

KANSAS CITY AREA TRANSPORTATION AUTHORITY

Invitation for Bids (IFB) #F23-5001-39A  
112 Tram Rail Expansion Joints

ADDENDUM #2

Issue Date: December 28, 2022

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This Addendum is hereby made a part of the Invitation for Bid and Project Documents to the same extent as if it were originally included therein and is intended to modify and/or interpret the bidding documents by additions, deletions, clarifications, or corrections. The Contractor shall acknowledge receipt of this Addendum on the "Receipt of Addenda" form (herein attached) and shall include the form in their Bid Submittal documents.

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BIDDER QUESTIONS/REQUESTS FOR CLARIFICATION

1. Q: 112 TRAM rail expansion joint drawing K922 section C-C shows milled AS400 steel section, is this material astralloy? If not, can you please provide more details on this type of steel?

A: Steel for the milled section shown in Section C-C shall have a minimum hardness of 350 BHN and shall meet or exceed the requirements outlined in §34 11 00 (included in this addendum)

2. Q: Please confirm material A through G in the written specifications Section 341193: Other Track Materials 2.1 Material are not part of this bid.

A: The following items are not anticipated to be included in the bid:

A - Insulated Bonded Joints  
B - Transition Rails  
C - Shims  
E - Bumping Post  
G - Precast Concrete Crossing Panels

The following item is to be included in the bid:

D - Miscellaneous Hardware to connect rail to annulus box, other rail, bridge deck, and stray current and or bonded negative return cable (if specified in plans or specifications)

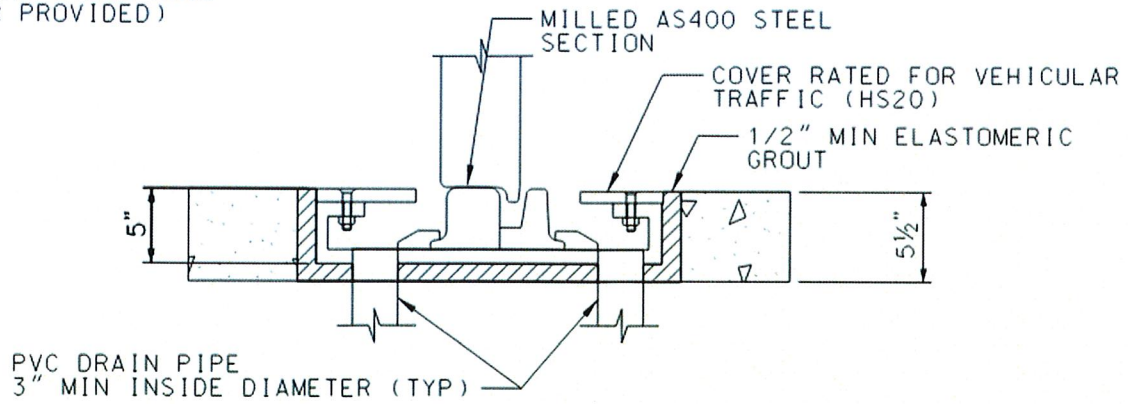
The following items is clarified:

F - While the installation and grouting of the box into the bridge deck is out of the scope of this contract, this procurement shall include in its shop drawings, the proposed grout material that (a) meets the design intent and (b) is constructable (e.g., can flow and be verified to fully fill and support under the expansion box)

3. Q: Drawing K922 show the enclosure of the expansion joint insulated with 1/2" min elastomeric grout. Would encapsulation of the enclosure with 5/32" thk polyQuik P-480 be acceptable?

A: Referencing Sheet K923 that addresses 112 Tram Rail (not K922 that references 115 RE Rail), alternate materials may be accepted, but the encapsulation shall meet the requirements from Section 34 11 93.

TRAM STOCK RAIL  
(COVER PROVIDED)



**The following are to be added to this bid package:**

BATES 302824 – Responses to questions  
BATES 302825 – 302829 – Specifications § 34 11 03

**Supersede the following plan sheets:**

BATES 302830 (K906/70) titled 115 RE and 112 Tram Rail Sections  
BATES 302831 (K923/87) titled 112 Tram Rail Expansion Joints

***Project Plan Sheets a separate document emailed with this Addendum #2 and posted to the project FTP site, which can be accessed as follows.***

Name	Package 4 – 112 Tram Expansion Joints
Number	F23-5001-39A
Site URL	<a href="https://kcata.sharepoint.com/sites/FTP/pro/tej/SitePages/Home.aspx">https://kcata.sharepoint.com/sites/FTP/pro/tej/SitePages/Home.aspx</a>
Bidder email	Bid_F23-5001-39A@kcata.org
Bidder Password	<b>TeecR+PD2X</b> (TANGO - echo - echo - charlie - ROMEO - Plus - PAPA - DELTA - Two - X-RAY)

***NOTE:*** This site is not compatible with Firefox or Safari browsers. After accessing the SharePoint site, ***you must type in the email address that is provided above (not your own) – you cannot use the hyperlink.*** Please note the “underscore” in the email. The complete password is comprised of the highlighted portion above.

