

PROJECT BID DOCUMENTS**Book 3****KC Streetcar Track Material Early Procurement****KCATA PROJECT NUMBER: #F22-5026-39A****ISSUE DATE: 10/18/2022****BID CLOSE DATE: 11/8/2022**

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REFERENCED DRAWINGS AND SPECIFICATIONS

The following list of drawings for the project is provided as a reference for the bidder and is part of the bid set:

Specifications for Special Track Work Numbered 300527 – 300568

Plan Sheets Numbered 300569 – 300589

Note that Spec Sheets for Special Track Work for Packages 2A and 2B (300534-300539) are slightly different for Special Track Work for Package 2C (300540 – 300545).

01 GENERAL REQUIREMENTS

01.01 PROJECT

Project Owner: **KANSAS CITY AREA TRANSPORTATION AUTHORITY**

Project Title: **KC Streetcar Track Material Early Procurement**

01.02 PROJECT DESCRIPTION:

The proposed projects generally include:

KC Streetcar Track Material Early Procurement

The scope of work of this procurement includes the following material packages (all 115 RE rail):

Package 2A – Equilateral 20M/25M Switch

Package 2B – Special Track Work including one 25M Curved Frog Switch, one 25M Straight Frog Switch, and two 25M Straight Frog Switches as optional items

Package 2C – VMF Non-Revenue Diamond and Switch including one diamond and one 25M Curved Frog Switch

Bidders may bid on one, two, or all the above bid packages. See the bid form for additional information and details.

All work shall conform to these specifications and the specifications issued by the Kansas City Metropolitan Chapter of the American Public Works Association and such modifications as may be required by the KCATA. In case of discrepancy, these specifications shall govern.

This project will be known as: **KC Streetcar Track Material Early Procurement**

The successful bidder shall furnish all necessary labor, materials, equipment, supplies, tools and supervision to accomplish the work called for in the contract in accordance with the plans and documents herein.

The project shall be accomplished under a single Unit Price Contract. Required work is not necessarily limited to the unit price items listed in the bid form. It is the intent of the drawings and specifications that the resulting improvements be fully completed, functional and ready for operation. The cost of work not specifically identified by a bid form unit price shall be included in provided unit price items.

Other than the noted optional switches above, KCATA does not anticipate adding or reducing the scope of work indicated in these bid packages.

01.03 STANDARD SPECIFICATIONS & DRAWINGS

01.03.01 The following standard specifications and drawings are hereby made part of these technical specifications and drawings by reference. All referenced specifications and drawings can be viewed, downloaded and/or ordered through the Kansas City Chapter of the American Public Works Association web site located at kcmetro.apwa.net. Copies of the referenced specifications and drawings can also be made available to any prospective bidder upon request through the KCATA.

01.03.02 Unless otherwise indicated on the plans, the Standard Technical Specifications

and Standard Drawings for this Project shall be referenced in the following order. Should a conflict between the Standard Specifications and Standard Drawings arise, the controlling references shall be (in order):

- (1) Kansas City Area Transportation Authority Standard Technical Specifications and Standard Plans and Details shall be the controlling references for all Kansas City Area Transportation Authority owned installations.
- (2) The Kansas City Metropolitan Chapter of the American Public Works Association's latest DIVISION III STANDARD DRAWINGS and STANDARD SPECIFICATIONS AND DESIGN CRITERIA unless otherwise indicated on the plans.
- (3) The State Department of Transportation's Standard Specifications and Standard Drawings unless otherwise indicated on the plans.

02 PROJECT SPECIAL PROVISIONS

01.01 PROJECT SUMMARY

This Section is included to detail general and special work or programs which may be required. Some of the specifications or statements in this section may also be addressed elsewhere in the Project Manual. Any interpretation of conflicting statements will be adjudicated by the Project Manager.

Bids shall be submitted on the Proposal or Bid Form provided. Each line item shall be bid using the listed units and quantities. It is intended the cost of all work, required to complete the entire project, be included in the Proposal form. All required work not provided a specific bid item shall be included in other bid items.

The Project shall be completed in accordance with the Federal Davis-Bacon Act. All field work shall meet current prevailing wage requirement.

02.01 CONSTRUCTION AND FABRICATION

02.01.01 Through the specifications and contract, the terms construct, construction and variations shall include fabricate, fabrication and variations.

01.01 CONSTRUCTION SCHEDULE REQUIREMENTS

01.01.01 Schedule limitations and considerations (if applicable) are identified below.

- (1) Package 2A – Equilateral switch shall be on delivered to the project site by NTP + 22 months
- (2) Package 2B – Special Trackwork shall be delivered to the project site by NTP + 13 months
- (3) Package 2C – VMF Non-Revenue Diamond and Switch shall be delivered to the project site by NTP + 12 months

01.01 TECHNICAL SPECIAL PROVISIONS

01.01.01 Please see the following technical specifications (Numbered 300527 – 300568):

- (1) Section 01 60 01 – Buy America Requirements
- (2) Section 34 11 00 – Rail
- (3) Section 34 11 23 – Special Trackwork for Packages 2A and 2B
- (4) Section 34 11 23 – Special Trackwork for Package 2C
- (5) Section 34 11 29 – General Track Construction
- (6) Section 34 11 93 – Other Track Materials.

02.01.02 Please see the following plan sheets for this package:

- (1) Plan Sheets Numbered 300569 – 300589

01.02 EXTENDED WARRANTIES

- (1) The Contractor shall be required to secure any extended or special riders to standard warranties that are required to comply with contract documents. See Section 03.10 on Page 31 of the General Provisions for additional Warranty Information.

03 GENERAL PROVISIONS

03.01 GENERAL REQUIREMENTS

03.01.01 MOBILIZATION

- (1) Mobilization shall include costs of all work and items necessary to begin the project. These items include but may not be limited to: obtaining KCATA and City required bonds, paying for permits, additional insurance (if required), setting up a construction office, etc. If requested, the Contractor shall submit a breakdown of items included in Mobilization.

03.01.02 ADMINISTRATION & MANAGEMENT

- (1) Administration & Management shall include costs of all work and items necessary to maintain the project. These items include but may not be limited to: Preparing and updating project schedule, preparation of shop drawing submittals, submittal of weekly payroll records, preparation of monthly payment applications and lien waivers, coordination with other contractors, coordination with utility companies, coordination with the KCATA's Project Management Office, attending progress meetings, etc. If requested, the Contractor shall submit a breakdown of items included in Administration & Management.

03.01.03 USE OF THE SITE AND/OR RIGHT-OF-WAY

- (1) The majority of the Contractor's work will be off site. However, for those areas of work that require site access (e.g., initial inspection, delivery of material, etc.) The Contractor shall adhere to the following items.
- (2) The Contractor shall clean public roadways of all construction debris as a result of construction activities at the end of each day.
- (3) The Contractor shall save and protect all existing trees during all phases of construction, unless otherwise noted in the plans.
- (4) The Contractor shall be responsible to directly coordinate their work with adjacent property owners and all other contractors working on or adjacent to site. Refer to the Special Provisions (if applicable) as outlined in the Project Manual for details regarding coordination with other contractors and KCATA.
- (5) Prior to construction, coordinate all streetlighting conflicts with local jurisdiction or utility company.
- (6) The Contractor is limited to areas for staging of materials and equipment, parking, temporary office facilities or other purposes as approved by the KCATA or its designated representative.

(7) The Contractor shall:

- (a) Coordinate acceptable locations of temporary facilities with the KCATA and local Jurisdiction.
- (b) Minimize disturbance of any adjacent businesses and property owners. All adjacent property owners and/or business owners shall be notified at least seven (7) calendar days in advance of necessary disruptions of use of driveways, sidewalks or entrances.

(8) Contractor shall restore all temporarily disturbed property, to at least its original condition, following completion of the work.

03.01.04 CONSTRUCTION STAGING

- (1) The Contractor shall coordinate all its construction operations with the KCATA. Once initial staging locations have been approved, the Contractor shall not move or otherwise operate outside these limits without first obtaining approval from the KCATA.
- (2) Staging areas for loading and unloading of materials also requires pre-approval. Locations of trash dumpsters and pick-up and drop-off schedules must be coordinated with the KCATA and the City's Traffic Division.
- (3) All contractor stockpiling, staging, and employee parking shall be confined to the locations shown on the plans or in the right-of-way. If the Contractor believes that it requires more working room than is provided in the permanent or temporary easement or right-of-way, the Contractor, at their expense, may obtain agreements with property owners for additional temporary access. The Contractor shall be responsible for gaining any temporary access required to complete the work. The Contractor shall provide the property owner and the KCATA with copies of any agreements reached for project access.

END OF SECTION

03.02 CONTRACT CONSIDERATIONS

03.02.01 SCHEDULE OF VALUES

- (1) Submit a printed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be considered.
- (2) Submit Schedule of Values within fifteen (15) calendar days after date of KCATA-Contractor Agreement.
- (3) Format: Utilize the Bid Form of this Project Manual. Identify each line item with number and title of the major specification Section. Identify site mobilization including bonds and insurance.
- (4) Include in each line item, the amount of Allowances specified in this Section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.
- (5) Include separately from within each line item, a direct proportional amount of Contractor's overhead and profit.
- (6) Revise schedule to list approved Change Orders, with each Application for Payment.
- (7) Include Engineering, material acquisition, and fabrication costs as separate line items if progress payment for these items will be requested.

03.02.02 APPLICATIONS FOR PAYMENT

- (1) Submit three copies of each application on AIA Form G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet.
- (2) Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
- (3) Payment Period: One Month.
- (4) When KCATA Project Management Office requires substantiating information, submit data justifying dollar amounts in question within three (3) working days of the request.
- (5) Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.
- (6) Include the following with the application:
 - (a) Partial Conditional release of liens including all major Subcontractors and vendors. (KCATA Form)
 - (b) Payroll records for all contractors for previous month. (Contractor standard)

- (c) Contractor Utilization Form (KCATA Form)
- (d) Affidavits attesting to off-site stored products. (KCATA Form)
 - (i) Requests for payment for material stored off site shall require verification of material be stored in a secure location separate from other projects and other material.
 - (ii) Owner verification of the above (at Contractor's expense)
- (e) Updated fabrication progress schedules, revised and current.

03.02.03 CHANGE PROCEDURES

- (1) The Contractor may submit a Request for Information (RFI) form to request substitutions, clarifications, or changes. The RFI will be reviewed by the KCATA and/or any applicable sub-consultants, and a response will be issued within ten (10) working days.
- (2) The KCATA, based upon its needs and preferences, may have established Add or Deduct Alternates for the project. The KCATA reserves the right to add or remove any alternate into or from the original base bid as the case may be.
- (3) The KCATA reserves the right to add or delete work from the contract if, in their sole opinion, it is in its best interest. The Contractor agrees to negotiate the desired work in good faith with the KCATA. Upon agreement, Contractor shall complete the work as agreed upon and in accordance with the project specifications.
- (4) If the KCATA chooses to remove proposed work items identified by line item in the bid form, the contract shall be deducted by the bid form amount. If field work on that item had begun or materials purchased and delivered, the KCATA and Contractor shall negotiate an appropriate adjustment to the line item cost.
- (5) The KCATA or their representative may issue Supplemental Design Instructions (SDI) to request minor changes or provide clarification in the Work not involving an adjustment to Contract Sum/Price or Contract Time
- (6) The KCATA may issue a Proposal Request which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor will prepare and submit a proposal within ten (10) working days.
- (7) Construction adjustments requiring time or cost changes to the contract must be processed as follows:
 - (a) The Contractor may propose changes by submitting a Change Order Request (COR) form to the KCATA, describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, and the effect on the Contract Sum/Price and Contract Time with full documentation and a statement describing the effect on Work by separate or other Contractors

- (b) The KCATA or their representative shall approve the Change Order Request Form (COR) and execute a Construction Change Directive (CCD) form. A complete description of the changes along with backup documentation (if appropriate) shall be provided. Once the CCD form is signed by authorized KCATA personnel, Contractor may commence with the work. The CCD does not allow for payment of the work.
- (c) The CCD's shall be formally incorporated into the contract by preparation and execution of a formal Change Order completed by the KCATA. Once the Change Order is executed, payment will be allowed to the Contractor for the work listed in the CCD.
 - (i) Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum/Price.
 - (ii) Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
 - (iii) Promptly enter changes in Project Record Documents.
 - (iv) Execution of Change Orders: KCATA will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

03.02.04 DEFECT ASSESSMENT

- (1) KCATA or their representative may inspect and evaluate all Work for defect assessment at any time.
- (2) Any Work, or portions of the Work, not conforming to specified requirements shall be either repaired or replaced at the discretion of the KCATA or their representative.
- (3) If, in the opinion of the KCATA, it is not practical to remove and replace the Work, the KCATA will direct one of the following remedies:
 - (a) The defective Work may remain, but the unit sum/price will be adjusted to a new sum/price reduced up to 50 percent at the discretion of the KCATA.
 - (a) The defective Work will be partially repaired according to the instructions of the KCATA, and the unit sum/price will be adjusted to a new sum/price reduced up to 50 percent at the discretion of the KCATA.
- (4) The individual specification sections may modify these options or may identify a specific formula or percentage sum/price reduction.
- (5) The authority of the KCATA to assess the defect and identify payment adjustment, is final.

03.02.05 ALTERNATES

- (1) Submit alternatives identifying the effect on adjacent or related components.

- (2) Alternatives quoted on Bid Forms will be reviewed and accepted or rejected at the KCATA or the KCATA designated representative's option. Accepted alternates will be identified in the KCATA-Contractor Agreement.
- (3) Coordinate related work and modify surrounding work to integrate the Work of each alternative.

END OF SECTION

03.03 COORDINATION AND MEETINGS

03.03.01 CONTRACTOR'S RESPONSIBILITY

- (1) Contractor shall be responsible for coordinating all work with KCATA's representative who will be identified prior to commencement of work.

03.03.02 TIMELY COMPLETION

- (1) Contractors shall coordinate the Work with other contractors so that all work once started in a given area will be completed in that area as soon as possible with good workmanship.

03.03.03 COORDINATION AND PROJECT CONDITIONS

- (1) Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.
- (2) If applicable, coordinate space requirements, supports, and installation of mechanical and electrical Work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- (3) If applicable, in finished areas, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- (4) Coordinate completion and clean-up of Work for Substantial Completion.
- (5) Coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of KCATA's activities and public.

03.03.04 PRECONSTRUCTION MEETING

- (1) If requested by the KCATA, KCATA designated representative, or Contractor, a pre-construction conference will be held within fifteen (15) calendar days following receipt of the Notice to Proceed.
- (2) Attendance Required: Attendees shall include Contractor, key Subcontractors, KCATA project manager, or their designated representative, and Architect/Engineer.
- (3) Agenda will be provided by KCATA Project Management Office (PMO) prior to pre-construction conference. The agenda will include the following items at a minimum:
 - (a) Designation of personnel representing the parties in Contract, and the KCATA.
 - (b) Submission of list of Subcontractor's, list of Products, schedule of values, and progress schedule.

- (c) Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract close-out procedures.
 - (d) Coordination of Construction Scheduling.
 - (e) Project special provisions.
- (4) The construction layout, construction scheduling as described hereinafter, and other pertinent aspects of the project will be discussed.
- (5) Contractor shall record minutes and distribute copies within two (2) working days after meeting to all participants, KCATA PMO, and those affected by decisions made.

03.03.05 SITE MOBILIZATION MEETING

- (1) If requested, the KCATA will schedule a meeting at the Project site prior to Contractor occupancy.
- (2) Attendance Required: KCATA project manager, Architect/Engineer, Contractor, Contractor's Superintendent, and major Subcontractors.
- (3) Agenda:
- (a) Use of premises by KCATA and Contractor.
 - (b) KCATA's requirements.
 - (c) Construction facilities and controls provided by KCATA.
 - (d) Temporary utilities provided by KCATA.
 - (e) Survey and layout.
 - (f) Safety, security and housekeeping procedures.
 - (g) Schedules.
 - (h) Application for payment procedures.
 - (i) Procedures for testing.
 - (j) Procedures for maintaining record documents.
 - (k) Requirements for start-up of equipment.
 - (l) Inspection and acceptance of equipment put into service during construction period.
- (4) Record minutes and distribute copies within two (2) working days after meeting to all participants, KCATA PMO, and those affected by decisions made.

03.03.06 PROGRESS MEETINGS

- (1) If the project warrants, and the KCATA or Contractor requests, the Contractor shall Schedule and administer meetings throughout progress of the Work at intervals acceptable to the KCATA.
- (2) Contractor shall make arrangements for meetings, prepare agenda with copies for participants and preside at meetings.
- (3) Attendance Required: Job superintendent, major Subcontractors and suppliers, KCATA, Architect/Engineer, as appropriate to agenda topics for each meeting.
- (4) Agenda:
 - (a) Review minutes of previous meetings.
 - (a) Review of Work progress.
 - (b) Field observations, problems, and decisions.
 - (c) Identification of problems which impede planned progress.
 - (d) Review of submittals schedule and status of submittals.
 - (e) Review of off-site fabrication and delivery schedules.
 - (f) Maintenance of progress schedule.
 - (g) Corrective measures to regain projected schedules.
 - (h) Planned progress during succeeding work period.
 - (i) Coordination of projected progress.
 - (j) Maintenance of quality and work standards.
 - (k) Effect of proposed changes on progress schedule and coordination.
 - (l) Other business relating to Work.
- (5) Record minutes and distribute copies within two (2) working days after meeting to all participants, KCATA PMO, and those affected by decisions made.

03.03.07 PRE-INSTALLATION MEETING

- (1) When required in individual specification sections, convene a pre-installation meeting at the site prior to commencing work of the section.
- (2) Require attendance of parties directly affecting, or affected by, work of the specific section.
- (3) Notify the KCATA four (4) working days in advance of meeting date.
- (4) Prepare agenda and preside at meeting:

- (a) Review conditions of installation, preparation and installation procedures.
- (b) Review coordination with related work.
- (5) Record minutes and distribute copies within two (2) working days after meeting to all participants, KCATA PMO, and those affected by decisions made.

END OF SECTION

03.04 REGULATORY REQUIREMENTS

03.04.01 CODES

- (1) In addition to these specifications, the laws, ordinances, and latest amendments thereto at the place of construction shall govern this project and shall include and conform to applicable laws, ordinances, and industry standards including:

ADAAG	Americans With Disabilities Act Accessibility Guidelines
UFAS	Uniform Federal Accessibility Standards
OSHA	Occupational Safety and Health Administration
SMACNA	Sheet Metal and Air-Conditioning Contractors' National Assn.
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers
UL	Underwriters' Laboratories
KCMMB	Kansas City Metro Materials Board
CRSI	Concrete Reinforcing Steel Institute
AISC	American Institute of Steel Construction
NRCA	National Roofing Contractors' Association.
ASTM	American Society of Testing Materials
AWI	Architectural Woodwork Institute Quality Standards
DWI	Door and Window Institute
ANSI	ANSI/AAMA Industry Standards
FGMA	FGMA Glazing Manual
NFPA	National Fire Protection Association
---	Class "A" Rating for Roofing (unless otherwise noted)
---	Missouri State Health Department
---	Missouri Inspection Bureau
---	National codes adopted by the local jurisdiction with respective local amendments.
1.	IBC International Building Code, Latest Edition.
2.	IMC International Mechanical Code, Latest Edition.
3.	IPC International Plumbing Code, Latest Edition.
4.	IEC International Electrical Code, Latest Edition.
5.	IFC International Fire Code, Latest Edition.
6.	NEC NFPA 70 National Electric Code Latest Edition

- (2) Also, any other ordinances, laws, rules, or regulations of the local jurisdiction, or federal, state, or local organizations having jurisdiction over any or all parts of this improvement.
- (3) In case of conflict, the KCATA Project Management Office will decide which authority is applicable, and its decision shall be final.

03.04.02 SPECIFICATIONS AND DRAWINGS

- (1) These specifications are intended to supplement the contract drawings, and it will not necessarily be the province of these specifications to describe all portions of the project which the drawings are competent to explain. All items and/or work necessary for the completion of the project must be supplied in place even if of such nature that they could have been indicated on the drawing or described in the specification. The decision of the KCATA Project Management Office as to the proper interpretation of the drawings and specifications shall be final.

END OF SECTION

03.05 PROJECT PROCEDURES

03.05.01 SITE VISITATION

- (1) Contractor shall visit the site to ensure familiarity with all work to be performed.
- (2) Failure of Contractor or their Subcontractors to visit the site shall in no way relieve them of their responsibilities.

03.05.02 AWARD OF CONTRACT AND BEGINNING WORK

- (1) Prior to execution of Contract, KCATA and Contractor shall review the following:
 - (a) Major Subcontractors and materials suppliers
 - (b) Construction schedule
 - (c) Unit prices, if any
 - (d) Clarification of work scope and/or alternates

03.05.03 LAYOUT WORK

- (1) Contractor shall verify all grades, lines, levels, and dimensions and establish benchmarks and survey control required for construction.

03.05.04 PROTECTION OF ADJACENT PROPERTY

- (1) Contractor shall protect all adjacent property, streets, curbs, fences, and plantings during construction that are not intended to be part of the project.
- (2) Any damaged material on adjacent property as mentioned in 02.05.06 shall be replaced or repaired to the KCATA's satisfaction at the Contractor's expense.

03.05.05 PROTECTION OF WORK IN PROGRESS

- (1) Work in progress shall be properly protected from damage.
- (2) Any work in progress that is damaged by other operations shall be repaired or replaced to the KCATA's satisfaction at the Contractor's expense.

03.05.06 CONSTRUCTION LIMITS

- (1) All construction activities must be limited within the designated construction limits as shown on the plans. If construction limits are not designated in the plans, the Contractor shall limit construction activities to within public right of way.

03.05.07 ALTERATION PROJECT PROCEDURES

- (1) Materials: As specified in Product sections; match existing Products and work for

patching and extending work.

- (2) Employ skilled and experienced installer to perform alteration work.

END OF SECTION

03.06 SUBMITTALS

03.06.01 REFERENCES

- (1) AGC (Associated General Contractors of America) publication "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry".

03.06.02 SUBMITTAL PROCEDURES

- (1) Transmit each submittal from Contractor to the KCATA or the KCATA designated representative. The Contractor shall submit the documents electronically in Portable Document format (PDF) via the Project's ProjectWise account. Coordinate submission of related items.
- (2) Hard copy submittals may also be required as directed by the KCATA.
- (3) Submittals received from other sources other than Contractor will be returned without action.
- (4) Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- (5) Identify Project, Contractor, Subcontractor or supplier, pertinent drawing and detail number, and specification section number, as appropriate.
- (6) Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- (7) Schedule submittals to expedite the Project and deliver to the KCATA or the KCATA designated representative at business address identified herein. Coordinate submission of related items.
- (8) For each submittal for review, allow fifteen (15) working days excluding delivery time to and from the Contractor.
- (9) Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- (10) Provide space for Contractor and Architect/Engineer review stamps.
- (11) Revise and resubmit submittals as required; identify all changes made since previous submittal.
- (12) When revised for resubmission, identify all changes made since previous submission.
- (13) Distribute copies of reviewed submittals as appropriate. Instruct parties to

promptly report any inability to comply with requirements.

- (14) Submittals not required or requested may not be reviewed or processed.

03.06.03 CONSTRUCTION PROGRESS SCHEDULES

- (1) Contractor shall prepare construction progress schedule for presentation at preconstruction conference.
- (2) Schedule shall be in bar chart format plotting all items of work and material/equipment fabrication/delivery on calendar covering estimated project construction period. Actual progress shall be plotted against estimated progress by solid and dashed lines. Chart shall also indicate estimated and actual per cent of completion at monthly intervals.
- (3) Schedule shall account for necessary coordination of the KCATA activities, if applicable.
- (4) Submit initial schedule within ten (10) working days after date of KCATA-Contractor Agreement established in Notice to Proceed.
- (5) Revise and resubmit the initial schedule as requested by the KCATA within five (5) working days of the request being made.
- (6) Submit revised schedules with each Application for Payment, identifying changes since previous version.
 - (a) Submit a computer-generated horizontal bar chart with separate line for each major portion of Work or operation identifying first workday of each week.
 - (b) Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
 - (c) Indicate estimated percentage of completion for each item of Work at each submission.
 - (d) Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by KCATA and required by Allowances.

03.06.04 PROPOSED PRODUCTS LIST

- (1) Within ten (10) working days after date of KCATA-Contractor Agreement, submit list of major products proposed for shop drawing or catalog cut review, with name of manufacturer, trade name, and model number of each product.
- (2) For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

03.06.05 PRODUCT DATA

(1) Product Data for Review:

- (a) Submitted to the KCATA or the KCATA designated representative for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- (b) After review, provide copies and distribute in accordance with Section 03.06.02 SUBMITTAL PROCEDURES for record documents purposes.

(2) Product Data for Information:

- (a) Submitted for the KCATA's and/or Architect/Engineer's knowledge.

(3) Product Data for Project Close-out:

- (a) Submitted for the KCATA's benefit during and after project completion.

(4) Submit in accordance with Section 03.06.02 SUBMITTAL PROCEDURES.

- (5) Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- (6) Indicate Product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- (7) After review distribute in accordance with Section 03.06.02 SUBMITTAL PROCEDURES and provide copies for record documents purposes.

03.06.06 SHOP DRAWINGS

(1) Shop Drawings for Review:

- (a) Submitted to the KCATA or the KCATA designated representative for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- (b) After review, produce copies and distribute in accordance with Section 03.06.02 SUBMITTAL PROCEDURES article above and for record documents purposes.

(2) Shop Drawings for Information:

- (a) Submitted for the KCATA's and/or Architect/Engineer's knowledge.

(3) Shop Drawings for Project Close-out:

- (a) Submitted for the KCATA's benefit during and after project completion.

- (4) Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

(5) After review, reproduce and distribute in accordance with Article on Procedures above and for Record Documents.

(6) Submit in accordance with Section 03.06.02 SUBMITTAL PROCEDURES.

03.06.07 SAMPLES

(1) Samples for Review:

(a) Submitted to the KCATA or the KCATA designated representative for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

(b) After review, produce duplicates and distribute in accordance with Section 03.06.02 SUBMITTAL PROCEDURES and for record documents purposes.

(2) Samples for Information:

(a) Submitted for the KCATA's and/or Architect/Engineer's knowledge.

(3) Samples for Selection:

(a) Submitted to the KCATA or the KCATA designated representative for aesthetic, color, or finish selection.

(b) Submit samples of finishes from the full range of manufacturers' standard colors, or in custom colors selected if required per specific product specifications, textures, and patterns for KCATA selection.

(c) After review, produce duplicates and distribute in accordance with Section 03.06.02 SUBMITTAL PROCEDURES and for record documents purposes.

(4) Submit samples where noted in individual Specification Sections to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

(5) Include identification on each sample, with full Project information.

(6) Submit the number of samples specified in individual specification sections; one of which will be retained by the KCATA or the KCATA designated representative.

(7) Reviewed samples which may be used in the Work are indicated in individual specification sections.

(8) Samples will not be used for testing purposes unless specifically stated in the specification section.

03.06.08 DESIGN DATA

(1) Submitted for the KCATA's and/or Architect/Engineer's knowledge.

- (2) Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

03.06.09 TEST REPORTS

- (1) Submitted for the KCATA's and/or Architect/Engineer's knowledge.
- (2) Submit test reports for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

03.06.10 CERTIFICATES

- (1) When specified in individual specification sections, submit certification by the manufacturer, installation/application Subcontractor, or the Contractor to the KCATA or the KCATA designated representative, in quantities specified for Product Data.
- (2) Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- (3) Certificates may be recent or previous test results on material or Product but must be acceptable to the KCATA or the KCATA designated representative.

03.06.11 MANUFACTURER'S INSTRUCTIONS

- (1) When specified in individual specification sections, submit instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to KCATA in quantities specified for Product Data.
- (2) Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- (3) Identify conflicts between manufacturers' instructions and Contract Documents.

END OF SECTION

03.07 SAFETY PLAN

03.07.01 GENERAL REQUIREMENTS

- (1) The Contractor shall prepare a construction safety plan which shall be present on site at all times. This plan shall identify hazards and what measures will be taken to protect workers and the public. In addition, a safety officer will be designated by the Contractor. This safety officer will be responsible for enforcing the safety plan. The safety officer shall notify the KCATA Project Manager when modifications to the safety plan are made.

END OF SECTION

03.08 QUALITY CONTROL

03.08.01 QUALITY ASSURANCE – CONTROL OF INSTALLATION

- (1) Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- (2) Comply with manufacturers' instructions, including each step, in sequence.
- (3) Should manufacturers' instructions conflict with Contract Documents, request clarification from the KCATA or the KCATA designated representative before proceeding.
- (4) Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- (5) Perform Work by persons qualified to produce required and specified quality.
- (6) Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- (7) Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

03.08.02 TOLERANCES

- (1) Monitor fabrication and installation tolerance control of Products to produce acceptable Work. Do not permit tolerances to accumulate.
- (2) Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from the KCATA or the KCATA designated representative before proceeding.
- (3) Adjust Products to appropriate dimensions; position before securing Products in place.

03.08.03 REFERENCES AND STANDARDS

- (1) For Products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- (2) Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established by code.
- (3) Obtain copies of standards where required by product specification sections.
- (4) Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the KCATA or the KCATA designated representative shall be altered from

the Contract Documents by mention or inference otherwise in any reference document.

03.08.04 MOCK-UPS AND FIELD SAMPLES

- (1) Tests will be performed under provisions identified in this section and identified in the respective product specification sections.
- (2) Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- (3) Acceptable samples represent a quality level for the Work.
- (4) Install field samples at the site as required by individual specifications Sections for review.
- (5) Where mock-up has been accepted by the KCATA or the KCATA designated representative and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so.

03.08.05 TESTING SERVICES

- (1) Testing and source quality control may occur on or off the project site. Perform off-site testing as required by any applicable building codes and/or manufacturer's recommendations.

03.08.06 INSPECTION SERVICES

- (1) Inspections may occur on or off the project site. Perform off-site inspecting as required by any applicable codes and/or manufacturer's recommendations.

03.08.07 MANUFACTURER'S FIELD SERVICES

- (1) When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and as otherwise applicable, and to initiate instructions when necessary.
- (2) Submit qualifications of observer to the KCATA or the KCATA designated representative seven (7) calendar days in advance of required observations. Observer subject to approval of the KCATA or the KCATA designated representative.
- (3) Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- (4) Submit report in accordance with Section 03.06.02 SUBMITTAL PROCEDURES within five (5) calendar days of observation to the KCATA or the KCATA designated representative for review.

03.08.08 EXAMINATION

- (1) Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- (2) Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- (3) Examine and verify specific conditions described in individual specification sections.
- (4) Verify that utility services are available, of the correct characteristics, and in the correct locations.

03.08.09 PREPARATION

- (1) Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

03.09 MATERIAL AND EQUIPMENT**03.09.01 PRODUCTS**

- (1) Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- (2) Provide interchangeable components of the same manufacture for components being replaced.

03.09.02 TRANSPORTATION AND HANDLING

- (1) Transport and handle Products in accordance with manufacturer's instructions.
- (2) Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged.
- (3) Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.
- (4) Protect finished surfaces including jambs and soffits of openings used as passageways through which equipment and materials are handled.
- (5) Maintain finished surfaces clean, unmarred, and suitably protected until accepted by KCATA.
- (6) Provide protection for finished floor surfaces in traffic areas prior to allowing equipment or materials to be moved over such surfaces.

03.09.03 STORAGE AND PROTECTION

- (1) Store and protect Products in accordance with manufacturers' instructions.
- (2) Store with seals and labels intact and legible.
- (3) Store sensitive Products in weather tight, climate controlled, enclosures in an environment favorable to Product.
- (4) Deliver products to job site in manufacturers' original container with labels intact and legible.
- (5) Promptly remove damaged material and unsuitable items from job site and promptly replace with material meeting the specified requirements at no additional cost to KCATA.
- (6) Maintain packaged materials with seals unbroken and labels intact until time of use.
- (7) The KCATA or the KCATA designated representative may reject as non-complying such material and products that do not bear identification satisfactory to the KCATA or the KCATA designated representative as to manufacturer, grade, quality, and other pertinent information.

- (8) For exterior storage of fabricated Products, place on sloped supports above ground.
- (9) Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- (10) Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of Products.
- (11) Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- (12) Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- (13) Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.
- (14) In event of damage, promptly make replacements and repairs to the KCATA or the KCATA designated representative's approval at no additional cost to KCATA.
- (15) Additional time required to secure replacements and to make repairs will not be considered by KCATA to justify an extension on the Contract Time and Completion.

03.09.04 PRODUCT OPTIONS

- (1) Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.
- (2) Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
- (3) Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

03.09.05 SUBSTITUTIONS

- (1) Instructions to Bidders specify time restrictions for submitting requests for Substitutions during the bidding period to requirements specified in this section.
- (2) Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- (3) A request constitutes a representation that the Bidder:
 - (a) Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
 - (b) Will provide the same warranty for the Substitution as for the specified Product.
 - (c) Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to KCATA.
 - (d) Waives claims for additional costs or time extension which may subsequently become apparent.
 - (e) Will reimburse the KCATA or the KCATA designated representative for review or redesign services associated with re-approval by authorities.
- (4) Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- (5) Substitution Submittal Procedure:
 - (a) Submit in accordance with Section 03.06.02 SUBMITTAL PROCEDURES a copy of request for Substitution for consideration. Limit each request to one proposed Substitution.
 - (b) Submit shop drawings, product data, and certified test results attesting to the proposed Product equivalence. Burden of proof is on proposer.
 - (c) The KCATA or the KCATA designated representative will notify Contractor in writing of decision to accept or reject request.

END OF SECTION

03.10 PROJECT CLOSEOUT

03.10.01 SUBSTANTIAL COMPLETION AND FINAL PAYMENT

- (1) Additional provisions related to Substantial Completion and Final Payment are included in AIA Document A207 Article 9 Payments and Completion, Paragraphs 9.8, 9.9, and 9.10.
- (2) All manufacturer's warranties required by the Contract Documents shall commence on the Date of Substantial Completion of Work or designated portions thereof. For work first completed after Substantial Completion, such manufacturing warranties shall commence on the date the Work is accepted unless some other warranty commencement date is specifically referenced elsewhere in the Contract Documents for a specific warranty.
- (3) The Contractor and each Subcontractor shall carefully and regularly check their work for conformance as the work is being done. Unsatisfactory work shall be corrected as the work progresses and not be permitted to remain and become a part of the punch list.
- (4) Notify the KCATA or the KCATA designated representative in writing when each work element at the site is ready for the punch list inspection. Prepare and submit with the notification a list of items to be corrected or completed.
 - (a) The KCATA or the KCATA designated representative will make arrangements for their punch list inspection at the earliest possible date.
- (5) Transmittal of the punch list to the Contractor shall set the date for reinspection prior to issuance of a Certificate of Substantial Completion. Upon receipt of the punch list, the Contractor shall within seven (7) days advise the KCATA or the KCATA designated representative of any questions that the Contractor or any of their Subcontractors may have concerning the requirements of the punch list.
- (6) When advised by the Contractor that the punch list items have been completed, the KCATA or the KCATA designated representative shall conduct a reinspection with the Contractor and any needed Subcontractors where applicable, to determine whether the Certificate of Substantial Completion can be issued.
 - (a) If, upon the first reinspection, it is found that punch list items are not sufficiently complete that a Certificate of Substantial Completion cannot be issued, the Contractor shall be responsible for the KCATA's costs for additional Professional Services for preparation of a new punch list and any subsequent reinspections and administrative services prior to issuance of the Certificate of Substantial Completion. The KCATA's costs for such additional Professional Services will be charged to the Contractor at the rate of \$150.00 per hour, plus applicable reimbursable expenses. Professional Services and expenses will be deducted from project retainage. . If the project does not have retainage, expenses shall be deducted from final payment. Documentation of these expenses will be provided to the Contractor by the KCATA.
- (7) When issued, the Certificate of Substantial Completion shall name the date, triggering

- the beginning of the warranty period, with any items to have a later starting date specifically noted. The Certificate shall also have attached to it the uncompleted punch list items and shall name the date for their completion.
- (8) Acknowledgement of the Date of Substantial Completion by the signature of all parties on the Certificate implies possession of the premises by the KCATA, and completion of incomplete punch list items by the Contractor and the Subcontractors at the KCATA's convenience. The KCATA shall cooperate in permitting the Contractors access to the work for the completion of punch list items.
- (9) Upon issue of the Certificate of Substantial Completion, the Contractor may submit the following applications:
- (a) Submittal of Final Payment Application. Final Certificate of Payment shall be issued by the KCATA or the KCATA designated representative bringing the total of payments up to the full payment less retainage or less an amount which the KCATA or the KCATA designated representative reasonably estimates would be required to cover more than the cost of any incomplete items of work.
- (b) Submittal of Retainage Release Application
- (10) Upon written notice by the Contractor that the remaining punch list items are completed, the KCATA or the KCATA designated representative shall verify this by inspection and shall issue to the KCATA a final Certificate of Payment stating that, to the best of their knowledge, information, and belief, the Work has been completed in accordance with the terms and conditions of the Contract Documents, and that the entire balance found to be due the Contractor, and noted in said Final Certificate of Payment, is due and payable. The KCATA shall make payments as stated in the Owner Contractor Agreement.
- (11) If, after Substantial Completion, final completion is delayed for more than thirty (30) calendar days through no fault of the KCATA or the KCATA designated representative, the Contractor shall be responsible for the KCATA's costs for additional professional services. During this period, the KCATA or the KCATA designated representative will make only one inspection to verify completion of punch list items. Any additional inspections required, and related administrative services will be considered additional professional services. The KCATA's costs for additional professional services will be charged to the Contractor at the rate of \$150.00 per hour, plus applicable reimbursable expenses. Professional Services and expenses will be deducted from project retainage. If the project does not have retainage, expenses shall be deducted from final payment. Documentation of these expenses will be provided to the Contractor by the KCATA.

03.10.02 PROJECT RECORD DOCUMENTS

- (1) At least fourteen (14) calendar days prior to the punch list inspection, prepare and submit to the KCATA or the KCATA designated representative one complete set of PDF project drawings, and one PDF complete set of specifications. Documents shall be neatly marked in red to show an accurate "as built" record of construction.

- (2) Carefully mark drawings during construction to accurately locate items of construction that will be concealed when the project is completed. Carefully measure and show dimensions of all concealed work including, but not limited to, buried piping, buried or concealed electrical services, utility entrances, cables, conduit and piping.
 - (a) Accurately show the location of utilities, including capped pipes, by two dimensions, depth below grade, additional valves, drains, cleanouts, changes in conduit routing, changes in wiring, changes in pull or junction boxes, etc., and the changes covered by any Change Orders issued during construction.
- (3) Neatly mark specifications to reflect names of manufacturers and products incorporated in the Work.
- (4) Final payment will not be made until project record documents are submitted to and approved by the KCATA or the KCATA designated representative.

03.10.03 OPERATIONS AND MAINTENANCE MANUALS

- (1) At least fourteen (14) calendar days before the punch list inspection, prepare and submit to the KCATA or the KCATA designated representative two complete sets of information describing the operation and maintenance of all systems, equipment, and finishes provided in this project. Information shall be presented in three ring, loose leaf binders with the words "Operation and Maintenance Manual" and the names and addresses of the Project, Contractor, the KCATA and the KCATA designated representative neatly and permanently marked on the cover.
- (2) Information shall be logically organized and subdivided in sections on the basis of operation without regard to construction trades, Subcontractors or specification sections. Each section shall be neatly tabbed and identified for easy reference.
- (3) Information required includes, but is not limited to:
 - (a) Complete list of Subcontractors, noting applicable specification section, item of work, Subcontractor's name, address, telephone number and the name of the person to contact.
 - (b) Schedule of Values of ongoing maintenance, if required.
 - (c) Manufacturer's recommendations for operation and maintenance of all equipment and systems including charts, diagrams, performance curves, catalog data and maintenance manuals.
 - (d) Manufacturer's recommendations for use and maintenance of all finish materials.
 - (e) Duplicate copies of all warranties, guarantees and bonds.

