PROJECT BID DOCUMENTS

Book 1

Pkg 3 – Traction Power Substation (TPSS)

KCATA PROJECT NUMBER: # F23-5003-39A

ISSUE DATE: 1/18/2023

BID CLOSE DATE: 2/8/2023 2:00 PM Local Time

VIRTUAL BID OPENING: Bid Close Date; 2 PM

OWNER: Kansas City Area Transportation Authority 1200 E. 18th Street, Kansas City, Missouri 64108 Telephone: 816-346-0200
PROCUREMENT CONTACT: Denise Adams 1350 E. 17th Street Kansas City, MO 64108 Telephone: 816-346-0224 Email: dadams@kcata.org
PROJECT MANAGER Linda Clark, PE Kansas City Area Transportation Authority 1200 E. 18th Street, Kansas City, Missouri 64108 Email: lclark@kcata.org

KC Streetcar Package 3 TPSS
Purchase and Delivery
Project No. #F23-5003-39A

Item No.	Unit Measure	Item Description	Quantity	Unit Price ($)	Total Price ($)
		Package 3 - Transit Power Substation			
1	LS	TPSS	1		$ -
2	DAYS	TPSS Storage	180		

TOTAL	$ -

Itemized Bid Proposal Submitted By: _____
Authorized Signature

Company: _____

Date: _____

Contents

01 NOTICE OF INVITATION FOR BIDS

The Kansas City Area Transportation Authority (KCATA) is a bi-state agency offering mass transit service within the greater Kansas City metropolitan area. KCATA is requesting that qualified contractors to provide bids for ***Pkg 3 – Traction Power Substation (TPSS).*** **The awarded contractor shall provide all equipment, tools, supplies, prevailing wage labor, supervision, insurance, warranties, and bonds to perform this work from inception to final acceptance by KCATA.**

Description of Work: Provide Traction Power Substation (TPSS) for the Kansas City Riverfront Extension. Specifications and plans are included in Book 3 – see sheets numbered 302593–302793 and 302794-302821, respectively. This work also includes coordination shown in the TPSS Responsibility Matrix (see BATES 304351-304352)

This solicitation is funded by Federal Transit Administration (FTA) grants. **The Authority has set a goal of 0%.** participation by certified Disadvantaged Business Enterprise (DBE) firm(s) for this project. Certified DBE firms are encouraged to submit bids as Primes or Subcontractors. Firms must be certified as a DBE by a member of the Missouri Regional Certification Committee, which includes KCMO, MoDOT, City of St. Louis, Metro or KCATA. A list of certified firms may be found at www.modot.gov/mrcc-directory. *MBE and WBE certifications from other agencies will not be counted toward DBE participation*. For further information on this subject contact Mr. Whitney Morgan, KCATA's DBE/Grants Specialist, at (816) 346-0277 or wmorgan@kcata.org.

Questions (technical, contractual, or administrative) must be directed in writing via email to Denise Adams at dadams@kcata.org. Questions and requests for clarifications, including requests for approved equals, will be received until **1/25/2023 2:00 PM Local Time.** KCATA's response to these submissions will be in the form of an Addendum, as required.

Submission of a bid shall constitute a firm offer to the KCATA for 90 days from the date of closing. This IFB does not commit the KCATA to award a contract or to pay any cost incurred in preparation of a submittal. Bidders shall read and understand the requirements of this Invitation for Bids covered in the sections listed under the Table of Contents of this document.

The KCATA reserves the right to accept or reject any or all bids received, to modify this request, or cancel in part or in its entirety the IFB if it is the best interest of the KCATA.

All contractual agreements are subject to final approval by the Kansas City Area Transportation Authority's Board of Commissioners, if the total award value is or exceeds $250,000. Board of Commissioners meet bi-monthly to approve and recommend award of contracts. This may affect schedule and NTP date.

This is a prevailing wage job under Federal Wage rates (Davis Bacon) and the Missouri State Annual Wage (MO AWO) rate. Awarded Contractor shall provide certified payrolls to KCATA with payment applications and/or invoices for review and approval prior to processing of payments.