**END OF ADDENDUM**

## **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

B. Section 34 11 29 – General Track Construction

##### **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



<u>Element</u>	<u>Chemical Analysis (wt %)</u>	<u>Product Analysis Tolerance (wt %)</u>	
		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<sup>-6</sup> 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**

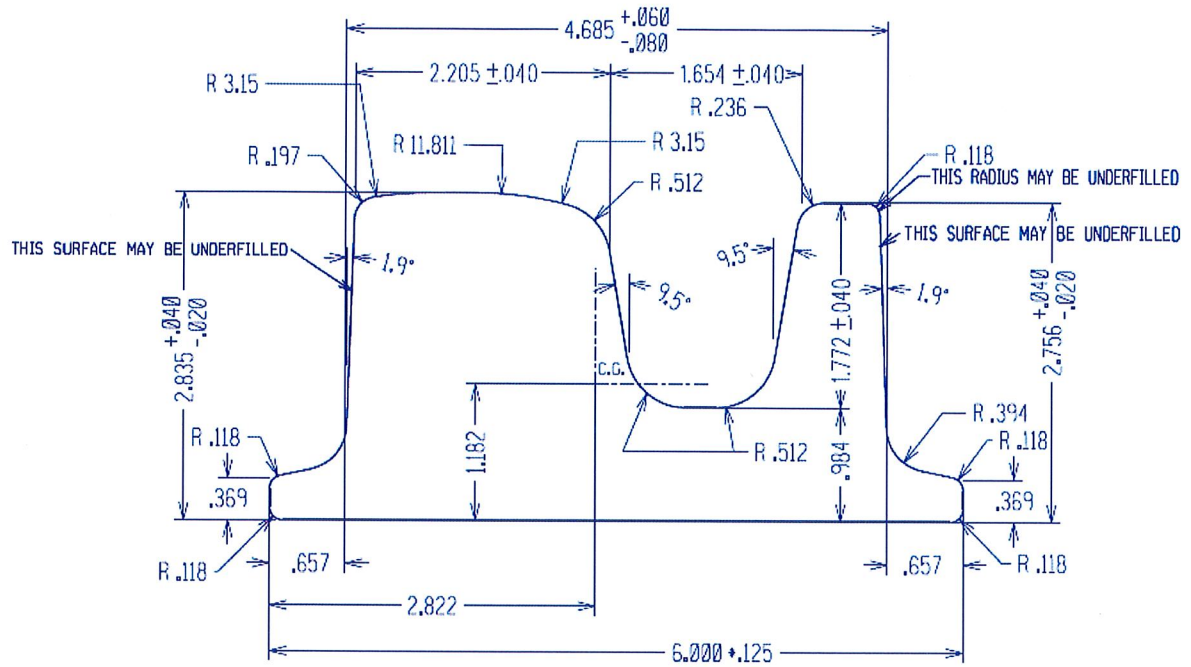
- A. No separate measurement will be made for Work described in this Section.

## **PART 5 - PAYMENT**

### **5.1 PAYMENT**

- A. No separate payment will be made for “Rail”. All costs pertaining thereto shall be included in the contract unit prices identified in Section 34 11 29 as listed in the Bid Form of Unit Prices.

## APPENDIX A



REVISION 6/17/13  
 BASE WIDTH 6.0±.125'  
 AREA=10.9306  
 Moment of Inertia (7.1143,24.9552,32.0695)  
 Radius of Gyration (.806761,1.51098,1.71287)

112TRAM	
CAD DWG FILE: COLD SIZE	FILE: 112TRAM
Roll Department	
ArcelorMittal Steel	
Steelton, PA 17113	
DATE 6/17/13	NOTE: PRINTED DIMENSIONS TO UNITS INDICATED
SCALE 1:1	

END OF SECTION

KANSAS CITY AREA TRANSPORTATION AUTHORITY (KCATA)

Invitation for Bids (IFB) #F223-5001-39A  
KC Streetcar 112 Tram Joint Expansion

**RECEIPT OF ADDENDA**

Proposers shall return this form when submitting their Bid Submittal. The form shall be signed and dated by an authorized representative of the firm. Failure to submit this form may deem the Bidder non-responsive. As additional addenda are issued, please notate date received below.