03.10.04 FINAL CLEANING

- (1) General cleaning during construction is required by the General Conditions.

- (2) Clean the site of rubbish, litter and other foreign substances caused by construction.
- (3) Finished Surfaces: Remove marks, fingerprints and other soil and dirt from painted, glazed, decorated, stained or otherwise finished surfaces, including ceilings. Remove construction dust from horizontal and vertical surfaces. Repaint or refinish as required to restore surfaces to "as new" quality.
- (4) Fixtures and Equipment: Remove stains, paint droppings, spots, dirt, etc., from electrical fixtures, plumbing fixtures, mechanical and electrical equipment, etc.
- (5) Concrete and Masonry: Remove paint, stains, dirt and other foreign materials from all exposed surfaces.
- (6) Removal of Protection: Remove temporary protection and facilities installed for protection of the work during construction.
- (7) At completion of the work, remove all temporary facilities, trash and debris from the site. Leave the site and building clean, neat, and ready for occupancy.
- (8) Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

03.10.05 CONTRACTOR'S AFFIDAVIT AND INDEMNITY

- (1) Submit three completed and notarized copies of AIA Form G706 "Contractor's Affidavit of Payment of Debts and Claims" and AIA Form G707 "Consent of Surety Company to Final Payment" with request for Final Payment.

END OF SECTION

03.11 TESTING, INSPECTIONS, PERMITS, & MAINTENANCE BONDS

03.11.01 TESTING

- (1) On-site testing shall be provided by the KCATA. KCATA provided testing shall include subgrade & aggregate density tests, concrete sampling and testing, and asphalt compaction testing. Contractor shall be responsible to notify the KCATA, its representative and the designated testing lab when materials are ready for testing, prior to placement of concrete or subsequent materials.
- (2) Fabrication-related testing shall be performed by the Contractor. A certified inspector shall perform these tests and shall document the inspection finding daily.
- (3) Contractor shall be responsible for all testing necessary to assure concrete and/or asphalt plants, products and materials are in compliance with the specifications, unless specifically identified otherwise.
- (4) Contractor shall provide adequate notice when requesting testing. A minimum of 24-hour notice shall be provided. Contractor may request testing services less than 24 hours after notice, however, if the KCATA testing lab is not available, the Contractor shall not proceed with work unless one of the following occurs:
 - (a) The KCATA project manager determines it is acceptable to proceed without the required testing. In this instance, the KCATA reserves the right to conduct post placement testing and charge the Contractor for any costs in excess of the normal testing charges.
 - (b) The Contractor obtains another testing lab, acceptable to the KCATA, to conduct testing. In this instance, the Contractor shall be responsible for all costs associated with the testing.
 - (c) The KCATA shall provide special inspection testing if required.
- (5) Subgrade and aggregate base for asphalt and concrete pavement must be proof rolled with a loaded dump truck in addition to density testing as specified. Proof roll truck shall have a minimum rear axle load of 20,000 lbs. for single axel or 40,000 lbs. for tandem axle. Proof rolling must be witnessed by the KCATA, its representative or the designated testing lab. Identified soft spots (areas rutting to a depth of greater than 1" shall be removed, re-compacted and retested prior to Contractor proceeding with pavement placement.

03.11.02 INSPECTIONS

- (1) Inspections shall be performed by the KCATA or their representative.

03.11.03 PERMITS

- (1) Contractor shall be required to pay for all required permits. All costs (e.g. electrical, excavation, traffic control, etc.) shall be paid for in accordance with Section 05 – Measurement and Payment.

- (2) For a list of anticipated permits and special instructions refer to Section 03.07 Anticipated Permits.

03.11.04 MAINTENANCE BOND

- (1) Two-year Maintenance Bond required.

END OF SECTION

04 STANDARD TECHNICAL SPECIFICATIONS

04.01 MOBILIZATION

(1) See Section 03.01.01 MOBILIZATION.

END OF SECTION

04.02 ADMINISTRATION & MANAGEMENT

(1) See Section 03.01.02 ADMINISTRATION & MANAGEMENT.

END OF SECTION

05 PROJECT MEASUREMENT AND PAYMENT

THE FOLLOWING SCOPE OR BID ITEMS MAY NOT BE INCLUDED IN THE PROPOSAL OR BID FORM. THE ONLY BID ITEMS FOR THIS PROJECT ARE AS INDICATED IN THE BID FORM. THE COST OF ALL WORK NECESSARY TO COMPLETE THE PROJECT AS INDICATED IN THE PLANS AND SPECIFICATIONS SHALL BE INCLUDED IN THE ITEMS LISTED IN THE BID FORM.

05.01 MOBILIZATION

- (1) Mobilization shall be considered Lump Sum and paid at the contract unit price as shown on the bid form. Such payment and price shall constitute full compensation for all labor, all bonds, permits, insurance, temporary office, materials, and equipment necessary to complete the item.
- (2) Mobilization costs shall be paid as follows: 1st Payment application – 50%, 2nd Payment application – 25%, 3rd Payment application – 25%. If requested, the Contractor shall submit a breakdown of items included in Mobilization.

Mobilization shall be limited to 5% or \$100,000 of contract value – whichever is less.

05.02 ADMINISTRATION AND MANAGEMENT

- (1) Administration & Management shall be considered Lump Sum and paid out as a percentage equal to the estimated percent complete of the project. Such payment and price shall constitute full compensation for all labor, materials and equipment necessary to complete the item.

05.03 FABRICATION

- (1) Payment for the fabrication of the materials included in this Contract shall be in accordance with Section 03.02.01 SCHEDULE OF VALUES.

SECTION 01 60 01

BUY AMERICA REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. The Buy America requirements including the provisions of 49 U.S.C. Section 5323(j) and 49 CFR Part 661 apply to this Project.
- B. This Project is partially funded by the FTA. No funds will be obligated by FTA for Owner's (grantee's) Project unless all iron, steel, and manufactured products used in the project are produced in the United States, unless a waiver has been granted by FTA or the product is subject to a general waiver:
 - 1. For waiver requirements see:
 - a. 49 CFR Part 661.7 Waivers.
 - b. 49 U.S.C. Section 5323(j)(2) Waiver.
 - 2. Recently published waivers may be viewed at URL's (web address) including, but not limited to, the following:
 - a. <https://www.transit.dot.gov/regulations-and-guidance/buy-america/waivers-granted>.
 - b. General Waivers:
 - 1) <https://www.law.cornell.edu/cfr/text/48/25.104> .
 - 2) <https://www.law.cornell.edu/cfr/text/49/661.7> .
- C. All products furnished for this Project shall comply with Buy America regardless of value.
- D. If a lower tier contractor discovers that a specified product - whether indicated in a specification section or on a drawing - does not meet Buy America requirements they shall immediately notify General Contractor in writing.
- E. Each lower tier contractor shall include a Buy America certificate with their product submittals in the form indicated in Part 2 below.

1.2 REFERENCES

- A. CFR - Code of Federal Regulations (<https://www.gpo.gov>):
 - 1. 49 CFR Part 661 - BUY AMERICA REQUIREMENTS.
- B. FTA - Federal Transit Administration:
 - 1. Johnson, J.P. (Sept. 2001). Guide to Federal Buy America Requirements. Legal Research Digest, September 2001 - Number 17, by Transit Cooperative Research Program (TCRP) Sponsored by the FTA.
 - 2. Johnson, J.P. (Mar. 2010). Guide to Federal Buy America Requirements - 2009 Supplement. Legal Research Digest 31, March 2010 - by Transit Cooperative Research Program (TCRP) Sponsored by the FTA.
- C. U.S.C. - United States Code (<https://www.gpo.gov>):
 - 1. 49 U.S.C. Section 5323(j) Buy America.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Buy America Certificate: Include following on company's letterhead:

BUY AMERICA CERTIFICATE

Certification requirement for procurement of steel, iron, or manufactured products.

Certificate of Compliance with 49 U.S.C. Section 5323(j)(1).

The bidder or offeror hereby certifies that it will meet the requirements of 49 U.S.C. Section 5323(j)(1) and the applicable regulations in 49 CFR Part 661.5.

Date: ____

Signature: _____

Company Name: _____

Title: _____

Certificate of Non-Compliance with 49 U.S.C. 5323(j)(1).

The bidder or offeror hereby certifies that it cannot comply with the requirements of 49 U.S.C. Section 5323(j)(1) and 49 C.F.R. 661.5, but it may qualify for an exception pursuant to 49 U.S.C. Sections 5323(j)(2)(A), 5323(j)(2)(B), or 5323(j)(2)(D), and 49 CFR 661.7.

Date: ____

Signature: _____

Company Name: _____ Title: _____

PART 3 - EXECUTION - NONE

END OF SECTION

SECTION 34 11 00 RAIL

PART 1 - GENERAL

1.1 SUMMARY

A. Scope

1. This specification covers carbon steel rails that are intended for use as tee rails and grooved rails for streetcars.

1.2 RELATED SECTIONS

A. Section 01 60 01 – Buy America Requirements

1.3 REFERENCES

A. American Railway Engineering and Maintenance-of-Way Association (AREMA:

1. AREMA – “Manual for Railway Engineering” (AREMA Manual), latest edition,

1.4 SUBMITTALS

A. Certification that the products submitted meet Buy America requirements of 49 U.S.C Section 5323(j) and 49 CFR Part 661.

PART 2 - PRODUCTS

2.1 OWNER SUPPLIED MATERIALS

A. 112 TRAM Rail

2.2 CONTRACTOR SUPPLIED MATERIALS

A. 115 RE Rail

2.3 TEE RAIL

A. 115 RE section head-hardened rail in accordance with the Intermediate Strength Rail requirements of AREMA “Specifications for Steel Rails” and as specified.

2.4 GROOVED RAIL MANUFACTURE

A. Grooved rail section shall be 112 TRAM Rail.

B. The steel shall be melted using electric-furnace process.

C. The steel in liquid form shall be vacuum degassed.

D. The steel shall be produced using a continuous casting process. The minimum reduction ratio from cast bloom to final product will be 8:1.

E. The Product shall be hot rolled.

F. All aspects of the Manufacturer’s quality system shall be in effect.

2.5 GROOVED RAIL CHEMICAL COMPOSITION

A. Final chemical testing will be from the tundish during casting and will represent the front and back of the heat. The average of the tests will be reported. Finished material representing the heat may be product tested. The product analysis shall be considered as meeting the specification if they are within the limits specified on the right side of the tables below.

1. Premium Strength

Element

Chemical Analysis (wt %)

Product Analysis Tolerance (wt %)

		Under Min.	Over Max.
Carbon	0.62 – 0.80	0.02	0.02
Manganese	0.70 – 1.20	0.05	0.05
Phosphorus Max.	0.025		0.008
Sulfur Max.	0.025		0.008
Silicon	0.15 – 0.58	0.02	0.02
Chromium Max.	0.15		0.03
Molybdenum Max.	0.050		
Aluminum Max.	0.010		
Copper Max.	0.40		
Hydrogen Max.	2.5 ppm		

B. Hydrogen

1. Hydrogen shall be subject to the limits listed above. If the hydrogen exceeds those limits, the blooms from the heat shall be controlled cooled per AREMA Chapter 4 Section 2.1.18 and the rails will be tested.

PART 3 - EXECUTION

3.1 MECHANICAL PROPERTIES AND ELECTRICAL RESISTANCE

- A. Brinell Hardness will be measured on the running surface of the rail after the decarburized layer has been removed. The frequency of testing shall be once per heat and will be conducted in accordance with ASTM E 10. For 112 TRAM rail, the minimum hardness will be 260 BHN. For intermediate strength 115 RE rail, the minimum hardness will be 350 BHN.
- B. Tensile tests will be taken from the running surface corner of the rail. The frequency shall be once per heat and will be conducted in accordance with ASTM A 370. Results will be determined by grade. For 112 TRAM rail, the minimum tensile strength will be 128 ksi with a 10% elongation. For 115 RE rail, the minimum tensile strength will be 155 ksi with a 10% elongation.
- C. If any tests fail to meet the requirements of 3.1.A or 3.1.B, then two further tests shall be performed on samples from two other rails from the same heat. If those two tests are successful, the rails from the heat are acceptable.
- D. Direct current resistance shall be measured on one rail per heat and shall not be more than 10.5 micro-ohms (x 10⁻⁶ ohms) per foot. Alternatively, the electrical resistance can be determined by calculating the electrical resistivity ratio in comparison to pure copper. The calculated resistivity ratio to Cu will be 15.0 maximum.

3.2 DIMENSIONAL TOLERANCES

- A. Tolerances for 115 RE Rail is per AREMA Chapter 4 Section 2.1.5.
- B. The drawings of the 112 TRAM Rail along with the nominal dimensions are listed in Appendix A. Dimensional tolerances to nominal are as follows:

Height of Rail (running or groove side)	-0.020"/+0.040"
Width of Groove	-0.040"/+0.040"
Depth of Groove	-0.040"/+0.040"
Width of Running Rail Head	-0.040"/+0.040"

Overall Top Width	-0.080"/+0.060"
Base Width	-0.125"/+0.125"
Base Concavity	-0.000"/+0.040"
Twist	0.063" max

3.3 IDENTIFICATION

- A. 115 RE Rail will be stamped per AREMA Chapter 4 Section 2.1.6.
- B. The 112 TRAM Rail will be cold stamped on the grooved head (not running surface) once at each end of the rail. The cold stamp will include manufacturer code, grade, and heat number (XX P x#####). The letter in the heat number specifies year produced.

3.4 SURFACE IMPERFECTIONS

- A. All rails shall undergo visual surface inspection to cull injurious imperfections.
- B. Surface imperfections may be conditioned as long as the rail microstructure is not affected by the operation. This may be accomplished by using appropriate methods (lamellar flap tool, grinding belt, etc.)
- C. Protrusions
1. Protrusions on the running surface or underside of the base shall be dressed smooth.
 2. Protrusions on any other surface are allowed up to 0.060". Protrusions higher than 0.060" may be conditioned down to 0.060".
- D. Depressions
1. Depressions in the base and rail body:
 - a. Hot scratches, scratches, and grooves that are principally longitudinal to the rail axis shall not exceed a depth of 0.040". Imperfections principally transverse to the rail axis shall not exceed 0.030". Transverse imperfections greater than 0.020" but not less than 0.040" may be conditioned down to 0.030".
 - b. Seams are allowed up to a depth of 0.040" and a surface area of 0.160" (transverse) by 1.180" (longitudinal).
 - c. Overlaps are allowed of up to 0.020" deep and can extend the full length of the rail.
 - d. Cold marks are allowed up to 0.020".
 2. Depressions in the running surface:
 - a. Imperfections in the running surface shall not exceed 0.020" in depth.
 - b. Principally longitudinal defects shall be a maximum of 0.160" wide, and principally transverse defects shall not have an area exceeding 0.400" x 0.080".

3.5 STRAIGHTNESS

- A. The rail shall be straightened in a roller straightening process.
- B. End straightness:
1. The straightness of the ends of the rails shall be checked with a 3' straightedge. Within this length, deviations from straightness in the vertical or horizontal directions shall not exceed 0.030". The deviation in the vertical direction is only allowed if the end has a continual upsweep.
- C. Line straightness:
1. Line straightness from end to end shall be determined by string (wire) lining. If there is a sharp kink, it shall be further examined and corrected. For general sweep, if an imaginary line was drawn from one end to the other of a 40' rail, the maximum tolerable gap will be 1".

3.6 COLD SAWING

- A. The cut shall be square in both the vertical and horizontal directions with a maximum deviation of 0.30”.
- B. Any excessive saw burr will be removed. No beveling of the end will be allowed.
- C. Rail shall be cold sawed only, all other cutting methods are prohibited.

3.7 CERTIFICATION

- A. A certified mill test report will be issued with the results of the chemical, mechanical and dimensional testing to confirm the product meets this specification.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

- A. No Separate measurement will be made for Work described in this Section.

PART 5 - PAYMENT

5.1 PAYMENT

- A. Payment for items in this Section will be incidental to the Contract unit cost of the Embedded Track and Ballasted Track bid items.

Technical drawing of a mechanical part, likely a bracket or flange, showing dimensions and tolerances. The drawing includes the following specifications:

- Overall Dimensions:**
 - Top Width: $4.685^{+.060}_{-.080}$
 - Bottom Width: $6.000^{+.125}$
 - Left Height: $2.835^{+.040}_{-.020}$
 - Right Height: $2.756^{+.040}_{-.020}$
- Internal Features and Radii:**
 - Top Left Corner: $R\ 3.15$
 - Top Center Corner: $R\ 11.811$
 - Top Right Corner: $R\ 3.15$
 - Right Side Corner: $R\ 236$
 - Right Side Corner: $R\ .118$
 - Right Side Corner: $R\ .394$
 - Right Side Corner: $R\ .118$
 - Bottom Left Corner: $R\ .118$
 - Bottom Right Corner: $R\ .118$
 - Internal Corner: $R\ .512$
 - Internal Corner: $R\ .512$
 - Internal Corner: $R\ .512$
- Angles and Fillets:**
 - Top Left Fillet: 1.9°
 - Top Center Fillet: 9.5°
 - Top Right Fillet: 9.5°
 - Right Side Fillet: 1.9°
- Other Dimensions:**
 - Top Left Segment: $2.205 \pm .040$
 - Top Right Segment: $1.654 \pm .040$
 - Right Side Segment: $1.772 \pm .040$
 - Bottom Left Segment: $.657$
 - Bottom Right Segment: $.657$
 - Internal Vertical Segment: 1.182
 - Internal Vertical Segment: $.984$
 - Internal Horizontal Segment: $.369$
 - Internal Horizontal Segment: $.369$
- Notes:**
 - "THIS SURFACE MAY BE UNDERFILLED" (multiple locations)
 - "THIS RADIUS MAY BE UNDERFILLED"
 - "C.G." (Center of Gravity)

112TRAM	
CAD DWG FILE: COLDSIZE	FILE: 112TRAM
	Roll Department
	ArcelorMittal Steel
DATE 6/17/13	Steeltown, PA 17113
SCALE 1:1	NOTE: PRINTED VERSION IS UNCONTROLLED COPY

END OF SECTION

SECTION 34 11 23

SPECIAL TRACKWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Description
 - 1. This Specification defines the requirements for the design, detailing, manufacturing, fabricating, furnishing and delivery of the special trackwork.
 - 2. Special trackwork for this project shall consist of turnouts and all related equipment including switches and other track materials. All special trackwork shall have high-strength, head-hardened AREMA 115 RE rail in embedded track. Switch assembly shall be a flexive tongue switch. Special trackwork shall include the following:
 - a. 25 M straight frog turnout with 115 lb. rail (115 lb. RBM frog) in embedded track.
 - b. 25 M continuously curved frog turnout with 115 lb. rail (115 lb. RBM frog) in embedded track.
 - 3. For Special Trackwork ties, see Contract Documents.
 - 4. The scope of work shall include all rail and associated components to include adapter plates for mounting switch machine rods. Supports and brackets for the switch machines shall be supplied by the switch machine manufacturer.

1.2 RELATED SECTIONS

- A. Section 01 60 01 – Buy America Requirements
- B. Section 34 11 00 – Rail
- C. Section 34 11 29 – General Track Construction
- D. Section 34 11 93 – Other Track Materials.

1.3 REFERENCES

- A. AREMA -American Railway Engineering and Maintenance-of-Way Association Manual for Railway Engineering, latest Edition.
- B. AREMA - American Railway Engineering and Maintenance-of-Way Association Portfolio of Trackwork Plans, latest Edition.
- C. ASTM - ASTM International, Current Editions.
- D. ANSI - American National Standards Institute, American National Standards Code, Current Edition.
- E. NEMA - National Electrical Manufacturers Association, Industrial Laminate Section Codes, Current Edition.
- F. AREMA – Various - Manual for Railway Engineering.
- G. AREMA Spec. 100 - Portfolio of Trackwork Plans.
- H. ASTM A 27 - Steel Castings, Carbon for General Application.
- I. ASTMA 47 - Ferrite Malleable Iron Castings.
- J. ASTMA 128 - Steel Castings, Austenitic Manganese.
- K. ASTMA 325 - High-Strength Bolts for Structural Steel Joints.
- L. ASTMA 490 - Heat-Treated Steel Structural Bolts.
- M. ASTMB 633 - Electrodeposited Coatings of Zinc on Iron and Steel.

- N. ASTM D 149 Rev A - Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.
- O. ASTM D 217 - Standard Test Method for Cone Penetration of Lubricating Grease.
- P. ASTM D 257 - DC Resistance or Conductance of Insulating Materials.
- Q. ASTM D 395 - Standard Test Method for Rubber Properties in Compression Set.
- R. ASTM D 429 - Rubber Property-Adhesion to Rigid Substrates.
- S. ASTM D 445 - Rubber Test Method for Kinematic Viscosity of Transparent and Opaque Liquids.
- T. ASTM D 471 - Rubber Property – Effect of Liquids.
- U. ASTM D 543 -Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
- V. ASTM D 566 - Standard Test Method for Dropping Point of Lubricating Grease.
- W. ASTM D 575 - Standard Test Method for Rubber Properties in Compression.
- X. ASTM D 751 - Standard Test Method for Coated Fabrics E1- 1997.
- Y. ASTM D 792 - Standard Test Method for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
- Z. ASTM D 814 - Standard Test Method for Rubber Property – Vapor Transmission of Volatile Liquids.
- AA. ASTM D 1004 -Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
- BB. ASTM D 2231 - Standard Practice for Rubber Properties in Forced Vibration.
- CC. ASTM D 2240 - Standard Test method for Rubber Property- Durometer Hardness.
- DD. ASTM D 3083 - Standard Specification for Flexible Poly (Vinyl Chloride) Plastic Sheeting for Pond, Canal, and Reservoir Lining.
- EE. ASTM D 4833 - Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products (E1-1996).
- FF. ANSI B18.2.1 - Square and Hex Bolts and Screws.
- GG. ANSI B18.21.1 - Lock Washers.
- HH. ANSI B18.22.1 - Plain Washers.
- II. NEMA LI-1 - Industrial Laminated Thermosetting Products.

1.4 TESTING

- A. Except where specifically stated otherwise, all testing specified shall be undertaken by the Manufacturer. If the Manufacturer has previous or existing test results or certifications that are applicable, it may supply those, subject to DESIGN PROFESSIONAL approval.

1.5 SUBMITTALS

- A. Submit or retain the following:
 1. The Manufacturer shall submit separate shop drawings for each special trackwork turnout for review by DESIGN PROFESSIONAL.
 2. Submit interface drawings addressing the attachment of the switch and detector rods to the special trackwork, prepared by the Manufacturer for review by DESIGN PROFESSIONAL.
 3. Retain full installation details and step-by-step procedures for installing the special trackwork in the field. The procedures also shall address the interface requirements for the installation of the switch machine.

4. Submit shop drawings showing the location and routing of turnout drainage connections for review.
5. Submit shop drawings showing the turnout encapsulation for review.
6. Submit certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661.

1.6 TOLERANCES

- A. All fabrication tolerances shall conform with the track gauge of 4'- 8 1/2", +/- 1/8", and a horizontal and vertical cross level tolerance of 1/16 inch.
- B. All component and fit tolerances shall meet the applicable requirements of AREMA Portfolio Drawings 1010 and 1011, and Specification 100.
- C. Special trackwork manufacturer shall conduct a wheel/rail study to verify gauge and include with trackwork submittal for DESIGN PROFESSIONAL's review.

1.7 COMPATIBILITY WITH SWITCH MACHINES

- A. Special trackwork and components shall be compatible with interface and operation of the designated switch machine manufacturer's model. Compatibility shall be confirmed by design and testing as specified herein.

1.8 SPECIAL TRACKWORK GEOMETRY

- A. The following dimensions are fixed for each turnout as indicated on the Contract Drawings and may not be altered by the Manufacturer:
 1. Turnout Lead.
 2. Length of switch alignment.
 3. Radius of switch points.
 4. Frog number.
 5. Throw at point of switch.
 6. Spread at heel of switch.

PART 2 - PRODUCTS

2.1 OWNER SUPPLIED MATERIALS

- A. 25 M straight frog turnout with 115 lb. rail (115 lb. RBM frog)
- B. 25 M continuously curved frog turnout with 115 lb. rail (115 lb. RBM frog)

2.2 CONTRACTOR SUPPLIED MATERIALS

- A. All materials required to meet electrical isolation requirements
- B. All materials required to embed the special trackwork.
- C. All additional materials not supplied by the special trackwork manufacturer required to fully install all special trackwork.

2.3 RAIL

- A. Rail for special trackwork, including stock rail and closure rail, shall be high strength, head-hardened and have zero cant.
- B. Stock rails shall vary in length according to Special Trackwork Drawings (K909 and K910).
- C. Rails shall be cut square and clean by means of rail saws, shears or abrasive cutting wheels in accordance with the applicable current AREMA standards. All jointed rail shall be developed from one continuous rail section.
- D. Curved rails (for curves with radius < 400 feet) shall be pre-curved in the shop by roller bending methods. The rails shall be curved to true radius throughout the designated curve length and shall not exhibit visible kinks or tangents. Applicable insulated joints shall also be pre-curved.

2.4 SWITCH POINTS

- A. Switch points shall be as per the Special Trackwork Contract Drawings. Switch points shall have reinforcing bars attached by square-head bolts and hex nuts; Reinforcing bars shall be 1/2 inch thick and double-reinforced, as per AREMA Portfolio Plan 221.
- B. Flexive switches shall consist of 115RE rail bounding an insert bed.
- C. Alignment of switch points shall be as per AREMA drawings with extended length for the installation of floating heel blocks. Switch point length currently is set as per the Contract Drawings. Manufacturer may substitute alternatives subject to the DESIGN PROFESSIONAL's approval.
- D. Switch points shall have an undercut design in accordance with AREMA Plan Basic Number 221, Detail 5100. Switch point stops shall bear against the supporting stock rails when points are in the thrown positions.
- E. All switches shall be installed for interlocked power operation except within the limits of the Vehicle Maintenance Facility.

2.5 HEEL BLOCKS

- A. AREMA 11' straight and 13' curved switch points shall have heel-joint assemblies as per AREMA Plan 221. AREMA switch points of 16'-6", 19'-6", and 26'-0" shall have floating heel block assemblies. CONTRACTOR shall consider alternate designs according to Contract Drawing K909 and K910 or approved Shop Drawing substitute.
- B. The floating heel block on the straight side of the turnout (curved switch point) shall consist of cast steel, Class B.
- C. At locations where a restraining rail in the crotch area between the stock rail and the closure rail extends to the heel block, the heel block shall incorporate a flangeway flare design to maintain the curve guarding for the longest possible distance. Material for such heel blocks shall be cast manganese steel.

2.6 RAIL BRACES AND SLIDE PLATES – (NOT USED)

2.7 GAUGE PLATES – (NOT USED)

2.8 TURNOUT FROGS

- A. Turnout frogs shall be fabricated to the designated turnout number geometrics and shall be flange-bearing welded boltless manganese frogs in accordance with AREMA Plans 622-03, 623-03 or 624-03; or flange-bearing welded boltless manganese frogs; or as applicable, and as designated on the Contract Drawings.
- B. Austenitic manganese steel castings shall be of a heavy wall thickness design in accordance with the requirements of AREMA Plan Basic Number 100, Section M2.2, and ASTM A 128, Grade A. Castings shall be explosive depth hardened in accordance with AREMA, Specifications for Special Trackwork, Article M2.7, with a minimum Brinell hardness of 350. Hardening shall project uniformly to 250 BHN at a depth of 1 1/8 inches.
- C. The Manufacturer shall produce shop drawings to specify the procedures to be used for the depth hardening process, the portions of each frog which are to be depth hardened, and the Brinell hardness pattern which the Manufacturer anticipates to achieve with such procedures.

2.9 FROG GUARD RAIL

- A. Frog guardrail shall consist of a tee rail design with single piece construction and level guardrail height. The ends of the guardrail shall be beveled and milled. The flangeway shall be the minimum width required for the proposed X.06.00455 wheel profile. Foot guards shall be provided. For details, refer to Contract Drawings.

2.10 TIE PLATES – (NOT USED)

2.11 TURNOUT PLATES

- A. Turnout plates shall be designed to accommodate the required turnout geometry and for use with an elastic rail clip system with welded on shoulders. The plates shall be insulated as required to conform with system electrical isolation requirements.

2.12 SWITCH RODS

- A. Switch rods shall be vertical insulated switch rods.
- B. Prior to assembly of insulated joints, the mating surface and ends of switch rods, steel channel, and splice plates shall be coated with an approved insulation enamel. The assembled joints shall be dielectrically tested to verify that insulated joints can withstand a potential of 1,500 volts dc for one minute without evidence of flashover, pinholes, or fracture.
- C. Switch Rod Insulation shall be as per AREMA C&S Requirement for insulation

2.13 TRACK CROSSINGS – (NOT USED)

2.14 LUBRICATION

- A. Lubricant for moving parts in turnouts shall meet the following requirements:
 - 1. Calcium soap - 9%.
 - 2. Graphite - 11.5%.
 - 3. Penetration, ASTM D 217 at 70° F worked – 340.
 - 4. Dropping Point, ASTM D 566 at 77° F - 101/214.
 - 5. Oil viscosity, ASTM D 445, cSt at 104° F - 81.8.
- B. Other types of lubricants may be used providing that the lubricant has been used successfully by other rail agencies, and subject to the DESIGN PROFESSIONAL's written statement of no objection.

2.15 RAIL JOINTS

- A. Rail joints for special trackwork shall be thermite welded or by means of joint bars. Where a joint occurs in a guarded rail section of the turnout, a separator block shall be provided for the full length of joint bar in between the two rails.
- B. Joint bars and separator blocks shall meet the requirements specified in Section 34 11 93.
- C. Insulated joints shall meet the requirements specified in Section 34 11 93. Insulated joints located in single rails shall be of an epoxy glue design. Insulated joints located in guarded rail sections shall be a poly-encapsulated design.
- D. All bolted joints shall be a minimum length of 36 IN and have six bolts.

2.16 SWITCH TIES – (NOT USED)

PART 3 - EXECUTION

3.1 DETAILED DESIGN

- A. The Manufacturer shall develop all required details in accordance with these specifications and good practice. Detailed shop drawings shall be provided by the CONTRACTOR for all components including but not limited to frogs, switches, closure rails, restraining rails, rail fastener plates, and fastener layouts. The CONTRACTOR shall address the following considerations in the design of special trackwork:
 - 1. Rail Lengths - Design layouts with rails that are to be left longer than the theoretical length shown on the Contract drawings and with blank (non-drilled) ends so that such rails can be cut and drilled in the field to compensate for accumulated construction tolerance deviations in assembly of the layouts.

2. Dimensions - All dimensions shall be confirmed in the field with respect to locations where the new special trackwork must tie into existing tracks. The location of existing joints and the amount of wear on existing rails shall be determined so that the location of joints can be detailed on the shop drawings.

3.2 SHOP ASSEMBLY FOR DOUBLE Crossovers & RR CROSSING – NOT USED

3.3 HANDLING AND DELIVERY

- A. All rails and special trackwork shall be handled carefully and delivered in open top containers to avoid damage by kinking, bending, nicking, or other potential damage to the rail. Rails and special trackwork components shall not be dropped or struck sharply. Handling and delivery shall be in accordance with accepted industry practice.
- B. Stock rails, closure rails, tongue rails, and frogs shall be delivered assembled with associated fasteners attached.
- C. Each turnout component shall have identification markings and be part of an identification system to aid turnout installation.
- D. All bundles, boxes and kegs shall be clearly marked with the following information:
 1. Identification of items contained.
 2. Supplier's name.
 3. Delivery date.
 4. Number of pieces.
 5. Gross weight.

3.4 ACCEPTANCE

- A. Acceptance is subject to inspection upon delivery.

PART 4 - MEASUREMENT

4.1 ITEM BASIS

- A. Measurement of the turnouts will be per each turnout supplied and installed.

PART 5 - PAYMENT

5.1 GENERAL

- A. The accepted measured quantity of each pay item will be paid for at the Contract unit price per unit of measurement. The Contract unit price will be payment in full for furnishing all labor, contractor supplied materials, tools, equipment and incidentals, and doing all Work necessary to complete the Work specified.

END OF SECTION

SECTION 34 11 23

SPECIAL TRACKWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Description
 - 1. This Specification defines the requirements for the design, detailing, manufacturing, fabricating, furnishing and delivery of the special trackwork.
 - 2. Special trackwork for this project shall consist of turnouts and all related equipment including switches and other track materials. All special trackwork shall have high-strength, head-hardened AREMA 115 RE rail in embedded track. Switch assembly shall be a flexive tongue switch. Special trackwork shall include the following:
 - a. 25 M continuously curved frog turnout with 115 lb. rail (115 lb. RBM frog) and diamond in embedded track.
 - 3. For Special Trackwork ties, see Contract Documents.
 - 4. The scope of work shall include all rail and associated components to include adapter plates for mounting switch machine rods. Supports and brackets for the switch machines shall be supplied by the switch machine manufacturer.

1.2 RELATED SECTIONS

- A. Section 01 60 01 – Buy America Requirements
- B. Section 34 11 00 – Rail
- C. Section 34 11 29 – General Track Construction
- D. Section 34 11 93 – Other Track Materials.

1.3 REFERENCES

- A. AREMA -American Railway Engineering and Maintenance-of-Way Association Manual for Railway Engineering, latest Edition.
- B. AREMA - American Railway Engineering and Maintenance-of-Way Association Portfolio of Trackwork Plans, latest Edition.
- C. ASTM - ASTM International, Current Editions.
- D. ANSI - American National Standards Institute, American National Standards Code, Current Edition.
- E. NEMA - National Electrical Manufacturers Association, Industrial Laminate Section Codes, Current Edition.
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- CC. ASTM D 2240 - Standard Test method for Rubber Property- Durometer Hardness.
- DD. ASTM D 3083 - Standard Specification for Flexible Poly (Vinyl Chloride) Plastic Sheeting for Pond, Canal, and Reservoir Lining.
- EE. ASTM D 4833 - Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products (E1-1996).
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4. Submit shop drawings showing the location and routing of turnout drainage connections for review.
5. Submit shop drawings showing the turnout encapsulation for review.
6. Submit certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661.

1.6 TOLERANCES

- A. All fabrication tolerances shall conform with the track gauge of 4' - 8 1/2", +/- 1/8", and a horizontal and vertical cross level tolerance of 1/16 inch.
- B. All component and fit tolerances shall meet the applicable requirements of AREMA Portfolio Drawings 1010 and 1011, and Specification 100.
- C. Special trackwork manufacturer shall conduct a wheel/rail study to verify gauge and include with trackwork submittal for DESIGN PROFESSIONAL's review.

1.7 COMPATIBILITY WITH SWITCH MACHINES

- A. Special trackwork and components shall be compatible with interface and operation of the designated switch machine manufacturer's model. Compatibility shall be confirmed by design and testing as specified herein.

1.8 SPECIAL TRACKWORK GEOMETRY

- A. The following dimensions are fixed for each turnout as indicated on the Contract Drawings and may not be altered by the Manufacturer:
 1. Turnout Lead.
 2. Length of switch alignment.
 3. Radius of switch points.
 4. Frog number.
 5. Throw at point of switch.
 6. Spread at heel of switch.

PART 2 - PRODUCTS

2.1 OWNER SUPPLIED MATERIALS

- A. 25 M continuously curved frog turnout with 115 lb. rail (115 lb. RBM frog) and diamond

2.2 CONTRACTOR SUPPLIED MATERIALS

- A. All materials required to meet electrical isolation requirements
- B. All materials required to embed the special trackwork.
- C. All additional materials not supplied by the special trackwork manufacturer required to fully install all special trackwork.

2.3 RAIL

- A. Rail for special trackwork, including stock rail and closure rail, shall be high strength, head-hardened and have zero cant.
- B. Stock rails shall vary in length according to Special Trackwork Drawings (K909A).
- C. Rails shall be cut square and clean by means of rail saws, shears or abrasive cutting wheels in accordance with the applicable current AREMA standards. All jointed rail shall be developed from one continuous rail section.
- D. Curved rails (for curves with radius < 400 feet) shall be pre-curved in the shop by roller bending methods. The rails shall be curved to true radius throughout the designated curve length and shall not exhibit visible kinks or tangents. Applicable insulated joints shall also be pre-curved.

2.4 SWITCH POINTS

- A. Switch points shall be as per the Special Trackwork Contract Drawings. Switch points shall have reinforcing bars attached by square-head bolts and hex nuts; Reinforcing bars shall be 1/2 inch thick and double-reinforced, as per AREMA Portfolio Plan 221.
- B. Flexive switches shall consist of 115RE rail bounding an insert bed.
- C. Alignment of switch points shall be as per AREMA drawings with extended length for the installation of floating heel blocks. Switch point length currently is set as per the Contract Drawings. Manufacturer may substitute alternatives subject to the DESIGN PROFESSIONAL's approval.
- D. Switch points shall have an undercut design in accordance with AREMA Plan Basic Number 221, Detail 5100. Switch point stops shall bear against the supporting stock rails when points are in the thrown positions.
- E. All switches shall be installed for interlocked power operation except within the limits of the Vehicle Maintenance Facility.

2.5 HEEL BLOCKS

- A. AREMA 11' straight and 13' curved switch points shall have heel-joint assemblies as per AREMA Plan 221. AREMA switch points of 16'-6", 19'-6", and 26'-0" shall have floating heel block assemblies. CONTRACTOR shall consider alternate designs according to Contract Drawing K909A or approved Shop Drawing substitute.
- B. The floating heel block on the straight side of the turnout (curved switch point) shall consist of cast steel, Class B.
- C. At locations where a restraining rail in the crotch area between the stock rail and the closure rail extends to the heel block, the heel block shall incorporate a flangeway flare design to maintain the curve guarding for the longest possible distance. Material for such heel blocks shall be cast manganese steel.

2.6 RAIL BRACES AND SLIDE PLATES – (NOT USED)

2.7 GAUGE PLATES – (NOT USED)

2.8 TURNOUT FROGS

- A. Turnout frogs shall be fabricated to the designated turnout number geometrics and shall be flange-bearing welded boltless manganese frogs in accordance with AREMA Plans 622-03, 623-03 or 624-03; or flange-bearing welded boltless manganese frogs; or as applicable, and as designated on the Contract Drawings.
- B. Austenitic manganese steel castings shall be of a heavy wall thickness design in accordance with the requirements of AREMA Plan Basic Number 100, Section M2.2, and ASTM A 128, Grade A. Castings shall be explosive depth hardened in accordance with AREMA, Specifications for Special Trackwork, Article M2.7, with a minimum Brinell hardness of 350. Hardening shall project uniformly to 250 BHN at a depth of 1 1/8 inches.
- C. The Manufacturer shall produce shop drawings to specify the procedures to be used for the depth hardening process, the portions of each frog which are to be depth hardened, and the Brinell hardness pattern which the Manufacturer anticipates to achieve with such procedures.

2.9 FROG GUARD RAIL

- A. Frog guardrail shall consist of a tee rail design with single piece construction and level guardrail height. The ends of the guardrail shall be beveled and milled. The flangeway shall be the minimum width required for the proposed X.06.00455 wheel profile. Foot guards shall be provided. For details, refer to Contract Drawings.

2.10 TIE PLATES – (NOT USED)

2.11 TURNOUT PLATES

- A. Turnout plates shall be designed to accommodate the required turnout geometry and for use with an elastic rail clip system with welded on shoulders. The plates shall be insulated as required to conform with system electrical isolation requirements.