The successful bidder shall furnish all necessary insurance, labor, materials, equipment, supplies, tools, applicable bonds, permits 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 stipulated lump sum. Required work is not necessarily limited to the bid items listed in the bid form. It is the intent of the drawings and specifications that the resulting improvements be fully completed and functional ready for operation. The cost of work not specifically identified by a bid item in the bid form shall be included as subsidiary to other bid items.

KCATA anticipates award of lump sum contracts using AIA document A-101 Standard Form of Agreement between Owner and Contractor AIA Contract 2017 Edition and AIA Contract Document A201, 2017 General Conditions (modified to include Federal Transit Administration and KCATA contract conditions). If KCATA determines to award Packages 2A, 2B, and 2C to different Bidders, these same AIA forms will be used.

A 5% bid bond is required with the bid submission. For the awarded contract, retainage will be held at 5% per payment application submitted.

The work for this project shall conform to all applicable codes, standards, regulation, and requirements enforced by all authorities having jurisdiction, including but not limited to: International Building Code, International Mechanical Code, Uniform Fire Code, and National Electrical Code. The contractor is responsible for notifying the engineer, by way of KCATA, of all knowledge of possible conflicts or discrepancies between requirements of these construction documents and applicable codes, standards, regulations, etc.

SEALED BIDS SHALL BE PROVIDED TO KCATA/RIDEKC NO LATER THAN 2/8/2023 2:00 PM Local Time with a virtual bid opening date tentatively scheduled for the day after at 2 PM. Bids received after the date/time specified above shall be considered late and shall not be opened or considered for award. Bids received electronically or by facsimile (fax) will not be opened or considered.

Our partner and funding source, the Federal Transit Administration, (FTA) requires that an award be made only to responsible contractors possessing the ability, willingness, and integrity to perform successfully under the terms and conditions of the contract. Responsibility criteria include administrative capacity, timeliness, and satisfactory current and past performance record. Contractors must not be suspended or disbarred by the federal government and be eligible for award of this contract.

It is the policy of KCATA to ensure that Disadvantage Business Enterprises (DBEs), as identified in 49 CFR Part 26, have an equal opportunity to receive and participate in Department of Transportation (DOT)-assisted contracts. For this project a goal of **0% participation** by Disadvantaged Business Enterprises (DBEs) has been established. DBE firms are encouraged to submit bids as Prime Contractors or Subcontractors. To be eligible, a firm must 1) be certified as a DBE under U.S. Department of Transportation's guidelines found in 49 CFR Part 26; and 2) hold a current, valid certification from a member of the Missouri Regional Certification Committee (MRCC) Unified Certification Program. MBE and WBE certifications from other organizations will not be accepted.

Bidders shall be aware that for the duration of the work and/or during the term of the contract on site interviews may be conducted by various agencies and/or firms to ensure full compliance with applicable wage rates, Buy America requirements, commercially useful functions as applicable to DBE work and all contractual requirements of the project. Subcontract documents shall be readily available to KCATA personnel upon request for verification of flow-down of FTA required terms and conditions during the duration of the contract.

The Kansas City Transportation Authority is exempt from federal excise, federal transportation and state sales tax and such taxes shall not be included in the bid price. The KCATA will provide the successful Bidder with a Sales Tax Exemption Certificate and a copy of KCATA's letter of Exemption from Missouri Sales and Use Tax.

Bids shall be submitted in a sealed envelope on the enclosed Bid Response Form along with all required submittal documents and must be clearly marked "BID SUBMITTAL: Pkg 3 – Traction Power Substation (TPSS)" and addressed to KCATA ATTN: Denise Adams 1350 East 17th Street, Kansas City, MO 64108.

Bids are subject to all terms, conditions and provisions as contained in the Project Manual.

Denise Adams
Procurement Department
Kansas City Area Transportation Authority

02 INVITATION FOR BID

02.01 BIDDING SCHEDULE

(1)	Bid Issue	1/18/2023
(2)	Pre-Bid Conference 272 921 Passcode: QCrGXw	1/26/2023 9 AM Local Time; Teams Meeting: ID: 286 290
(3)	Deadline for Questions	1/25/2023 2:00 PM Local Time
(4)	KCATA responds to Questions	Within two days after Question Deadline
(5)	Bid Closing	2/8/2023 2:00 PM Local Time
(a)	Street, Kansas City, MO 64108	Location Shipping and Receiving at KCATA; 1350 East17th
(6)	Bid Opening	After Bid Closing 2:00 PM local time
(7)	Notice of Award	January 2023
(8)	Issue Construction Contract	February 2023

02.02 PROJECT REQUIREMENTS SUMMARY

It is anticipated that one contract will be awarded for this work. The bid response forms are provided for use. No changes or qualifications are to be made to the bid form.