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*We hereby acknowledge that the Addenda noted below was received all information has been incorporated into the Bid as required.*

Addendum #1 dated December 20, 2022      Date Received \_\_\_\_\_

Addendum #2 dated December 28, 2022      Date Received \_\_\_\_\_

Addendum #3 dated \_\_\_\_\_      Date Received \_\_\_\_\_

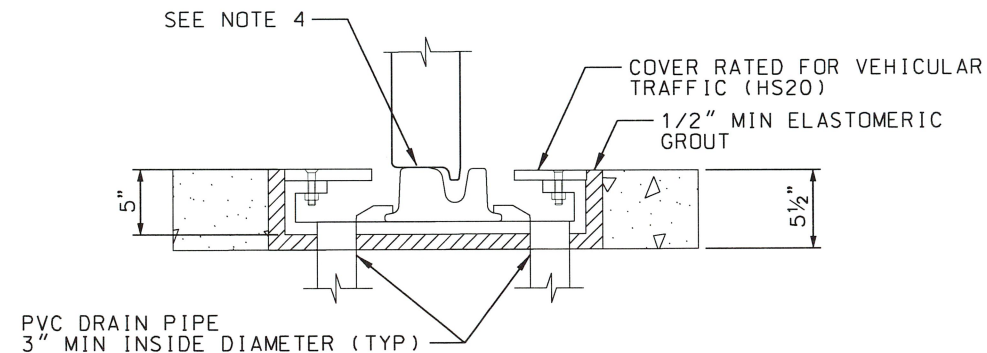
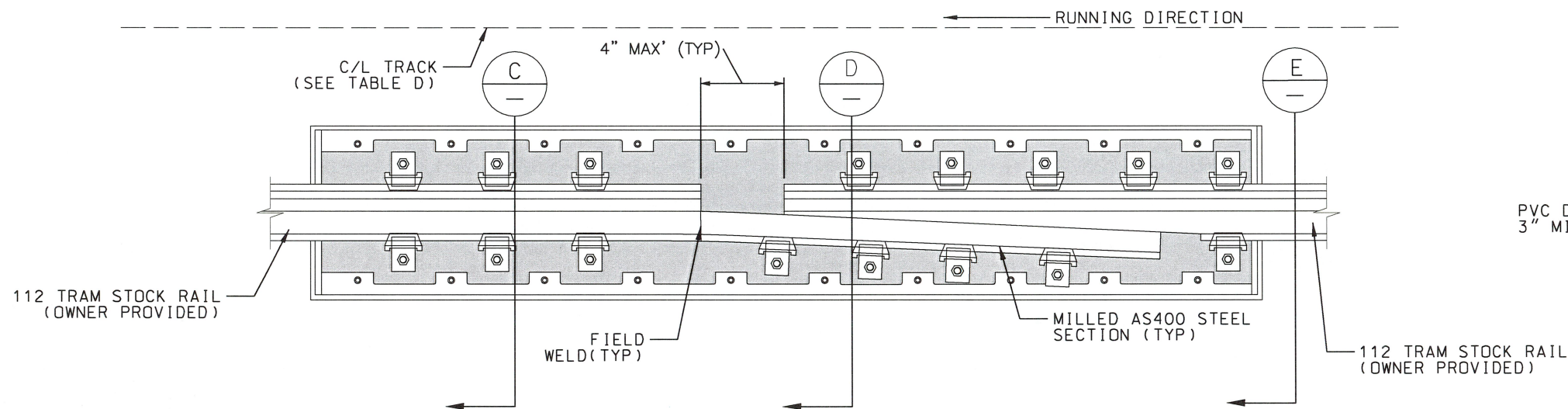
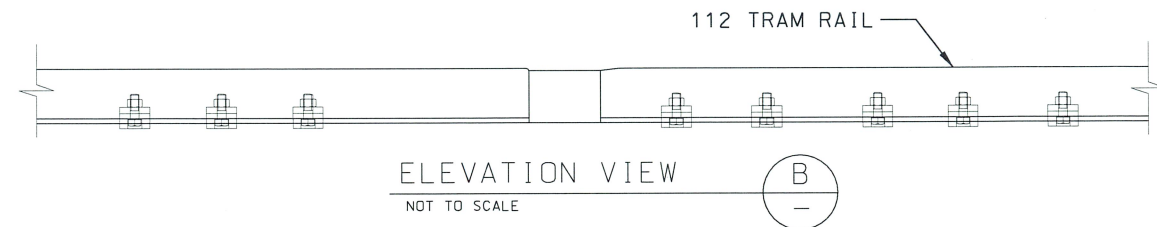
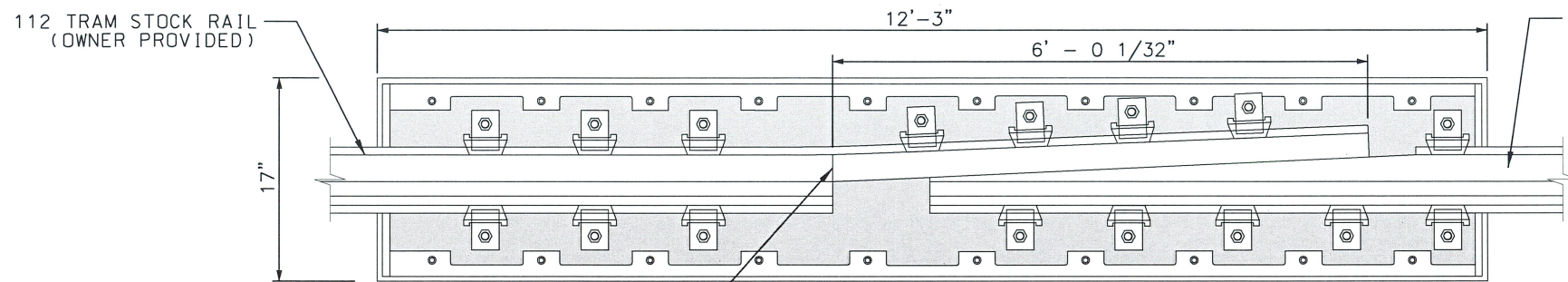
Company Name \_\_\_\_\_ Date \_\_\_\_\_