2.12 SWITCH RODS

- A. Switch rods shall be vertical insulated switch rods.
- B. Prior to assembly of insulated joints, the mating surface and ends of switch rods, steel channel, and splice plates shall be coated with an approved insulation enamel. The assembled joints shall be dielectrically tested to verify that insulated joints can withstand a potential of 1,500 volts dc for one minute without evidence of flashover, pinholes, or fracture.
- C. Switch Rod Insulation shall be as per AREMA C&S Requirement for insulation

2.13 TRACK CROSSINGS – (NOT USED)

2.14 LUBRICATION

- A. Lubricant for moving parts in turnouts shall meet the following requirements:
 - 1. Calcium soap - 9%.
 - 2. Graphite - 11.5%.
 - 3. Penetration, ASTM D 217 at 70° F worked – 340.
 - 4. Dropping Point, ASTM D 566 at 77° F - 101/214.
 - 5. Oil viscosity, ASTM D 445, cSt at 104° F - 81.8.
- B. Other types of lubricants may be used providing that the lubricant has been used successfully by other rail agencies, and subject to the DESIGN PROFESSIONAL's written statement of no objection.

2.15 RAIL JOINTS

- A. Rail joints for special trackwork shall be thermite welded or by means of joint bars. Where a joint occurs in a guarded rail section of the turnout, a separator block shall be provided for the full length of joint bar in between the two rails.
- B. Joint bars and separator blocks shall meet the requirements specified in Section 34 11 93.
- C. Insulated joints shall meet the requirements specified in Section 34 11 93. Insulated joints located in single rails shall be of an epoxy glue design. Insulated joints located in guarded rail sections shall be a poly-encapsulated design.
- D. All bolted joints shall be a minimum length of 36 IN and have six bolts.

2.16 SWITCH TIES – (NOT USED)

PART 3 - EXECUTION

3.1 DETAILED DESIGN

- A. The Manufacturer shall develop all required details in accordance with these specifications and good practice. Detailed shop drawings shall be provided by the CONTRACTOR for all components including but not limited to frogs, switches, closure rails, restraining rails, rail fastener plates, and fastener layouts. The CONTRACTOR shall address the following considerations in the design of special trackwork:
 - 1. Rail Lengths - Design layouts with rails that are to be left longer than the theoretical length shown on the Contract drawings and with blank (non-drilled) ends so that such rails can be cut and drilled in the field to compensate for accumulated construction tolerance deviations in assembly of the layouts.

2. Dimensions - All dimensions shall be confirmed in the field with respect to locations where the new special trackwork must tie into existing tracks. The location of existing joints and the amount of wear on existing rails shall be determined so that the location of joints can be detailed on the shop drawings.

3.2 SHOP ASSEMBLY FOR DOUBLE Crossovers & RR CROSSING – NOT USED

3.3 HANDLING AND DELIVERY

- A. All rails and special trackwork shall be handled carefully and delivered in open top containers to avoid damage by kinking, bending, nicking, or other potential damage to the rail. Rails and special trackwork components shall not be dropped or struck sharply. Handling and delivery shall be in accordance with accepted industry practice.
- B. Stock rails, closure rails, tongue rails, and frogs shall be delivered assembled with associated fasteners attached.
- C. Each turnout component shall have identification markings and be part of an identification system to aid turnout installation.
- D. All bundles, boxes and kegs shall be clearly marked with the following information:
 1. Identification of items contained.
 2. Supplier's name.
 3. Delivery date.
 4. Number of pieces.
 5. Gross weight.

3.4 ACCEPTANCE

- A. Acceptance is subject to inspection upon delivery.

PART 4 - MEASUREMENT

4.1 ITEM BASIS

- A. Measurement of the turnouts will be per each turnout supplied and installed.

PART 5 - PAYMENT

5.1 GENERAL

- A. The accepted measured quantity of each pay item will be paid for at the Contract unit price per unit of measurement. The Contract unit price will be payment in full for furnishing all labor, contractor supplied materials, tools, equipment and incidentals, and doing all Work necessary to complete the Work specified.

END OF SECTION

SECTION 34 11 29

GENERAL TRACK CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

A. Description

1. This section specifies general track construction which consists of the mainline and yard trackwork indicated on the plans including installing direct fixation track, ballasted track, embedded/paved track, special trackwork, and track appurtenances.

1.2 RELATED SECTIONS

A. Section 01 60 01 – Buy America Requirements

1.3 REFERENCES

A. American Railway Engineering and Maintenance-of-Way-Association (AREMA):

1. AREMA - "Manual for Railway Engineering" (AREMA Manual), latest edition.
2. AREMA - "Portfolio of Trackwork Plans", latest edition.

B. ASTM International (Formerly known as American Society for Testing and Materials) (ASTM):

1. ASTM A 123-Standard Specification for Zinc (Hot dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM 0570-98 (2018) e1 – Standard Test Method for Water Absorption of Plastics.
3. ASTM D 638-10 – Standard Test Method for Tensile Properties of Plastics.
4. ASTM D 3786 - Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method.
5. ASTM D 4318-10 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
6. ASTM D 4491-99a (2009) - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
7. ASTM D 4533-11 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
8. ASTM D 4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
9. ASTM D 4751-12 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.
10. ASTM D 4833 - Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
11. ASTM D 5199-12 - Standard Test Method for Measuring Nominal Thickness of Geosynthetics.
12. ASTM E10-12 - Standard Test Method for Brinell Hardness of Metallic Materials.

C. American Public Transportation Association (APTA):

1. APTA - "Guidelines For Design of Rapid Transit Facilities" (APTA Guidelines).

D. The Society for Protective Coatings (Formerly known as Steel Structures Painting Council (SSPC)):

1. SPCC-SP 1 – Solvent Cleaning.

E. American Association of State and Highway Transportation Officials (AASHTO).

F. Kansas City Metropolitan Chapter of the American Public Works Association (APWA).

1.4 DEFINITIONS

A. Approach Slab: A reinforced concrete slab located at the interface of ballasted track with direct fixation track or paved track to provide a transition between ballasted track construction and the types of track with significantly higher track modulus.

- B. Ballast: An integral part of the track structure, generally composed of crushed stone in which ties are embedded. Track ballast includes ballast compacted beneath the ties, in the cribs between the ties, and in the ballast shoulders at the ends of the ties.
- C. Bumping Post: A device placed at the end of stub-end tracks to prevent a moving rail vehicle from inadvertently rolling off the end of the track.
- D. Closure Rails: The rails between the parts of any special trackwork layout, such as the rails between the switch and the frog in a turnout; also the rails connecting the frogs of a crossing or of adjacent crossings, but not forming parts thereof.
- E. Continuous Welded Rail (CWR): A number of rails welded together into a single length.
- F. Crossing, Road: The intersection of one or more tracks and a street, road, or highway, at grade.
- G. Crossing, Railroad: The intersection of two tracks, at grade, consisting of four frogs, also known as a “diamond”.
- H. Crosslevel: The difference in elevation of the tops of heads of opposite rails measured at right angles to the track alignment.
- I. Crossover, Single: Two turnouts with the track between the frogs arranged to form a continuous passage between two nearby and generally parallel tracks.
- J. Crossover, Double: Two crossovers which intersect between the connected tracks.
- K. Crossover, Universal: Two single crossovers, one being right hand and the other left hand, joining two nearby parallel tracks. The two single crossovers are located in close proximity to one another and typically are operated by the same signal interlocking.
- L. Frog: A device used at the intersection of two running rails to provide support for wheel treads and passageways for their flanges, thus permitting wheels traversing either rail to cross the other left hand, joining two nearby parallel tracks.
- M. Frog Number: The number used to designate the size of a frog, and being equal to one-half the cotangent of one-half the frog angle.
- N. Grade Line: The line on the profile representing the top of the roadbed ready to receive the sub-ballast at the intersection of the roadbed with a vertical plane through the track center line.
- O. Guard Rail: A rail or other device laid parallel with the running rails of a track to prevent wheels from being derailed; or to hold wheels in correct alignment to prevent their flanges from striking the points of frogs. A rail or other device laid parallel with the running rails of a track to keep derailed wheels adjacent to running rails.
- P. Inside Rail: On curved track, the rail closest to the curve center, the rail with the shorter radius. Sometimes referred to as the "low rail".
- Q. Joint Bar: A steel member, embodying beam-strength and stiffness in its structural shape and material; commonly used in pairs for the purpose of joining rail ends together, and holding them accurately, evenly, and firmly in position with reference to surface and gauge- side alignment.
- R. Outside Rail: On curved track, the rail farthest from the curve center; the rail with the longer radius. Sometimes referred to as the "high rail".
- S. Pocket Track: A track located between the two mainline tracks on which an out-of-service train may lay over or reverse direction.
- T. Profile Grade Line (PGL): The datum line which defines the vertical alignment of the track, applied at the top of the low rail.
- U. Rail Fastening - Ballasted Track: A resilient device used to secure the running rail to the concrete tie at the proper track gauge to provide proper vertical, lateral, and longitudinal restraint of the rail.

- V. Rail Fastener - Direct Fixation Track: A resilient device used in track to secure the running rails to concrete in tunnels, cut and cover structures, aerial structures, and slab track at the proper gauge to provide proper vertical, lateral, and longitudinal restraint of the rail. Also known as direct fixation fasteners or DF fasteners.
- W. Rail Joints: A fastening designed to unite the abutting ends of contiguous rails.
- X. Rail Joint, Insulated: A rail joint designed to arrest the flow of electric current from rail to rail by means of insulation so placed as to separate the rail ends and other metal parts connecting them. Commonly called insulated joints or "IJ's".
- Y. Restraining Rail: A guard rail installed parallel to, concentric with, and on the gauge side of the inside running rail of curved track with a flangeway of approximately 2-1/8 inches. It extends into the tangent track on each end of the curve, bears against the back side of the wheels, and steers the inside wheels of each truck around the curve, thereby reducing the degree of contact of the leading outside wheel flange with the outside rail. It also reduces gauge wear on the outside running rail.
- Z. Roadbed: The foundation (prepared subgrade) on which the track structure consisting typically of sub-ballast and ballast is placed.
- AA. Special Trackwork: A generic term referring to turnouts, single and double crossovers, track crossings, and other such items.
- BB. Standard Rail: A synonymous term to head-hardened 115 RE rail.
- CC. Stock Rail: A running rail against which a switch rail bears in a turnout.
- DD. Stub-up: A conduit temporarily terminated in the roadbed for later use by signal, communication, or traction power installers.
- EE. Sub-Ballast: A material which provides a semi-impervious layer between the finished subgrade of the roadbed and the ballast, to provide better drainage, prevent upheaval by frost, and better distribute the load over the roadbed.
- FF. Subgrade: The finished surface of the roadbed below the level of sub-ballast or track slab.
- GG. Superelevation: The vertical distance of the outer rail of a curve above the inner rail. It is provided to overcome or partially overcome the effects of curvature and speed.
- HH. Switch, Point of: The tip of the tapered end of a switch rail; the end of a switch rail farthest from the frog or heel block.
- II. Switch Point, Undercut: A switch point planed to mate with a stock rail having a planed undercut, in order to provide an effective point width of zero.
- JJ. Switch Rail (Switch Point): A planed, tapered, movable rail which mates with a stock rail to enable movement of a train from one track to another.
- KK. Switch, Split: The common type of track switch consisting essentially of two planed, movable switch rails.
- LL. Top of Rail (T/R): The top surface of the head of the running rail.
- MM. Track, Ballasted: Track constructed of rails, crossties, and ballast. It is the predominant form of track constructed at-grade, but it is also used on short bridges.
- NN. Track, Direct Fixation: Track constructed of rail and rail fasteners attached by means of anchor bolts to concrete, located in tunnels, cut and cover structures, aerial structures, and slab track.
- OO. Track, Embedded (Paved): Track constructed on a track slab and, except for the flangeways, embedded in asphalt, concrete, paving blocks, rubber epoxy, or other such material to the elevation of the top of rail.
- PP. Track, Gauge: The distance between the inside faces of running rails at right angles measured at a point 5/8 inch below the top of rail. Standard gauge: 4 feet 8-1/2 inches.

- QQ. Track, Mainline: A track designated by route name and direction, and which is for the purpose of carrying revenue passengers.
- RR. Track, Secondary and Yard: Track constructed for the purpose of switching, storing, or maintaining rail vehicles or connecting such tracks to mainline tracks.
- SS. Trackway: The foundation on which the track is constructed. It usually consists of an earthen roadbed, but it may also be one of the following: a concrete roadbed for support of direct fixation track or paved track; a ballasted bridge deck (designed to receive ballast); or an aerial structure.
- TT. Turnout: An arrangement of a switch and a frog with stock rails and closure rails, enabling rail vehicles to be diverted from one track to another.
- UU. Turnout Number: The number corresponding to the number of the frog used in the turnout.
- VV. Zero Thermal Stress: The state of uniform stress in CWR, while the rail is unrestrained and free to move longitudinally.
- WW. For additional definitions, refer to AREMA Manual and Portfolio of Trackwork Plans.

1.5 SUBMITTALS

A. Shop Drawings, include the following:

1. General plan for distributing CWR, including:
 - a. Storage location upon delivery and prior to installation.
 - b. General layout of CWR site.
2. Complete details of the proposed methods, including equipment, of laying and fastening CWR. Include method and equipment proposed for achieving zero thermal stress.
3. Description of temperature adjustment and final anchoring procedures for CWR, including charts, tables, and field instructions on heating, cooling and stretching.
4. Charts shall be provided that indicate gaps for varying lengths of rail and varying rail temperatures.

B. Installation Procedures: Prepare and submit a description of the procedures and methods to be employed in the construction of embedded track. At a minimum, include the following:

1. The methods of placing rail, supporting structures, and concrete to produce finished track meeting the alignment requirements within the specified tolerances.
2. The procedure for handling, installing, and field welding continuous welded rail.
3. In accordance with the requirements of APWA-KCMO 2703 SA-2 4,500 psi special aggregate concrete, "Special Aggregate Concrete – Bridge Deck, Sidewalk, Barriers and Curbs, Diaphragms, and Approach Slab", including:
 - a. Procedures for forming, mixing, placing, and curing of concrete.
 - b. Proposed concrete and joint materials; include packing, storing, handling, proportioning, additives, mixing, and placing details.
4. The method of ensuring that the rail and supporting structure are not dislocated during placement of concrete.
5. The procedures for erecting the support beams and securing the rail.
6. Procedures for installation of track drain components.
7. Procedures for installing the rail boot, including splices, and boot clips.
8. Quality control procedures to ensure proper installation.

C. Tie-In to Existing Track Work Plan: Prepare and submit a description of the procedures and methods to be employed in the construction of embedded track at existing track tie-in locations per the process described in section 1.5.B "General Track Construction" and including the following:

1. As part of the Work Plan, provide an installation schedule defining the sequence of operations by which the work will be performed, the anticipated duration of each operation and a definition of the work limits of the tie-in work. Describe each installation operation in detail, indicating the materials, labor, and mechanical equipment needed.
2. As part of the Work Plan, describe any non-track-related work including OCS, drainage, pavement, communications, structural, etc.

3. The CONTRACTOR shall coordinate the general timing of the outage with the CITY/OWNER prior to submitting the Work Plan.
 4. The CONTRACTOR shall submit the Work Plan to the DESIGN PROFESSIONAL and CITY/OWNER for review a minimum of two weeks prior to the proposed start date of any work. No work shall be started until all comments from the DESIGN PROFESSIONAL and CITY/OWNER have been resolved and the Work Plan has been approved.
 5. A separate Work Plan shall be submitted for each location where a tie-in will occur.
- D. Track equipment to be used on Roadbed: Submit weights and dimensions of track equipment proposed for use on roadbed prior to employ it on roadbed.
- E. Rail Mounted or Hi-Rail Construction Equipment: Submit a complete list of track equipment for use during trackwork construction, within 30 days after receipt of the Notice to Proceed. Include rail-mounted geometry inspection vehicle:
1. Equipment to be utilized shall not exceed design clearance envelope and loading criteria for the Streetcar System.
 2. Submit a complete description of all proposed modified equipment, including calculations verifying that loading criteria for the light rail system will not be exceeded.
 3. Certify that the equipment modifications will clear all structures and other facilities at the areas where the equipment will be used.
 4. Certify rail wheels are in good condition, without excessive wear. Damage to frogs, crossing panels, etc. shall be repaired or replaced as determined by the CITY/OWNER.
- F. Product Data: Submit manufacturer's data for CONTRACTOR-furnished material including microfiber, non-woven filter fabric, and adhesive for bonding tags to concrete. Submit installation information and sufficient description to verify that materials comply with the specifications. Include specification data and manufacturer's installation instructions for microfiber and non-woven filter fabric. Submit product data for support beams and associated hardware, rail boot, and slab joint materials.
- G. Mix Design: Submit concrete mix design as specified in APWA-KCMO 2703 SA-2 4,500 psi special aggregate concrete, "Special Aggregate Concrete – Bridge Deck, Sidewalk, Barriers and Curbs, Diaphragms, and Approach Slab"
- H. Certification: Certification of concrete mix design, reinforcement, and bonding agents.
- I. Samples: Submit sample for non-woven filter fabric.
- J. Test Reports: Submit summaries of test results each week for field weld tests, Brinnell Hardness Tests, insulated joint continuity tests, track geometry vehicle measurements, and any other periodic testing required by Contract. If there was no activity during the week, submit each summary noting no activity.
- K. Rail Laying Record: Submit records in accordance with Article 3.14 D. herein.
- L. Submit manufacturers' rail specifications to the Authority for approval.
- M. Submit certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661.

1.6 QUALITY ASSURANCE

- A. Comply with:
1. Codes and regulations of the jurisdictional authority.
 2. APTA Guidelines, latest edition.
 3. AREMA Manual, latest edition.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. CITY/OWNER-Furnished Material:
1. None.

B. CONTRACTOR-Furnished Material: Supply track construction material indicated in the Contract Documents.

1.8 MONUMENTATION AND SURVEYING

- A. Monuments will be provided by the CITY/OWNER to establish the centerlines of tracks as specified in KCMO Public Works Construction Specification, Section 1722 - Surveying and Construction Staking
- B. The CONTRACTOR shall set monuments at all points as shown on the Contract Drawings.
- C. The CONTRACTOR shall be responsible for the preservation of all Geographic Reference Stations, State of Missouri and City of Kansas City Missouri maintained benchmarks, section corners, property monuments of any kind and other reference marks set by the CITY/OWNER or any other governmental authority as shown on the plans or informed of in writing in accordance with KCMO Public Works Construction Specification, Section 1722 - Surveying and Construction Staking.
- D. Do not use controls for surveys other than the monumentation described above unless otherwise approved by the Contracting Officer.
- E. Perform surveying required herein in accordance with KCMO Public Works Construction Specification, Section 1722 - Surveying and Construction Staking. Assume full responsibility for all dimensions and elevations taken and the setting of lines and grades relating thereto.

PART 2 - PRODUCTS

2.1 CITY/OWNER FURNISHED MATERIALS

A. None.

2.2 CONTRACTOR FURNISHED MATERIALS

A. Concrete Materials:

- 1. Provide concrete reinforcement as specified in the contract drawings and in Section 03 30 00, "Cast-in-place Concrete".
- 2. Track slab concrete shall be as specified in the contract drawings and in Section 03 30 00, "Cast-in-place Concrete".

B. Rail Support Structure:

- 1. Provide steel support beams.
- 2. Include leveling screws, rail clips, and other accessories as recommended by the support beam manufacturer.
- 3. Where necessary, provide 4" X 4" x 3/16" bearing plates fabricated of ASTM A 36 steel or equivalent.

C. Rail Boot:

- 1. Provide extruded rubber rail boot as recommended by manufacturer. The rail boot shall be fabricated to fit 115RE or 112 TRAM rail.
- 2. Provide splices for the rail boot as required, fabricated to be compatible with the rail boot. Include all required splice materials as recommended by the boot manufacturer to fully isolate the rails electrically.

D. Track Drains:

- 1. Provide track drains fabricated of materials approved by the Authority. Include appropriate end panels, outlets, and grates. Furnish devices as necessary to secure the grates to the troughs.
- 2. Where embedded track is in shared right-of-way, track drain grate and frames must be traffic rated (HS20-44 loading). Steel angle support and bolting of grating to angles shall be strong enough and designed to transfer HS20-44 loading into the concrete slab.
- 3. Rail must be isolated from track grate, frame, and any other metal items.

2.3 METAL TAGS

- A. For ballasted track, provide aluminum or brass identification tags stamped in 1/4 inch increments from zero superelevation to maximum superelevation to mark the superelevation on curved track. These tags shall be 1-1/4 inches wide by 2 inches long by 0.050 inch thick, and stamped with numerals 1/2 inch high.
- B. Adhesive for Bonding Tags to Concrete: As proposed by the CONTRACTOR and approved by the CITY/OWNER.

2.4 RAIL

- A. Tee-rail: 115 RE section head-hardened rail in accordance with the requirements of AREMA "Specifications for Steel Rails" and as specified.
- B. Block rail: 112 TRAM – Low profile (72mm) higher strength rail (grade S900/R260).

2.5 TIES

- A. Ballasted trackwork construction shall consist of concrete crossties, unless otherwise shown on plans or in the special provisions.
- B. Concrete crossties: 8 feet 3 inches in length unless specified elsewhere conforming to AREMA "Specifications for Concrete Ties". Concrete ties shall be prestressed monoblock concrete. Type to be used shall be shown on the Contract Drawings.
- C. Concrete switch ties of varying lengths conforming to AREMA "Specifications for Concrete". Concrete ties shall be prestressed monoblock concrete. Type used shall be as shown on Contract Drawings.
- D. Concrete ties for at-grade road crossings shall be 10 feet in length conforming to AREMA "Specifications for Concrete".

PART 3 - EXECUTION

3.1 GAUGE

- A. Measure the track gauge between points 5/8 inch below the top. For tee-rail, measure perpendicular to and from inside face to inside face of the running rails. For 112 TRAM rail, measure from outside face of groove to and from outside face of groove.
- B. Tangent and curved track gauge:
 - 1. 4 feet 8-1/2 inches for tee-rail.
 - 2. 4 feet 8-1/2 inches for 112 TRAM rail in tangent and curves greater than 150' radius.
 - 3. As specified by plans for curves 150' or less radius track.
- C. Special trackwork track gauge (tee-rail): 4 feet 8-1/2 inches. Special trackwork manufacturer shall conduct a wheel/rail interface study to verify gauge and include with trackwork submittal for DESIGN PROFESSIONAL's review.
- D. Allowable gauge variation:
 - 1. See Table 34 11 29-1
- E. Gauge Transition: The plans shall outline the method for transitioning between gauges of different widths.

3.2 ALIGNMENT

- A. Alignment consists of a series of straight lengths of track referred to as tangents, connected by simple, compound or reverse curves, with or without spirals.
- B. The track shall be constructed to the alignment and profile indicated on the plans, within the tolerances specified in Table 34 11 29-1.

- C. Use outer rails of curves as the line rail. Either rail may be used as the line rail in tangent; however, use that same rail for the full length of that tangential segment of track.
- D. The ends of the chord to be at points on the gauge side of the line rail 5/8 inch below the top of the rail head.
- E. In addition to the requirements specified, for ballasted track:
 - 1. Place the track in good alignment before the finishing lift is made.
 - 2. Follow immediately behind the finishing lift with a mechanical means of lining the track and line to accurate alignment. Typically line and surface in the same operation, but the finishing lift may include adjustments to “accurate alignment”.

3.3 SURVEYING REQUIREMENTS

- A. Refer to KCMO Public Works Construction Specification, Section 1722 - Surveying and Construction Staking.
- B. Verify layout information shown in relation to the existing CITY/OWNER-provided monuments and existing structures before proceeding with layout of the actual work. As the work proceeds, check every major element of work for line. Bring discrepancies in location of structures to the attention of the CITY/OWNER before starting trackwork. Maintain an accurate surveyor's field book of such checks; make available for the CITY/OWNER's reference. Record deviations which are accepted by the CITY/OWNER on the Record Drawings.
- C. Verify the actual grade line and the profile of the top of rail. Variations from the design grade line and profile shall meet tolerances specified in Table 34 11 29-1.
- D. Furnish and place markers for the control points and reference points of the track centerlines, as indicated. Stake centerlines at station platforms, grade crossings, and bridge structures for inspection by the CITY/OWNER.
- E. Upon completion of the project, the CONTRACTOR shall provide the CITY/OWNER with all original surveying field notes, layouts, and computations in standard bound survey books. The CONTRACTOR shall also provide the CITY/OWNER all electronic files, code libraries, CAD drawings and any other files or documents, whether electronic or paper, that are part of the survey work. Point code files shall be submitted in raw data file format and plain text ASCII, comma or space delimited format having one record of point number, northing, easting, elevation and point code (in that order per line). All electronic files must be submitted in an uncompressed file format on a USB flash drive or CD-ROM disk. Individual electronic files shall not span multiple disks. All disks shall be labeled with the CITY/OWNER project number, project location, date (month and year) of the survey and disk number if more than one as required.
- F. Maintain control points and reference points for the duration of the project.

3.4 SUPERELEVATION, SPIRALS, AND CURVATURE

- A. Superelevation:
 - 1. Superelevate mainline track curves as indicated.
 - 2. Maintain superelevation uniformly over the length of curve or as otherwise shown.
 - 3. Superelevate the outer rail above the inner rail; install the inner rail at the required profile indicated.
- B. Spirals: Establish the superelevation at the point of tangency at zero and increase the superelevation uniformly through the length of the spiral to full elevation of the outer rail at the spiral-to-curve point. Install the spiral at the ends of simple curves and segments of compound curves as indicated.
- C. Curvature: Curve information shall be as shown. Shop fabricated rail shall be marked by the manufacturer for installation.

3.5 TRACK SURFACE

- A. Track surface is the relationship of opposite rails to each other in profile and crosslevel:

1. Track profile is the running surface along the top of the grade rail.
2. The ideal surface is a uniform profile consisting of straight gradients connected by vertical curves, with zero crosslevel on tangents, and predetermined crosslevel on curves.
3. Do not raise the profile of track being surfaced above established grades.
4. When surfacing or raising track, select one rail, usually the lower rail on curves and the line rail on tangents, as the grade rail. Bring the other rail to surface by adjusting the crosslevel as needed.

3.6 SUBGRADE PREPARATION

- A. Place and compact the required depth of subgrade material as specified in Section 32 11 00, "Aggregate Base Course". Reference shall also be made to the project Geotechnical Report and details in the plans.

3.7 CONCRETE PLACEMENT

- A. Place concrete in accordance with the requirements of Section 03 30 00, "Cast-in-place Concrete".
- B. During placement of reinforcing steel and concrete use care to avoid disturbance of the support structure, rail, boot, track drains, and associated hardware. CONTRACTOR is to take measures to prevent uplift during the concrete pour.
- C. Finish concrete with broom finish per Section 03 35 10, "Concrete Finishing" Part 3, Section 3.2.E.

3.8 TRACK DRAINS

- A. Install track drain components in accordance with the plans and/or supplier's recommendations.
- B. Brace track drains with temporary supports to maintain correct position during concrete placement.
- C. Cover track drains during concrete placement to prevent concrete from entering the trough.

3.9 SUPPORT STRUCTURE

- A. Install the rail support structure as recommended by the support beam supplier. Place a bearing plate below each adjusting screw. In areas of sloped subgrade, create a flat area in the subgrade slightly larger than the bearing plate.
- B. Space beams according to the details in the plans.
- C. Adjust the support beams to the required elevation prior to placing rail.

3.10 RAIL INSTALLATION

- A. Place rail strings on the support beams and install the rail boot on the rail. Apply the rail clips loosely using procedures recommended by the supplier.
- B. Where rail will require field welding, place rail boots no closer than ten feet to the proposed weld. Field weld CWR as specified in Section 34 11 16, "Trackwork - Field Rail Welding".
- C. Prior to placing concrete, join rail strings and adjust the jacking screws and tighten rail clips to bring rails to correct grade and alignment. Complete installation of the rail boot and verify the correct installation of all boot splices.

3.11 RAIL

- A. Follow plans or track charts in determining exact location and lengths of head-hardened 115RE and 112 TRAM rail.
- B. All 115RE rail with the exception of 115RE rail in special trackwork and within restraining rail limits shall be installed with a 1:40 cant.
- C. All 112 TRAM rail and 115RE within special trackwork and restraining rail limits shall be installed with no cant.

D. The transition between 1:40 canted rail and rail with no cant shall take place between the ties on either side of the transition location. Transition location shall be determined by the CONTRACTOR in the field and based on the contract documents. Transition from flat rail to canted shall not exceed 1" over 31', the twist rate criteria for spirals.

3.12 CUTTING AND DRILLING RAIL

A. Use only the following tools for cutting rail:

1. Rail saw.
2. Abrasive cutting wheels.

B. Drill holes:

1. When necessary, drill new holes; do not punch, slot, or burn with a torch.
2. Drill holes 1-1/8 inch in diameter; locate as indicated.
3. Drill with the joint bars removed or before their application. Mark the location of the center of the hole, or drill through an approved template. Do not drill bolt holes using the joint bars as a template.
4. When bolt holes are drilled with a power track drill, maintain a uniform feeding pressure. Reduce pressure as the bit point breaks through the opposite side of the web. Do not force the drill.
5. Remove all rough edges from drilled rail holes.
6. Do not leave bolt holes in the ends of rail to be welded.
7. Reaming or enlarging incorrectly drilled holes to allow joint bar bolts to be installed will not be permitted. Rejected holes shall be sawcut from the rail.
8. Torch cuts or blown holes will not be acceptable.
9. Rail strings have handling holes. These holes shall be cropped before welding.

3.13 RAIL JOINTS

A. Either weld or bond rail joints as indicated.

B. Field weld rails in accordance with Section 34 11 16, "Trackwork - Field Rail Welding".

C. Install bonded joints where indicated in accordance with the requirements of this section and Section 34 11 93, "Other Track Materials".

D. Install bonded joints in track that is in final horizontal and vertical alignment with ballast tamping completed.

3.14 LAYING CONTINUOUS WELDED RAIL

A. Unload and lay CWR in a place and in a manner that prevents damage to the ties, rails, and structures.

B. Lay opposite CWR strings in a manner which results in a 5 foot minimum stagger of welds.

C. Make every effort to minimize or eliminate field cuts and field welds in CWR. Designate location in finished track by route name, stations of ends of rail string, and right or left rail as determined by facing in the direction of increasing stationing. Place all rail numbers on the same side of the CWR string.

D. Record the following information at the time of laying the rails on the support ties, in troughs, crossties, or DF plinth and again at the time of anchoring CWR. Furnish copies of this documentation to the CITY/OWNER.

1. Location by station, track designation, and rail.
2. Date and time.
3. Rail weight and section, mill brand, year rolled, and the heat number of the end rails in each CWR string.
4. Length of CWR string in feet.
5. The following temperatures, at the beginning of the activity and again at the end of the activity:
 - a. Ambient temperature.

- b. Rail temperature.
 - 6. Approximate weather conditions.
 - 7. Adjustment applied (type and rail end movement).
- E. Between the time of laying the rail (placement on the ties) and anchoring the rail, the CONTRACTOR shall monitor rail temperatures and adjust each Dutchman as required to avoid rail buckling or rail end batter.

3.15 RAIL TEMPERATURE

- A. Determine rail temperature by means of an AREMA standard rail thermometer as specified in the AREMA Manual.
- 1. Place rail thermometers on the shaded side of the rail base next to the web and leave in place until no change in its reading is detected, but not less than five minutes.
 - 2. Take rail temperature at the time of adjusting the gap between rail ends.

3.16 DESTRESSING RAIL

- A. Rail zero stress (neutral) temperature at final closure and fastening shall be $75^{\circ}\text{F} \pm 10^{\circ}\text{F}$ ($24^{\circ}\text{C} \pm 5^{\circ}\text{C}$).
- B. The rail shall have a uniform longitudinal stress along the entire fastened length (except at free ends).
- C. The CONTRACTOR shall submit a detailed procedure for achieving uniform longitudinal rail stress for the zero stress temperature specified herein.
- D. Final closure shall be by field weld with the rail fully fastened (except immediately adjacent to the field weld as necessary to perform the weld) near or at final elevation and alignment. If post closure rail realignment is required, the CONTRACTOR shall provide sufficient longitudinal restraint either side of the location of realignment to assure the rail stress state is not changed by the realignment Work.

3.17 TEMPORARY FASTENING

- A. Temporarily fasten track for use of on-track equipment.
- B. Prior to equipment being placed on newly laid rail, secure the rail in a manner that will prevent damage to the CWR, rail fasteners, and other track materials.
- C. Move equipment over newly laid rail in such a manner as to prevent damage to trackwork materials.
- D. Temporarily fasten newly laid rail on ballasted track at not less than:
- 1. Every third tie on tangents and on curves having a radius greater than 1,900 feet.
 - 2. Every other tie on curves having a radius of 1,900 feet or less.
- E. Do not field weld or bond between contiguous CWR strings and between CWR strings and special trackwork units before the rail has been brought to final vertical and horizontal alignment, before the rail has been adjusted to the indicated zero thermal stress range, and before the rail has been fully fastened.

3.18 PERMANENT RAIL FASTENING

- A. Adjust the CWR string lengths for the specified zero thermal stress temperature:
- 1. Adjust rail on DF bridges before adjusting ballasted track approaches. Anchor 300 track feet on each side at the temperature specified for DF track. When adjusting the approaches, unclip the 300 ballasted track feet up to the structure and adjust the ballasted track string to the appropriate temperature for ballasted track.
 - 2. When closing on a fully anchored string, remove 300 feet of existing rail clips, readjust the existing string for temperature and refasten before executing the field weld.
 - 3. Fasten the CWR strings in a manner which ensures that there is no unfastened portion of rail greater than 100 feet in length between fastened portions of the same string.

4. When joining newly constructed track to existing track in operation, adjust the adjacent 300 track feet of the existing track for zero thermal stress temperature in conjunction with the de-stressing of the new track.
 5. Obtain approval of the CITY/OWNER prior to de-stressing existing track in operation. De-stressing work of operating track shall not be scheduled during streetcar operating hours.
- B. Vibrate the rail to relieve internal rail stresses and fully fasten the string. Record movement at quarter points and submit to the CITY/OWNER daily:
1. Use vibrators, approved by the CITY/OWNER, to relieve internal rail stresses.
 2. Do not strike CWR with objects which might damage the rail surface.
- C. Temperature of a rail, when being fastened opposite a previously fastened rail, shall be within 5 degrees F of the previously fastened rail's temperature at the time of its fastening.
- D. Once the rail has been adjusted to achieve zero thermal stress at the specified temperature, maintain the correct rail gap until the rail is fully fastened.

3.19 ZERO THERMAL STRESS

- A. Zero thermal stress at the specified temperature in CWR may be achieved by heating, cooling, or pulling the rails, or a combination thereof. When zero thermal stress at the specified temperature is obtained, begin fastening immediately.
- B. Maintain the stress within the rail to achieve the specified zero thermal stress range during installation of joints.

3.20 FIELD WELDING

- A. Perform field welds in accordance with the requirements of Section 34 11 16, "Trackwork - Field Rail Welding".

3.21 RAIL END-HARDENING - NONE

3.22 END-HARDENING TESTS - NONE

3.23 RAIL BEVEL

- A. Bevel rail ends at bonded joints in accordance with AREMA Standard Plan Basic Number 1005.

3.24 RAIL GRINDING

- A. Upon completion of the track by the CONTRACTOR to the specified tolerances and after acceptance, rail grinding will be done by the CITY/OWNER.

3.25 FINAL ALIGNMENT AND TRACK INSPECTION

- A. Survey the track on top of both rails at center of rail head every 50 feet on tangents, 25 feet on curves, at points of switch, and points of frog to determine if the horizontal and vertical alignment, gauge, crosslevel, and superelevation are within the tolerances specified in Table 34 11 29-1 for each type of track construction.
- B. Correct any track geometry deviations disclosed by the inspection specified above and perform any necessary re-inspection to ascertain that corrections have been made. Correction of track geometry deviations will be at the CONTRACTOR's expense.

3.26 ELECTRICAL TESTS

- A. All rail boot shall be high voltage spark tested as specified by manufacturer.
- B. Track-to-earth resistance tests will be performed by the CONTRACTOR.
1. Testing will be conducted, per ASTM-G165, by the CONTRACTOR as track construction progresses to ensure proper rail isolation is being achieved during construction.

C. The CONTRACTOR shall correct CONTRACTOR installations that fail the track-to-earth resistance tests, during construction testing or final acceptance testing. Following completion of these corrective measures, CONTRACTOR shall notify the CITY/OWNER as specified herein for testing and the installations will be re-tested. All corrective measures shall be completed at the expense of the CONTRACTOR.

D. Final acceptance testing of track to earth resistance will be performed by CONTRACTOR and results shall be submitted to DESIGN PROFESSIONAL in a final report to demonstrate compliance with tolerances.

E. Acceptance criteria: Track-to-earth resistance shall be more than:

1. Embedded track: 150 ohms per 1000 linear feet of track.
2. Special trackwork: 150 ohms per 1000 linear feet of track.
3. Ballasted trackwork: 500 ohms per 1000 linear feet of track.

3.27 PRECURVED RAIL

A. Install fabricated precurved rail as shown and in accordance with the approved manufacturer's fabrication drawings.

B. Mark precurved radius and installation location.

3.28 RESTRAINING RAIL

A. Install fabricated restraining rail as shown and in accordance with the approved manufacturer's fabrication drawings.

**TABLE 34 11 29-1
TRACK CONSTRUCTION TOLERANCES**

Class and Type of Track	Gauge Variation	Cross Level and Superelevation Variation	Vertical Track Alignment		Horizontal Track Alignment	
			Total Deviation	Middle Ordinate In 62' Chord	Total Deviation	Middle Ordinate In 62' Chord
Direct Fixation and Paved Track	+1/8" - 1/16"	± 1/8"	± 1/4"	± 1/8"	± 1/8"	± 1/8"
Mainline Ballasted Track	± 1/8"	± 1/8"	± 1/2"	± 1/8"	± 1/2"	± 1/8"
Yard Ballasted Track	+3/16" - 1/8"	± 3/16"	± 3/8"	± 1/4"	± 3/8"	± 1/4"
Shop Track	± 1/8"	± 1/8"	± 1/4"	± 1/8"	± 1/4"	± 1/8"

Notes:

- (1) Total deviation is measured between the theoretical and actual alignment centerline at any point in the track.
- (2) Total horizontal and vertical deviation in road crossings ± 1/4".
- (3) In the Station Platform areas: Total Horizontal deviation shall be 0" towards Platform and 1/8" away from platform; Total Vertical deviation shall be 0" above Platform and 1/8" below platform.

PART 4 - MEASUREMENT

4.1 ITEM BASIS

- A. Plan quantities are final quantities; no field measurement will be made.
- B. Measurement of the 115 RE Track Slab, 115 RE Track Slab Adjacent to Parking, 11' Wide 115 RE Track Slab, 115 RE Track Slab Adjacent to Streetcar Stop, 115 RE Embedded Track Exclusive Guideway Double Track, 115 RE Embedded Track Off-Street Platform, 115 RE Embedded Track Off-Street 112 TRAM Track Slab, 112 TRAM Embedded Track Main St. Viaduct over KCTRR, Pre-Grouted 112 TRAM Rail on Brookside Blvd Bridge over Brush Creek, and 115 RE Ballasted Track will be track foot supplied and installed. No separate measurement will be made for the other track materials required for the track construction.

PART 5 - PAYMENT

5.1 GENERAL

- A. The accepted measured quantity of pay item will be paid for at the Contract unit price per unit of measurement. The Contract unit price will be payment in full for furnishing all labor, materials, tools, equipment and incidentals, and doing all Work necessary to complete the Work specified.

END OF SECTION

SECTION 34 11 93 OTHER TRACK MATERIALS

PART 1 - GENERAL

1.1 SUMMARY

A. Description

1. This Section defines the requirements for the manufacture, testing, and supply of insulated joint bars, transition rails, shims, miscellaneous hardware for fastening of running rail and special trackwork and elastomeric grout. All hardware shall be new and sized to match the fastener component for which they will be used.

