
DRAWN BY: SWF	DATE: 02/27/2015	APPROVED BY: TR	DATE: 09/29/2015	VERT. SCALE: 3/16"=1'

Balfour Beatty / GRAHAM JOINT VENTURE

2000 SOUTH COLORADO BOULEVARD
SUITE 2-300
DENVER, COLORADO 80222
(303) 758-4058

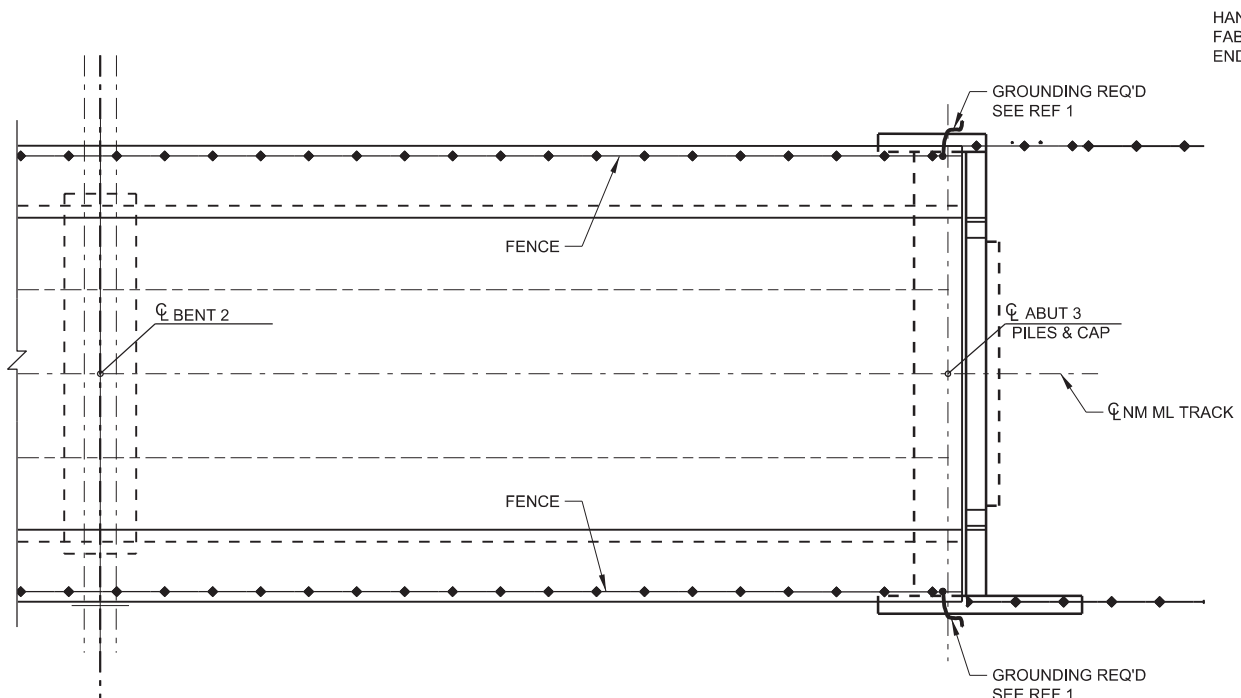
North Metro Rail Line
REGIONAL TRANSPORTATION DISTRICT
1600 BLAKE STREET
DENVER, COLORADO 80202
(303) 628-9000