Disadvantage Business Enterprise Goal Participation Goal: **0%**

Retainage Held	**5%**	of Contract Amount
Minimum Prime Contractor Participation	**20%**	of Contract Amount
Minimum DBE Prime Contractor Participation	**30%**	of Contract Amount
Bid Bond	**5%**	of Total Bid Amount
Payment Bond	**100%**	of Contract Amount
Performance Bond	**100%**	of Contract Amount
Maintenance Bond	**100%**	of Contract Amount (2 Year)

02.02.01 Contract Completion

Notice to Proceed (NTP) will be issued by KCATA's Procurement Dept. and authorize the contractor to initiate the project, prepare shop drawings and order equipment and materials.

The total contract duration is estimated to be NTP + 450 calendar days.

02.02.02 Liquidated Damages

For the contract awarded, liquidated damages, not a penalty, shall be assessed at $3,200 per calendar day for each day that the work is not substantially complete beyond the completion date listed above in Section 02.02.01.

02.02.03 Plans, Specifications and Project Manuals

Plans and specifications are available for download on KCATA's website.

02.03 BID INFORMATION

02.03.01 Project

Pkg 3 – Traction Power Substation (TPSS)

Project # F23-5003-39A

02.03.02 Owner(s)

Kansas City Area Transportation Authority/RIDE KC
1200 East 18th Street
Kansas City, Missouri 64108

KCATA Procurement
1200 E. 18th Street
Denise Adams
Telephone 816-346-0224
E-mail: dadams@kcata.org

KCATA Project Manager
1200 E. 18th Street
Linda Clark, PE
E-mail: lclark@kcata.org

02.03.03 Place and Time

The Procurement Department for the Kansas City Area Transportation Authority (KCATA) will receive sealed bids until the date and time identified above at KCATA's Shipping and Receiving on our complex located at 1350 East 17th Street Kansas City, MO. Bids received after this time will not be accepted. *Bids will be opened and read aloud publicly virtually via TEAMS meeting 1 day after Bid Due date at 2 PM.*

02.03.04 Description of Project

KCATA is requesting qualified contractors to provide bids for Pkg 3 – Traction Power Substation (TPSS). The

awarded Contractor shall provide all equipment, tools, supplies, labor, supervision, insurance, and bonds to perform this work from inception to final acceptance by KCATA.

For this scope of work, "Supplier" shall have the meaning of the entity fabricating and supplying the material scoped in these Books, 1, 2, and 3. Unless noted otherwise, the term "Contractor" shall be interchangeable with Supplier in these documents. Where an apparent conflict is noted, "Construction Contractor" shall be used to differentiate the Supplier from the entity installing the fabricated material (Construction Contractor).

Description of Work: Provide Traction Power Substation (TPSS) for the Kansas City Riverfront Extension. Specifications and plans are included in Book 3 – see sheets numbered 302593–302793 and 302794-302821, respectively. This work also includes coordination shown in the TPSS Responsibility Matrix (see BATES 304351-304352)

KCATA reserves the right to add to or reduce the scope if it determines it is in the best interest of the KCATA. Scope change may be accomplished by addition/ reduction of quantities or otherwise addition/elimination of work items in their entirety. Contractor shall obtain approval from the KCATA prior to ordering of equipment and materials intended for use to accomplish the Work.

02.03.05 Type of Owner-Contract Agreement

Lump Sum contract - AIA document A-101 Standard Form of Agreement between Owner and Contractor, 2017 Edition and AIA document A-201, 2017 General Conditions (modified to include Federal Transit Administration and KCATA contract conditions).

02.03.06 Prime Contractor Participation

The successful Bidder of this contract must accept responsibilities as the Prime Contractor and perform no less than the percentage amount listed in Section 02.02 on Page 3 with its own supervision and crew. For a DBE Prime Contractor bidder, the minimum participation is also listed in the 02.02 on Page 3.