1.2 RELATED SECTIONS

- A. Section 01 60 01 – Buy America Requirements

1.3 REFERENCE STANDARDS

A. Insulated Joints and Transition Rails:

1. AAR Part 58 - Signal Specification.
2. AAR Part 116 – Signal Specification.
3. AREMA Chapter 4 – Section 3.8 - Specifications for Bonded Insulated Rail Joints, latest edition.
4. AREMA Chapter 4 – Section 3.4 - Specifications for Quenched Carbon steel Joint Bars and Forged Compromise Joint Bars, latest edition.
5. ASTM E 165-02 - Standard Test Method for Liquid Penetrant Examination.
6. ASTM A 194/A 194M-13 – Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service.
7. ASTM F 436-11 - Standard Specification for Hardened Steel Washers.
8. ASTM A 490-12 - Standard Specifications for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
9. ASTM A325-10e1 - Standard Specifications for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
10. ISO 9001:2008 – Quality Management Systems-Requirements.
11. ASTM D 1002-10 – Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively.
12. SSPC SP-10 – Near-White Blast Cleaning.

B. Shims:

1. ASTM A 653/A 653M-11 - Standard Specification for Steel Sheet, Zinc-Coated or Zinc-Iron Alloy-Coated by the Hot-Dip Process.
2. CSA G40.21-04 - Structural Quality Steels General Instruction.
3. CSA G164-M92 (R2003) - Hot-Dip Galvanizing of Irregularly Shaped Articles.
4. ISO 9001:2008 - Quality Management Systems- Requirements.

C. Miscellaneous Hardware:

1. ASTM B 633-13 Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
 - a. Bolts and nuts shall conform to:
 - 1) AREMA Chapter 4 Section 303 Rail Drillings, Bar Punching, and Track Bolts
 - 2) AREMA Chapter 4 Section 3.5 Specifications for Heat-Treated Carbon-Steel Track Bolts and Carbon-Steel Nuts
 - b. Spring washers shall conform to:
 - 1) AREMA Chapter 4 Section 3.6 Specifications for Spring Washers

D. Bumping Posts:

1. ISO 9001:2008 Quality Management Systems- Requirements
2. AWS D1.1 Welded Steel Construction (Metal Arc Welding)

E. Rail Expansion Joints:

1. TCRP 155 Chapter 5.10 Rail Expansion Joints

1.4 SUBMITTALS

A. Submit or retain the following:

1. Insulated Bonded Joints and Transition Rails:
 - a. Submit detailed description of the adhesive to be used to bond the joint bars to the rail, and the method by which the quality of the adhesive formulation and preparation is regulated, maintained and monitored.
 - b. Retain drawings showing details of bolts, lock nuts and all other components of the assembly, including fully detailed step-by-step installation instructions.
 - c. Submit inspection and test plan.
 - d. Retain packaging procedures.
 - e. Retain most recent historical rolling load test records demonstrating adherence to these Specifications.
 - f. Submit statement of the manufacturer's capabilities to carry out the work in accordance with the technical and quality assurance/control requirements.
 - g. Submit delivery procedures.
 - h. Submit testing facilities certifications.
 - i. Submit Insulated rail joint electrical test procedures and equipment.
 - j. Submit insulated rail joint electrical test results.
2. Shims:
 - a. Submit inspection and test plan and procedures.
 - b. Retain packaging procedures.
 - c. Submit delivery procedures.
3. Miscellaneous Hardware:
 - a. Retain shop drawings detailing the hardware to be furnished for the Work.
 - b. Submit prequalification test results for review or prequalification test plans to include:
 - 1) Test procedures
 - a) Schedule of qualification tests to be performed
 - b) Name of independent test laboratory proposed to perform tests
 - c. Retain production run test plans to include:
 - 1) Test procedures
 - 2) Test reporting procedures.
 - d. Retain hardware manufacture quality assurance reports to include:
 - 1) Production run test reports
 - 2) Packaging procedures
4. Bumping Post
 - a. Submit manufacturer's project specification information.
5. Elastomeric Grout
 - a. Submit manufacturer's project specification information.
6. Precast Concrete Crossing Panels
 - a. Submit manufacturer's project specification information.
7. Rail Expansion Joints
 - a. The Manufacturer shall submit shop drawings for each geometrically unique rail expansion joint for review.
 - b. Retain full installation details and step-by-step procedures for installing the rail expansion joints in the field.
8. Submit certification that all products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661.

1.5 QUALITY ASSURANCE/QUALITY CONTROL

A. General:

1. The Contractor shall include its inspection and testing plan for the work. The inspection and testing plan shall identify who, what, when and where in the process of design, production, assembly, shipment and acceptance that all inspections will be performed.
2. The Contractor shall conduct review of fabrication drawings, showing the details and procedures for the manufacture, cutting of the plates, machining of the inclined surfaces, drilling, punching or cutting of holes, and the finishing to specified tolerances prior to commencement of fabricated work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Insulated Bonded Joints:

1. Insulated Bonded Joints shall be in accordance with Section 2.8 and Section 2.11 of the AREMA Manual for Railway Engineering, Chapter 4, latest edition and as directed below. The CONTRACTOR shall furnish single bonded insulated rail joints, in kit form, of the epoxy bonded type as manufactured by L.B. Foster Allegheny Rail Products, Co., Portec Rail Products Inc., Railway Bonded insulated joints, or approved equal.
2. Joint bars for insulated bonded joints shall provide for full face contact, conforming to the shape of the designated TRAM or RE rail section, and shall be fabricated from quenched carbon steel as specified in the AREMA specifications, except as defined herein. The joint bars shall be smooth and straight for installation along tangent track, or pre-curved to match the rail radius at the connection point of special trackwork and in curves with a radius less than 400 feet.
3. The fishing height of the joint bars shall be within a tolerance of + 0 inches to $\frac{1}{32}$ inch of the dimensions defined in the AREMA specifications. The contact surface of the joint bars adjacent to the rail shall be smooth and straight within a tolerance of $\pm \frac{1}{32}$ inch using a 36 inch straight edge. The inside face of the joint bars shall be smooth, with no stamping or branding permitted.
4. Insulated bonded joints shall be complete with $\frac{3}{16}$ " thick high pressure laminated end posts, steel core bushings, and heat-treated oval neck track bolts, nuts, and washers. Nuts shall be designed with a locking feature to prevent loosening meeting Contract requirements.
5. Provide holes in the rail and joint bars as required. The size and location of deburred holes shall conform to the AREMA Manual for Railway Engineering, Volume 1, Chapter 4 Rail, Section 1.3 Rail Drillings, Bar Punchings and Bolts.
6. The structural adhesive used as the bonding agent shall produce a minimum lap shear strength of 3,500 psi at 75 degrees F as per test prescribed in ASTM D 1002. Adhesive and electrical insulation materials supplied with the joint bars shall have a shelf life of not less than one year when stored in a location protected from the weather. A corrosion inhibitor shall also be included in the adhesive formulation.
7. The insulating materials shall consist of a high pressure and laminated design; impervious to oil, grease, and water; and having electrical resistance characteristics equal to or greater than fiber insulation meeting the requirements of the AREMA Signal Manual of Recommended Practice, Sections 8.5.2 Recommended Developmental Criteria for Fabricated Insulating Parts for Track Insulation and 8.5.3 Recommended Developmental Criteria for Track Insulating Material; and the Electrical Resistance Test specified herein.

B. Transition Rails:

1. New transition rails shall conform to the requirements of the "Specifications For Quenched Carbon-Steel Joint Bars and Forged Compromise Joint Bars" found in Chapter 4, PART II of the AREMA Manual for Railway Engineering.
2. Transition rails shall be of the size, shape, and punching pattern required to fit the rail sizes and sections being joined. Only factory designed and forged or cast transition rails shall be used.
3. TRAM rail transition pieces shall be machined to smoothly transition from an RE section to TRAM section. CONTRACTOR to submit shop drawings for review.

C. Shims:

1. Regular and tapered steel shims used to adjust the elevation of the direct fixation fasteners shall be manufactured to the shape, size and configuration to accommodate the direct fixation fastener system. The tapered shims shall be used to adjust rail cant transition from 1:20 to zero at the special trackwork areas and to maintain the required rail cant at grade crossings.
 2. Steel shims specified to the thickness of 20 gauge and 11 gauge shall be manufactured from galvanized steel, coating designation G90, meeting the requirements of ASTM A 653M, lock forming quality or approved equivalent.
 3. Steel shims specified to the thicknesses of $\frac{1}{8}$ inch, $\frac{3}{8}$ inch, $\frac{1}{2}$ inch and all tapered shims shall be manufactured from hot-rolled plate steel meeting the requirements of CSA G40.21, Grade 260 or equal. The measured thickness shall be inclusive of galvanizing. Steel shims shall be hot-dip galvanized in accordance with the latest edition of CSA G164, or equal. Galvanizing of shims shall consist of a minimum coating of 2 ounces/ft² on each side after manufacture.
 4. Steel shims shall be sheared or cut by a method to obtain the required configuration, and which is acceptable to the buyer. Edges sheared, punched or cut during manufacture shall be ground to remove all sharp edges. Shims are to be hot dipped galvanized after all machining is complete. Slotted or circular holes shall be drilled, punched or cut at right angles to the shim surfaces.
 5. Steel shims shall be smoothly finished and free from injurious warp and other surface imperfections due to projecting fins of metal caused by shearing, drilling or punching operations.
- D. Miscellaneous Hardware:
1. All miscellaneous hardware shall meet the physical dimensions, strength and properties and test requirements as defined herein.
 2. The hex head bolts shall be used for embedding into concrete with or without epoxy grout and shall consist of the minimum dimensions required for the particular use. The hex head bolt shall be capable of withstanding the ultimate torque requirement necessary to destroy the diameter bolt as specified in ASTM A 325. The ultimate tensile strength of the hex head bolt itself shall equal or exceed the tensile strength of 56,380 pounds as specified in ASTM A 325.
 3. Circular holes for joint bolts shall be drilled to conform to the drawings. A variation of nothing under and $\frac{1}{16}$ inch over in the size of the bolt holes will be permitted. A variation of $\frac{1}{32}$ inch in the location of the holes will be permitted. Chamfer the entrance and exit sides of the holes.
 4. Miscellaneous heat-treated carbon-steel track bolts and carbon-steel nuts shall be in accordance with Section 2.9 of the 2006 AREMA Manual for Railway Engineering. Miscellaneous spring washers shall be in accordance with Section 2.10 of the 2006 AREMA Manual for Railway Engineering.
- E. Bumping Post:
1. Bumping posts shall be Western Cullen Hayes WCTS bumping posts or approved equal.
- F. Elastomeric Grout
1. Elastomeric grout shall be Icosit KC 340/45 or approved equal.
- G. Precast Concrete Crossing Panels
1. Precast concrete crossing panels shall be Century Group Pedestrian Crossing Panels or approved equal.
- H. Rail Expansion Joints
1. The Contractor shall furnish and install the track expansion joints. This work consists of adding track expansion joints as shown in the Contract Drawings.
 2. Rail material shall be 112 Tram Rail.
 3. Rail bed plates, fills and shims must be drilled to fit the steel tie pattern and be bolted in place as shown in the Contract Drawings.
 4. The rail expansion joint supplier shall verify all dimensions and elevations as required to provide an adequate foundation for the bed plates of the rail expansion joints.

PART 3 - EXECUTION

3.1 QUALIFICATION TESTING

A. Insulated Bonded Joint Bars:

1. Six samples of the designated RE rail section will be prepared for qualification testing. Four of the pieces shall be 24 inches long and two of the pieces shall be 36 inches. All qualification testing will be performed at the expense of the Contractor.
2. End Hardening Tests:
 - a. All six samples shall endure head-hardened rail in accordance with the CONTRACTOR's submitted procedure. Two sample ends shall be selected and tested as specified below:
 - 1) Brinell hardness readings will be taken at the centerline of the rail head longitudinally at $\frac{1}{4}$ inch intervals for a distance of one inch from the hardened end. The rail sample shall then be sawed longitudinally along the centerline and the Brinell hardness readings shall be taken at $\frac{1}{4}$ inch intervals, $\frac{3}{16}$ inch below head of rail, for a distance of 2 inches from the hardened end. The de-carburized surface on the rail head shall be removed before taking Brinell hardness readings.
 - 2) Acceptance shall be based on a Brinell hardness measured at a spot on the center line of the head between 341 and 401 at all locations within $\frac{1}{2}$ inch of the rail end. The heat-affected zone defined as the region in which the hardness is above that of the parent metal shall cover the full width of the rail head and extend longitudinally a minimum of 1.5 inches from the end of the rail. The effective hardness zone $\frac{1}{2}$ inch from the end of the rail shall be at least $\frac{1}{4}$ inch deep.
 - 3) If either of the samples fails to meet the acceptance criteria, the procedure shall be modified and the tests repeated until acceptance hardness values have been achieved.
3. Longitudinal Compression Test:
 - a. Two bonded joints shall be completely assembled, by others, from the four sample pieces of RE rail each 2 feet long. Each joint assembly shall then be sawn in half where the rails are butted together. The sawing shall be performed in a manner which will prevent overheating and damage to the epoxy bond, and the cut will be perpendicular to the centerline of the top of the rail with a tolerance of \pm one degree. The sawn ends of the bars at one end of the test piece, and the end of rail at the other, shall have fair bearing in the test machine to ensure that the loading and reaction are through the centroid of the rail, and parallel to its axis. Loads shall be applied longitudinally in increments of 25,000 pounds. Each load increment shall be maintained constant until the longitudinal deflection of the rail ceases before increasing the load to the next increment. The load will be increased in these designated increments until a total load of 600,000 pounds is attained, or failure occurs. At each increment of loading, the load and differential movement of the rail and joint bars, measured to 0.001 inch, shall be recorded.
 - b. The bonded joint shall be accepted based on the Longitudinal Compression Test when it is demonstrated that the joints have not slipped at any time during application of the incremental loads, up to 600,000 pounds, nor the magnitude of differential movement is $\frac{1}{16}$ inch in any direction. At the completion of the test, after the load on the rail has been released, the relative position of the rail and joint bar shall be within 0.020 inch of its original position.
 - c. If either sample fails to meet the above-defined requirements, the installation procedure shall be modified and the tests repeated.
4. Electrical Resistance Test:
 - a. Test Procedure:
 - 1) Fully assemble an insulated rail joint consisting of two lengths of 115 RE rail; one 24 inches long and the other 42 inches long. The rail shall be supported on non-conducting material.
 - 2) 500 volts (DC) shall be applied to the rail across the insulated joint for a duration of 3 minutes, while the current flow through the joint is measured and recorded to the nearest 0.1 microampere.

- b. Acceptance Criteria:
 - 1) The minimum resistance shall be 10 megohms for 500 volts (DC).
 - 5. Rolling Load Test:
 - a. After completion of the Electrical Resistance Test, the same bonded joint shall be subjected to the Rolling Load Test per Section 2.11.7.4 of the current AREMA Manual for Railway Engineering.
 - b. If the sample fails to meet the above defined acceptance test requirements, the installation procedure shall be modified and the tests repeated.
 - 6. Additional Follow-up Testing:
 - a. Test Procedure:
 - 1) The bonded insulated joint shall be subjected to follow-up testing after it has passed the electrical resistance test, electrical impedance test and the rolling load test.
 - 2) Repeat the electrical resistance and impedance tests as specified above.
 - 3) Subject the joint assembly to the Longitudinal Compression Test after completion of the electrical resistance and impedance tests.
 - b. Acceptance Criteria:
 - 1) The follow-up testing results shall follow the acceptance criteria previously established for each respective test.
- B. Shims
 - 1. Prototype Testing:
 - a. Prototypes of each designated type of steel shim shall be manufactured, tested and supplied to the CITY/OWNER for review and written statement of no objection prior to the start of production.
 - b. The prototype testing shall include checks of all dimensions, coating thickness, and surface finish for each type of shim specified.
 - 2. Production Testing:
 - a. The CONTRACTOR shall submit mill certificates defining the chemical and mechanical properties of the material supplied for the manufacture of the steel shims.
 - b. Dimensional measurements shall be performed by the CONTRACTOR to ensure conformance with the specifications. At least 2% of all the shims manufactured for the project and not less than 2 shim types manufactured per production day. Test results shall be submitted to the CITY/OWNER for review.
 - c. The coating thickness of shims galvanized by the CONTRACTOR or its agent shall be verified by the CONTRACTOR using magnetic gauges or by a procedure acceptable to the CITY/OWNER. Tests on the coating thicknesses shall be performed on at least 1% of all the shims produced for the project and on not less than 1 shim type per production day. Certified test results shall be submitted to the CITY/OWNER for approval.
- C. Miscellaneous Hardware:
 - 1. Hardware Production Test Requirements:
 - a. The CONTRACTOR shall submit mill certificates on the chemical and mechanical properties of the material supplied for the manufacture of the hardware.
 - b. The hex head bolts and lag screws shall be subjected to and meet the pre-qualification test acceptance criteria as specified in ASTM A 325.
 - c. The hex head bolts and lag screws shall be subjected to and meet the production run test acceptance criteria as specified in ASTM A 325.
 - 2. Coating:
 - a. All hex head bolts shall be coated in accordance with ASTM B 633, Type II (Olive Drab) Fe/Zn
 - b. All other designated hardware shall be galvanized in accordance with the applicable ASTM specifications.

3.2 PACKAGING, LABELING, AND STORAGE

- A. Insulated Bonded Joint Bars:
 - 1. Packaging:

- a. All materials used for packaging and crating for delivery shall be new, robust and of equal quality to the best commercial packaging and delivery crating practices accepted in the industry.
- b. The choice of packaging shall be based on the most severe operational and climatic conditions expected during transit and storage. Key factors to be considered shall include the following:
 - 1) Possibility of rough handling during transit and storage from manufacturer to final destination.
 - 2) Shock, vibrational and static impacts, and environmental exposure during loading, unloading and transit operations.
 - 3) Geographic and climatic conditions at the final destination.
 - 4) Handling facilities and practices used at points of loading and discharging of cargo.
- 2. Labeling:
 - a. Each package unit shall be marked to identify contents, quantity, and gross weight.
- B. Transition Rails:
 - 1. Transition rails shall be wired together in pairs and separated from the other rails.
- C. Shims:
 - 1. Shims shall be packaged by the category of thickness, handled and stored in a manner that will prevent damage to the materials. The CONTRACTOR's commercial practice for preservation and packaging shall provide adequate protection against deterioration and physical damage during storage and handling.
 - 2. Shipment marking information shall be provided on the interior and exterior of delivery containers. The information shall include nomenclature, manufacturer's name and part catalog number, contract or order number, and destination.
- D. Miscellaneous Hardware:
 - 1. The hardware shall be manufactured, transported and stored so that no physical damage occurs to the threads. The hardware shall be packaged in equal quantities and in accordance with commercial practice for preservation and packaging.
 - 2. Shipment marking information shall be provided on the exterior of delivery containers. The information shall include nomenclature, manufacturer's name and part catalog number, contract or order number, and destination. Each pallet shall not exceed 2000 pounds in weight and each pallet shall clearly show the quantities on each pallet.

3.3 INSTALLATION OF BONDED INSULATED RAIL JOINTS

- A. Each crew and its foreman shall be pre-qualified before installing each type of glued joint. In order to become pre-qualified, a crew shall fabricate two joints in track to simulate actual joint installation and then cut the joints out of the track. The joint will then be tested in accordance with the Longitudinal Compression Test. Failure of a test sample disqualifies the foreman and, at the discretion of the DESIGN PROFESSIONAL, the entire crew.
- B. All rail shall be 112 TRAM or head-hardened 115 RE and all rail ends shall be beveled in accordance with AREMA Standard Plan No. 1005-40-Beveling of the Rail Ends for Special Trackwork. Remove all foreign materials, loose rust, and scale to near white metal on the end 21 inches of the web, bottom of head and top of base of each rail in accordance with SSPC SP-10.
- C. Field fabricated single bonded insulated joints shall be installed at locations shown on the Contract drawings and in conformance with the manufacturer's recommended procedures. Two insulated joints, on opposite rails, shall be installed at each callout on the respective Plan, unless otherwise indicated.
- D. The center of the joint shall be approximately centered between rail supports and the CONTRACTOR shall alternate the direction of the bolt insertion.
- E. The DESIGN PROFESSIONAL shall be notified 24 hours in advance of installation of all insulated joints.

- F. Installation procedures shall be submitted for the DESIGN PROFESSIONAL's review at least 30 days prior to beginning Work and shall include at least the following items:
 - 1. Care and storage of materials
 - 2. Date of glue manufacture
 - 3. Glue shelf life
 - 4. Rail end preparation
 - 5. Weather and temperature restrictions
 - 6. Mixing and application of glue
 - 7. Installation of insulated joint bar and pin bolts
 - 8. Curing restrictions
 - 9. Detection of glue bond failures
- G. Insulated Rail Joint Electrical Test
 - 1. All insulated joints shall be tested after installation into track.
 - 2. Electrical Test
 - a. The insulated joint assembly shall be dry. Apply 500 volts DC across the joint from rail to rail and from each rail to one bar, each arrangement for a duration of 5 seconds. Use a megohmmeter that reads directly in megohms to measure resistance.
 - b. The acceptance criterion for this test shall be a minimum resistance of 10 megohms.
 - 3. The CONTRACTOR shall submit test procedures and equipment identification for the DESIGN PROFESSIONAL's review at least 30 Days prior to beginning Work. The electrical test shall be performed by a certified electrician employed by the CONTRACTOR and approved by the DESIGN PROFESSIONAL.
 - 4. Results of the electrical test shall be submitted to the DESIGN PROFESSIONAL for approval.
 - 5. Any single bonded insulated joint that fails the electrical test in track shall be removed, replaced and retested at CONTRACTOR's expense. Replacement procedure shall be approved by the DESIGN PROFESSIONAL.
- H. Insulating paint shall be applied to the circumference of the rail head and post after assembly and curing of bonded insulated joint adhesive. The insulating paint shall be applied as a stripe centered on the end post 1", $\pm 1/4$ " wide.
- I. Rail cuts and end drilling shall conform to the requirements in Section 34 11 29, "General Track Construction".

3.4 BUMPING POST

- A. Contractor shall furnish and install bumping post at the locations shown on the Plans.
- B. Contractor shall position anti-climbing ribs so as to engage anti-climbing ribs of the streetcar. Contractor shall configure bumping posts to avoid any contact with the streetcar coupler or train-line electronics mounted on the coupler.
- C. Bumping posts shall be installed by Contractor in conformance with the manufacturer's installation instructions. Insulated joints shall be placed before bumping posts as shown on the Plans.
- D. Contractor shall coordinate with the manufacturer's representative to visit the Project site and certify the installation of the bumping post upon completion of installation

3.5 ELASTOMERIC GROUT

- A. Contractor shall furnish and install elastomeric grout at the locations shown on the Plans.

3.6 PRECAST CONCRETE CROSSING PANELS

- A. Precast concrete crossing panels shall be made of durable, long-lasting pre-cast concrete with compatible rubber flangeway fillers. Crossing panels shall be compatible with the approved cross tie. Crossing panels shall be constructed with due regard to access for track maintenance, electrical isolation, non-interference with electrical track circuits or rail fastenings, tire adhesion, and slip resistance for pedestrians.

- B. Contractor shall furnish and install precast concrete crossing panels at the locations shown on the Plans. Contractor shall coordinate with streetcar operations staff to identify precise locations of crossing panels and confirm location with DESIGN PROFESSIONAL following approval of the Bumping Post submittal. Rail joints shall not be located within the limits of a crossing.
- C. Panels shall use ADA-compliant flangeway fillers.
- D. Contractor shall install panels per manufacturer's recommendations.

3.7 RAIL EXPANSION JOINTS

- A. The Contractor shall install the rail expansion joints per Manufacturer's recommendations.

PART 4 - MEASUREMENT

4.1 ITEM BASIS

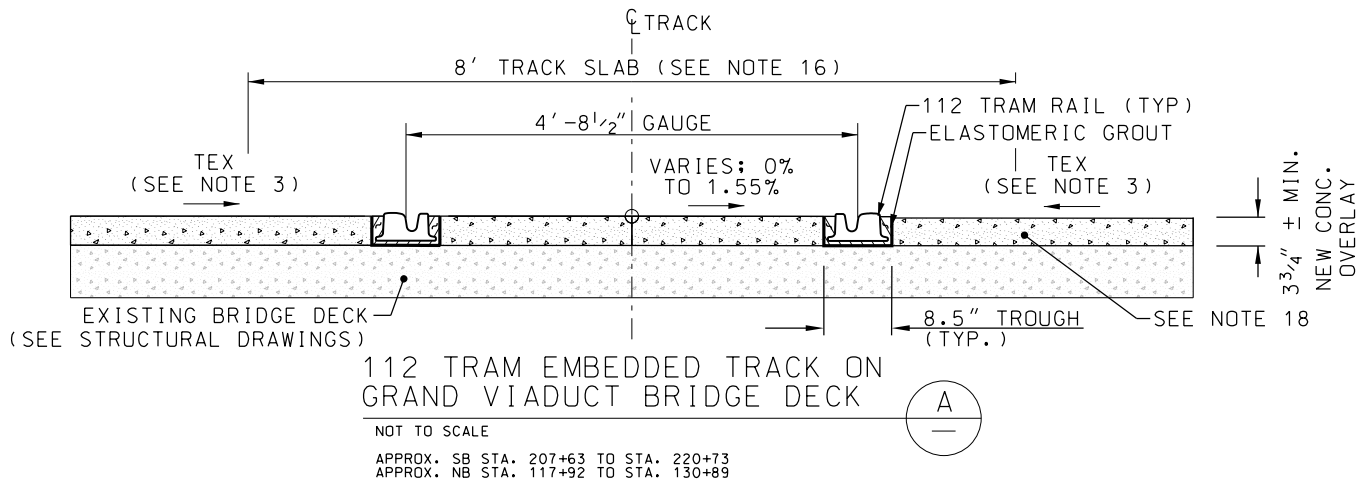
- A. Measurement of the transition rails, insulated joints and bumping post will be per each item supplied and installed. Measurement of elastomeric grout will be per cubic foot supplied and installed. Rail expansion joints will be per pair supplied and installed. No separate measurement will be made for the other track materials required for the track construction.

PART 5 - PAYMENT

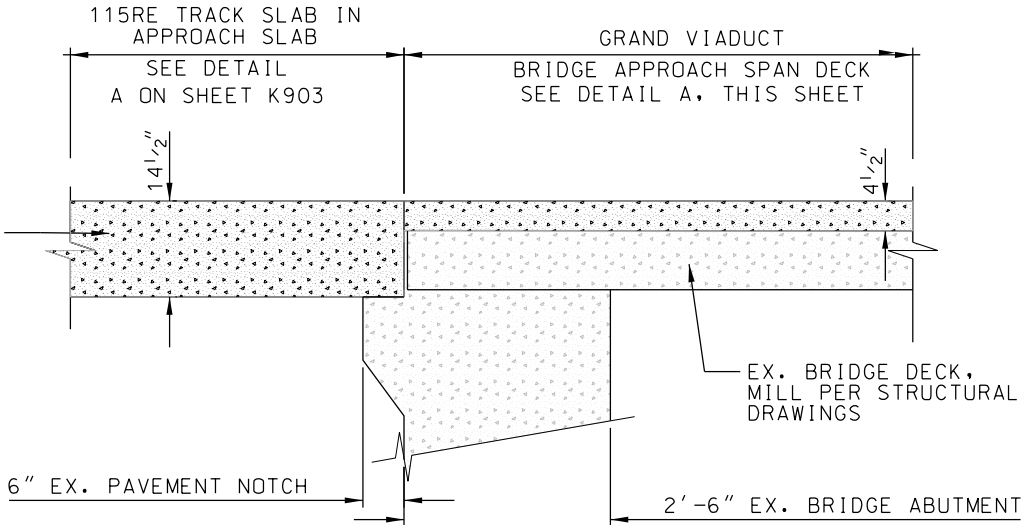
5.1 PAYMENT

- A. The accepted measured quantity of each pay item will be paid for at the Contract unit price per unit of measurement. The Contract unit price will be payment in full for furnishing all labor, materials, tools, equipment and incidentals, and doing all Work necessary to complete the Work specified. Cost for the other track materials than those listed above will be incidental to the Contract unit cost of the Embedded Track and Ballasted Track bid items.

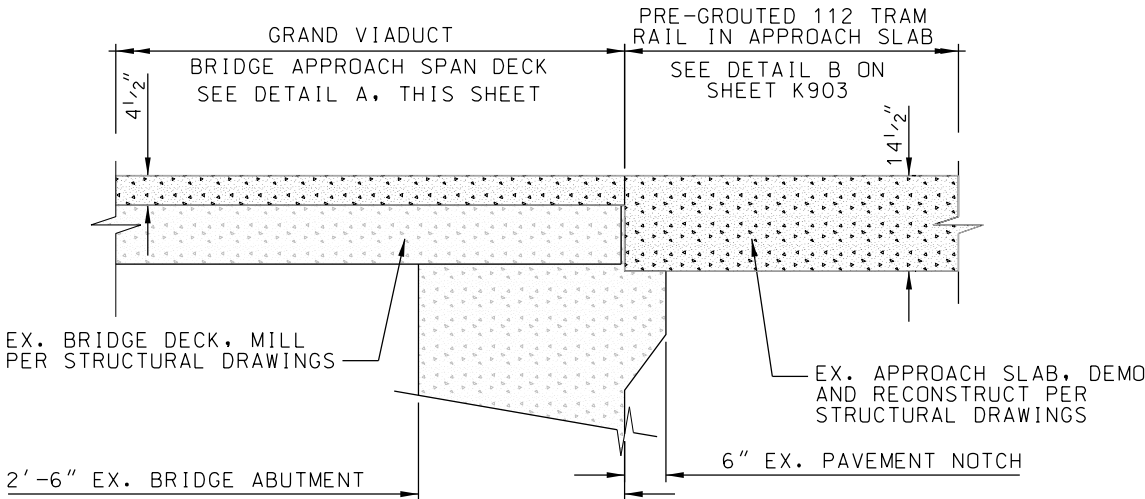
END OF SECTION



EX. APPROACH SLAB, DEMO
AND RECONSTRUCT PER
STRUCTURAL DRAWINGS



TRACK SLAB SECTION AT SOUTH BRIDGE ABUTMENT
NOT TO SCALE



TRACK SLAB SECTION AT NORTH BRIDGE ABUTMENT
NOT TO SCALE

NOTES:

1. SEE CIVIL DRAWINGS FOR TEMPORARY PAVEMENT SAW CUTS, REPLACEMENT LIMITS, AND TYPES.
2. TRACK GAUGE IS MEASURED AT 5/8" BELOW TOP OF RAIL AND FROM THE GAUGE FACE TO GAUGE FACE. ALL TRACKWORK SHALL BE CONSTRUCTED AT 4'-8 1/2" STANDARD GAUGE.
3. TRACK EDGE CROSS-SLOPES (TEX) ARE SHOWN ON K100 SERIES DRAWINGS AND SHALL BE FIELD ADJUSTED TO MINIMIZE ROADWAY REGRADING. COORDINATE WITH ENGINEER FOR APPROVAL. CROSS-SLOPES ADJACENT TO TRAVEL LANES NOT TO EXCEED 5%, OR 7% IN MIXED TRAFFIC LANES WHERE ADJACENT TO PARKING LANE OR CURB, WITHOUT APPROVAL OF ENGINEER. TEX NOT TO EXCEED 12% IN SEMI-EXCLUSIVE AND EXCLUSIVE GUIDEWAY.
4. CONTRACTOR TO SUBMIT TRACK APPURTENANCES (GAUGE TIE, FASTENERS, ETC.) FOR REVIEW AND APPROVAL BY ENGINEER PRIOR TO FABRICATION.
5. ALL 115RE TRACK SHALL HAVE A 1:40 CANT, UNLESS OTHERWISE SPECIFIED. 112 TRAM RAIL SHALL HAVE ZERO CANT.
6. REFER TO PROJECT GEOTECHNICAL REPORT FOR ENGINEERING RECOMMENDATIONS REGARDING UNSUITABLE MATERIAL. SUBMIT OVER EXCAVATION BACKFILL MATERIAL FOR REVIEW AND APPROVAL BY ENGINEER.
7. RESTRAINING RAIL REQUIRED FOR ALL HORIZONTAL CURVES WITH A RADIUS LESS THAN 400'.
8. SEE SYSTEM WIDE ELECTRICAL PLANS FOR THE REQUIRED SYSTEM ELEMENTS INCLUDING DUCT BANKS, INSULATED JOINTS, CROSS BONDING, NEGATIVE RETURN, AND OTHER SYSTEM APPURTENANCES THAT INTERFACE WITH TRACK/CIVIL WORK.

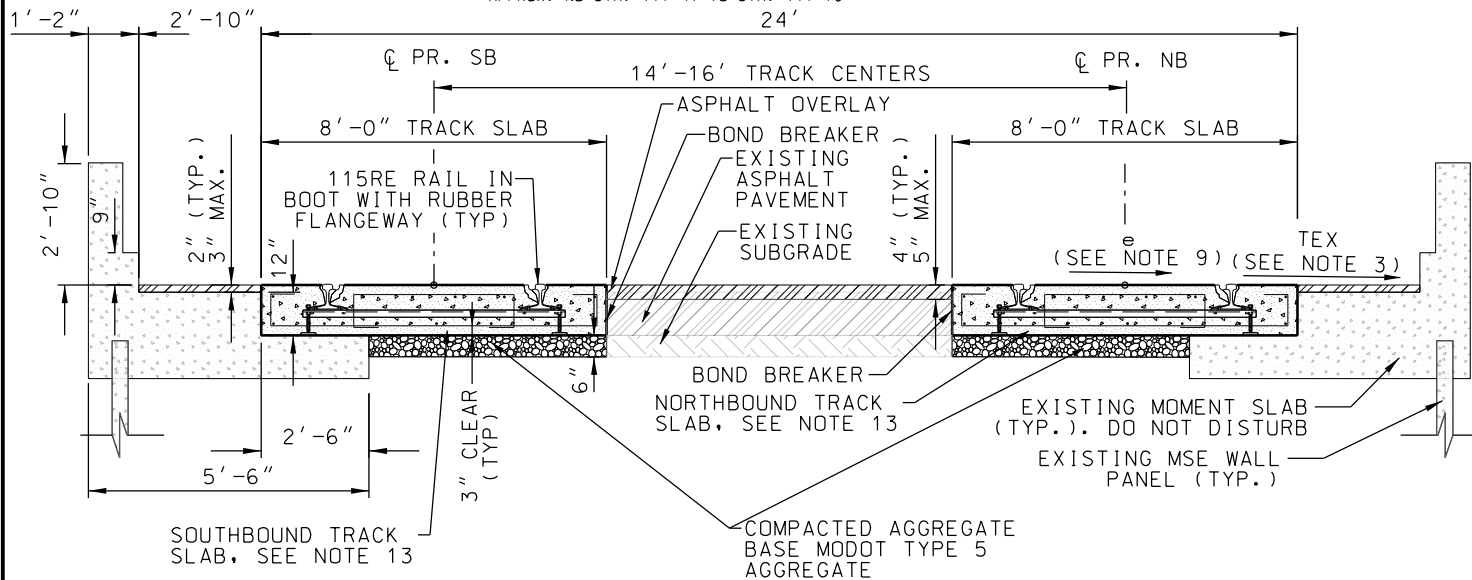
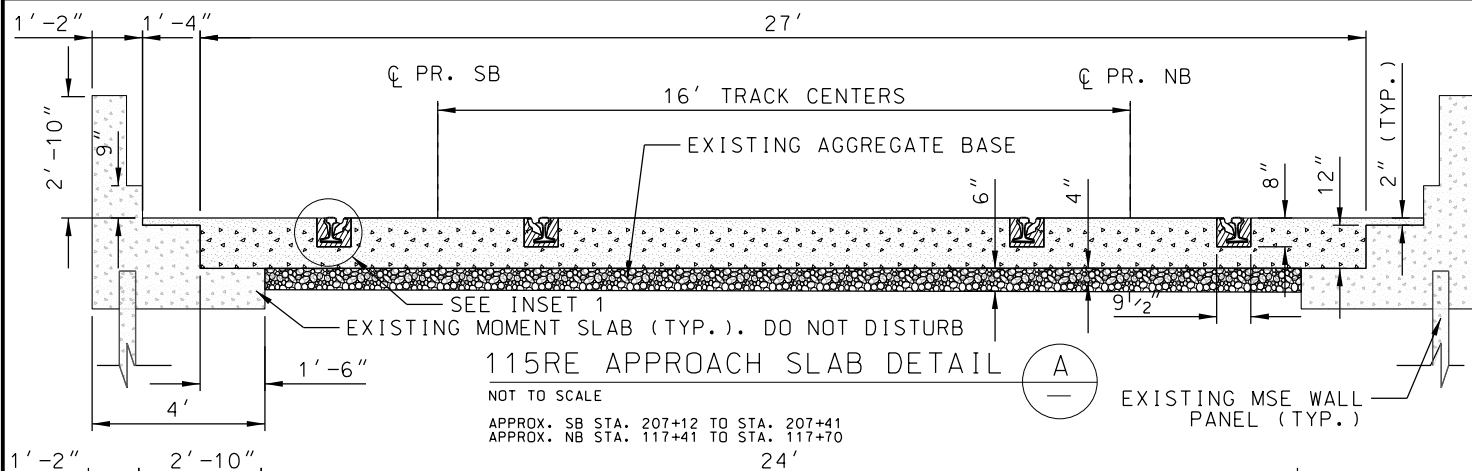
9. e IS THE CROSS SLOPE BETWEEN THE RAILS. 0% (TYP). SEE K101 TO K111 DRAWINGS FOR "e" VALUE. THE HIGH RAIL IN THE CURVE WILL BE THE OUTSIDE RAIL UNLESS OTHERWISE NOTED.
10. TIE NEEDS TO HAVE ADEQUATE WEEP HOLES. CONTRACTOR TO TAKE EXTRA CARE IN VIBRATING BELOW THE TIE TO ENSURE THERE IS FULL CONCRETE CONSOLIDATION ALL AROUND THE TIE.
11. DOWELS REQUIRED WHERE EXISTING PAVEMENT IS GREATER THAN 3' FROM EDGE OF TRACK SLAB
12. SUBGRADE REQUIRED TO MEET COMPACTION REQUIREMENTS OUTLINED IN THE GEOTECHNICAL REPORT.
13. ALL TRACK SLAB CONCRETE SHALL BE F'C = 4500 PSI WITH MICROFIBER DOSING, 3 LB PER CY.
14. MAX. GRADE NOT TO EXCEED 10% EXCEPT IN CROSSWALKS, WHERE GRADE SHALL NOT EXCEED 5%. WHERE TRACK SLAB IS IN AN INTERSECTION OR CLOSE PROXIMITY TO THE CURB PAVEMENT SURFACE WILL BE FINAL MATERIAL AND FOLLOW DETAIL B ON SHEET K901.
15. CONTRACTOR TO SUBMIT INSTALLATION PLAN FOR HOLDING GAUGE IN ELASTOMERIC GROUT TROUGH TO ENGINEER FOR REVIEW AND APPROVAL PRIOR TO INSTALLATION.
16. TRACK SLAB LIMITS ON STRUCTURE SHOWN FOR PAY LIMITS. CONTRACTOR MAY POUR BRIDGE PAVEMENT MONOLITHICALLY WITH TRACK SLAB.
17. SEE SHEETS ST101 TO ST107 FOR GRAND BOULEVARD VIADUCT BRIDGE DETAILS.