NORTH METRO RAIL LINE

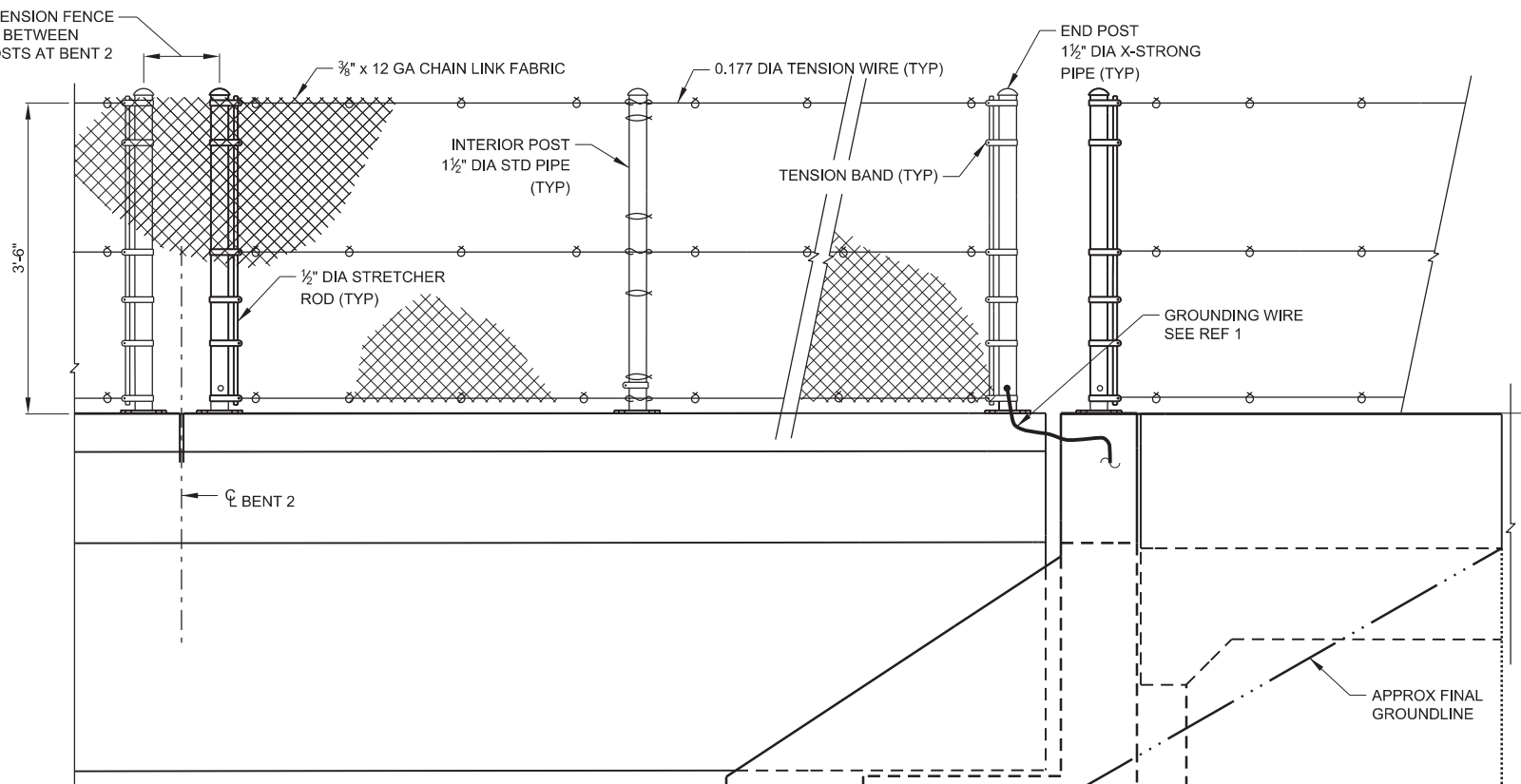
**STRUCTURAL
DECK WATERPROOFING DETAILS
NORTH METRO OVER MARION STREET**

DWG No. SB-965

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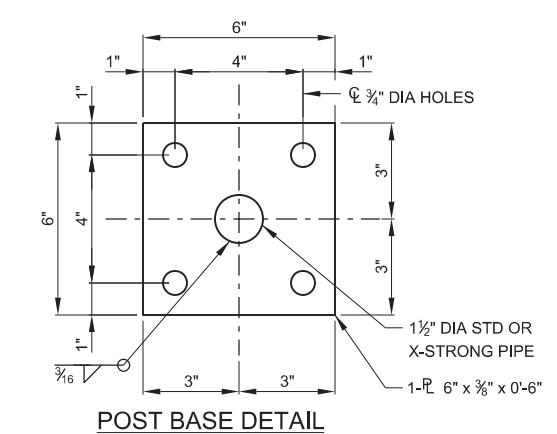


PARTIAL PLAN



PARTIAL ELEVATION

NOTE:
FOR ADDITIONAL FENCE FABRICATION AND
INSTALLATION DETAILS, SEE REF 1.