After bid submittal, none of the work or services covered by this contract shall be subcontracted without prior written approval of the KCATA. The prime contractor shall submit a list of proposed subcontractors and major suppliers with their bid identifying NAICS Codes for each.

02.03.07 Bid Security

A Bid Guarantee in indicated Section 02.02 on Page 3 shall be provided in accordance with the Instructions to Bidders. For this project, the payment bond shall be provided as shown in Section 02.02 on Page 3.

02.03.08 Equal Employment Opportunity

(1) Contractors shall comply with all federal, state and city Equal Employment Opportunity laws and regulations and with KCATA's Affirmative Action Requirements (AA).

(2) It is the policy of the Kansas City Area Transportation Authority to ensure that Disadvantaged Business Enterprises (DBE's) are afforded full opportunity to submit Bids, and to receive and participate in KCATA contracts. In the execution of its projects, the KCATA will not discriminate against any individual or organization based on race, color, national origin, religion, age, disability, or sex.

(3) Prospective Bidders, Sub-Bidders, and major on-site material suppliers will be required to submit certain forms relative to DBE participation, affirmative action and other forms as indicated in the appendix.

(4) Blank AA and DBE forms and assistance in completing the forms may be obtained from Whitney Morgan at KCATA. His office is located at 1350 E. 17th Street, Kansas City, Missouri, 64108, or you may call Mr. Morgan at 816-346-0277.

02.03.09 DBE Participation Goal

The KCATA may have established a specific goal for participation by DBE firms on this project. If established, the goal for this project is listed in in Section 02.02 on Page 3 and is 0%. Bidders must submit a "Schedule of Participation by Contractors/Subcontractors" form and the "Letter of Intent to Subcontract" for each DBE firm listed in the Schedule at time of bid submission. Certifications for each subcontractor reflecting compliance with Debarment, Employment Verification, Employment Verification Memo of Understanding and Lobbying must be submitted per request of KCATA following bid submission. **Prime/General Contractors are required to submit all required certifications and documents for their company, per attached checklist, at the time of their bid submission.** Failure to provide this information for DBE subcontractors by the established deadline may result in the bid being deemed non-responsive.

(1) This Contract is subject to the requirements of Title 49, Code of Federal Regulations, Part 26, participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs. A goal for DBE participation has been set at 0% for this project.

(2) The Contractor shall not discriminate on the basis of race, color national origin, or sex in the performance of this Contract. The Contractor shall carry out applicable requirements of 49 CFR. Part 26 in the award and administration of this DOT-assisted contract. Failure by the Contractor to carry out these requirements is a material breach of this Contract, which may result in the termination of this Contract or such other remedy as KCATA deems appropriate, which may include but is not limited to: 1) withholding monthly progress payments; assessing sanctions; liquidated damages; and/or disqualifying the Contractor from future bidding due to being non-responsible. Each subcontract the Contractor signs with a subcontractor must include the assurance in this paragraph (see 49 C.F.R. 26.13(b)).

(3) The Contractor may not substitute, remove, or terminate a DBE subcontractor without KCATA's prior written consent. Written consent of termination may only be given if the Contractor has demonstrated good cause. Before submitting its request to terminate or substitute a DBE subcontractor, the Prime Contractor must give notice in writing to the DBE subcontractor, with a copy to KCATA, of its intent to request to terminate and/or substitute, and the reason for the request. The Contractor must give the DBE five days to respond to the Contractor's notice and advise KCATA and the Contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why KCATA should not approve the Contractor's action. If required in a particular case as a matter of public necessity (e.g., safety), the response period may be shortened.

(a) Good Cause. Good cause includes the following circumstances:

The listed DBE subcontractor fails or refuses to execute a written contract; or

(i) The listed DBE subcontractor fails or refuses to perform the work of its normal industry standards. Provided, however, that the good cause does not exist if the failure or refusal of the DBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the Prime Contractor; or

(ii) The listed DBE subcontractor fails or refuses to meet the Prime Contractor's reasonable, nondiscriminatory bond requirements; or

(iii) The listed DBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness; or

(iv) The listed DBE subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant to 2 CFR Parts 180, 215 and 1200 or applicable state law; or

(v) The DBE subcontractor is not a responsible contractor; or

(vi) The listed DBE subcontractor voluntarily withdraws from the project and provides the Prime Contractor written notice of its withdrawal.