REV	DATE	DESCRIPTION	DESIGNED BY	PBS
			CHECKED BY	JWR
			DRAWN BY	MMW
			CHECKED BY	JWR
			APPROVED BY	NKS
PLOT DATE: 9/12/2022			DATE	08-11-2022



EARLY PROCUREMENT PACKAGE 2B		DATE: 09-13-2022
10450 Holmes Road Suite 600 Kansas City, MO 64131-3471 816-360-2700 Certificate of Authority: 000856		
NOT FOR CONSTRUCTION		

KANSAS CITY STREETCAR - RIVERFRONT EXTENSION		SCALE FOR 22"x34": NOT TO SCALE
TRACK SLAB DETAILS SHEET 2 OF 5		FILENAME: K902.dgn
		CONTRACT NO.: CONTRACT NO. ***
		VOLUME: 1
		DRAWING NO.: SHEET NO.:
		K902 56

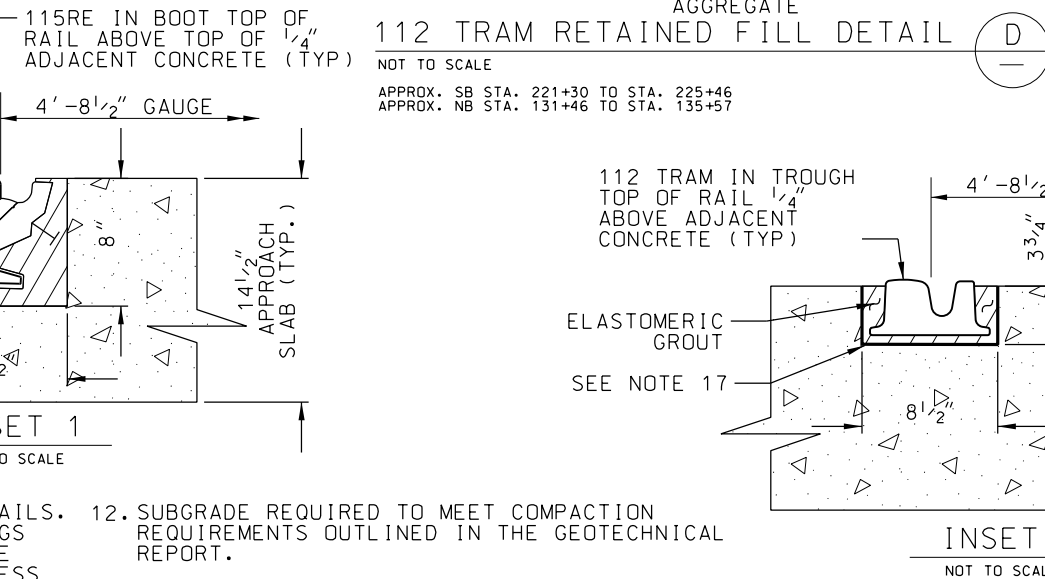
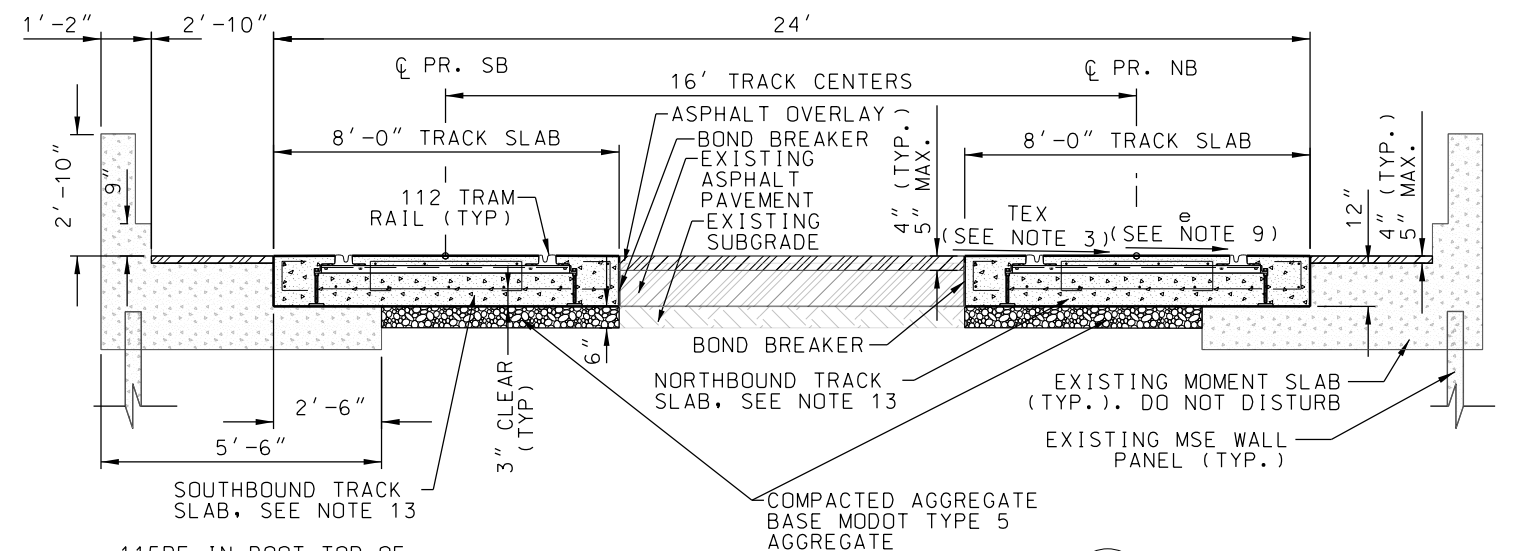
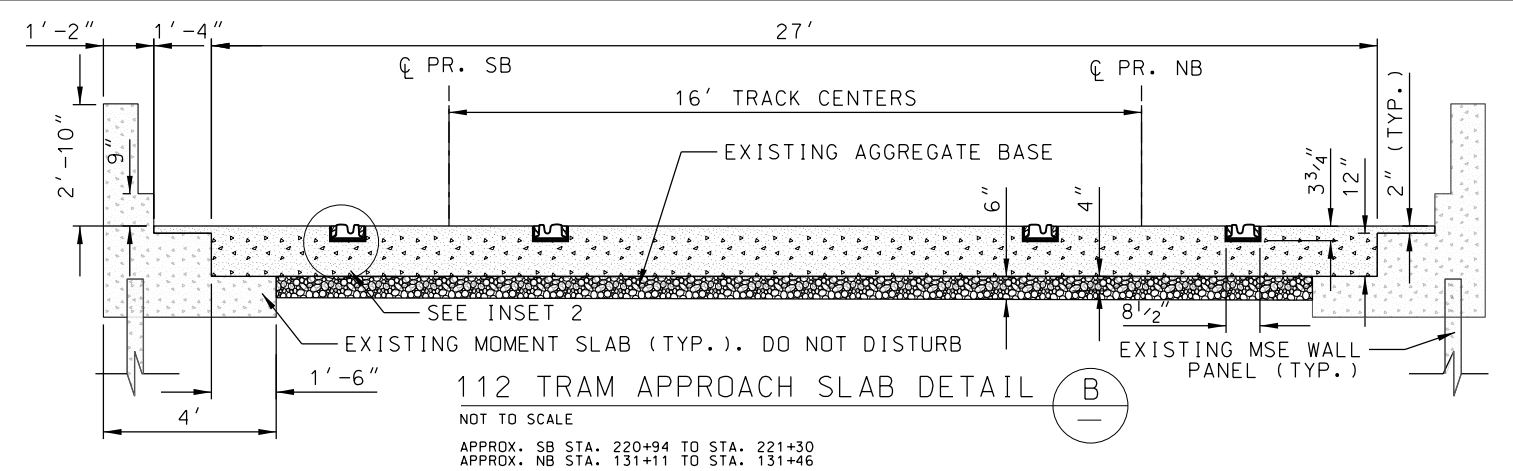
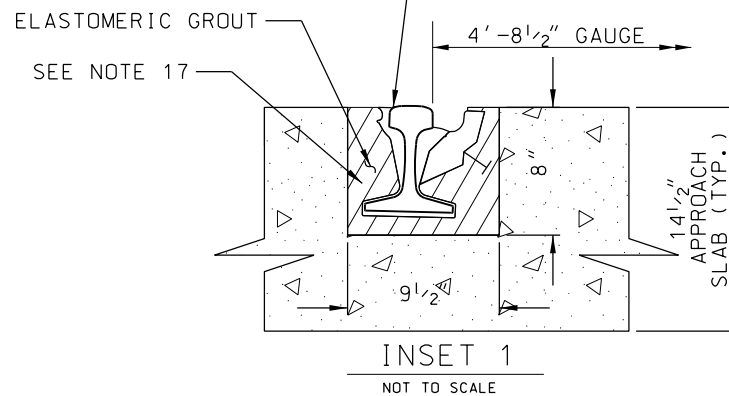


- NOTES:
- SEE CIVIL DRAWINGS FOR TEMPORARY PAVEMENT SAW CUTS, REPLACEMENT LIMITS, AND TYPES.
 - TRACK GAUGE IS MEASURED AT 5/8" BELOW TOP OF RAIL AND FROM THE GAUGE FACE TO GAUGE FACE. ALL TRACKWORK SHALL BE CONSTRUCTED AT 4' - 8 1/2" STANDARD GAUGE.
 - TRACK EDGE CROSS-SLOPES (TEX) ARE SHOWN ON K100 SERIES DRAWINGS AND SHALL BE FIELD ADJUSTED TO MINIMIZE ROADWAY REGRADING. COORDINATE WITH ENGINEER FOR APPROVAL. CROSS-SLOPES ADJACENT TO TRAVEL LANES NOT TO EXCEED 5%, OR 7% IN MIXED TRAFFIC LANES WHERE ADJACENT TO PARKING LANE OR CURB, WITHOUT APPROVAL OF ENGINEER. TEX NOT TO EXCEED 12% IN SEMI-EXCLUSIVE AND EXCLUSIVE GUIDEWAY.
 - CONTRACTOR TO SUBMIT TRACK APPURTENANCES (GAUGE TIE, FASTENERS, ETC.) FOR REVIEW AND APPROVAL BY ENGINEER PRIOR TO FABRICATION.
 - ALL 115RE TRACK SHALL HAVE A 1:40 CANT, UNLESS OTHERWISE SPECIFIED. 112 TRAM RAIL SHALL HAVE ZERO CANT.
 - REFER TO PROJECT GEOTECHNICAL REPORT FOR ENGINEERING RECOMMENDATIONS REGARDING UNSUITABLE MATERIAL. SUBMIT OVER EXCAVATION BACKFILL MATERIAL FOR REVIEW AND APPROVAL BY ENGINEER.
 - RESTRAINING RAIL REQUIRED FOR ALL HORIZONTAL CURVES WITH A RADIUS LESS THAN 400'.
 - SEE SYSTEM WIDE ELECTRICAL PLANS FOR THE REQUIRED SYSTEM ELEMENTS INCLUDING DUCT BANKS, INSULATED JOINTS, CROSS BONDING, NEGATIVE RETURN, AND OTHER SYSTEM APPURTENANCES THAT INTERFACE WITH TRACK/CIVIL WORK.

REV	DATE	DESCRIPTION	DESIGNED BY	PBS
			CHECKED BY	JWR
			DRAWN BY	MMW
			CHECKED BY	JWR
			APPROVED BY	NKS
PLOT DATE: 9/12/2022			DATE	08-11-2022



- e IS THE CROSS SLOPE BETWEEN THE RAILS. 0% (TYP). SEE K101 TO K111 DRAWINGS FOR "e" VALUE. THE HIGH RAIL IN THE CURVE WILL BE THE OUTSIDE RAIL UNLESS OTHERWISE NOTED.
- TIE NEEDS TO HAVE ADEQUATE WEEP HOLES. CONTRACTOR TO TAKE EXTRA CARE IN VIBRATING BELOW THE TIE TO ENSURE THERE IS FULL CONCRETE CONSOLIDATION ALL AROUND THE TIE.
- DOWELS REQUIRED WHERE EXISTING PAVEMENT IS GREATER THAN 3' FROM EDGE OF TRACK SLAB

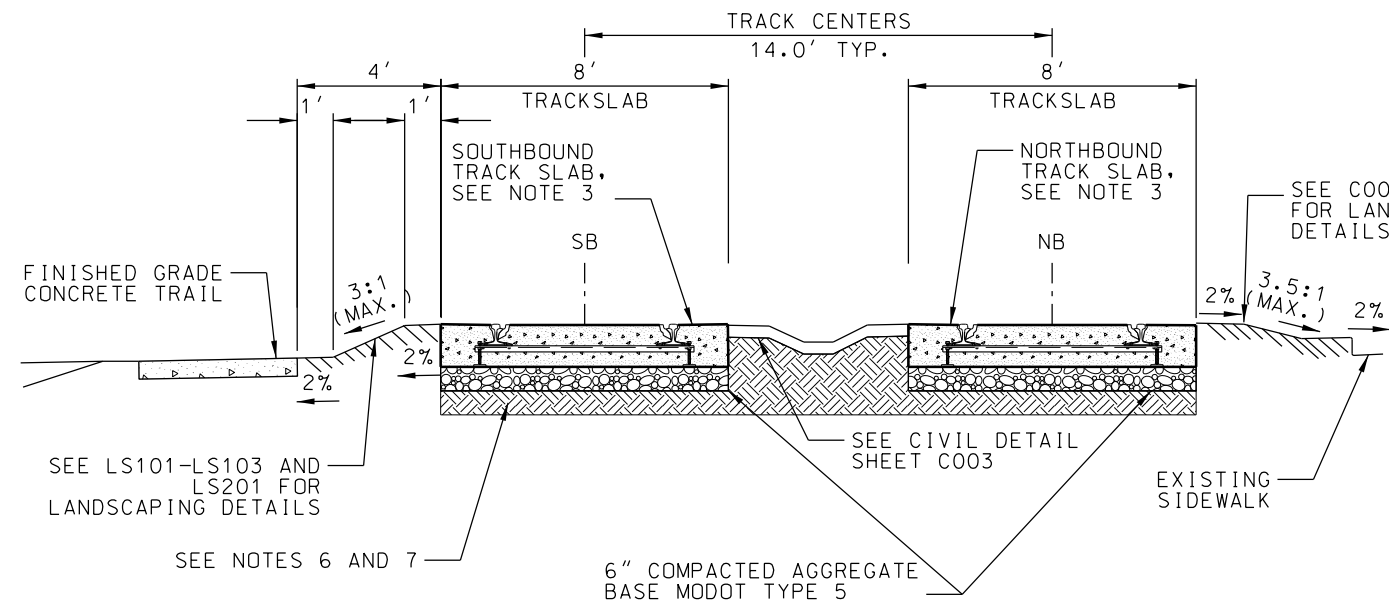


- SUBGRADE REQUIRED TO MEET COMPACTION REQUIREMENTS OUTLINED IN THE GEOTECHNICAL REPORT.
- SEE DETAILS A AND C, SHEET K901 FOR TRACK SLAB DETAILS. ALL TRACK SLAB CONCRETE SHALL BE F'c = 4500 PSI WITH MICROFIBER DOSING, 3 LB PER CY.
- MAX. GRADE NOT TO EXCEED 10% EXCEPT IN CROSSWALKS, WHERE GRADE SHALL NOT EXCEED 5%. WHERE TRACK SLAB IS IN AN INTERSECTION OR CLOSE PROXIMITY TO THE CURB PAVEMENT SURFACE WILL BE FINAL MATERIAL AND FOLLOW DETAIL B ON SHEET K901.

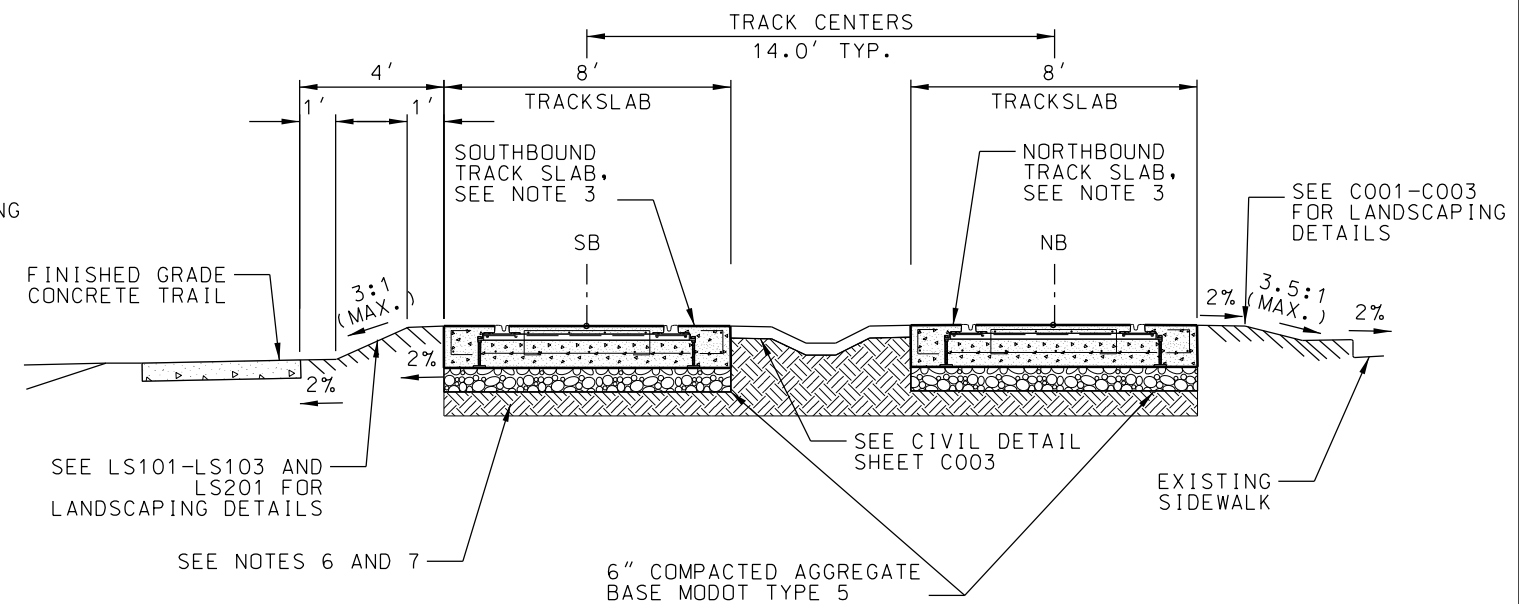
- CONTRACTOR TO SUBMIT INSTALLATION PLAN FOR HOLDING GAUGE IN ELASTOMERIC GROUT TROUGH TO ENGINEER FOR REVIEW AND APPROVAL PRIOR TO INSTALLATION.
- SEE SHEETS ST101 TO ST107 FOR GRAND BOULEVARD VIADUCT BRIDGE DETAILS.

EARLY PROCUREMENT PACKAGE 2B	DATE: 09-13-2022
HDR Engineering, Inc. 10450 Holmes Road Suite 600 Kansas City, MO 64131-3471 816-360-2700 Certificate of Authority: 000856	
NOT FOR CONSTRUCTION	

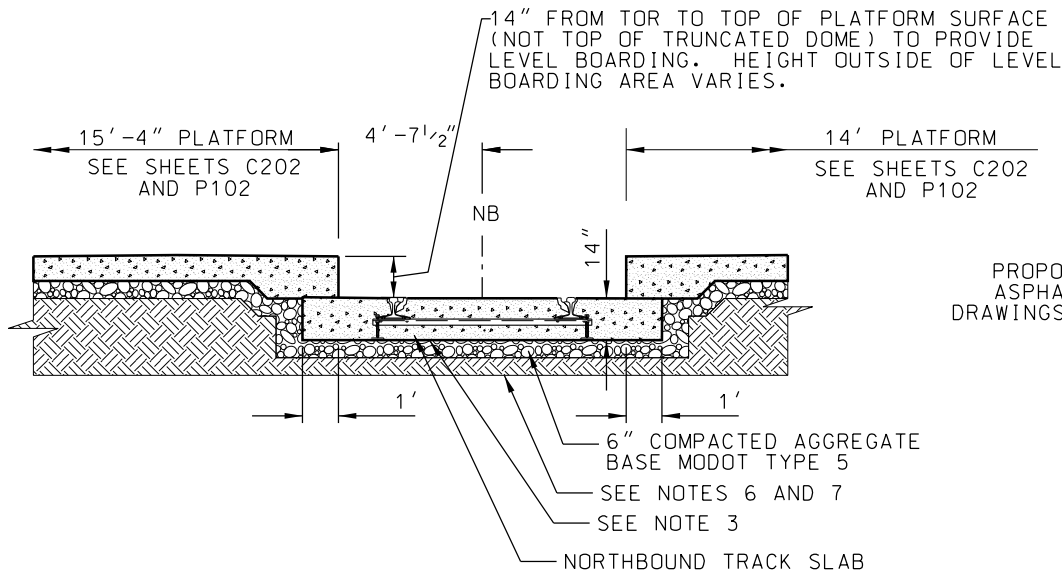
KANSAS CITY STREETCAR - RIVERFRONT EXTENSION		SCALE FOR 22"x34":
TRACK SLAB DETAILS		NOT TO SCALE
SHEET 3 OF 5		FILENAME: K903.dgn
		CONTRACT NO.: CONTRACT NO. ***
		VOLUME: 1
		DRAWING NO.: SHEET NO.:
		K903 57



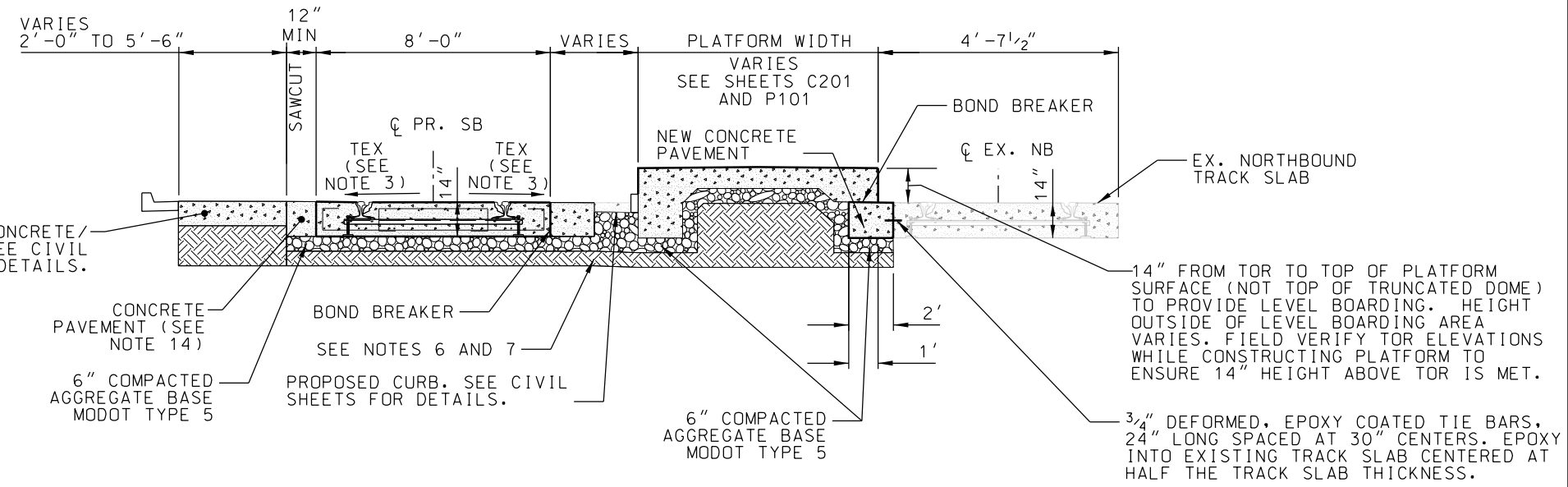
115RE EMBEDDED TRACK OFF-STREET **A**
NOT TO SCALE
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APPROX. NB STA. 138+61 TO STA. 148+88



112 TRAM EMBEDDED TRACK OFF-STREET **B**
NOT TO SCALE
APPROX. SB STA. 226+20 TO STA. 228+61
APPROX. NB STA. 136+75 TO STA. 138+61



115RE EMBEDDED TRACK AT OFF-STREET PLATFORM **C**
NOT TO SCALE
APPROX. NB STA. 148+88 TO STA. 150+83



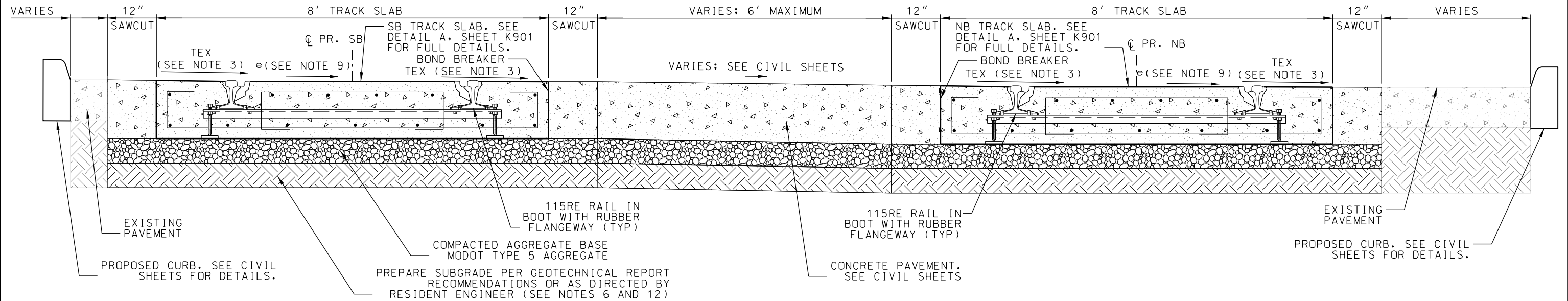
115RE EMBEDDED TRACK PLATFORM WITH EXISTING TRACK **D**
NOT TO SCALE
APPROX. SB STA. 200+78 TO STA. 201+67

NOTES:

- DIMENSIONS AND MINIMUM CLEARANCES NOTED IN DETAIL ARE APPROXIMATE AND SHOULD BE UPDATED IN FINAL APPROVED SHOP DRAWINGS PRIOR TO INSTALLATION.
- TRACK GAUGE IS MEASURED AT 5/8" BELOW TOP OF RAIL AND FROM THE GAUGE FACE TO GAUGE FACE
- SEE DETAIL A, SHEET K901 FOR TRACK SLAB DETAILS. ALL TRACK SLAB CONCRETE SHALL BE F'C = 4500 PSI WITH MICROFIBER DOSING, 3 LB PER CY.
- ALL RAIL SHALL HAVE 1:40 CANT, UNLESS OTHERWISE SPECIFIED. 112 TRAM RAIL SHALL HAVE ZERO CANT.

- FOR PAVING LIMITS AND SIDEWALK CURB REPLACEMENT LOCATIONS, SEE CIVIL PLANS.
- REFER TO PROJECT GEOTECHNICAL REPORT FOR ENGINEERING RECOMMENDATIONS REGARDING UNSUITABLE MATERIAL. SUBMIT OVER EXCAVATION BACKFILL MATERIAL FOR REVIEW AND APPROVAL BY ENGINEER.
- SUBGRADE REQUIRED TO MEET COMPACTION REQUIREMENTS OUTLINED IN THE GEOTECHNICAL REPORT. PREPARE SUBGRADE PER GEOTECHNICAL RECOMMENDATIONS OR AS DIRECTED BY RESIDENT ENGINEER.
- MAX. GRADE NOT TO EXCEED 10% EXCEPT IN CROSSWALKS, WHERE GRADE SHALL NOT EXCEED 5%. WHERE TRACK SLAB IS IN AN INTERSECTION OR CLOSE PROXIMITY TO THE CURB PAVEMENT SURFACE WILL BE FINAL MATERIAL AND FOLLOW DETAIL B ON SHEET K901.

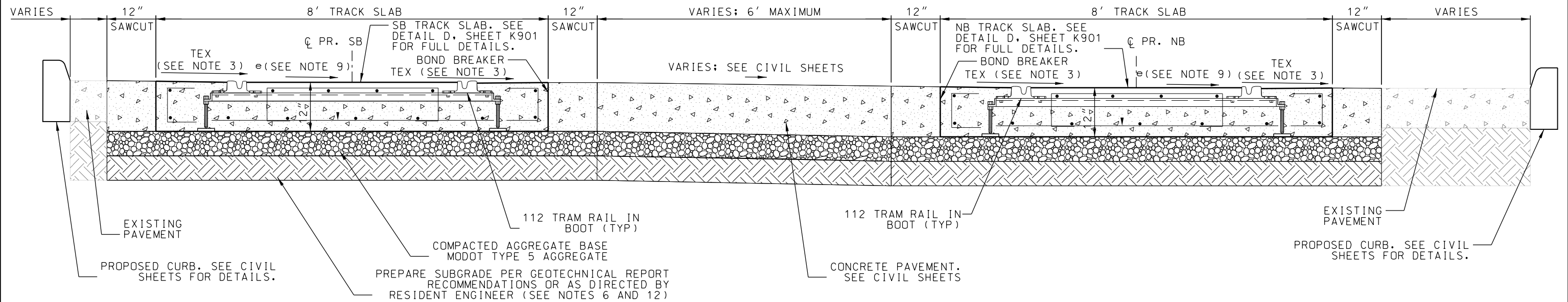
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			CHECKED BY	JWR		 10450 Holmes Road Suite 600 Kansas City, MO 64131-3471 816-360-2700 Certificate of Authority: 000856	NOT FOR CONSTRUCTION		NOT TO SCALE
			DRAWN BY	MMW					FILENAME:
			CHECKED BY	JWR					CONTRACT NO.:
			APPROVED BY	NKS					CONTRACT NO. ***
PLOT DATE: 9/12/2022			DATE		08-11-2022	TRACK SLAB DETAILS SHEET 4 OF 5			VOLUME:
									DRAWING NO.:
									SHEET NO.:
									K904
									58



115RE EMBEDDED TRACK WITH PAVEMENT CONNECTION

NOT TO SCALE

APPROX. SB STA. 199+89 TO STA. 200+78;
 SB STA. 201+67 TO STA. 205+51
 APPROX. NB STA. 113+00 TO STA. 117+70

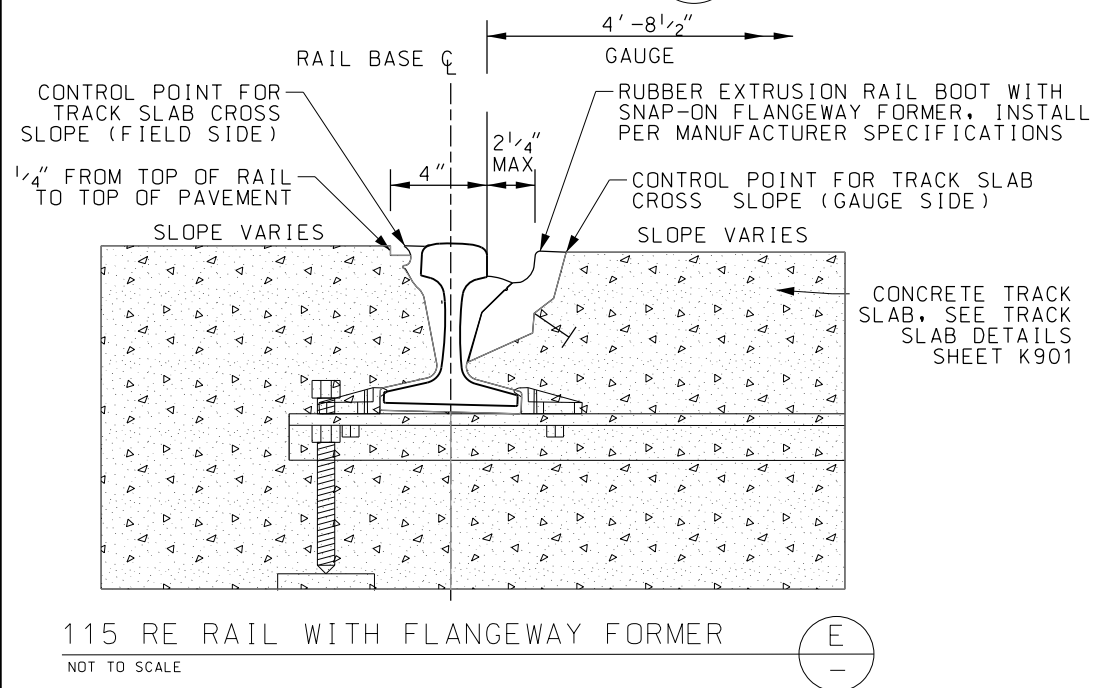
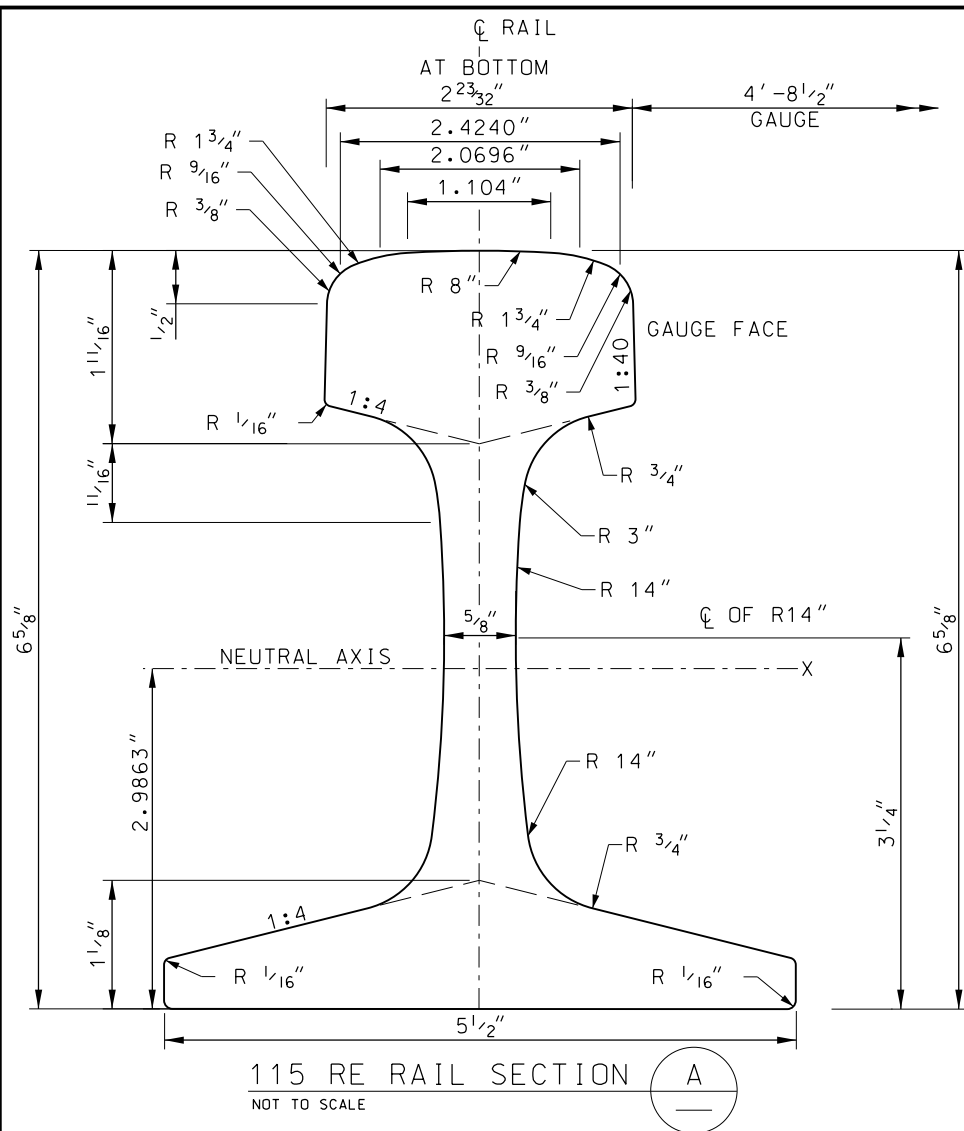