POST BASE DETAIL

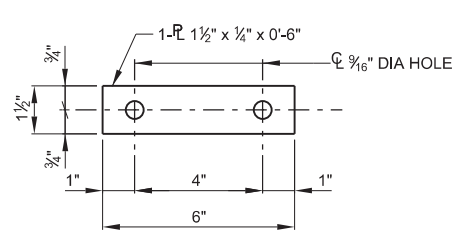


PLATE P100

REFERENCES LEGEND

IDENTIFIER	SHEET NAME
1	SYSTEM PLANS AND STRUCTURAL STANDARD DRAWINGS



RTD BRIDGE NO. NM 2.63

NO.	REVISIONS	BY	DATE
0	ISSUED FOR CONSTRUCTION	DWC	09/29/2015

DESIGNED BY: TJW DRAWN BY: SWF	DATE: 05/07/2015 DATE: 05/08/2015	CHECKED BY: DWC APPROVED BY: TR	DATE: 06/03/2015 DATE: 09/29/2015	HORZ. SCALE: 1/8"=1' & 1/2"=1' VERT. SCALE: 1/8"=1' & 1/2"=1'
				2000 SOUTH COLORADO BOULEVARD SUITE 2-300 DENVER, COLORADO 80222 (303) 758-4058

RTD FasTracks
North Metro Rail Line
REGIONAL TRANSPORTATION DISTRICT
1600 BLAKE STREET
DENVER, COLORADO 80202
(303) 628-9000

NORTH METRO RAIL LINE
STRUCTURAL FENCE DETAILS
NORTH METRO OVER MARION STREET

RTD BRIDGE NO. NM 2.63

DWG No. SB-966

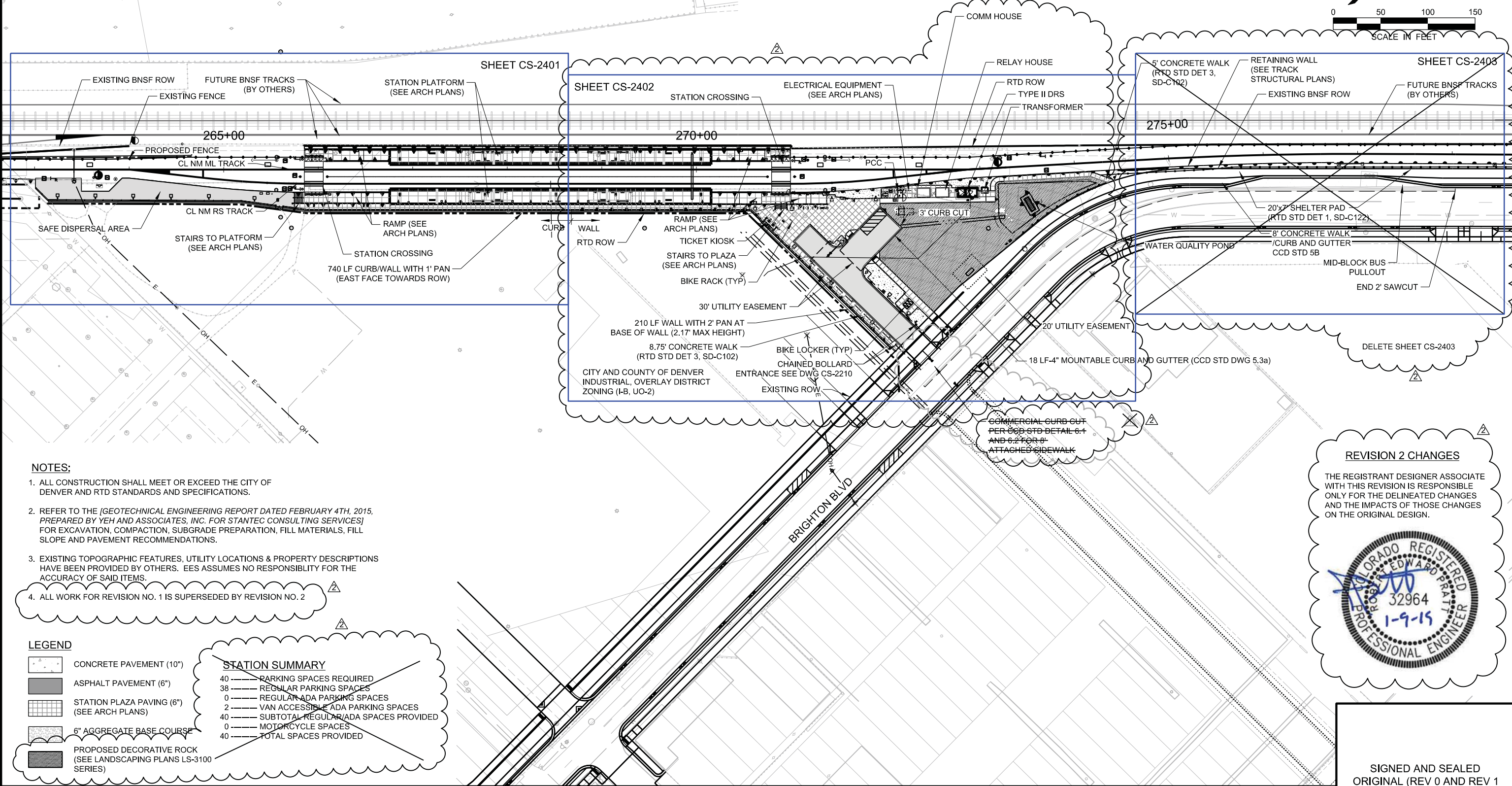
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 NM-SB-966-FD.dgn