(vii) The listed DBE is ineligible to receive DBE credit for the type of work required.

(viii) A DBE owner dies or becomes disabled with the result that the listed DBE contractor is unable to complete its work on the contract.

(ix) Other documented good cause that compels KCATA to terminate the DBE subcontractor. Provided the good cause does not exist if the Prime contractor seeks to terminate a DBE it relied upon to obtain the contract so that the Prime Contractor can self-perform the work for which the DBE contractor was engaged or so that the Prime Contractor can substitute another DBE or non-DBE contractor.

Before submitting its request to terminate or substitute a DBE subcontractor, the Prime Contractor must give notice in writing to the DBE subcontractor, with a copy to KCATA's Whitney Morgan at wmorgan@kcata.org of its intent to request to terminate and/or substitute, and the reason for the request. The Prime Contractor must give the DBE five days to respond to the Prime Contractor's notice and advise the KCATA and the Contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why KCATA should not approve the Prime Contractor's action. If required in a particular case as a matter of public necessity (e.g., safety), the response period may be shortened.

02.03.10 Statement of Financial Assistance

This contract is subject to a financial assistance contract between the KCATA and the U. S. Department of Transportation Federal Transit Administration (FTA).

02.03.11 Ineligible Bidders

All Bidders are required to certify they are not on the Comptroller General's list of ineligible contractors.

02.03.12 Completion and Liquidated Damages

(1) Work shall be completed within the time stated in the bid documents and agreement from the date of the Notice to Proceed. Liquidated damages specified above will be assessed per calendar day from the scheduled completion date for delay until the Work is substantially complete to the satisfaction of KCATA's Project Manager.

(2) The Date of Substantial Completion of the Work is the date certified by written Notice that the work is 95% or more complete, except for a minimal list of deficiencies.

(3) Occupancy or utilization of Completed Work, or a portion of completed work, by the KCATA, does not constitute Substantial Completion or Final Acceptance.

(4) Contractor has no right to damages for any causes of delay by the KCATA. Scheduling of the Work must be mutually agreed upon by the KCATA and the Contractor before Work can commence. The KCATA's operational requirements are paramount and shall take precedence. A request for an adjustment of time shall be forwarded in writing to KCATA's Project Manager as soon as the Contractor is aware of circumstances beyond the Contractor's control. Requests shall include a statement of cause and expected time delay. The Project Manager may from time to time award extensions to the contract time justified by delay caused by either the Contractor or the KCATA, provided that adequate evidence is presented to enable the Project Manager to determine with exactness the extent and duration of delay for each item involved. Time may only be adjusted by Change Order.

(5) The Contractor in their submittal of Bid Response Form(s) is undertaking to complete the Work within the stated and agreed contract time, has taken into consideration and made allowances for all of the ordinary delays and hindrances incident to such Work, whether because of delays in procuring equipment, materials, workers or other causes.

(6) KCATA will suffer financial loss if the Work is not Substantially Complete on the date set forth in the contract documents. The Contractor and/or the Contractor's Surety shall be liable for and shall pay the KCATA the sums previously identified for each day of delay until the Work is Substantially Complete. The KCATA is authorized to withhold from monies due the Contractor the sum as indicated above that has been assessed as liquidated damages.

02.03.13 Pre-Bid Conference

For a pre-bid conference, please see the information below:

- 1/26/2023 9 AM Local Time; Teams Meeting: ID: 286 290 272 921 Passcode: QCrGXw

02.03.14 Pre- Award Communications

For information and questions related to this bid Invitation, contact the Procurement Department personnel indicated below. Questions, requests for clarification and comments regarding this Invitation must be submitted in writing and are due from Bidders at the date and time identified above. If required, KCATA will respond in the form of an Addendum.

Denise Adams
Kansas City Area Transportation Authority

1200 East 18th Street
Kansas City, MO 64108
Buyer Phone: 816-346-0224
e-mail : dadams@kcata.org

02.03.15 Potential Bidders

A list of Contractors who have expressed an interest in submitting bids on KCATA projects is available upon request. Since the project is open to all Bidders complying with the bid requirements, other Contractors not on this list may also be submitting bids. Potential bidders list, or plan holders list, may be obtained by submitting a formal question to Denise Adamsat dadams@kcata.org.