112 TRAM TRACK WITH PAVEMENT CONNECTION

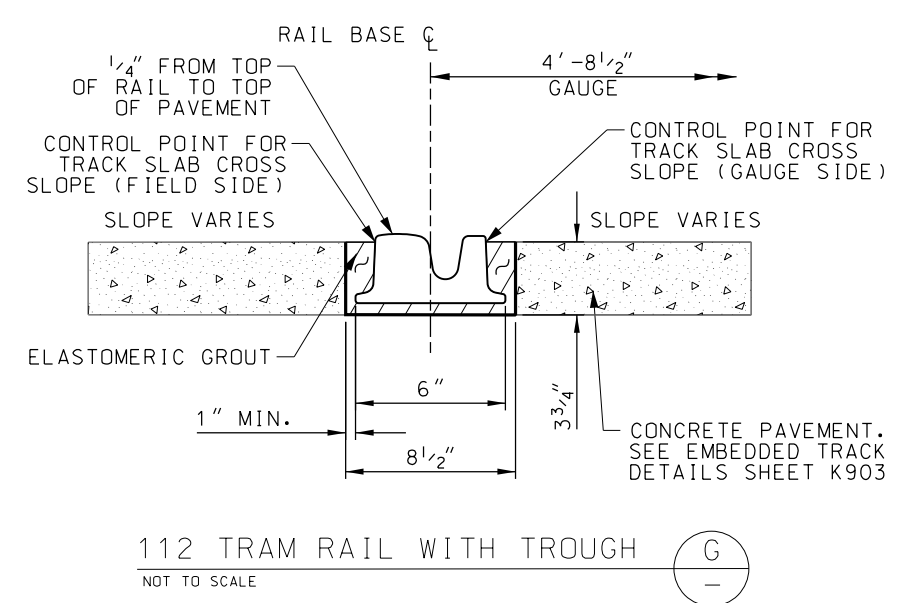
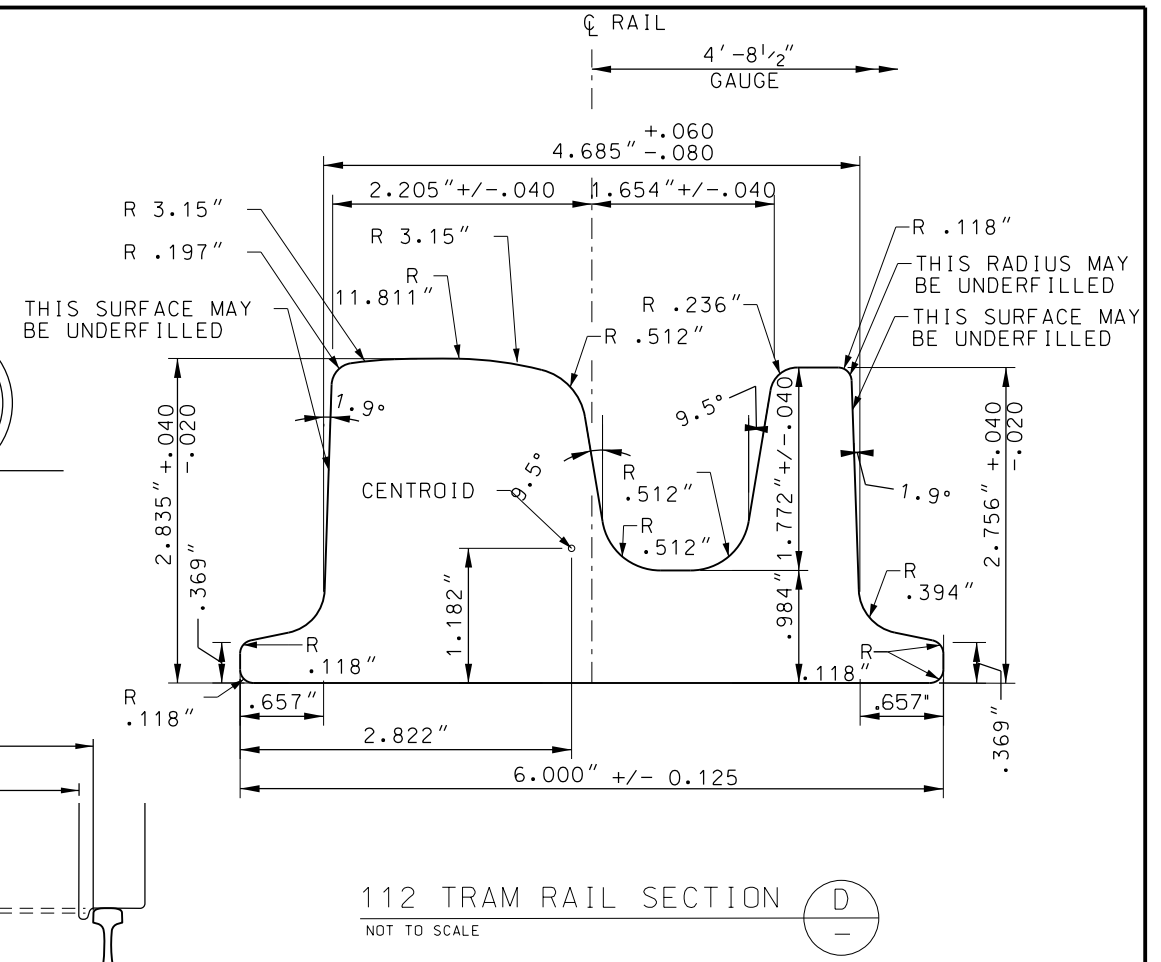
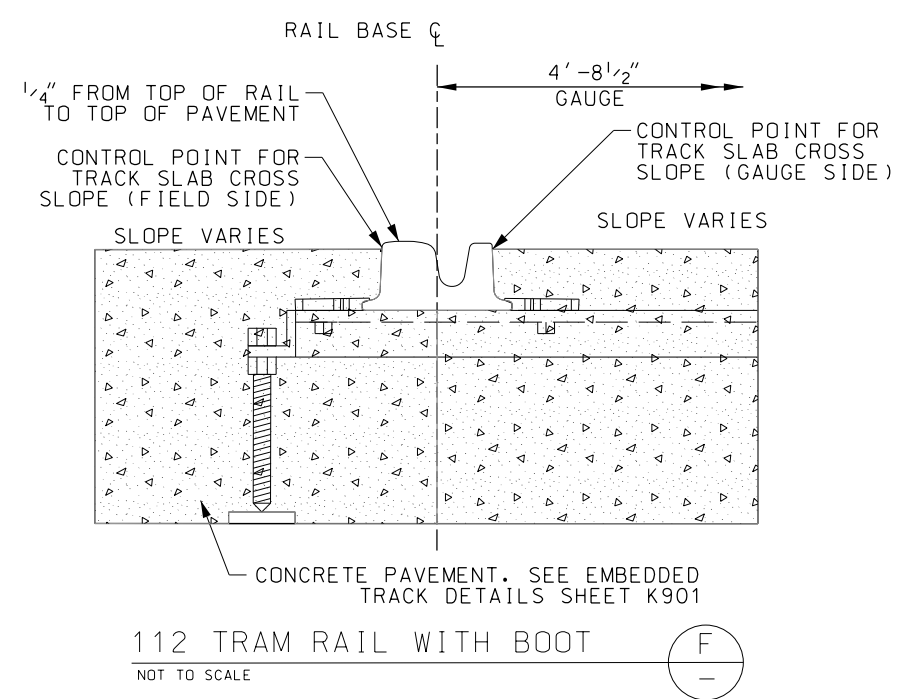
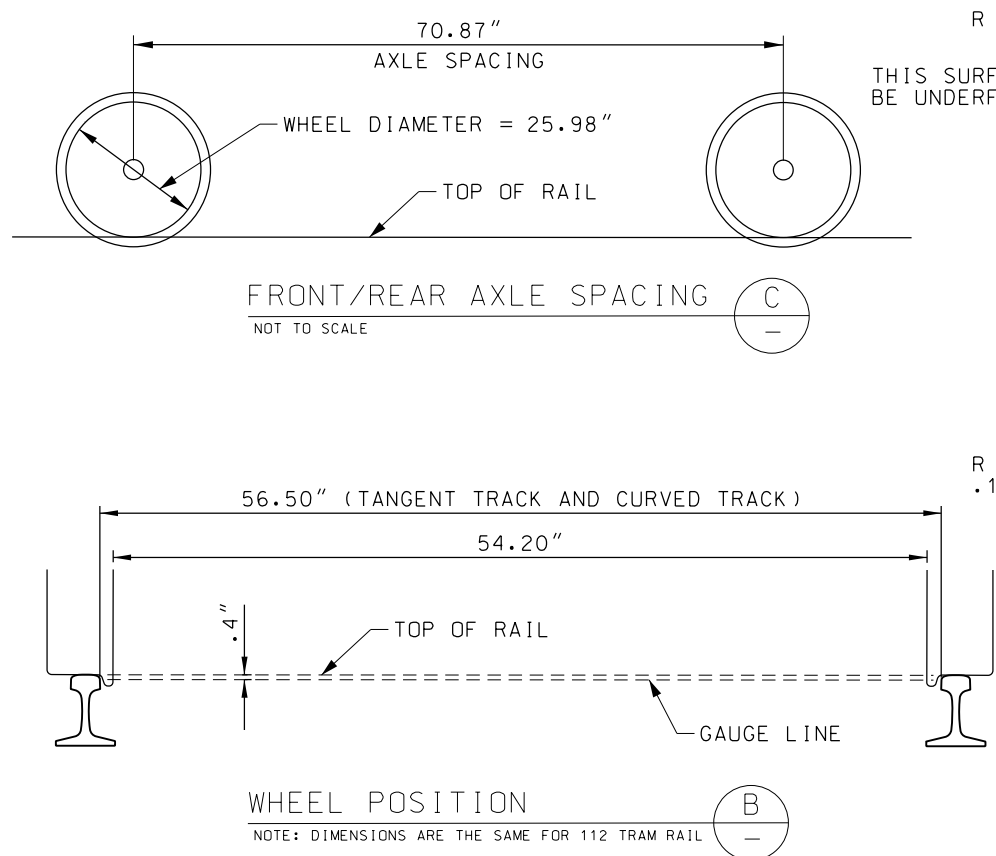
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APPROX. SB STA. 225+46 TO STA. 226+20;
 APPROX. NB STA. 135+57 TO STA. 136+75

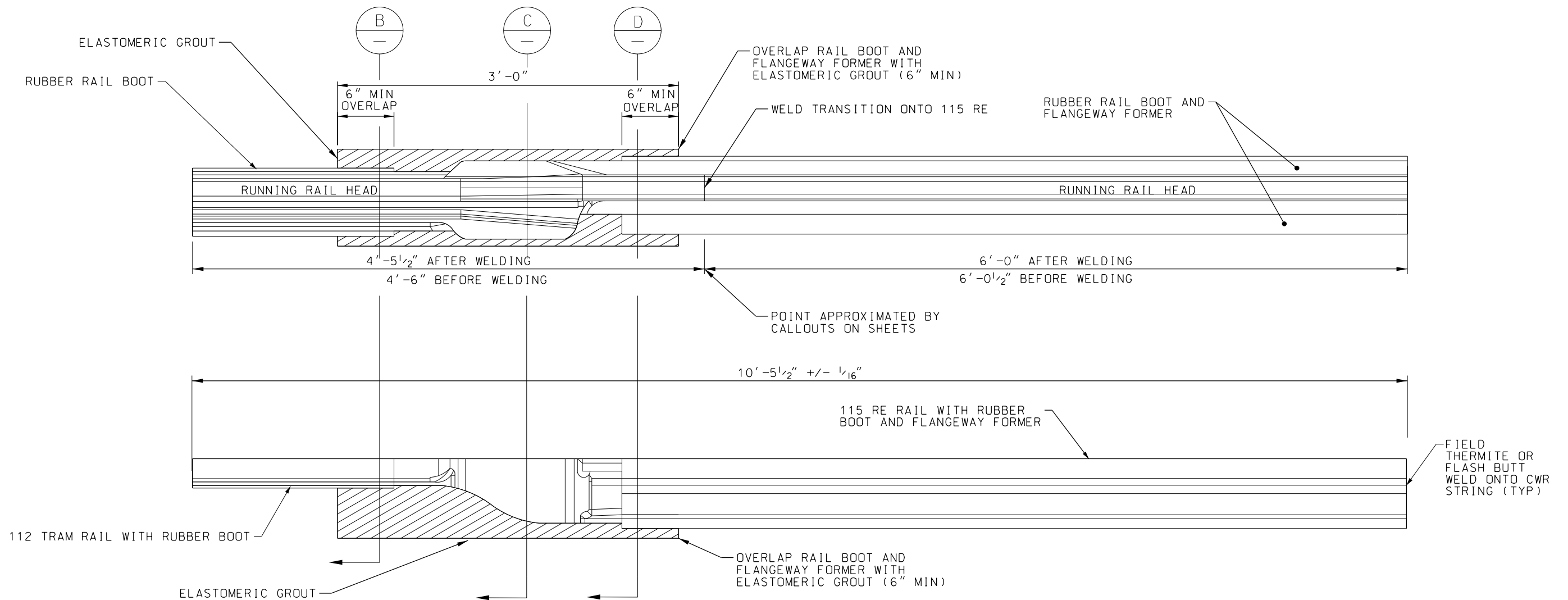
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			DRAWN BY	MMW	10450 Holmes Road		SHEET 5 OF 5	CONTRACT NO.: CONTRACT NO. ***
			CHECKED BY	JWR	Suite 600			VOLUME: 1
			APPROVED BY	NKS	Kansas City, MO 64131-3471			DRAWING NO.: SHEET NO.:
					816-360-2700			K905 59
					Certificate of Authority: 000856			
PLOT DATE: 9/12/2022			DATE: 08-11-2022		NOT FOR CONSTRUCTION			



NOTES:
1. SEE SHEET K916 FOR RESTRAINING RAIL DETAILS.
2. ALL TRACK SLAB CONCRETE SHALL BE F'C = 4500 PSI WITH MICROFIBER DOSING, 3 LB PER CY.



REV	DATE	DESCRIPTION	DESIGNED BY	PBS	EARLY PROCUREMENT PACKAGE 2B	DATE: 09-13-2022	KANSAS CITY STREETCAR - RIVERFRONT EXTENSION	SCALE FOR 22"x34": NOT TO SCALE
			CHECKED BY	JWR	HDR	HDR Engineering, Inc.		FILENAME: K906.dgn
			DRAWN BY	MMW	10450 Holmes Road			CONTRACT NO.: CONTRACT NO. ***
					Suite 600			VOLUME: 1
			CHECKED BY	JWR	Kansas City, MO 64131-3471			DRAWING NO.: SHEET NO.:
			APPROVED BY	NKS	816-360-2700			K906 60
					Certificate of Authority: 000856			
PLOT DATE: 9/12/2022			DATE		08-11-2022		NOT FOR CONSTRUCTION	



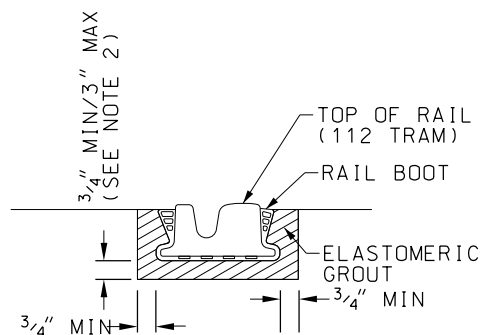
TRANSITION RAIL PLAN AND ELEVATION

NOT TO SCALE



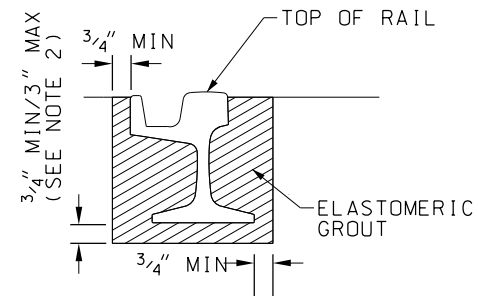
NOTES:

- CONTRACTOR TO SUBMIT SHOP DRAWINGS FOR REVIEW AND APPROVAL BY ENGINEER PRIOR TO MANUFACTURING TRANSITION RAIL.
- A MINIMUM OF 7" CONCRETE DEPTH BELOW ELASTOMERIC GROUT REQUIRED. INCREASE TRACK SLAB DEPTH AS NEEDED TO ACHIEVE 7" DEPTH BELOW GROUT
- CONTRACTOR TO FOLLOW ELASTOMERIC GROUT MANUFACTURER'S RECOMMENDATION FOR INSTALLATION.
- WHERE TRANSITION RAIL ASSEMBLY CONFLICTS WITH STEEL GAUGE TIE, ADJUST GAUGE TIE(S) IN CONFLICT WITH SPACING NO GREATER THAN 7 1/2' TO AVOID CONFLICT. NO GAPS BETWEEN GAUGE TIES SHALL EXCEED 10'.
- TRANSITION RAILS FOR THE GRAND BOULEVARD BRIDGE EXPANSION JOINTS WILL BE CURVED AT A CENTERLINE RADIUS OF 1616' ON THE SOUTHBOUND TRACK AND 1600' ON THE NORTHBOUND TRACK. SEE SHEET K921 FOR DETAILS AND PLAN AND PROFILE RIBBONS FOR STATIONING.



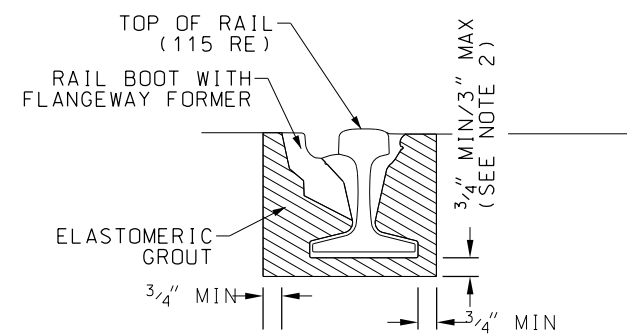
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REV	DATE	DESCRIPTION

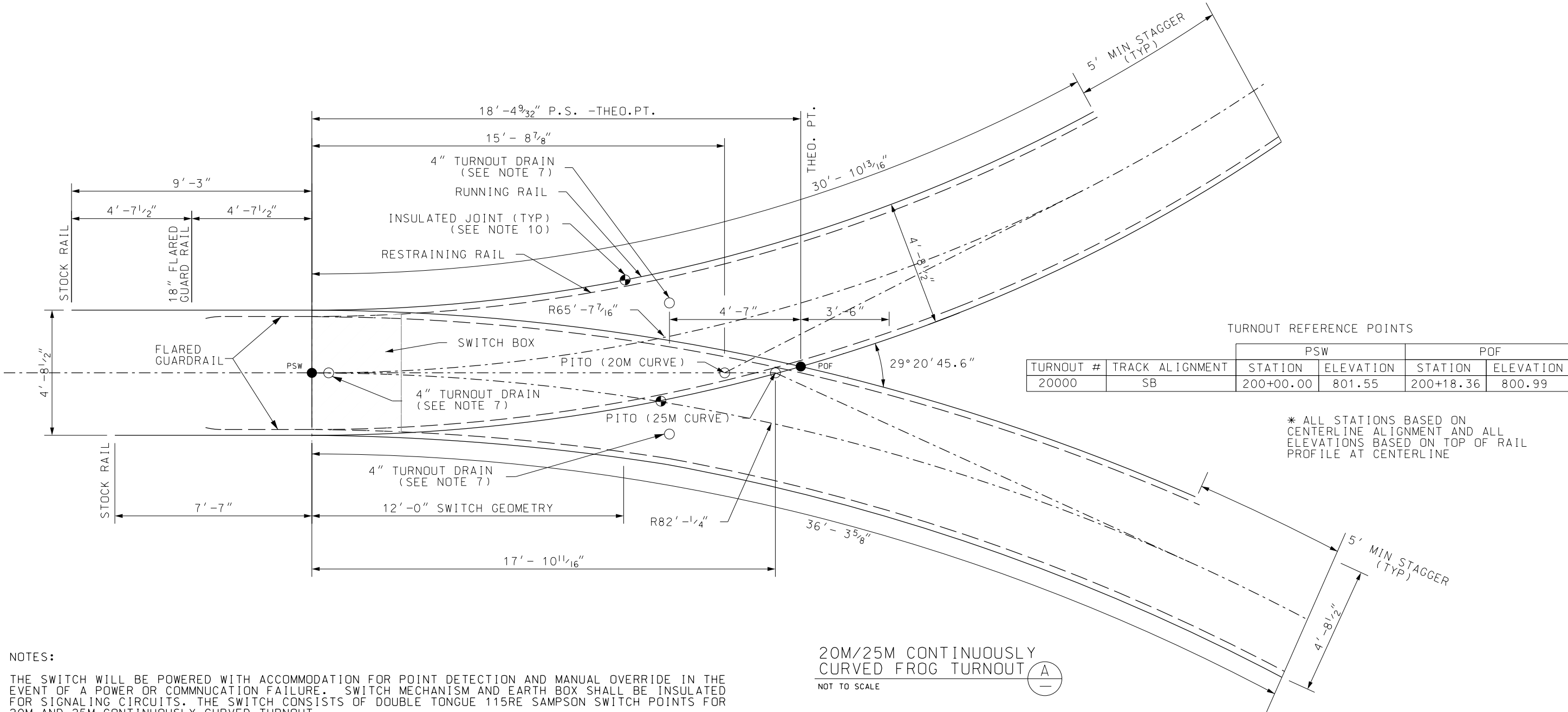
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CHECKED BY	JWR
DRAWN BY	MMW
CHECKED BY	JWR
APPROVED BY	NKS
DATE	10-07-2022



100% SUBMITTAL	DATE: 10-07-2022
HDR	HDR Engineering, Inc.
10450 Holmes Road	Suite 600
Kansas City, MO 64131-3471	816-360-2700
Certificate of Authority: 000856	
NOT FOR CONSTRUCTION	

KANSAS CITY STREETCAR - RIVERFRONT EXTENSION
TRANSITION RAIL



SCALE FOR 22"x34": NOT TO SCALE
FILENAME: K907.dgn
CONTRACT NO.: CONTRACT NO. ***
VOLUME: 1
DRAWING NO.: SHEET NO.:
K907 58

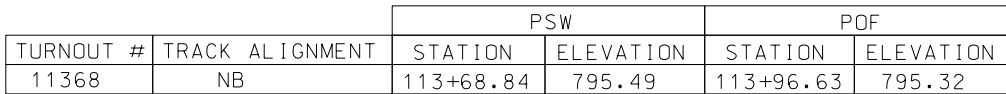


NOTES:

1. THE SWITCH WILL BE POWERED WITH ACCOMMODATION FOR POINT DETECTION AND MANUAL OVERRIDE IN THE EVENT OF A POWER OR COMMUNICATION FAILURE. SWITCH MECHANISM AND EARTH BOX SHALL BE INSULATED FOR SIGNALING CIRCUITS. THE SWITCH CONSISTS OF DOUBLE TONGUE 115RE SAMPSON SWITCH POINTS FOR 20M AND 25M CONTINUOUSLY CURVED TURNOUT.
2. ALL JOINTS AND CONNECTIONS TO BE FIELD WELDED UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS ARE IN FEET AND INCHES.
4. TURNOUT TO BE FULLY INSULATED FOR ELECTRICAL ISOLATION PROVIDED THROUGH ENCAPSULATION PER MANUFACTURER AND MATERIAL SUPPLIER SPECIFICATIONS AND APPROVED BY ENGINEER. ISOLATION SHALL SATISFY RESISTIVITY REQUIREMENTS PER SPECIFICATIONS.
5. SWITCH MACHINE SHALL BE CENTERED BETWEEN TONGUE SWITCHES AFTER GEOMETRY DIMENSIONS AND TOLERANCES HAVE BEEN SATISFIED.
6. ALL GAUGE RODS SHALL BE DRILLED AND SECURED TO TURNOUT AFTER GEOMETRY DIMENSIONS AND TOLERANCES HAVE BEEN SATISFIED.
7. TURNOUT DRAINS TO BE CONNECTED TO OVERALL DRAINAGE NETWORK. PROVIDE POWERED CONNECTIONS FOR SWITCH HEATERS AND POWER SWITCHES. PROVIDE DRAINAGE CONNECTION FOR SWITCH DRAIN AND TURNOUT DRAINS (LOCATION AND ROUTING TO BE DETERMINED WITH APPROVED SHOP DRAWINGS). SWITCH DRAIN TO BE PVC WITH RUBBER TIGHT GASKET.
8. EARTHBOX MACHINE AND SWITCH HEATER BOXES SHALL BE DESIGNED FOR HS20 LOADING. REFER TO SYSTEMS PLANS SHEET Z602 FOR SWITCH HEATER DETAILS.

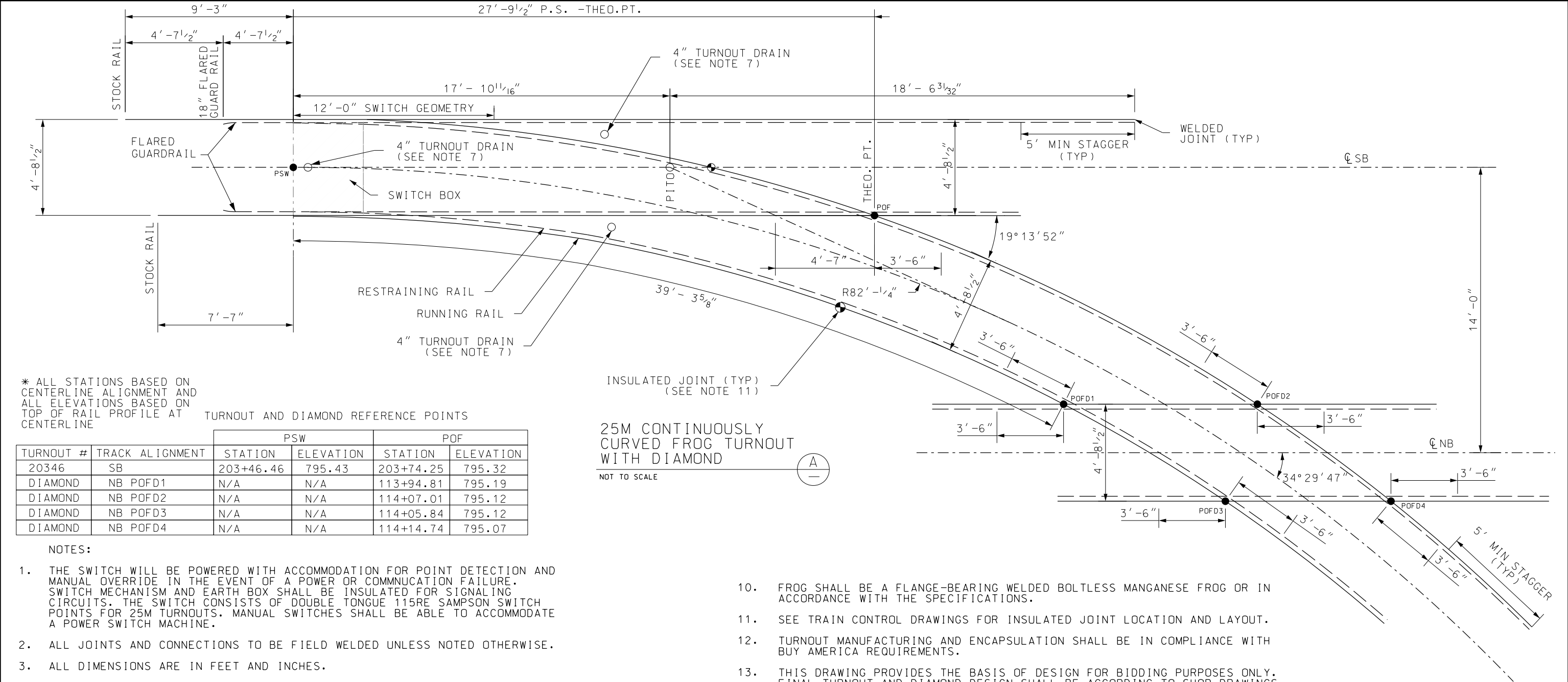
9. FROG SHALL BE A FLANGE-BEARING WELDED BOLTLESS MANGANESE FROG OR IN ACCORDANCE WITH THE SPECIFICATIONS.
10. SEE TRAIN CONTROL DRAWINGS FOR INSULATED JOINT LOCATION AND LAYOUT.
11. TURNOUT MANUFACTURING AND ENCAPSULATION SHALL BE IN COMPLIANCE WITH BUY AMERICA REQUIREMENTS.
12. THIS DRAWING PROVIDES THE BASIS OF DESIGN FOR BIDDING PURPOSES ONLY. FINAL TURNOUT DESIGN SHALL BE ACCORDING TO SHOP DRAWINGS SUBMITTED BY THE SUPPLIER AND REVIEWED AND APPROVED BY THE ENGINEER.
13. VERIFY INSULATED JOINT REQUIREMENTS WITH THE ENGINEER PRIOR TO FABRICATING TURNOUT.
14. TURNOUT TO BE FULLY RESTRAINED WITH MAXIMUM FLANGEWAY WIDTH OF 2 1/4". SEE NOTE 16.
15. MANUFACTURER SHALL CONDUCT AN ANALYSIS VERIFYING TRACK GAUGE AND FLANGEWAY WIDTH (WHERE RESTRAINED) AND SUBMIT A SUMMARY MEMO OF FINDINGS AND RECOMMENDATIONS TO ENGINEER FOR REVIEW AND APPROVAL PRIOR TO FABRICATION OF TURNOUT.
16. ALL RAILS ARE HIGH STRENGTH HEAD-HARDENED 115RE. REFER TO DETAIL A, SHEET K905 FOR 115RE RAIL DETAILS.
17. ENCAPSULATE TRANSITION BETWEEN STANDARD BOOT AND RESTRAINING RAIL BOOT WITH ELASTOMERIC GROUT.
18. MAINTAIN 8' TRACK SLAB FOR BOTH TRACKS THROUGH THE TURNOUT.

REV	DATE	DESCRIPTION	DESIGNED BY	PBS	<div></div>	EARLY PROCUREMENT PACKAGE 2A	DATE: 09-13-2022	<div>KANSAS CITY STREETCAR - RIVERFRONT EXTENSION</div> <div>20M/25M EQUILATERAL CONTINUOUSLY CURVED FROG TURNOUT</div>	SCALE FOR 22"x34": NOT TO SCALE	
			CHECKED BY	JWR		<div><div>HDR Engineering, Inc.</div><div>10450 Holmes Road Suite 600 Kansas City, MO 64131-3471 816-360-2700 Certificate of Authority: 000856</div></div>			DRAWING NO.: K908	SHEET NO.: 147
			DRAWN BY	MMW						
			CHECKED BY	JWR						
			APPROVED BY	NKS						
PLOT DATE: 9/13/2022			DATE	08-11-2022		NOT FOR CONSTRUCTION				



10. FROG SHALL BE A FLANGE-BEARING WELDED BOLTLESS MANGANESE FROG OR IN ACCORDANCE WITH THE SPECIFICATIONS.
11. SEE TRAIN CONTROL DRAWINGS FOR INSULATED JOINT LOCATION AND LAYOUT.
12. TURNOUT MANUFACTURING AND ENCAPSULATION SHALL BE IN COMPLIANCE WITH BUY AMERICA REQUIREMENTS.
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17. ALL RAILS ARE HIGH STRENGTH HEAD-HARDENED 115RE. REFER TO DETAIL A, SHEET K906 FOR 115RE RAIL DETAILS.
18. ENCAPSULATE TRANSITION BETWEEN STANDARD BOOT AND RESTRAINING RAIL BOOT WITH ELASTOMERIC GROUT.
19. MAINTAIN 8' TRACK SLAB FOR STRAIGHT AND DIVERGING TRACK THROUGH THE TURNOUT.

300577



* ALL STATIONS BASED ON CENTERLINE ALIGNMENT AND ALL ELEVATIONS BASED ON TOP OF RAIL PROFILE AT CENTERLINE

TURNOUT AND DIAMOND REFERENCE POINTS

TURNOUT #	TRACK ALIGNMENT	PSW		POF	
		STATION	ELEVATION	STATION	ELEVATION
20346	SB	203+46.46	795.43	203+74.25	795.32
DIAMOND	NB POFD1	N/A	N/A	113+94.81	795.19
DIAMOND	NB POFD2	N/A	N/A	114+07.01	795.12
DIAMOND	NB POFD3	N/A	N/A	114+05.84	795.12
DIAMOND	NB POFD4	N/A	N/A	114+14.74	795.07

NOTES:

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- ALL JOINTS AND CONNECTIONS TO BE FIELD WELDED UNLESS NOTED OTHERWISE.
- ALL DIMENSIONS ARE IN FEET AND INCHES.
- TURNOUT AND DIAMOND TO BE FULLY INSULATED FOR ELECTRICAL ISOLATION PROVIDED THROUGH ENCAPSULATION PER MANUFACTURER AND MATERIAL SUPPLIER SPECIFICATIONS AND APPROVED BY ENGINEER. ISOLATION SHALL SATISFY RESISTIVITY REQUIREMENTS PER SPECIFICATIONS.
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- EARTHBOX MACHINE AND SWITCH HEATER BOXES SHALL BE DESIGNED FOR HS20 LOADING. REFER TO SYSTEMS PLANS SHEET Z602 FOR SWITCH HEATER DETAILS.
- RIGHT-HAND TURNOUT SHOWN, LEFT-HAND IS MIRROR IMAGE.

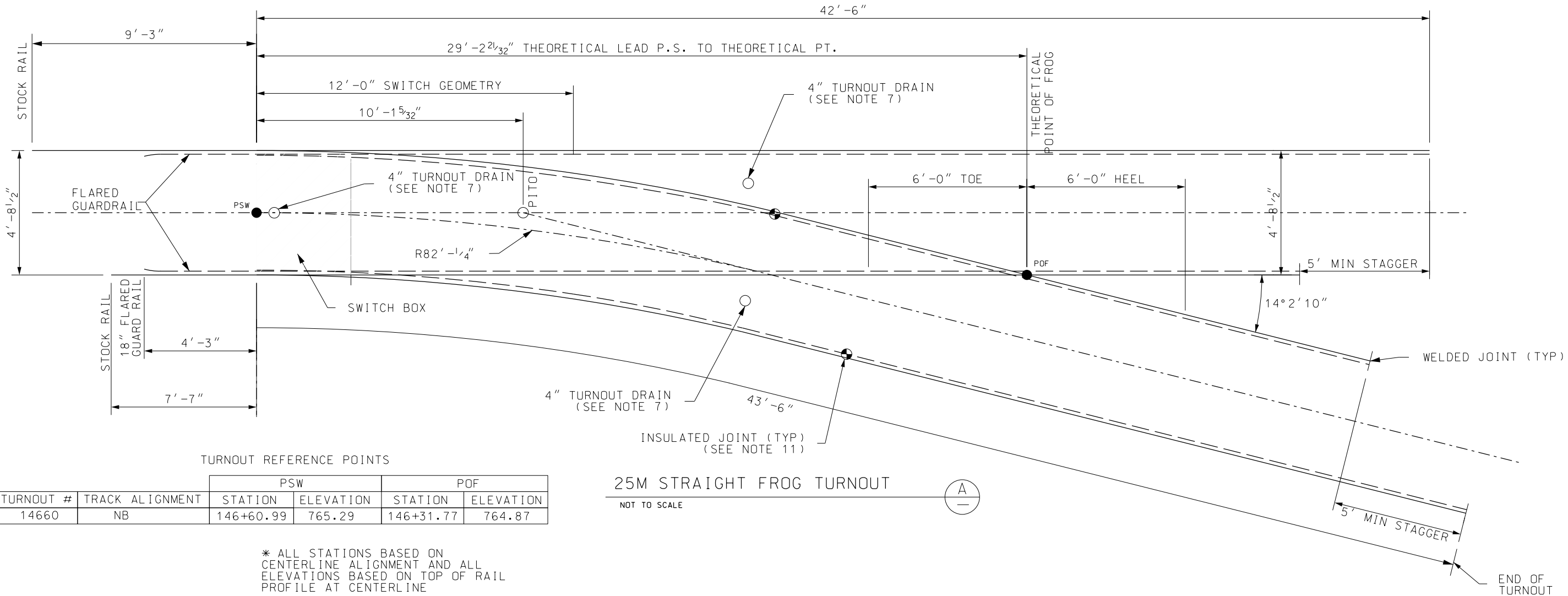
- FROG SHALL BE A FLANGE-BEARING WELDED BOLTLESS MANGANESE FROG OR IN ACCORDANCE WITH THE SPECIFICATIONS.
- SEE TRAIN CONTROL DRAWINGS FOR INSULATED JOINT LOCATION AND LAYOUT.
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- ALL RAILS ARE HIGH STRENGTH HEAD-HARDENED 115RE. REFER TO DETAIL A, SHEET K906 FOR 115RE RAIL DETAILS.
- ENCAPSULATE TRANSITION BETWEEN STANDARD BOOT AND RESTRAINING RAIL BOOT WITH ELASTOMERIC GROUT.
- MAINTAIN 8' TRACK SLAB FOR STRAIGHT AND DIVERGING TRACK THROUGH THE TURNOUT AND DIAMOND.

REV	DATE	DESCRIPTION	DESIGNED BY	PBS
			CHECKED BY	JWR
			DRAWN BY	MMW
			CHECKED BY	JWR
			APPROVED BY	NKS
PLOT DATE: 5DATE\$			DATE	10-07-2022



100% SUBMITTAL	DATE: 10-07-2022
HDR HDR Engineering, Inc. 10450 Holmes Road Suite 600 Kansas City, MO 64131-3471 816-360-2700 Certificate of Authority: 000856	
NOT FOR CONSTRUCTION	

KANSAS CITY STREETCAR - RIVERFRONT EXTENSION		SCALE FOR 22"x34": NOT TO SCALE
25M CONTINUOUSLY CURVED FROG TURNOUT WITH DIAMOND		FILENAME: \$FILES\$ CONTRACT NO.: \$CONTRACT\$ VOLUME: \$VOLUME\$ DRAWING NO.: SHEET NO.: K909A.dgnK909A



TURNOUT #	TRACK ALIGNMENT	PSW		POF	
		STATION	ELEVATION	STATION	ELEVATION
14660	NB	146+60.99	765.29	146+31.77	764.87

* ALL STATIONS BASED ON CENTERLINE ALIGNMENT AND ALL ELEVATIONS BASED ON TOP OF RAIL PROFILE AT CENTERLINE

NOTES:

1. THE SWITCH WILL BE POWERED WITH ACCOMMODATION FOR POINT DETECTION AND MANUAL OVERRIDE IN THE EVENT OF A POWER OR COMMUNICATION FAILURE. SWITCH MECHANISM AND EARTH BOX SHALL BE INSULATED FOR SIGNALING CIRCUITS. THE SWITCH CONSISTS OF DOUBLE TONGUE 115RE SAMPSON SWITCH POINTS FOR 25M TURNOUTS. MANUAL SWITCHES SHALL BE ABLE TO ACCOMMODATE A POWER SWITCH MACHINE.

2. ALL JOINTS AND CONNECTIONS TO BE FIELD WELDED UNLESS NOTED OTHERWISE.

3. ALL DIMENSIONS ARE IN FEET AND INCHES.

4. TURNOUT TO BE FULLY INSULATED FOR ELECTRICAL ISOLATION PROVIDED THROUGH ENCAPSULATION PER MANUFACTURER AND MATERIAL SUPPLIER SPECIFICATIONS AND APPROVED BY ENGINEER. ISOLATION SHALL SATISY RESISITVITY REQUIREMENTS PER SPECIFICATIONS.

5. SWITCH MACHINE SHALL BE CENTERED BETWEEN TONGUE SWITCHES AFTER GEOMETRY DIMENSIONS AND TOLERANCES HAVE BEEN SATISFIED.

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8. EARTHBOX MACHINE AND SWITCH HEATER BOXES SHALL BE DESIGNED FOR HS20 LOADING. REFER TO SYSTEMS PLANS SHEET Z602 FOR SWITCH HEATER DETAILS.

9. RIGHT-HAND TURNOUT SHOWN, LEFT-HAND IS MIRROR IMAGE.
10. FROG SHALL BE A FLANGE-BEARING WELDED BOLTLESS MANGANESE FROG IN ACCORDANCE WITH THE SPECIFICATIONS.

11. SEE TRAIN CONTROL DRAWINGS FOR INSULATED JOINT LOCATION AND LAYOUT.

12. TURNOUT MANUFACTURING AND ENCAPSULATION SHALL BE IN COMPLIANCE WITH BUY AMERICA REQUIREMENTS.

13. THIS DRAWING PROVIDES THE BASIS OF DESIGN FOR BIDDING PURPOSES ONLY. FINAL TURNOUT DESIGN SHALL BE ACCORDING TO SHOP DRAWINGS SUBMITTED BY THE SUPPLIER AND REVIEWED AND APPROVED BY THE ENGINEER.