Address/City/State/Zip \_\_\_\_\_

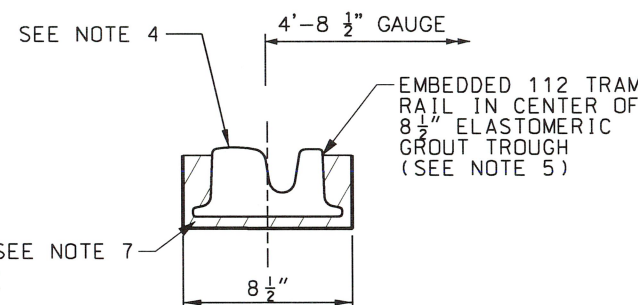
Authorized Signature \_\_\_\_\_ Printed Name \_\_\_\_\_

Telephone \_\_\_\_\_ Fax \_\_\_\_\_ Email \_\_\_\_\_

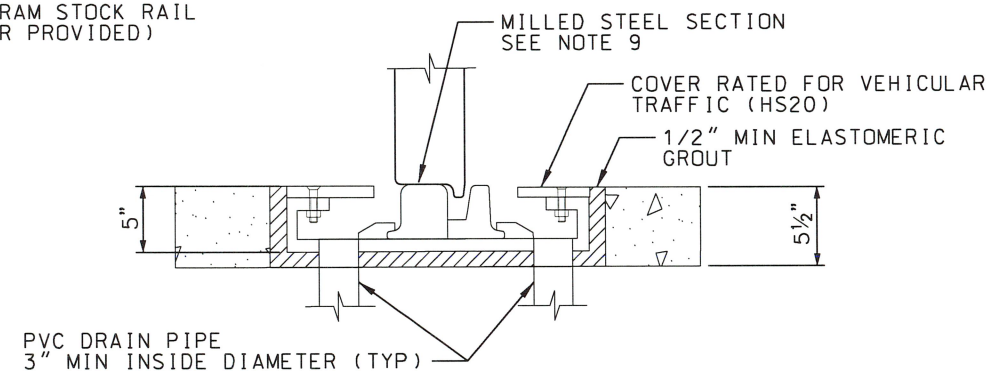




RAIL EXPANSION JOINT DETAIL  
NOT TO SCALE



PROPOSED SECTION  
NOT TO SCALE



PROPOSED SECTION  
NOT TO SCALE

NOTES:

- JOINT SHOWN IS PROVIDED AS BASIS OF DESIGN. VENDOR SHALL SUBMIT JOINT MEETING THE PARAMETERS SHOWN HERE AND IN SPECIFICATIONS OR APPROVED EQUAL.
- REFER TO K103 TO K106 FOR ADDITIONAL INFORMATION. FIELD VERIFY FOR ALL SIZE AND SHAPE LIMITATIONS.
- FABRICATOR SHALL SUPPLY SHOP DRAWING FOR APPROVAL THAT MEET DIMENSIONS AND DETAILS SHOWN ON THIS PLAN.
- CONTRACTOR TO INSTALL PROPOSED TOP OF RAIL 1/4" ABOVE ADJACENT BRIDGE DECK.
- CONTRACTOR TO SUBMIT INSTALLATION PLAN FOR HOLDING GAUGE IN ELASTOMERIC GROUT TROUGH TO ENGINEER FOR REVIEW AND APPROVAL.
- JOINT SHALL ALLOW FOR OPERATING SPEEDS UP TO 35 MPH.
- MINIMUM THICKNESS GROUT BELOW RAIL SHALL BE 1".
- EXPANSION JOINTS SHALL BE BONDED WITHIN THE BOX FOR CONTINUITY OF NEGATIVE RETURN CURRENT AND TRACK CIRCUIT.
- STEEL FOR MILLED SECTION SHALL MEET OR EXCEED THE REQUIREMENTS OUTLINED IN SPECIFICATION SECTION 34 11 00, INCLUDING A MINIMUM HARDNESS OF 350 BHN.