02.03.16 Contract Documents

The contract documents consist of the following:

1 The Agreement Form
2 General Conditions
3 Supplemental Conditions
4 Addenda
5 Special Provisions
6 Technical Specifications
7 Construction Drawings (if applicable)
8 Contract Modifications Issued after date of Agreement
9 Bid Response Form
10 Schedule of Values
11 Unit Prices

02.03.17 Wage Rates

The U.S. Department of Labor has established minimum wages to be paid on this project. A copy of the U.S. Department of Labor Federal (General) decision is attached for reference as well as a copy of the Annual Wage Order for Jackson County, Missouri In the event that there is a discrepancy with regard to rates contained in State of Missouri and U.S. Department of Labor wage rates, the higher of the two rates shall prevail.

03 BIDDING REQUIREMENTS

03.01 INSTRUCTIONS TO BIDDERS

03.01.01 General

(1) All bids shall be made in accordance with the Invitation for Bid and these bidding requirements. All bids will be reviewed by the CFO prior to the letting of any contract.

(2) Bidders shall note the Equal Opportunity and Affirmative Action requirements applicable to this project. Particular attention should be paid to the related documentation, certification forms, questionnaires, etc., which must be completed and submitted.

(3) Where the words "KCATA" or "Owner" or "Authority" is used in these instructions, reference is made to the Kansas City Area Transportation Authority.

(4) Where the words "Project Manual" or "Bid Document" or "Contract Document" are used in the Project Manual, synonymous reference is made to the same instrument including any associated drawings or Addenda issued prior to receipt of bids.

(5) The bid, along with all other accompanying documents or materials submitted by the bidder, will be deemed to constitute the entire bid. The bidder shall promptly furnish any additional information requested relative to its bid.

03.01.02 Protests

(1) The following protest procedures apply. “Days” shall mean business days of KCATA administrative personnel which are days other than a Saturday, Sunday or legal holiday observed by KCATA.

(a) Pre-Submittal. A pre-submittal protest is received prior to the proposal due date. Pre-submittal protest must be received by the Authority in writing and addressed to the KCATA CFO, no later than five (5) days before the proposal closing date.

(b) Post-Submittal/ Pre-Award. A post-submittal/pre-award protest is a protest making an award and is received after receipt of proposals but before award of a contract. Post-submittal protests must be received by the Authority, in writing and addressed to the KCATA CFO, no later than five (5) days after the proposal closing date.

(c) Post- Award. A Post-award protest must be received by the Authority in writing and addressed to the KCATA CFO no later than five (5) days from the date of the Notice of Intent to Award.

(d) The KCATA CFO shall respond in writing within five (5) days from the date of the written request. If the protester is not satisfied with the response, the protester may appeal in writing to the KCATA CEO. This appeal or request for a hearing should be in writing within five (5) days from the date of the CFO’s response.

(e) The KCATA Chief Financial Officer will decide if the protest and the appeal (if any) have been given fair and reasonable consideration, or if additional consideration is warranted. The CEO's response will be provided within ten (10) days after receipt of the request. The Chief Operations Officer's response is final and no further action on the protest shall be taken by KCATA.

(f) By written notice to all parties, the KCATA CFO may extend the time provided for each step of the protest procedure, extend the date of notice of award, or postpone the award of a contract if deemed appropriate for protest resolution.

(g) Protesters should be aware of the Federal Transit Administration's protest procedures with the FTA Regional Office. If federal funding is involved, FTA will review protests from a third party only when: 1) KCATA does not have a written protest procedure or fails to follow its procedure, or fails to review a protest, or 2) violations of specific federal laws or regulations have occurred.

(h) An appeal to FTA must be received by FTA's regional office within five (5) working days of the date the protester learned or should have learned KCATAs decision. Protests shall be addressed to the Regional Administrator, FTA Regional 7, 901 Locust, Room 404, Kansas City, MO 64106.

03.01.03 DBE Participation

KCATA has a goal that a percentage of the Work in this contract be contracted to Disadvantaged Business Enterprises (DBE). The DBE goal for this project is 0%. Bidders must comply in full with 49 CFR Part 26 "Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs". Bidders should contact Whitney Morgan at 816-346-0277 if they have questions or need assistance regarding DBE participation. He may be emailed at wmorgan@kcata.org.