14. VERIFY INSULATED JOINT REQUIREMENTS WITH THE ENGINEER PRIOR TO FABRICATING TURNOUT.



15. TURNOUT TO BE FULLY RESTRAINED WITH MAXIMUM FLANGEWAY WIDTH OF 2' 1/4". SEE NOTE 16.

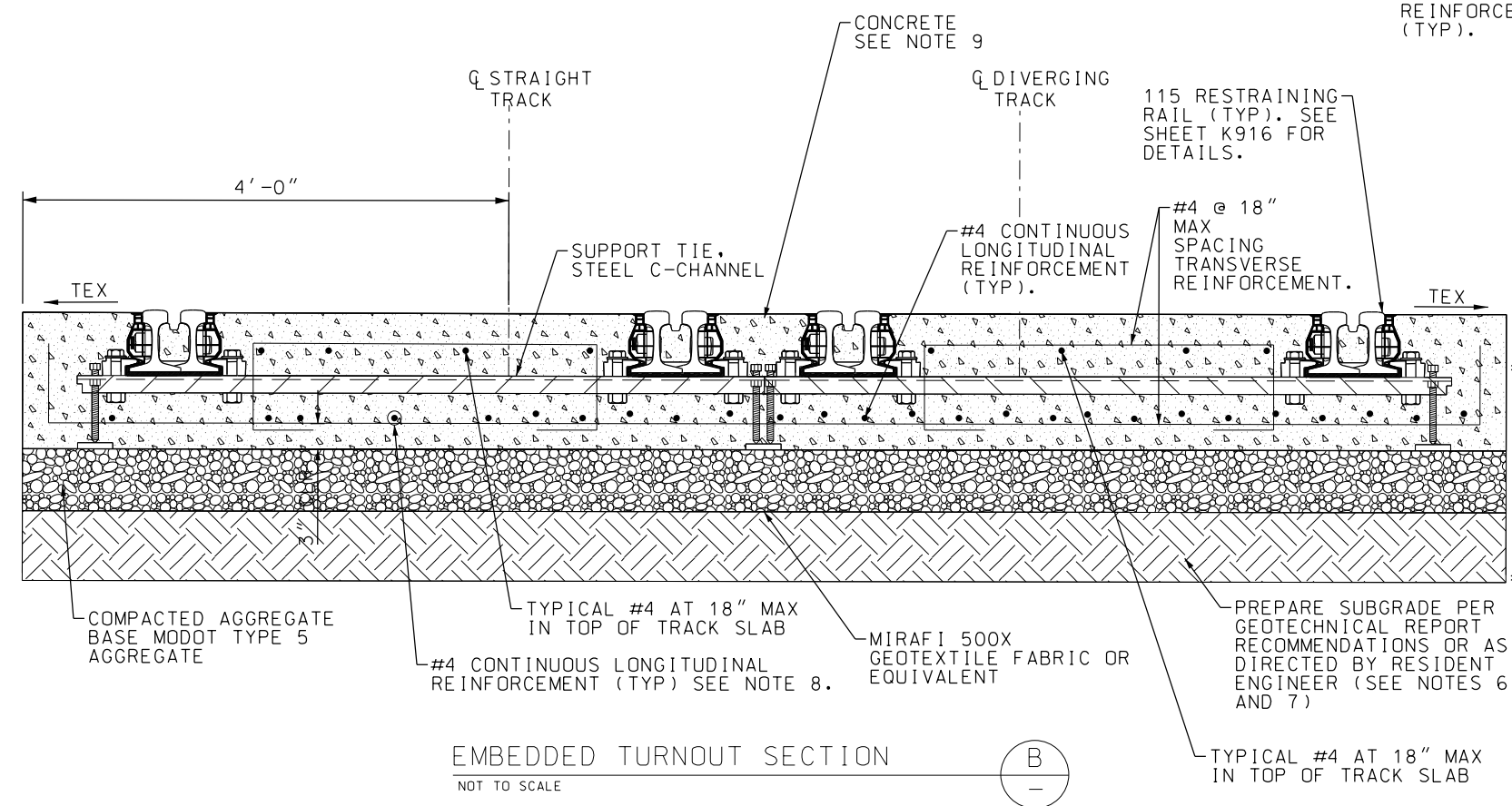
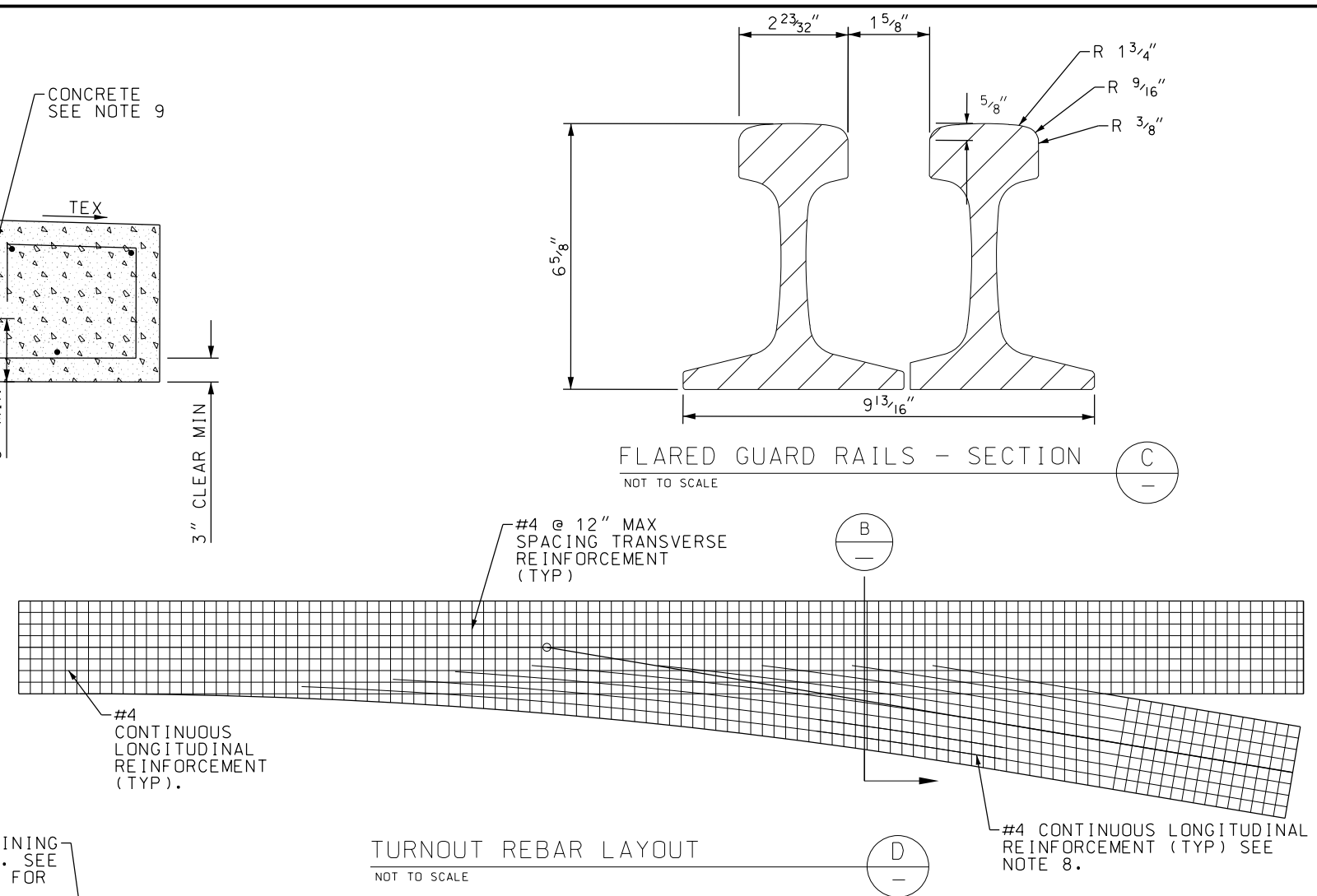
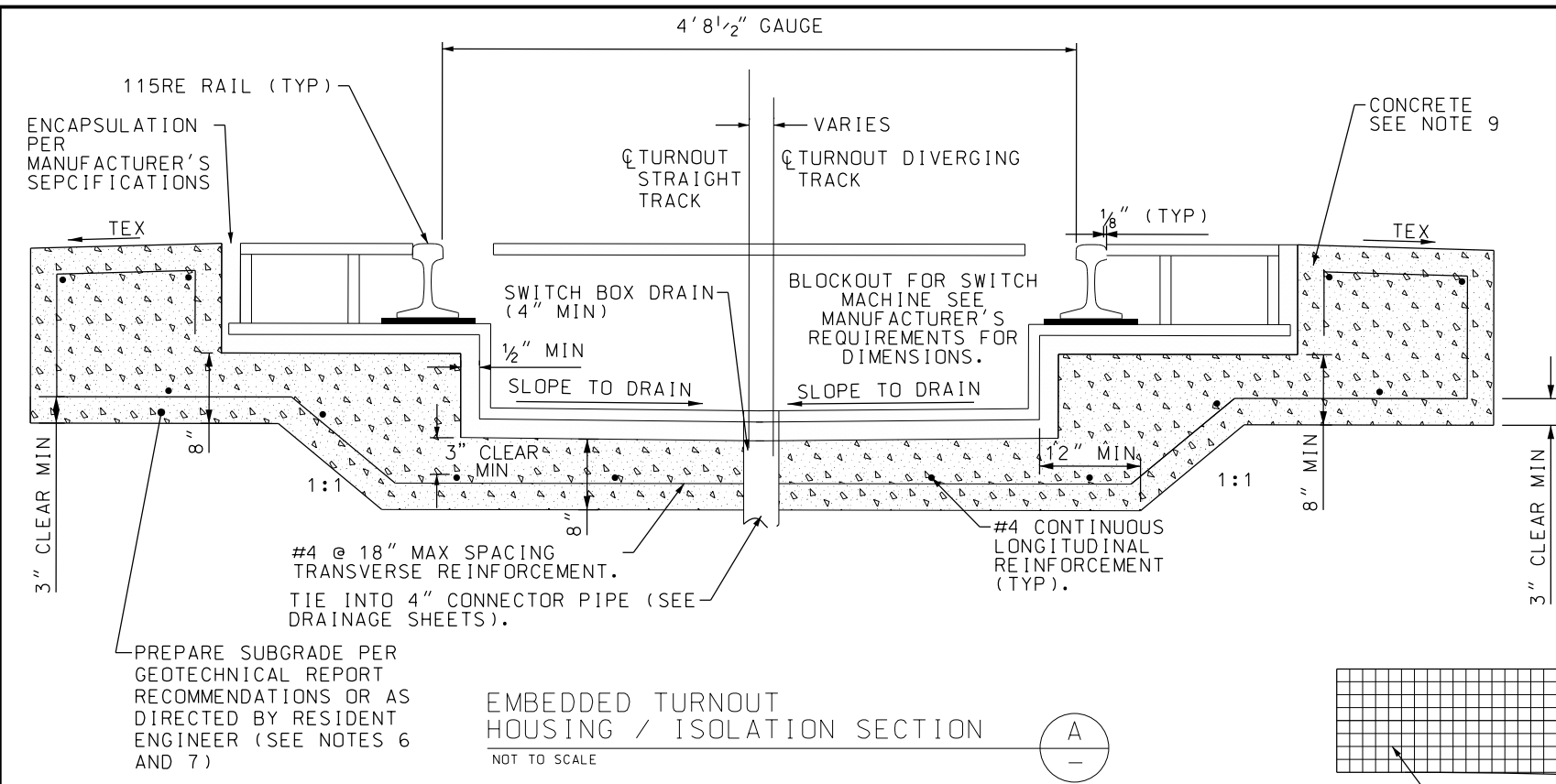
16. MANUFACTURER SHALL CONDUCT AN ANALYSIS VERIFYING TRACK GAUGE AND FLANGEWAY WIDTH (WHERE RESTRAINED) AND SUBMIT A SUMMARY MEMO OF FINDINGS AND RECOMMENDATIONS TO ENGINEER FOR REVIEW AND APPROVAL PRIOR TO FABRICATION OF TURNOUT.

17. ALL RAILS ARE HIGH STRENGTH HEAD-HARDENED 115RE. REFER TO DETAIL A, SHEET K906 FOR 115RE RAIL DETAILS.

18. ENCAPSULATE TRANSITION BETWEEN STANDARD BOOT AND RESTRAINING RAIL BOOT WITH ELASTOMERIC GROUT.

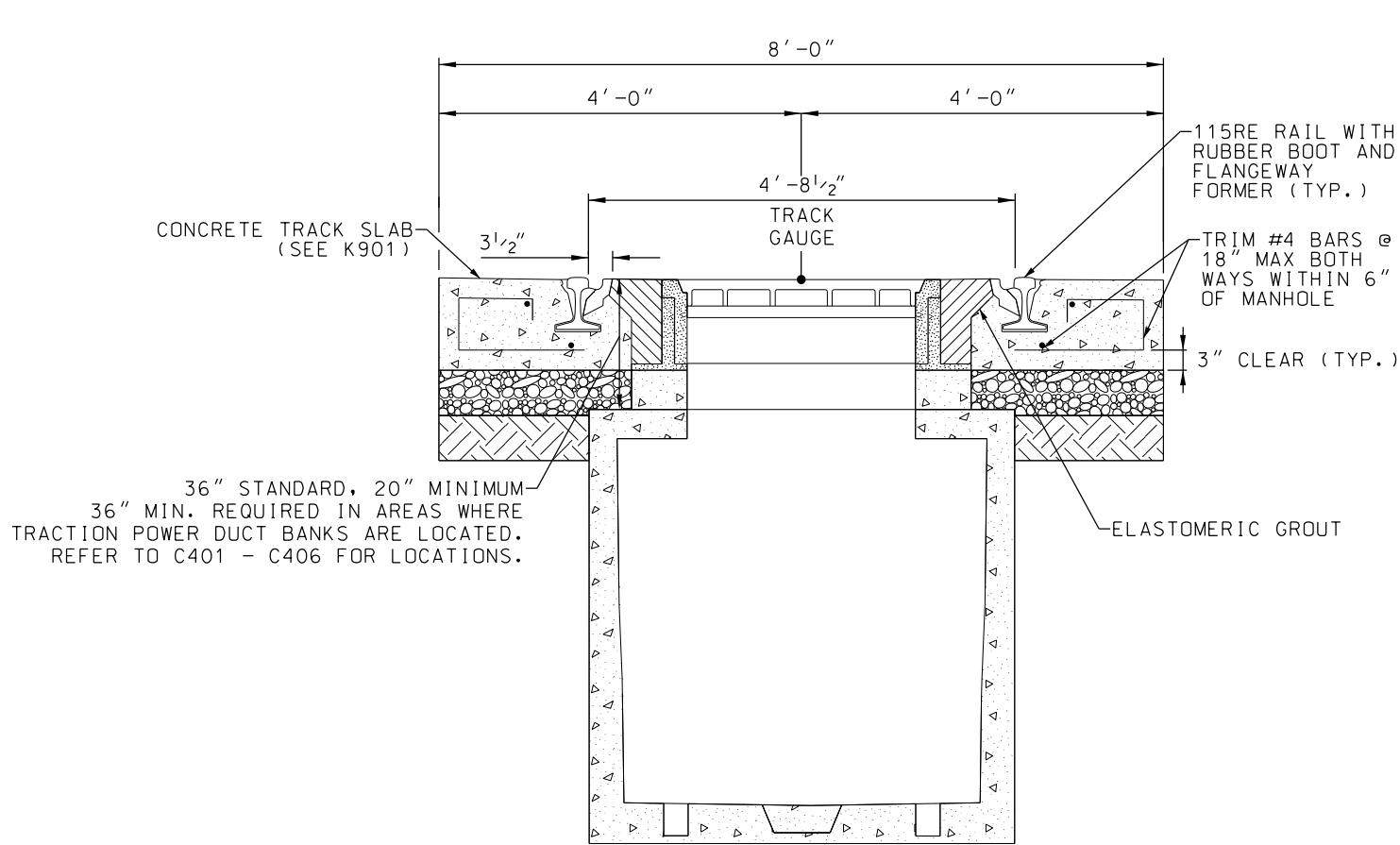
19. MAINTAIN 8' TRACK SLAB FOR STRAIGHT AND DIVERGING TRACK THROUGH THE TURNOUT.

REV	DATE	DESCRIPTION	DESIGNED BY	PBS		EARLY PROCUREMENT PACKAGE 2B		DATE:09-13-2022	KANSAS CITY STREETCAR - RIVERFRONT EXTENSION	SCALE FOR 22"x34": NOT TO SCALE	
			CHECKED BY	JWR		 <div>HDR Engineering, Inc. 10450 Holmes Road Suite 600 Kansas City, MO 64131-3471 816-360-2700 Certificate of Authority: 000856</div>				FILENAME: K910.dgn	
			DRAWN BY	MMW						CONTRACT NO.:	
			CHECKED BY	JWR						CONTRACT NO. ***	
			APPROVED BY	NKS						VOLUME: 1	
PLOT DATE: 9/13/2022			12:44:12 PM		DATE	08-11-2022	NOT FOR CONSTRUCTION			DRAWING NO.:	SHEET NO.:
25M STRAIGHT FROG TURNOUT										K910	149



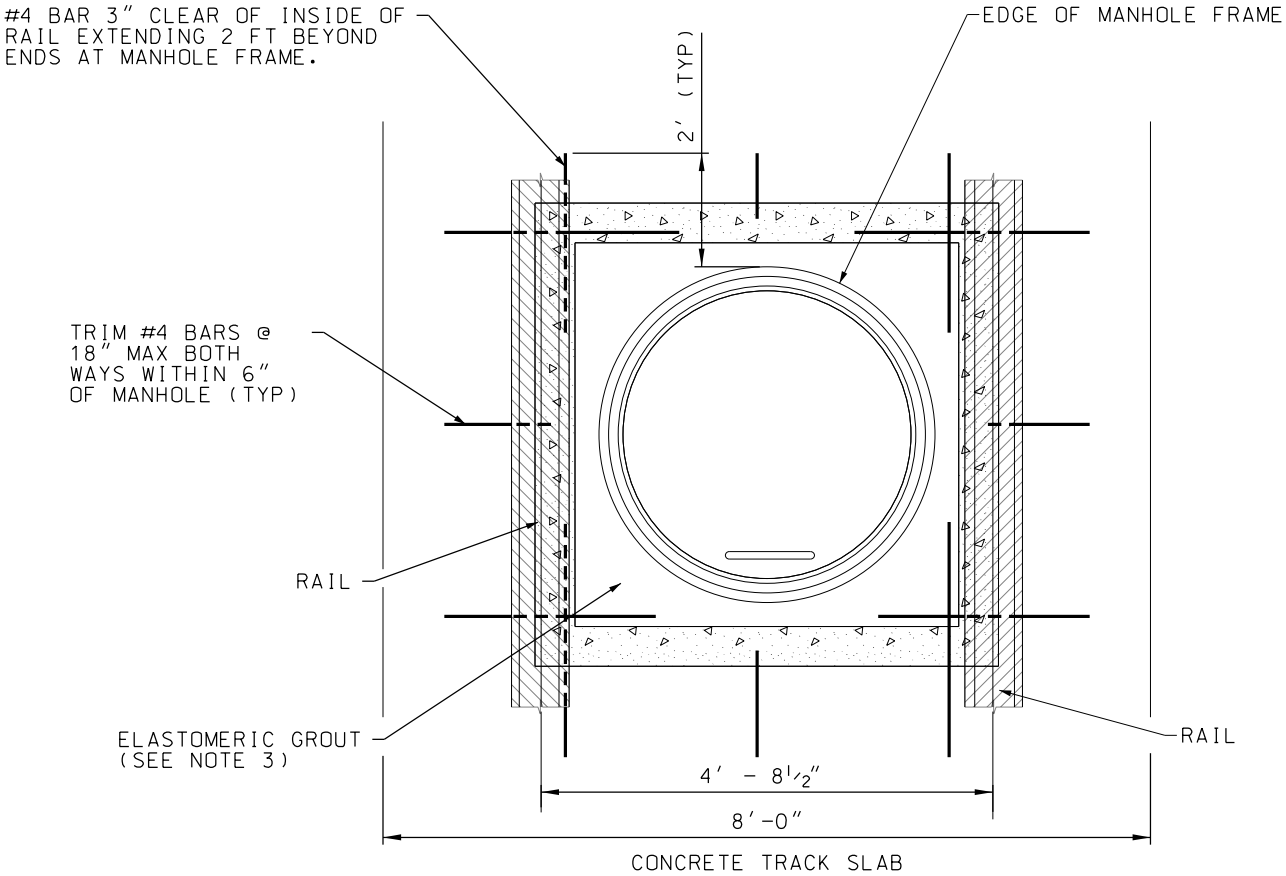
- NOTES
1. ALL RAILS ARE HEAD-HARDENED 115RE. REFER TO DETAIL A, SHEET K906 FOR 115RE DETAILS.
 2. TOP OF CONCRETE BETWEEN RAILS IS 1/4" BELOW TOP OF RAIL.
 3. TRACK EDGE CROSS-SLOPE (TEX) ARE SHOWN ON PLAN AND PROFILE DRAWINGS AND SHALL BE FIELD ADJUSTED TO MINIMIZE ROADWAY REGRADING. COORDINATE WITH ENGINEER FOR APPROVAL. UNLESS ADJACENT TO PARKING LANE OR CURB, CROSS-SLOPES ADJACENT TO TRAVEL LANES NOT TO EXCEED 5% WITHOUT APPROVAL OF ENGINEER.
 4. ALL TRACK SHALL HAVE 1:40 CANT, UNLESS OTHERWISE SPECIFIED.
 5. SEE SHEET K906 FOR FLANGWAY WIDTH REQUIREMENTS.
 6. REFER TO PROJECT GEOTECHNICAL REPORT FOR ENGINEERING RECOMMENDATIONS REGARDING UNSUITABLE MATERIAL. SUBMIT OVER EXCAVATION BACKFILL MATERIAL FOR REVIEW AND APPROVAL BY ENGINEER.
 7. SUBGRADE REQUIRED TO MEET COMPACTION REQUIREMENTS OUTLINED IN THE GEOTECHNICAL REPORT.
 8. THE DIVERGING TRACK CONTINUOUS LOGITUDINAL REINFORCEMENT SHALL BE EXTENDED 15'-0" INTO THE TURNOUT TRACK SLAB. THESE BARS SHALL BE PLACED IN ADDITION TO AND ON TOP OF THE LONGITUDINAL REINFORCEMENT THAT IS PLACED PARALLEL WITH THE STRAIGHT TRACK.
 9. ALL TRACK SLAB CONCRETE SHALL BE F'C = 4500 PSI WITH MICROFIBER DOSING, 3 LB PER CY.

REV	DATE	DESCRIPTION	DESIGNED BY	PBS		EARLY PROCUREMENT PACKAGE 2B	DATE:09-13-2022	KANSAS CITY STREETCAR - RIVERFRONT EXTENSION	TURNOUT ENCAPSULATION AND SECTION DETAILS	SCALE FOR 22"x34":	
			CHECKED BY	JWR			NOT TO SCALE				
			DRAWN BY	MMW						FILENAME:	
			CHECKED BY	JWR						K911.dgn	
			APPROVED BY	NKS						CONTRACT NO.:	
										CONTRACT NO. ***	
										VOLUME:	
										1	
PLOT DATE: 9/12/2022		9:41:33 PM	DATE	08-11-2022		NOT FOR CONSTRUCTION				DRAWING NO.:	SHEET NO.:
										K911	65



TRACK SLAB WITH MANHOLE
BETWEEN THE RAILS DETAIL

NOT TO SCALE



MANHOLE PLAN VIEW

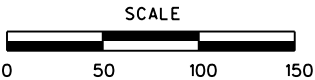
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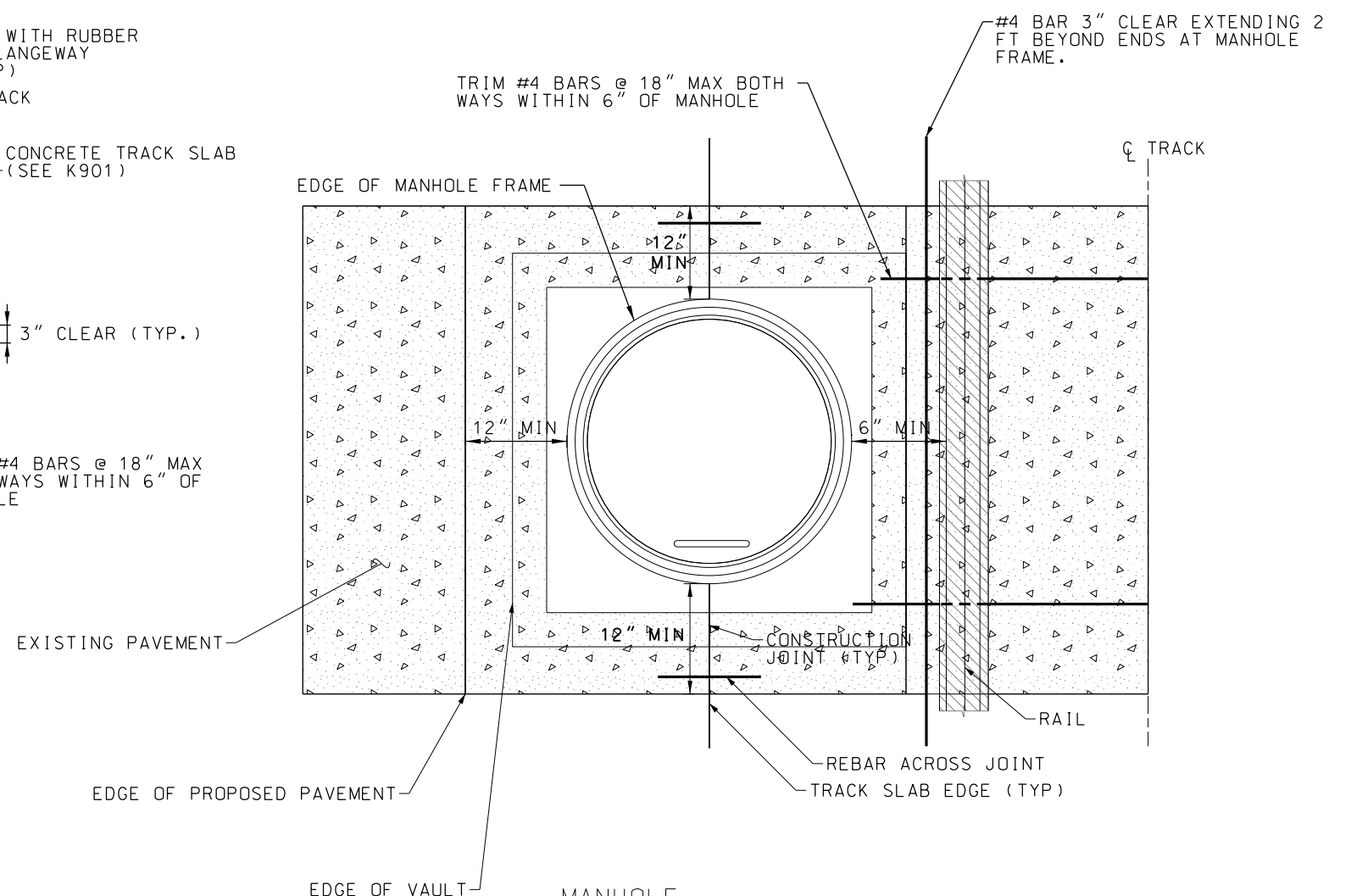
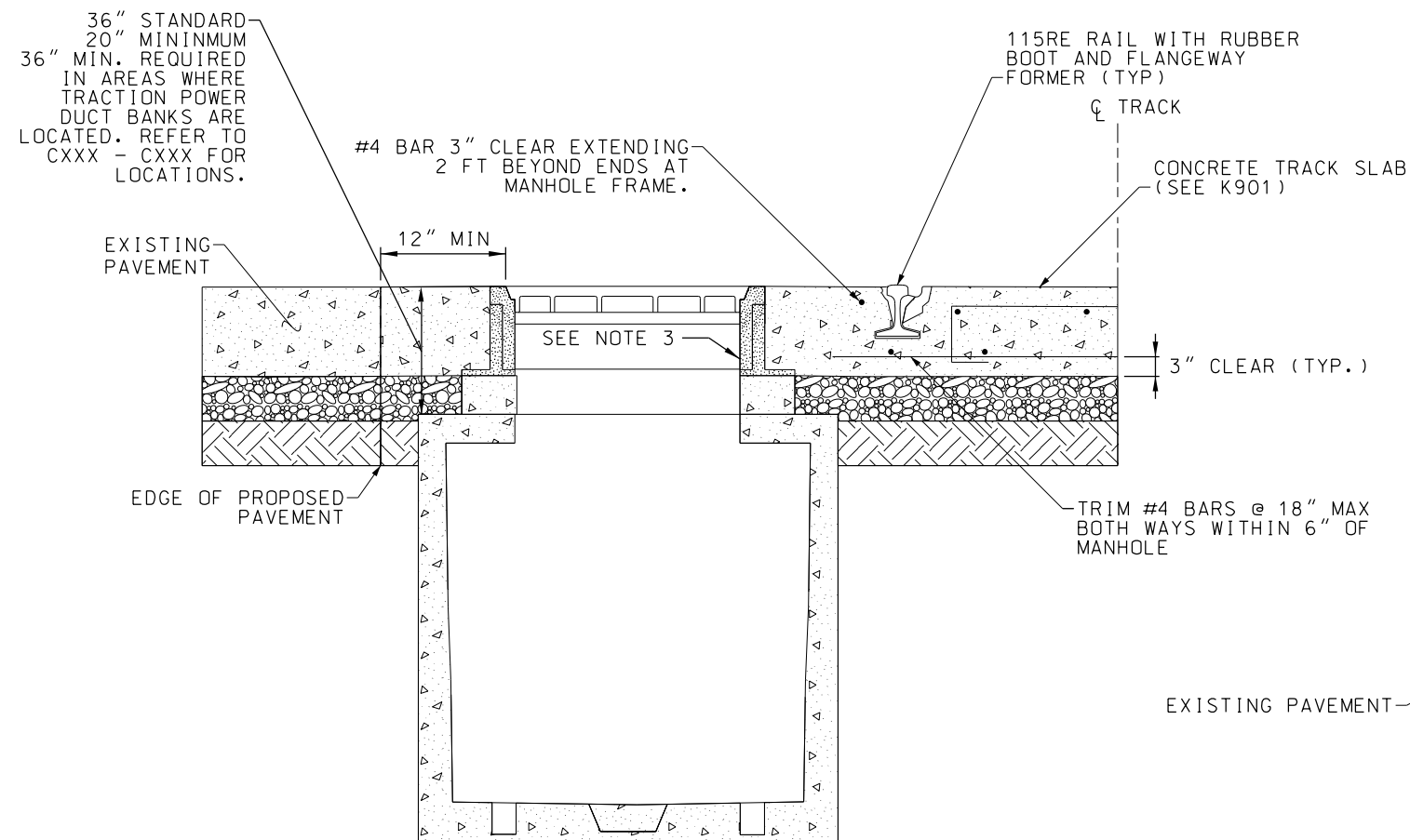
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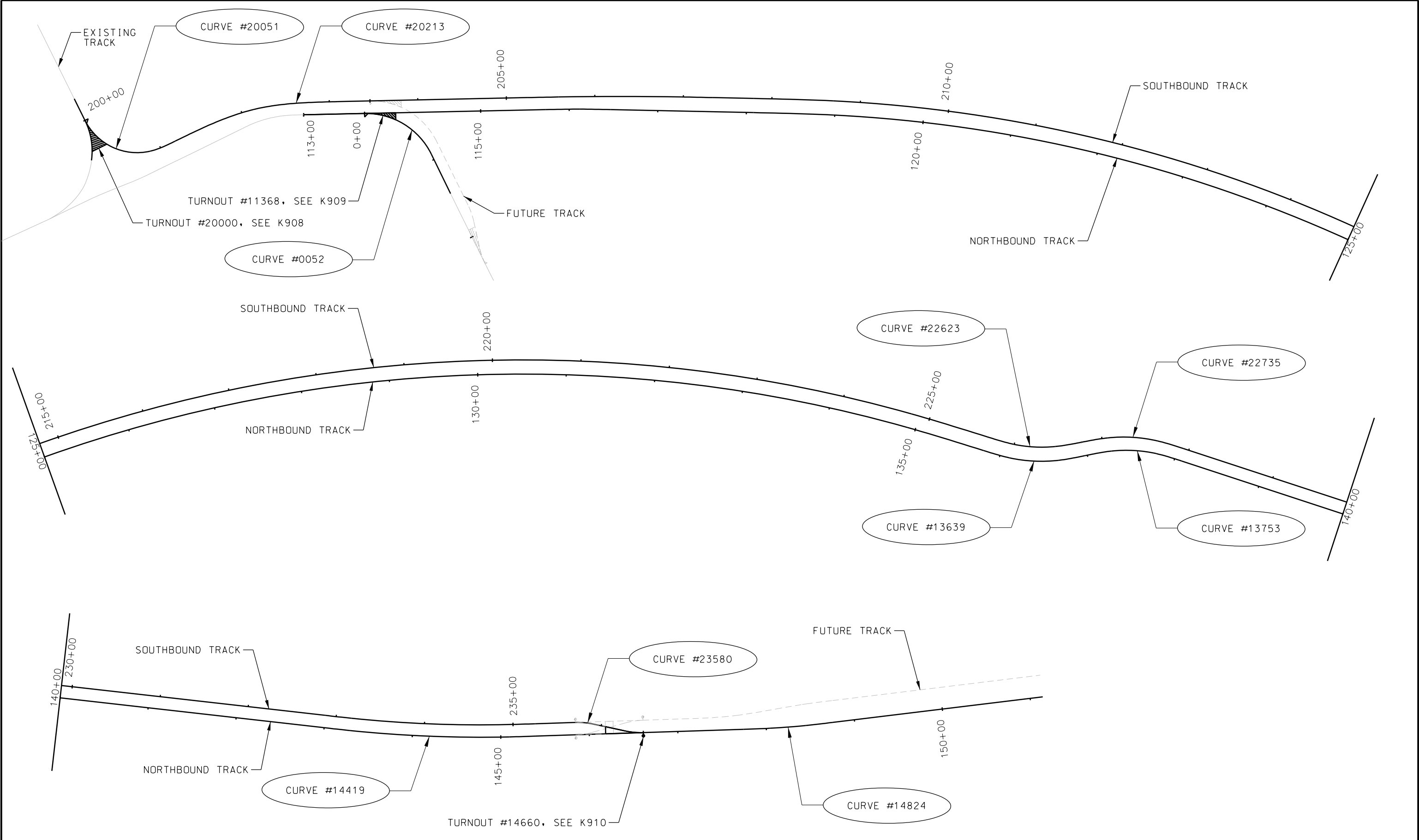
1. TRACK GAUGE IS MEASURED AT $\frac{5}{8}$ " BELOW TOP OF RAIL AND FROM THE GAUGE FACE TO GAUGE FACE.
2. WHERE MANHOLE CONFLICTS WITH STEEL GAUGE TIE, ADJUST GAUGE TIE(S) IN CONFLICT WITH SPACING NO GREATER THAN $7\frac{1}{2}$ ' TO AVOID CONFLICT. NO GAPS BETWEEN GAUGE TIES SHALL EXCEED 10'.
3. FIELD FIT MANHOLES BETWEEN RAILS TO MAKE THE MANHOLE SURROUNDING MATERIAL LOOK CLEANER WHEN FINISHED, MATCHING THE MATERIAL USED IN THE SMALLEST TRANSVERSE OFFSET.
4. MANHOLE SHOWN IN DETAIL, BUT SAME REQUIREMENTS APPLY FOR INLETS OF DIFFERENT SHAPES AND MATERIALS.
5. UTILITY LOCATIONS TO BE VERIFIED BY CONTRACTOR IN THE FIELD.
6. ALL TRACK SLAB CONCRETE SHALL BE $F'c = 4500$ PSI WITH MICROFIBER DOSING, 3 LB PER CY.
7. CONTROL JOINTS MAY BE PLACED AT MANHOLE TO CONTROL CRACKING.
8. WORK DONE AT LOCATIONS WITH A MANHOLE BETWEEN THE RAILS NEEDS TO BE COORDINATED WITH CITY AND STREETCAR AUTHORITY.


WORK DONE AT LOCATIONS WITH A
MANHOLE BETWEEN THE RAILS NEEDS
TO BE COORDINATED WITH CITY AND
STREETCAR AUTHORITY.



REV	DATE	DESCRIPTION	DESIGNED BY	PBS	100% SUBMITTAL	DATE: 10-07-2022	KANSAS CITY STREETCAR - RIVERFRONT EXTENSION	SCALE FOR 22"x34": NOT TO SCALE
			CHECKED BY	JWR	HDR	HDR Engineering, Inc.	MANHOLE REBAR DETAIL	FILENAME: K912.dgn
			DRAWN BY	MMW	10450 Holmes Road		SHEET 1 OF 2	CONTRACT NO.: CONTRACT NO. ***
			CHECKED BY	JWR	Suite 600			VOLUME: 1
			APPROVED BY	NKS	Kansas City, MO 64131-3471			DRAWING NO.: SHEET NO.:
					816-360-2700			K912 63
					Certificate of Authority: 000856			
						NOT FOR CONSTRUCTION		
PLOT DATE: 9/16/2022			9:38:37 AM		DATE		10-07-2022	

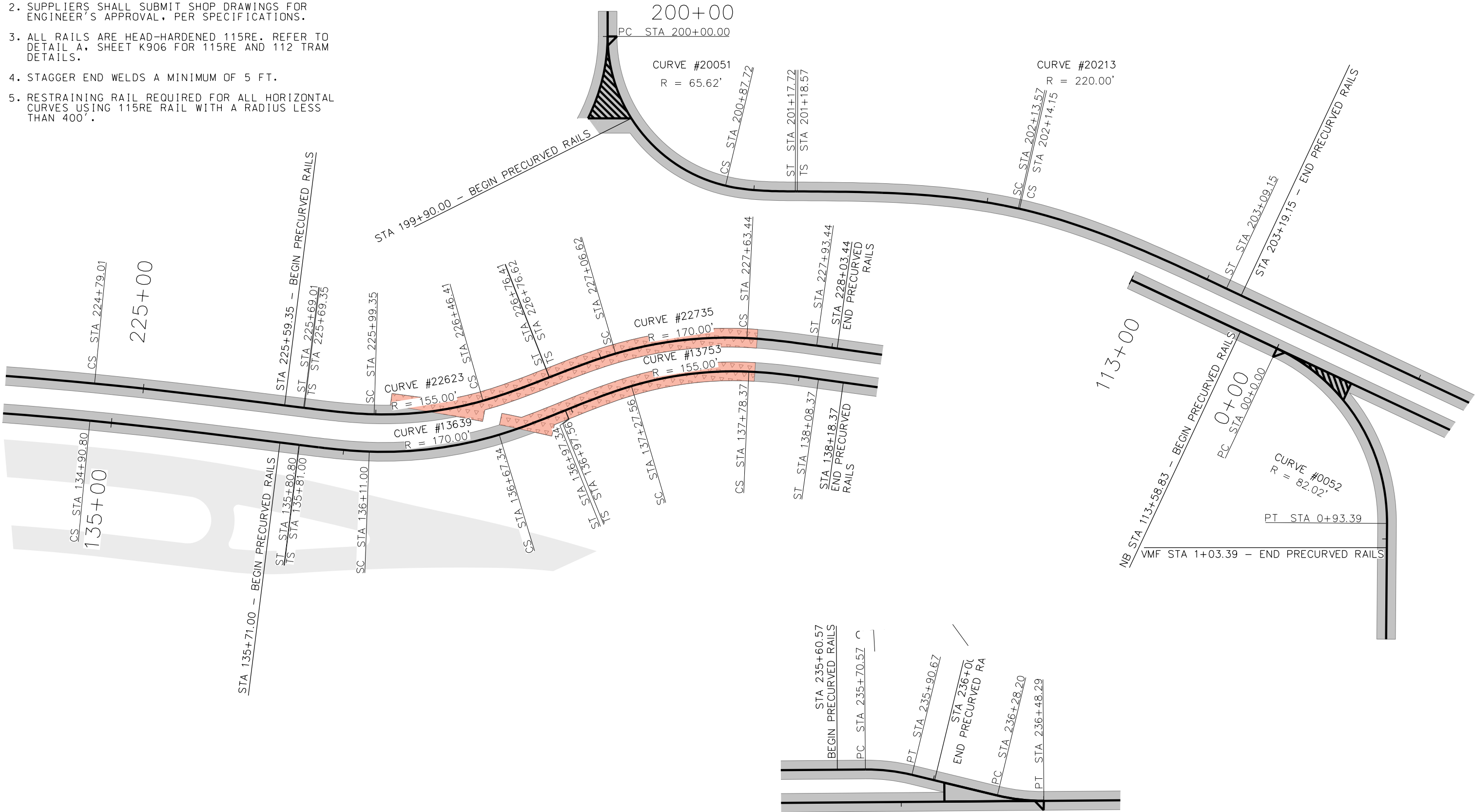






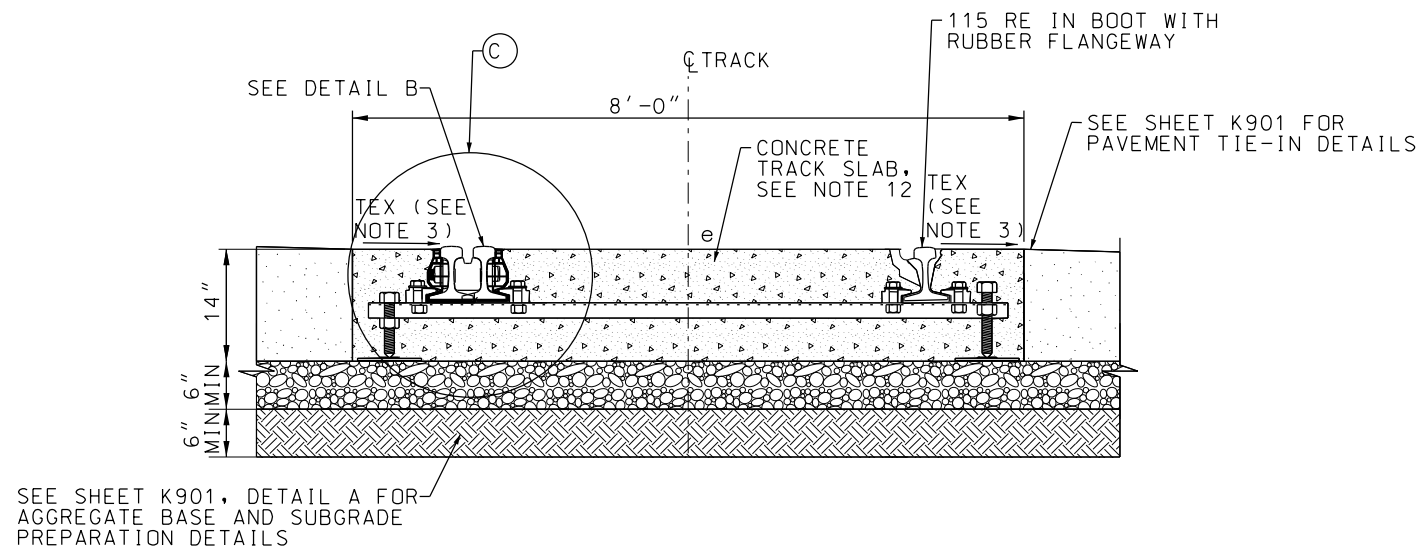
REV	DATE	DESCRIPTION	DESIGNED BY	PBS	EARLY PROCUREMENT PACKAGE 2B	DATE: 09-13-2022	KANSAS CITY STREETCAR - RIVERFRONT EXTENSION	SCALE FOR 22"x34": NOT TO SCALE
			CHECKED BY	JWR		HDR Engineering, Inc.		FILENAME: K915.dgn
			DRAWN BY	MMW	10450 Holmes Road			CONTRACT NO.: CONTRACT NO. ***
			CHECKED BY	JWR	Suite 600			VOLUME: 1
			APPROVED BY	NKS	Kansas City, MO 64131-3471			DRAWING NO.: SHEET NO.:
					816-360-2700			K915 69
					Certificate of Authority: 000856			
PLOT DATE: 9/12/2022			DATE: 08-11-2022		NOT FOR CONSTRUCTION			

NOTES:

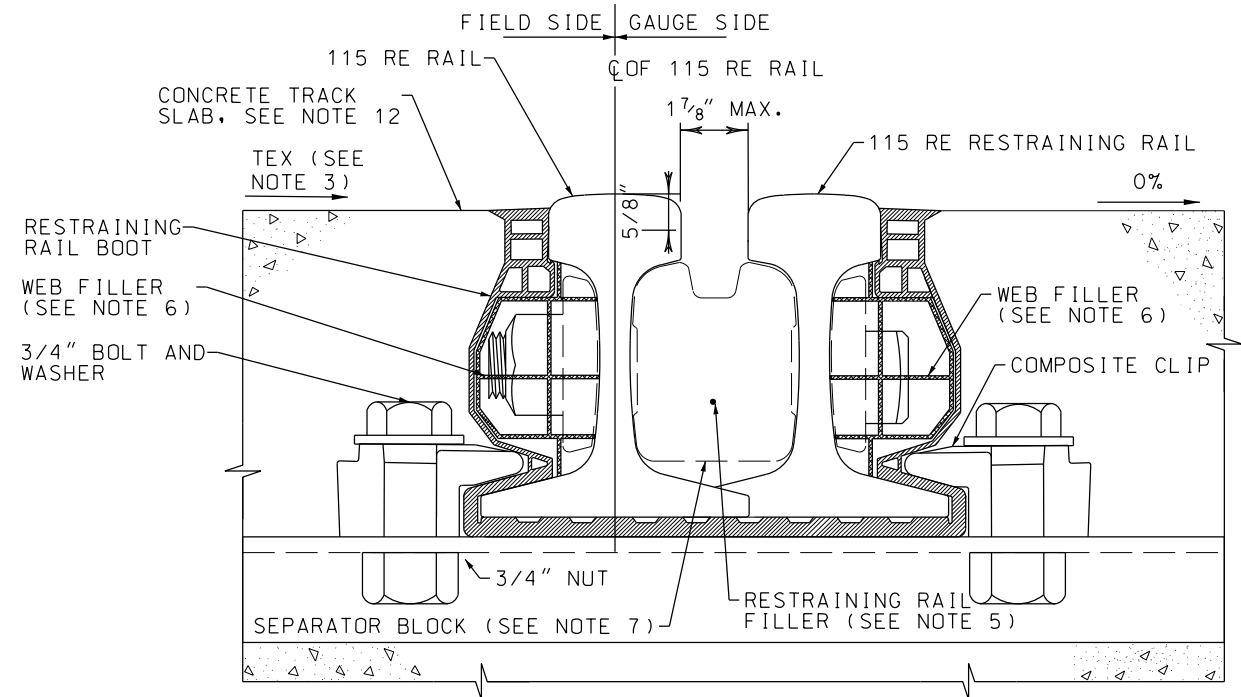
1. CURVE GEOMETRY SHOWN IS FOR TRACK CENTERLINE.
2. SUPPLIERS SHALL SUBMIT SHOP DRAWINGS FOR ENGINEER'S APPROVAL, PER SPECIFICATIONS.
3. ALL RAILS ARE HEAD-HARDENED 115RE. REFER TO DETAIL A, SHEET K906 FOR 115RE AND 112 TRAM DETAILS.
4. STAGGER END WELDS A MINIMUM OF 5 FT.
5. RESTRAINING RAIL REQUIRED FOR ALL HORIZONTAL CURVES USING 115RE RAIL WITH A RADIUS LESS THAN 400'.