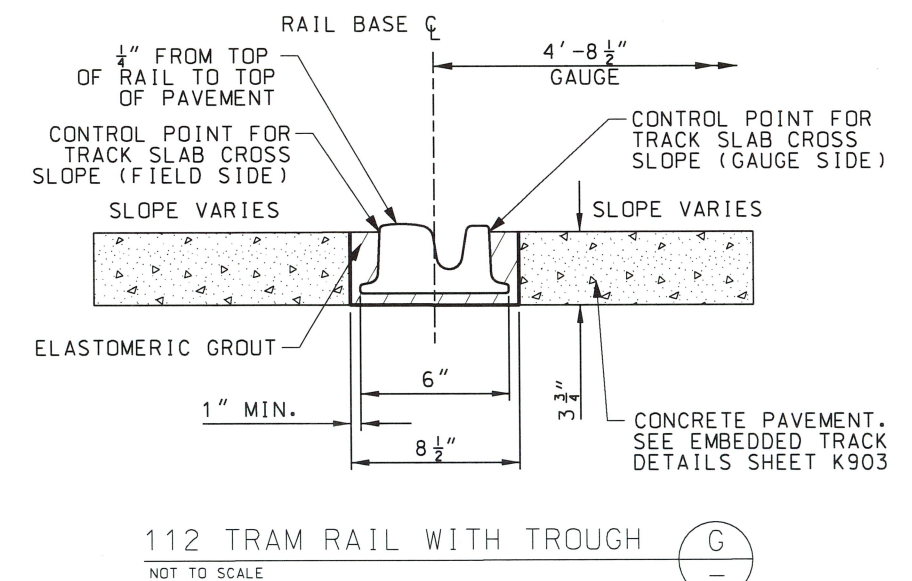
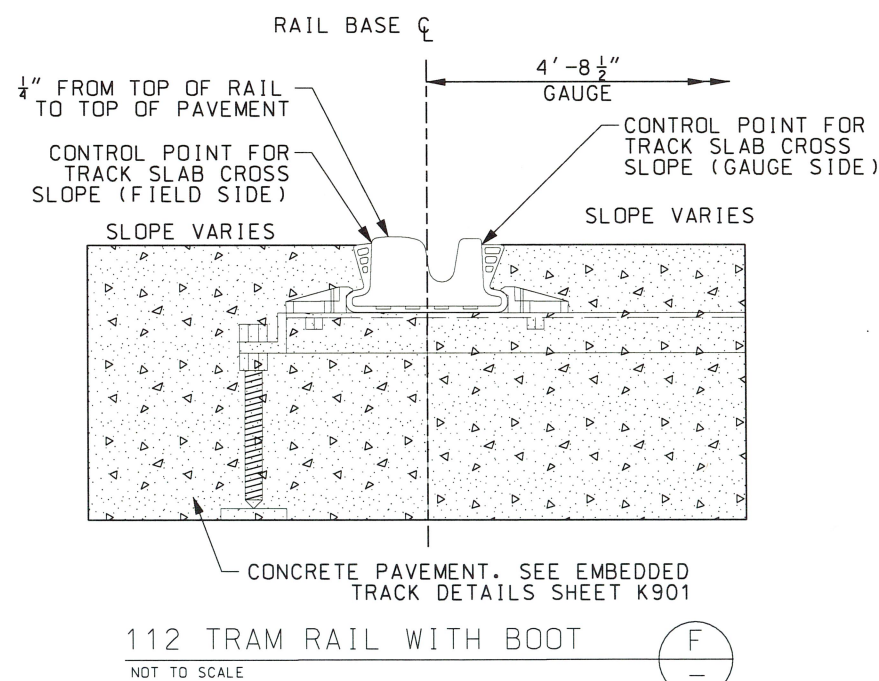
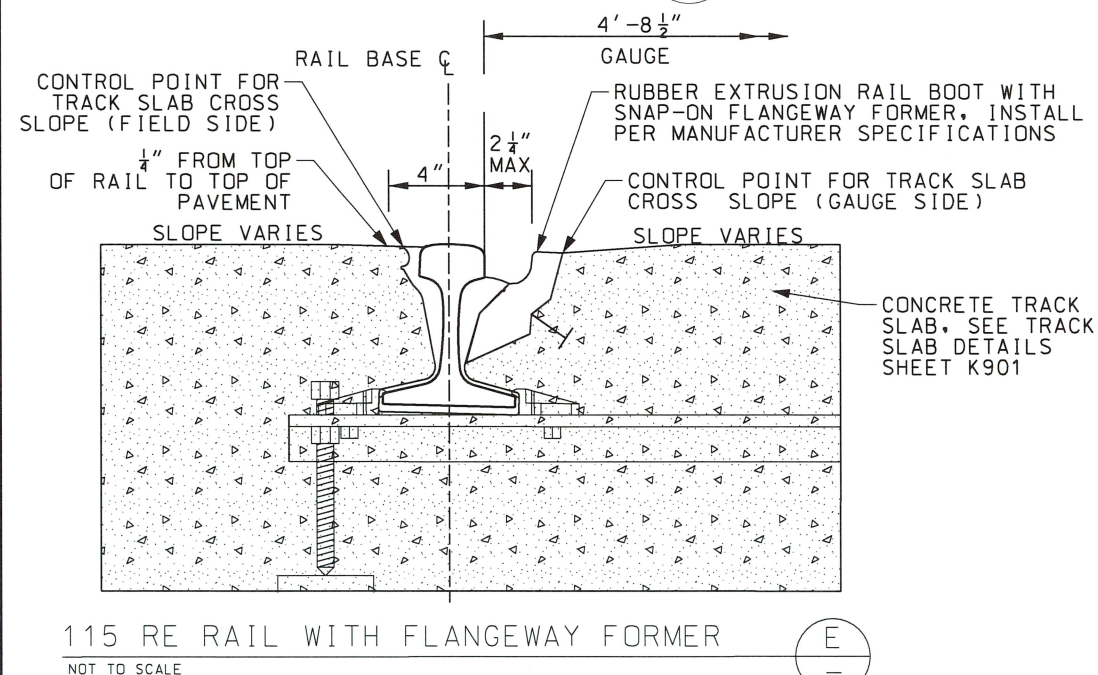
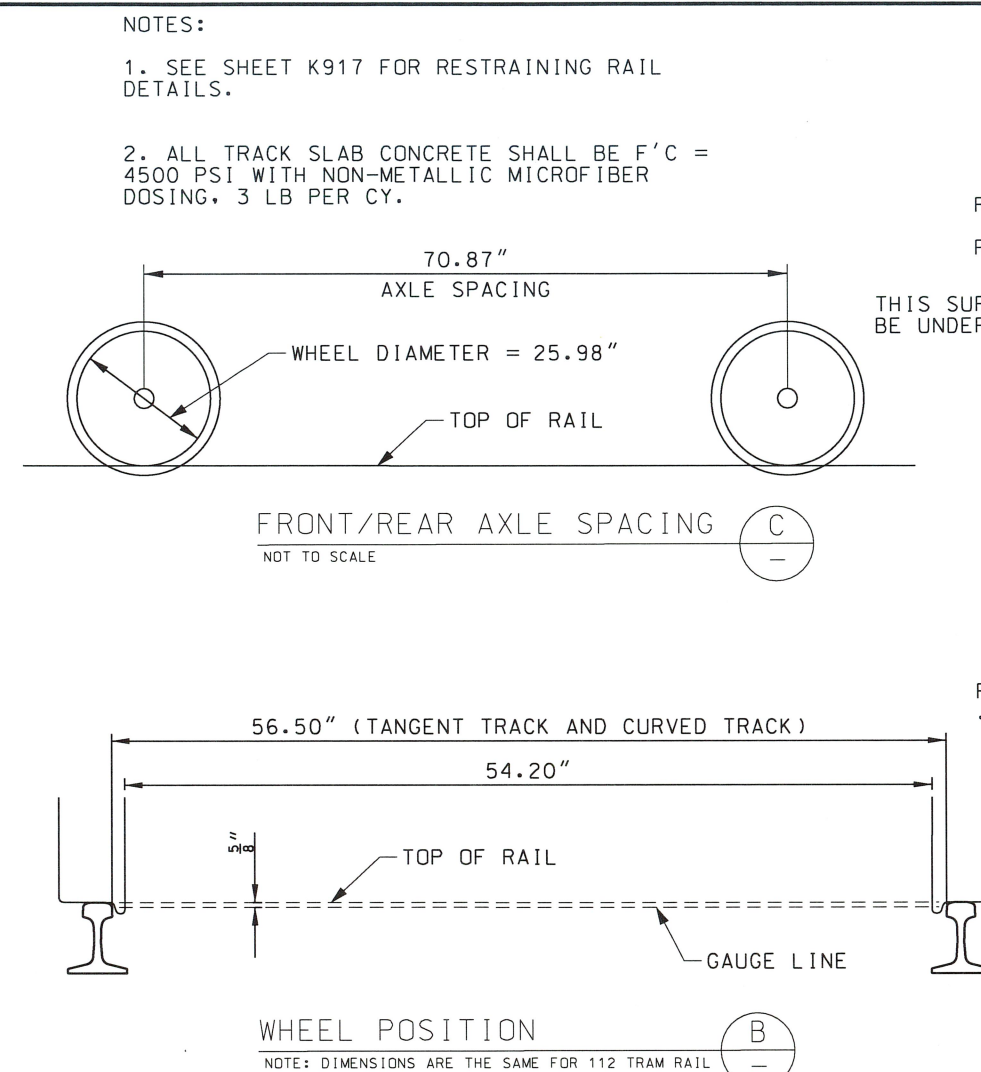
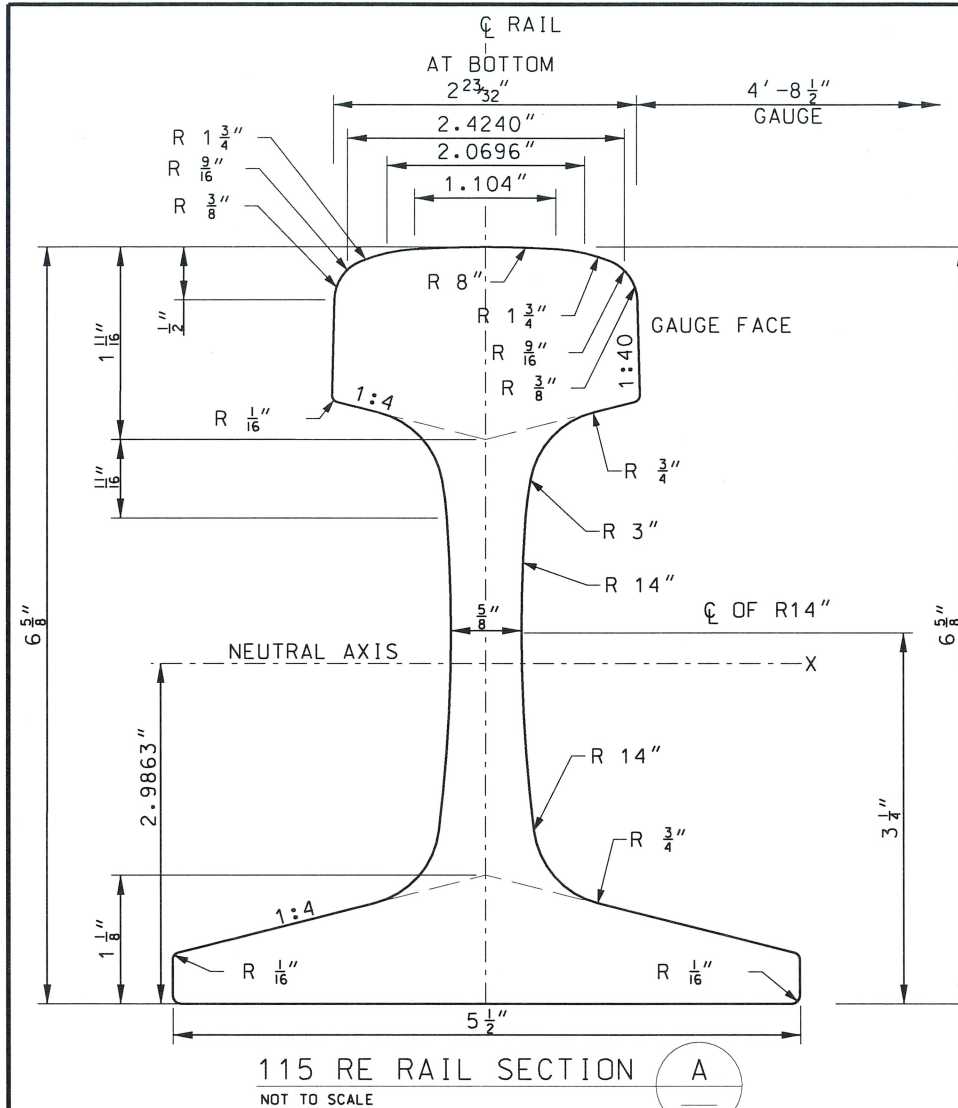
LOCATION	MAX CONTRACTION	MAX EXPANSION	TOTAL MOVEMENT	NB RADIUS	SB RADIUS
	INCHES	INCHES	INCHES	FEET	FEET
ABUTMENT 1 APPROACH SLAB	0.92	0.36	1.28	TANGENT	TANGENT
PIER 2	1.68	1.20	2.88	1600	1616
PIER 5	2.28	1.44	3.72	1600	1616
PIER 8	2.38	1.41	3.79	1600	1616
PIER 11	0.79	0.51	1.30	1600	1616
PIER 12	1.48	1.02	2.50	1600	1616
ABUTMENT 2 APPROACH SLAB	1.57	0.67	2.24	1600	1616