RFC
T. W. W.
 03-039.12.06
 Rev 02
 01/31/2019

CALL UTILITY NOTIFICATION
 BURLINGTON NORTHERN/
 SANTA FE RAILROAD
1-800-533-2891
 CALL 3-BUSINESS DAYS (NOT INCLUDING INITIAL DAY OF CONTACT) IN ADVANCE BEFORE YOU DIG,
 GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.



CALL UTILITY NOTIFICATION
 CENTER OF COLORADO
1-800-922-1987 or 811
 CALL 3-BUSINESS DAYS (NOT INCLUDING INITIAL DAY OF CONTACT) IN ADVANCE BEFORE YOU DIG,
 GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.



- NOTES:**
1. ALL CONSTRUCTION SHALL MEET OR EXCEED THE CITY OF DENVER AND RTD STANDARDS AND SPECIFICATIONS.
 2. REFER TO THE [GEOTECHNICAL ENGINEERING REPORT DATED FEBRUARY 4TH, 2015, PREPARED BY YEH AND ASSOCIATES, INC. FOR STANTEC CONSULTING SERVICES] FOR EXCAVATION, COMPACTION, SUBGRADE PREPARATION, FILL MATERIALS, FILL SLOPE AND PAVEMENT RECOMMENDATIONS.
 3. EXISTING TOPOGRAPHIC FEATURES, UTILITY LOCATIONS & PROPERTY DESCRIPTIONS HAVE BEEN PROVIDED BY OTHERS. EES ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF SAID ITEMS.
 4. ALL WORK FOR REVISION NO. 1 IS SUPERSEDED BY REVISION NO. 2

LEGEND

	CONCRETE PAVEMENT (10")
	ASPHALT PAVEMENT (6")
	STATION PLAZA PAVING (6") (SEE ARCH PLANS)
	6" AGGREGATE BASE COURSE
	PROPOSED DECORATIVE ROCK (SEE LANDSCAPING PLANS LS-3100 SERIES)

STATION SUMMARY

40	PARKING SPACES REQUIRED
38	REGULAR PARKING SPACES
0	REGULAR ADA PARKING SPACES
2	VAN ACCESSIBLE ADA PARKING SPACES
40	SUBTOTAL REGULAR/ADA SPACES PROVIDED
0	MOTORCYCLE SPACES
40	TOTAL SPACES PROVIDED

REVISION 2 CHANGES

THE REGISTRANT DESIGNER ASSOCIATE WITH THIS REVISION IS RESPONSIBLE ONLY FOR THE DELINEATED CHANGES AND THE IMPACTS OF THOSE CHANGES ON THE ORIGINAL DESIGN.

NO.	REVISIONS	BY	DATE
1	NMC-DCN000125 - SITE REVISIONS BRIGHTON WIDENING	REP	07/20/2018
2	NMC-DCN000076 - REVISED CURB CUT FOR ATTACHED 8' SW.	REP	01/30/2017
0	ISSUED FOR CONSTRUCTION	REP	09/01/2016

DESIGNED BY: JRR	DATE: 10/21/2014	CHECKED BY: REP	DATE: 09/01/2016	HORIZ. SCALE: 1"=100'
DRAWN BY: LER	DATE: 10/21/2014	APPROVED BY: REP	DATE: 09/01/2016	VERT. SCALE: N/A

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RTD FasTracks
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NORTH METRO RAIL LINE

CIVIL

48TH & BRIGHTON AT NATIONAL WESTERN CENTER STATION

OVERALL SITE PLAN

SIGNED AND SEALED
 ORIGINAL (REV 0 AND REV 1
 IS ON FILE

DWG No. CS-2200

USER: pafoster
 1/15/2019 11:11:02 AM
 NMC-CS-2200-NWSSiteOverall.dgn