REV	DATE	DESCRIPTION	DESIGNED BY	PBS			EARLY PROCUREMENT PACKAGE 2B	DATE:09-13-2022	KANSAS CITY STREETCAR - RIVERFRONT EXTENSION	SCALE FOR 22"x34": NOT TO SCALE
			CHECKED BY	JWR			 <div>HDR Engineering, Inc. 10450 Holmes Road Suite 600 Kansas City, MO 64131-3471 816-360-2700 Certificate of Authority: 000856</div>	HORIZONTAL PRECURVED RAIL DETAILS		FILENAME: K916.dgn
			DRAWN BY	MMW						CONTRACT NO.: CONTRACT NO. ***
			CHECKED BY	JWR						VOLUME: 1
			APPROVED BY	NKS						DRAWING NO.: K916
PLOT DATE: 9/12/2022			9:42:04 PM		DATE	08-11-2022	NOT FOR CONSTRUCTION			



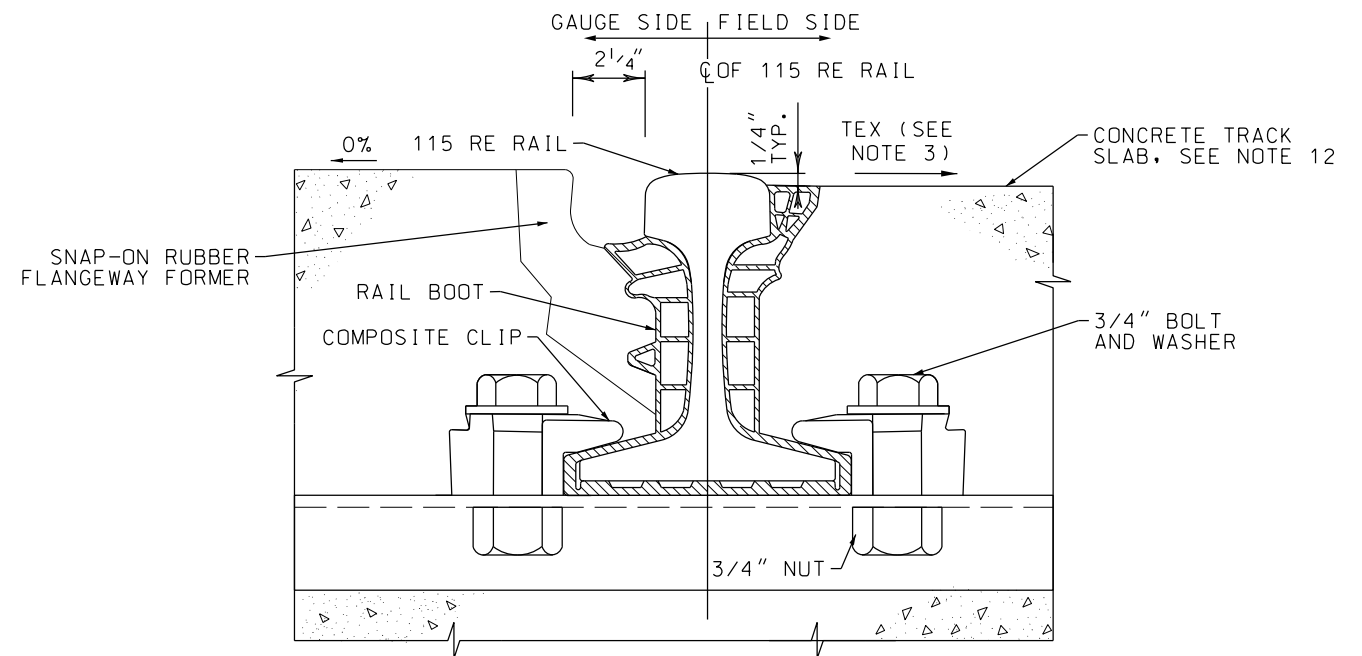
EMBEDDED TRACK WITH
RESTRAINING RAIL - CROSS SECTION (A)
NOT TO SCALE



RESTRAINING RAIL BOOT/TIE - EMBEDDED TRACK
ASSEMBLY AND FLANGEWAY DETAIL (B)
NOT TO SCALE

NOTES:

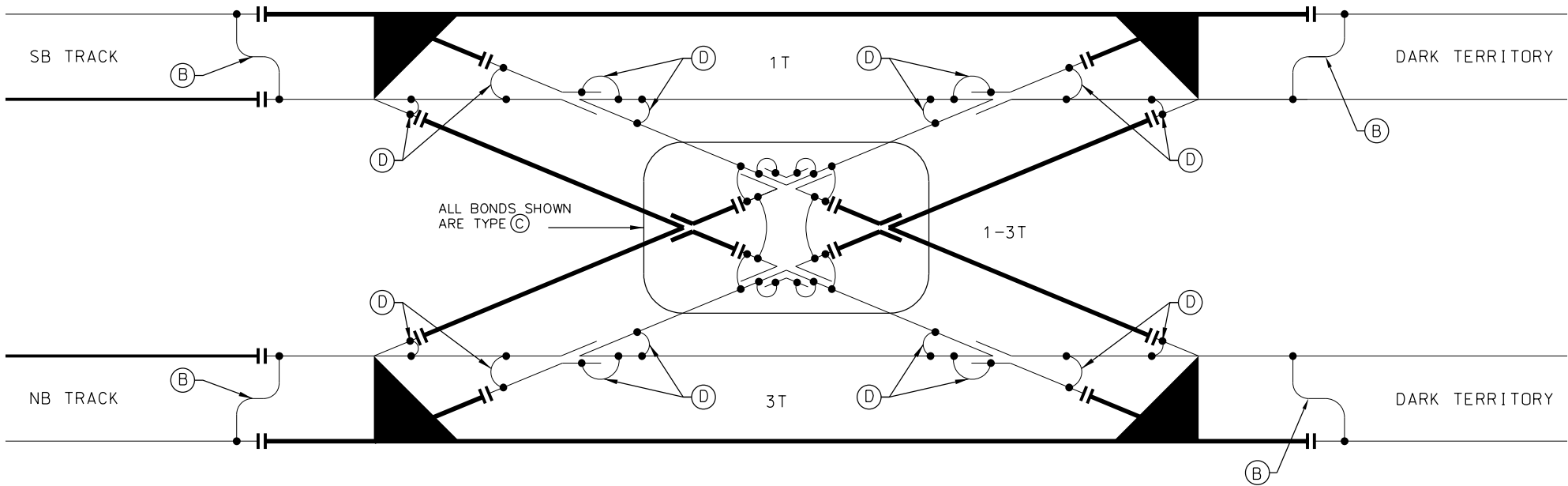
1. PROPOSED PROFILE IS TOP OF LOW RAIL. NOTE THAT TOP OF CONCRETE BETWEEN RAILS IS 1/4" BELOW TOP OF RAIL.
2. AVOID DAMAGING THE RAIL BOOT DURING STORAGE AND INSTALLATION. REPAIR ALL PUNCTURES, RIPS, TEARS AND GOUGES IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS TO PREVENT STRAY CURRENT LEAKAGE.
3. TRACK EDGE CROSS-SLOPE (TEX) ARE SHOWN ON K100 SERIES DRAWINGS AND SHALL BE FIELD ADJUSTED TO MINIMIZE ROADWAY REGRADING. COORDINATE WITH ENGINEER FOR APPROVAL. CROSS-SLOPES ADJACENT TO TRAVEL LANES NOT TO EXCEED 5%, OR 7% IN MIXED TRAFFIC LANES WHERE ADJACENT TO PARKING LANE OR CURB, WITHOUT APPROVAL OF ENGINEER. TEX NOT TO EXCEED 12% IN SEMI-EXCLUSIVE AND EXCLUSIVE GUIDEWAY.
4. EMBEDDED RESTRAINING RAIL SHALL BE INSTALLED WITHOUT CANT
5. BETWEEN SEPARATOR BLOCK ASSEMBLIES, SPACE BETWEEN RUNNING RAIL AND RESTRAINING RAIL SHALL BE FILLED WITH EITHER GUARD RAIL FILLER OR FLOWABLE FILL IN EMBEDDED TRACK ONLY, MAINTAINING A FLANGEWAY DEPTH OF 2 1/8" BELOW THE TOP OF RAIL.
6. WEB FILLER REQUIRED ALONG BOTH SIDES OF RAIL BOOT ASSEMBLY BETWEEN LOCATIONS OF SEPARATOR BLOCK HEAD BOLTS.
7. MAXIMUM SEPARATOR BLOCK SPACING 18" CENTER TO CENTER. SEPARATOR BLOCK MAY BE SOLID TYPE OR SPLIT TYPE.
8. FIRST AND LAST 18" OF RESTRAINING RAIL FLANGEWAY TO BE FLARED TO 3 1/2".
9. FOR TRACK SLAB DETAILS SEE SHEETS K901-K905.
10. RESTRAINING RAIL TO BE INSTALLED ON THE INSIDE RUNNING RAIL FOR CURVES WITH 115 RE RAIL AND A RADIUS UNDER 400' AND SHALL EXTEND 10' BEYOND THE LIMITS OF THE CURVE OR AT THE SPIRAL TO TANGENT POINT PROVIDED THAT POINT IS AT LEAST 10 FEET BEYOND THE POINT ON THE SPIRAL WHERE THE INSTANTANEOUS RADIUS IS EQUAL TO 400'.
11. FOR REVENUE SERVICE TRACK USING 115 RE RAIL, USE RESTRAINING RAIL ON BOTH RAILS FOR RADII UNDER 100'.
12. ALL TRACK SLAB CONCRETE SHALL BE F'C = 4500 PSI WITH MICROFIBER DOSING, 3 LB PER CY. SEE DETAIL A, SHEET K901 FOR TRACK SLAB DETAILS.



RAIL BOOT/TIE ASSEMBLY
AND FLANGEWAY DETAIL (C)
NOT TO SCALE

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			CHECKED BY	JWR	HDR	HDR Engineering, Inc.		FILENAME: K917.dgn
			DRAWN BY	MMW	10450 Holmes Road			CONTRACT NO.:
					Suite 600			CONTRACT NO. ***
			CHECKED BY	JWR	Kansas City, MO 64131-3471			VOLUME:
			APPROVED BY	NKS	816-360-2700			1
					Certificate of Authority: 000856			DRAWING NO.: SHEET NO.:
PLOT DATE: 9/12/2022			DATE		08-11-2022		RESTRAINING RAIL	
					NOT FOR CONSTRUCTION		K917 71	

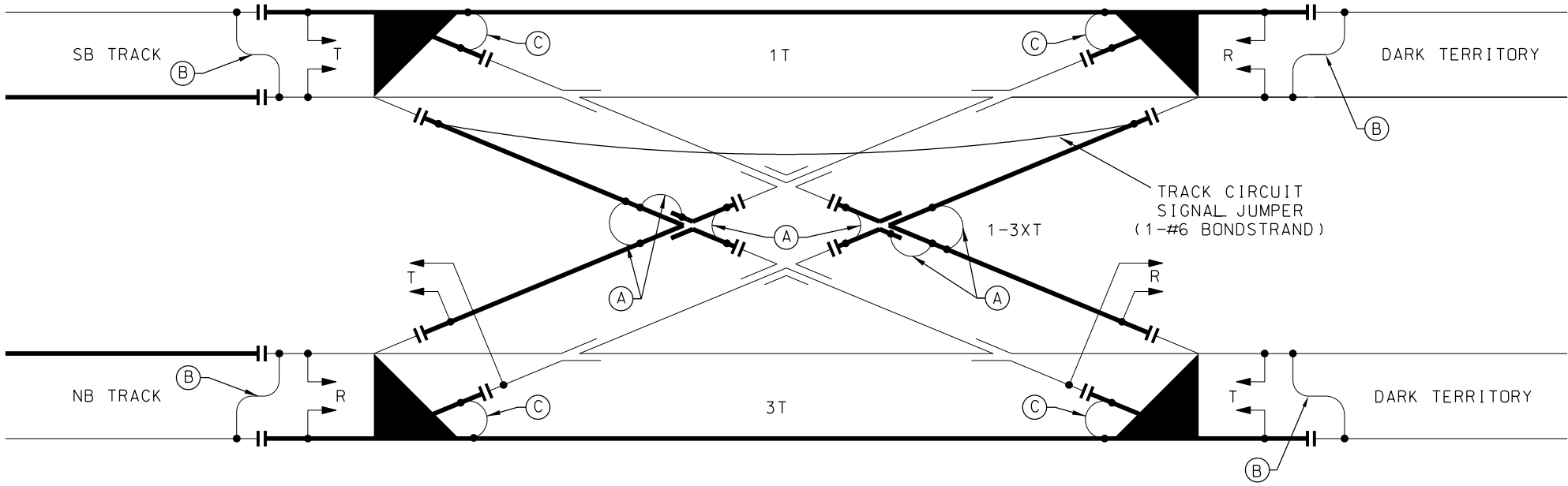
NEGATIVE RETURN BONDING



NOTES:

1. JUMPERS NOT REQUIRED IF CONTINUOUS CAST BED PLATE IS USED.
2. SEAL OPENINGS AROUND CONDUITS AND DRAIN PIPES WITH ELASTOMERIC GROUT AT INSULATION LINER.
3. SEE TRACK DRAWINGS FOR ADDITIONAL BATHTUB AND TRACK CONSTRUCTION DETAILS.
4. THE CONTRACTOR SHALL PROVIDE BONDING PLANS FOR EACH SWITCH POINT LOCATION FOR APPROVAL.
5. ARRANGEMENT SHOWN IS GENERAL AND IS PROVIDED TO SHOW TYPICAL ARRANGMENTS OF TRACK CIRCUITS, BONDS AND RETURN RAIL CONFIGURATIONS.
6. ALL 500 KCMIL CABLES ARE ROPELAY
7. CROSS BONDING SHALL NOT BE COMBINED WITH NEGATIVE RETURN AT SUBSTATION.



SIGNAL BONDING

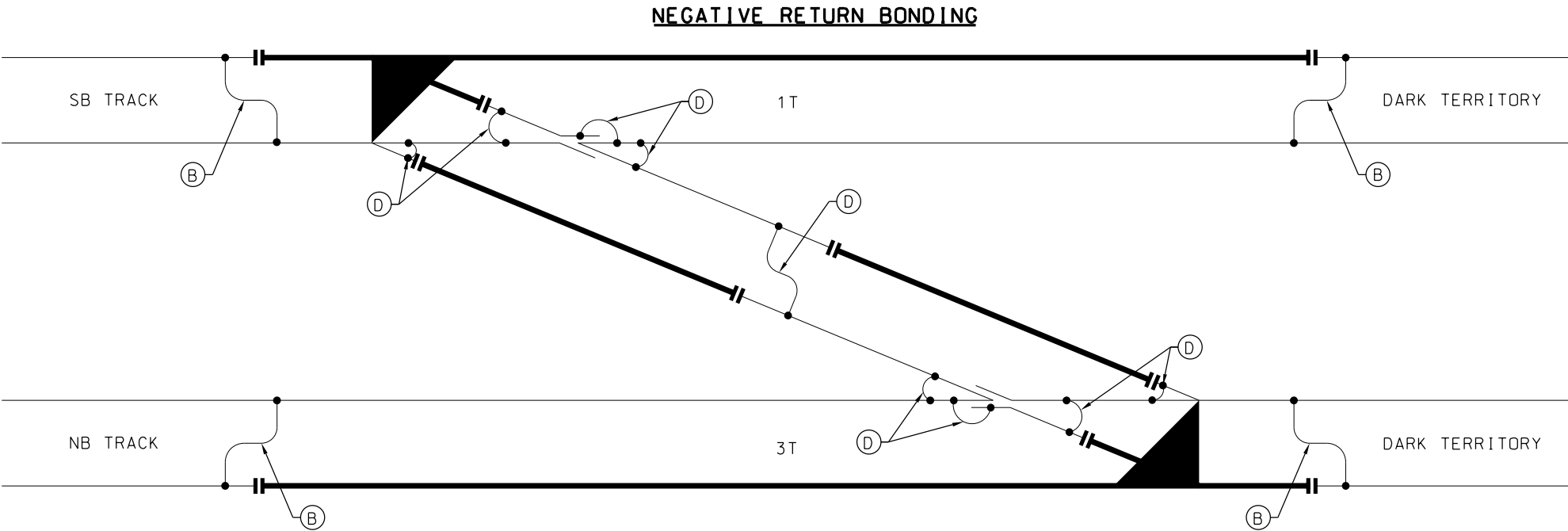


SIGNAL AND POWER BONDING KEY

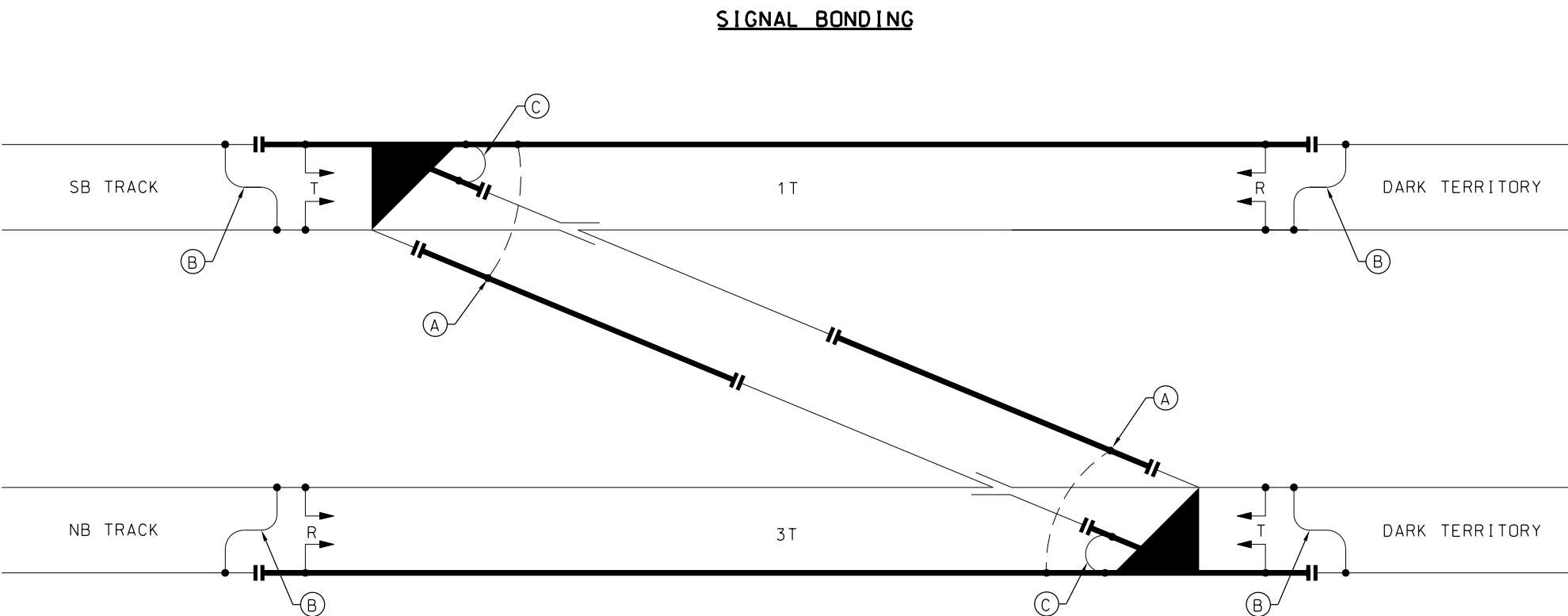
- (A) 1-#6 BOND STRAND (TRACK CIRCUIT JUMPER)
- (B) 3-500 KCMIL
- (C) 2-250 KCMIL
- (D) 2-500 KCMIL

- ||— INSULATED JOINT
- SIGNAL RAIL
- NEGATIVE RETURN RAIL



REV	DATE	DESCRIPTION	DESIGNED BY	AJW			EARLY PROCUREMENT PACKAGE 2B	DATE:09-13-2022	KANSAS CITY STREETCAR - RIVERFRONT EXTENSION	SCALE FOR 22"x34": NOT TO SCALE
			CHECKED BY	JLM			 <div>HDR Engineering, Inc. 10450 Holmes Road Suite 600 Kansas City, MO 64131-3471 816-360-2700 Certificate of Authority: 000856</div>	TRAIN CONTROL TURNOUT BONDING		FILENAME:
			DRAWN BY	ZJ						N607
			CHECKED BY	AJW						CONTRACT NO.:
			APPROVED BY	NKS						CONTRACT NO. ***
										VOLUME:
PLOT DATE: 9/12/2022			DATE		08-11-2022	NOT FOR CONSTRUCTION			DRAWING NO.:	SHEET NO.:
									N607	389

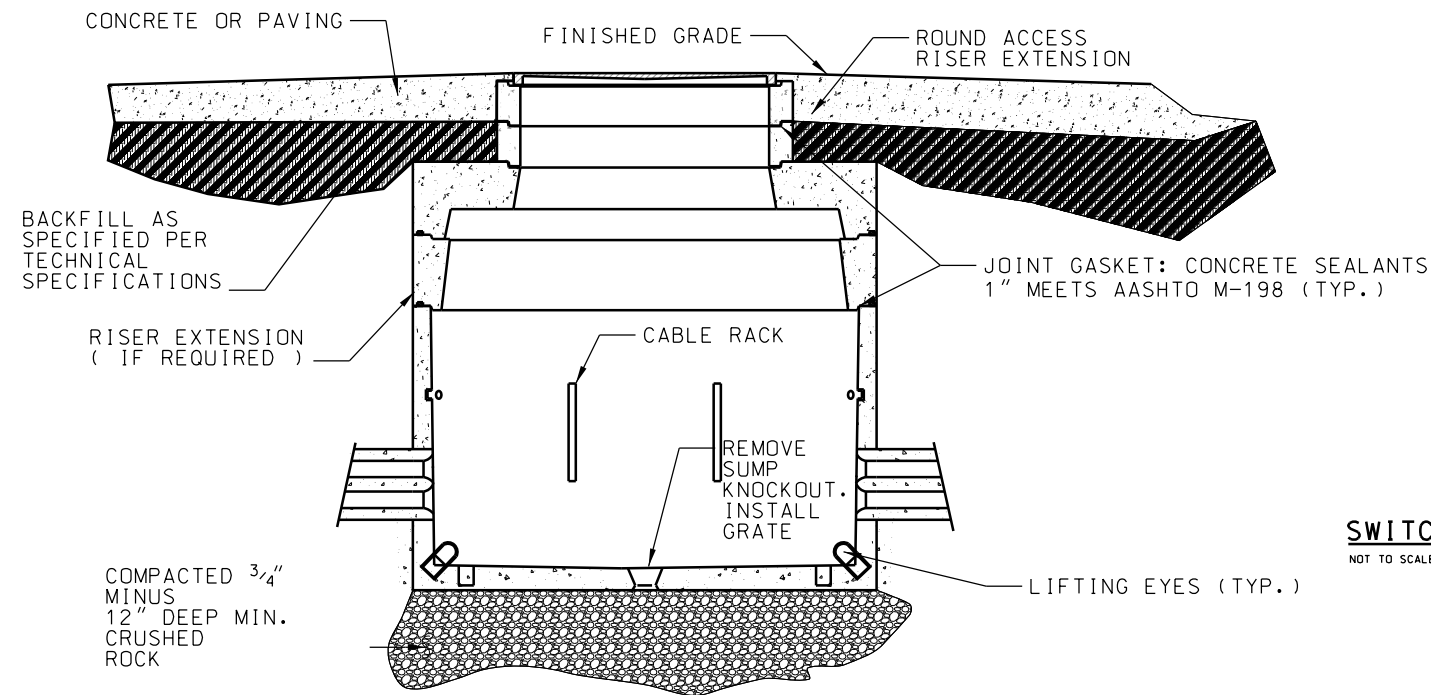


- NOTES:**
1. JUMPERS NOT REQUIRED IF CONTINUOUS CAST BED PLATE IS USED.
 2. SEAL OPENINGS AROUND CONDUITS AND DRAIN PIPES WITH ELASTOMERIC GROUT AT INSULATION LINER.
 3. SEE TRACK DRAWINGS FOR ADDITIONAL BATHTUB AND TRACK CONSTRUCTION DETAILS.
 4. THE CONTRACTOR SHALL PROVIDE BONDING PLANS FOR EACH SWITCH POINT LOCATION FOR APPROVAL.
 5. ARRANGEMENT SHOWN IS GENERAL AND IS PROVIDED TO SHOW TYPICAL ARRANGMENTS OF TRACK CIRCUITS, BONDS AND RETURN RAIL CONFIGURATIONS.
 6. ALL 500 KCMIL CABLES ARE ROPELAY
 7. CROSS BONDING SHALL NOT BE COMBINED WITH NEGATIVE RETURN AT SUBSTATION.

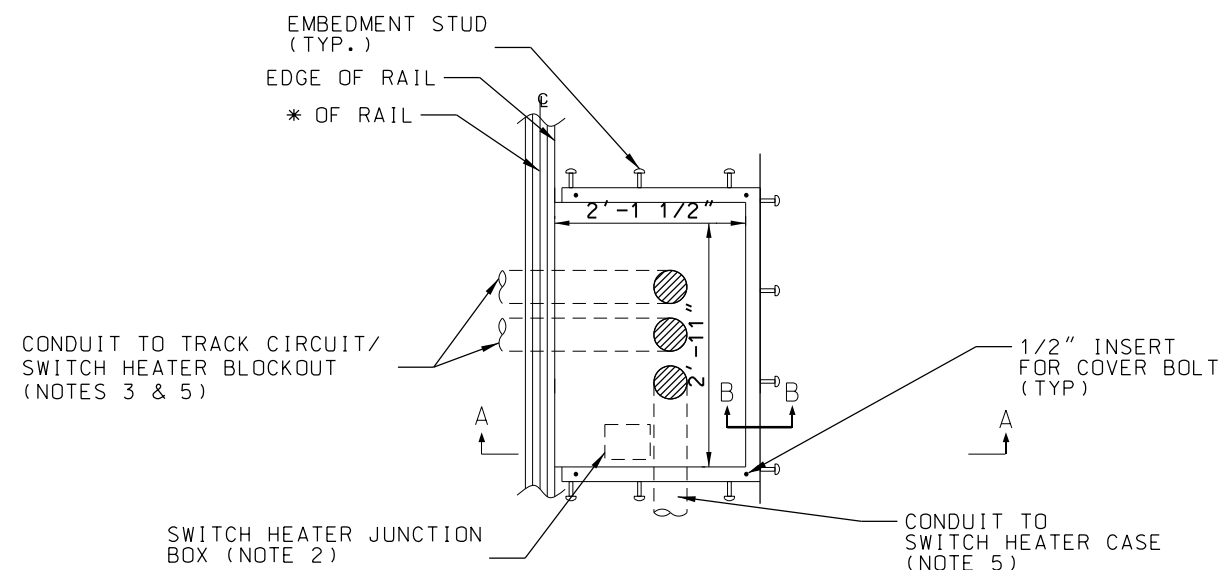


- SIGNAL AND POWER BONDING KEY**
- (A) 1-#6 BOND STRAND (TRACK CIRCUIT JUMPER)
 - (B) 3-500 KCMIL
 - (C) 2-250 KCMIL
 - (D) 2-500 KCMIL
-
- INSULATED JOINT
 - SIGNAL RAIL
 - NEGATIVE RETURN RAIL

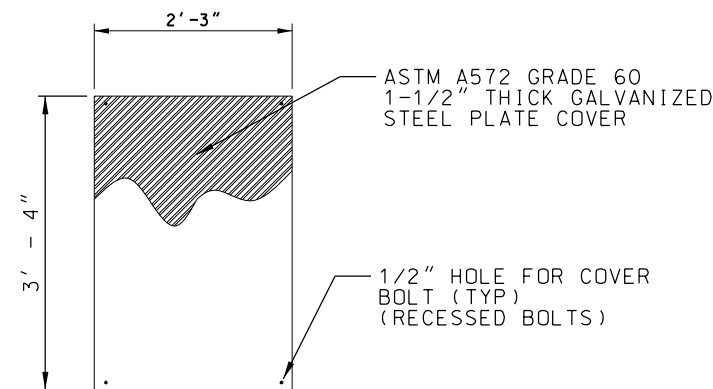
REV	DATE	DESCRIPTION	DESIGNED BY	AJW			EARLY PROCUREMENT PACKAGE 2B	DATE:09-13-2022	KANSAS CITY STREETCAR - RIVERFRONT EXTENSION	TRAIN CONTROL TURNOUT BONDING	SCALE FOR 22"x34":		
			CHECKED BY	JLM			 HDR Engineering, Inc. 10450 Holmes Road Suite 600 Kansas City, MO 64131-3471 816-360-2700 Certificate of Authority: 000856				NOT TO SCALE	FILENAME:	
			DRAWN BY	ZJ							CONTRACT NO.:		
			CHECKED BY	AJW							CONTRACT NO. ***	VOLUME:	
			APPROVED BY	NKS							1	DRAWING NO.:	SHEET NO.:
			DATE	08-11-2022								N608	390
PLOT DATE: 9/12/2022			9:42:22 PM				NOT FOR CONSTRUCTION						



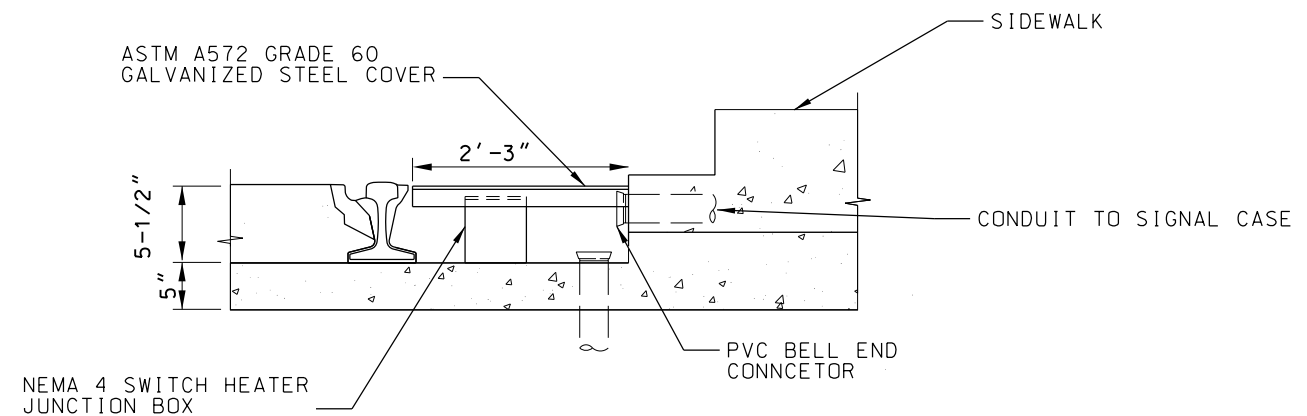
TYPE 5 COMMUNICATION FIBER SPLICE VAULT INSTALLATION DETAIL ①
NOT TO SCALE



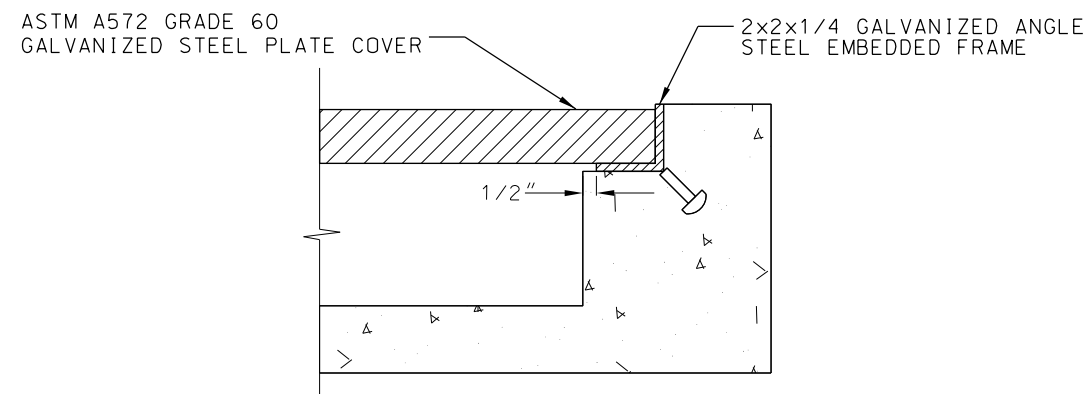
SWITCH HEATER/TRACK CIRCUIT BLOCKOUT DETAIL ②
NOT TO SCALE



SWITCH HEATER / TRACK CIRCUIT BLOCKOUT COVER
NOT TO SCALE



SECTION A-A
NOT TO SCALE



SECTION B-B
NOT TO SCALE
(TYPICAL ALL THREE SIDES)

NOTES:

1. 2"x 2"x1/4" ANGLE STEEL FRAME SHALL BE EMBEDDED IN THE CONCRETE ALLOWING THE GALVANIZED STEEL COVER TO BE FLUSH WITH FINISHED GRADE.
2. DEPTH OF BLOCKOUT SHALL BE SUFFICIENT FOR TOP OF SWITCH HEATER JUNCTION BOX TO HAVE MINIMUM 1INCH CLEARANCE.
3. CONTRACTOR SHALL CONNECT THE 2-4" NIPPLES IN EACH BLOCKOUT WITH 4" GRSC CONDUIT AND SUPPORT AS REQUIRED BY THE NEC.
4. SEE TRACK PLANS FOR TRACK SLAB CIVIL ELEMENT.
5. CONTRACTOR SHALL SEAL RACEWAYS WITH WATER PROOF SEALANT AFTER CABLE IS INSTALLED. CONDUIT SEALS SHALL PROTECT CONDUIT FROM BEING FILLED WITH RE-ENTERABLE RESIN.
6. AFTER SYSTEMS ACCEPTANCE TESTING, BLOCKOUTS TO BE FILLED WITH 3M SCOTCHCAST RE-ENTERABLE ELECTRICAL INSULATED RESIN 2123 OR APPROVED EQUAL.

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			CHECKED BY	JLM	<div> <div>HDR</div> <div>HDR Engineering, Inc.</div> <div>10450 Holmes Road</div> <div>Suite 600</div> <div>Kansas City, MO 64131-3471</div> <div>816-360-2700</div> <div>Certificate of Authority: 000856</div> </div>		SYSTEMWIDE ELECTRICAL	FILENAME: Z602
			DRAWN BY	ZJ			CONTRACT NO.:	CONTRACT NO. ***
			CHECKED BY	AJW			VOLUME:	1
			APPROVED BY	NKS			DRAWING NO.:	SHEET NO.:
							Z602	356