MOVEMENT AND RADIUS AT RAIL  
EXPANSION JOINTS

REV	DATE	DESCRIPTION	DESIGNED BY MMO		ISSUED FOR BID	DATE: 12-23-2022	<b>KANSAS CITY STREETCAR - RIVERFRONT EXTENSION</b>  <b>112 TRAM RAIL EXPANSION JOINTS</b>	SCALE FOR 22"x34": NOT TO SCALE FILENAME: K923.dgn CONTRACT NO.: CONTRACT NO. *** VOLUME: DRAWING NO.: SHEET NO.:
			CHECKED BY JWR		 HDR Engineering, Inc. 10450 Holmes Road Suite 600 Kansas City, MO 64131-3471 816-360-2700 Certificate of Authority: 000856	<b>K923</b>		<b>87</b>
			DRAWN BY MMO					
			CHECKED BY JWR					
			APPROVED BY NKS					
PLOT DATE: 12/23/2022 3:03:52 PM			DATE: 12-23-2022		NOT FOR CONSTRUCTION			

1282831



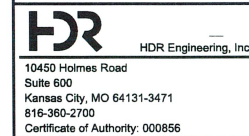


REV	DATE	DESCRIPTION	DESIGNED BY	MMC
			CHECKED BY	JWF
			DRAWN BY	MMC
			CHECKED BY	JWF
			APPROVED BY	NKS
PLOT DATE:		12/23/2022	8:45:38 AM	DATE 12-23-2022



ISSUED FOR BID
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DATE: 12-23-2022



NOT FOR CONSTRUCTION

22 **KANSAS CITY STREETCAR - RIVERFRONT EXTENSION**

## 115 RE AND 112 TRAM RAIL SECTIONS

SCALE FOR 22"x34":	
NOT TO SCALE	
FILENAME:	
K906.dgn	
CONTRACT NO.:	
CONTRACT NO. ***	
VOLUME:	
I	
DRAWING NO.:	SHEET NO.
K906	70

302830

KANSAS CITY AREA TRANSPORTATION AUTHORITY

Invitation for Bids (IFB) #F23-5001-39A  
112 Tram Rail Expansion Joints

ADDENDUM #1

Issue Date: December 20, 2022

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CORRECTIONS

BID BOOK 3

Please add the attached sheets and pages to Book 3:

- BATES 302490 (K906/59) Titled 115 RE and 112 Tram Rail Sections
- BATES 302822 (K923.dgn/K932) Titled 112 Tram Rail Expansion Joints
- BATES 302492 – 305502 Specifications

ATTACHMENT

- Receipt of Addenda Form
- Project Plan Sheets

**END OF ADDENDUM**

KANSAS CITY AREA TRANSPORTATION AUTHORITY (KCATA)

Invitation for Bids (IFB) #F223-5001-39A  
KC Streetcar 112 Tram Joint Expansion

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Addendum #2 dated \_\_\_\_\_      Date Received \_\_\_\_\_

Addendum #3 dated \_\_\_\_\_      Date Received \_\_\_\_\_

Company Name \_\_\_\_\_ Date \_\_\_\_\_

Address/City/State/Zip \_\_\_\_\_

Authorized Signature \_\_\_\_\_ Printed Name \_\_\_\_\_

Telephone \_\_\_\_\_ Fax \_\_\_\_\_ Email \_\_\_\_\_







**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 3.03 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:

KCMO Project No. 89022015

Kansas City Area Transportation Authority  
Kansas City Streetcar Riverfront Extension  
OTHER TRACK MATERIALS  
34 11 93 - 1

302492

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:

KCMO Project No. 89022015

Kansas City Area Transportation Authority  
 Kansas City Streetcar Riverfront Extension  
 OTHER TRACK MATERIALS  
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302493

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:

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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 1/4 inch, 3/8 inch, 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/ft<sup>2</sup> 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 1/16 inch over in the size of the bolt holes will be permitted. A variation of 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 expansion joint shall be a milled AS400 steel section over the bridge expansion joint and tie into a 112 TRAM rail section on either end of the joint.
  3. Streetcar rails shall be restrained such that the wheel is continuously bearing throughout the joint. The lid of the rail expansion joint box may be used to restrain the streetcar wheel provided the lid is designed for the loading. The rail expansion joint must also meet HS20 loading.

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4. The rail expansion joint supplier shall provide flash butt weld from the rail expansion joint assembly to 112 TRAM rail.
5. The overall dimension of the assembly including the 112 TRAM rail stock rails shall be determined by the expansion joint supplier.
6. The overall depth of the rail expansion joint assembly box and surrounding embedment materials shall not exceed 5 1/2".
7. 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 endue 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 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 1/4 inch intervals, 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 1/4 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 1/4 inch from the end of the rail shall be at least 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 +/- 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:

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### 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.
- B. Contractor shall utilize nozzle for placement of elastomeric grout.

### **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**

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**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.

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## **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**

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