Contractor Utilization Plan/Request for Waiver. This is a commitment that the Prime understands the DBE participation required on the project. In the event the Prime is not making a commitment to meet or exceed the established goal on the project, they must request a waiver and provide documentation that good faith efforts were expended to try to meet the goal. Good faith efforts are efforts that, given all relevant circumstances, a Proposer actively and aggressively seeking to meet the goals can reasonably be expected to make.

Failure to meet the contracted DBE participation commitment without documented evidence of good faith efforts may result in termination of the contract. In evaluating good faith efforts, KCATA will consider whether the Proposer has performed the following, along with any other relevant factors:

(1) Advertised opportunities to participate in the contract in general circulation media, trade and professional association publications, small and minority business media, and publications of minority and women's business organizations in sufficient time to allow DBE firms to participate effectively.

(2) Provided notice to a reasonable number of minority and women's business organizations of specific opportunities to participate in the contract in sufficient time to allow DBE firms to participate effectively.

(3) Sent written notices, by certified mail or facsimile, to qualified DBEs soliciting their participation in the contract in sufficient time to allow them to participate effectively.

(4) Attempted to identify portions of the work for qualified DBE participation in order to increase the likelihood of meeting the goals, including breaking down contracts into economically feasible units. A Bidder should send letters by certified mail or facsimile to those DBE contractors identified by the Missouri Regional Certification Committee (MRCC) listed in those categories, which are in those subcontractors' scope of work. The portion of work for which a proposal from a DBE is being solicited shall be as specific as possible. Letters which are general are not acceptable.

(5) Requested assistance in achieving the goals from KCATA's DBE Officer and acted on KCATA's recommendations.

(6) Conferred with qualified DBEs and explained the scope and requirements of the work for which their bids or proposals were solicited.

(7) Attempted to negotiate in good faith with qualified DBEs to perform specific subcontracts; not rejecting them as unqualified without sound reasons based on a thorough investigation of their capabilities. Documentation of good faith negotiations with DBEs from whom proposals were received in an effort to reach a mutually acceptable price should include:

(a) Names, addresses and telephone numbers of DBEs that were contacted and date of contact.

(b) The information provided to DBEs regarding the plans and specifications for portions of the work to be performed by them.

(c) The reasons no agreement was reached with any DBE, including the basis for any Bid rejection (i.e., availability, price, qualifications or other);

(d) Descriptions of attempts to provide technical assistance to DBEs to obtain necessary insurance and/or to obtain necessary supplies at the best prices available.

03.01.04 Bid Documents

(1) Bid documents include the Notice of Invitation For Bids, Invitation For Bids, Bidding Requirements, Submittal Documents, Post Proposal Submittal Documents, and Wage Rates.

(2) Bidders shall use complete sets of the Project Manual and accompanying drawings in preparing bids. The KCATA and the Architect assume no responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

(3) Bidder is required to submit, in addition to bid response form(s), the documents identified as REQUIRED DOCUMENTS LIST FOR BID SUBMISSION

(4) Requests for interpretation or clarification of the bidding documents shall be directed to Denise Adams of KCATA via email (dadams@kcata.org) by deadline shown in Section 02.01

BIDDING SCHEDULE on Page 3. KCATA's practice is to answer questions via Addendum for purposes of transmitting the same information to all interested bidders.

03.01.05 Bid Submittal and Pricing

(1) Prior to bidding, each Bidder shall carefully examine the bidding documents and the site to fully understand existing conditions and limitations under which the Work is to be performed. Each Bidder shall include in its bid a sum to cover the cost of all items necessary to perform the Work as set forth in the contract documents.

(2) No allowance will be made to any Bidder because of failure to examine the Documents and the site. Bidders shall notify KCATA immediately if any inconsistency or error is discovered upon examination of the bidding documents or the project site.

(3) In submitting a bid, the bidder represents that:

(a) Offeror has read and understands the bidding documents.

(b) Offeror has visited the site and familiarized himself with the conditions under which the Work is to be performed.

(c) Offeror's bid is based on the materials, systems, products, and equipment required by the Bidding Documents, without exception.

(4) The intent of the bid documents is to provide ample information for the Contractor to interpret and understand that the labor, equipment, supplies and any other components and/or accessories required for the completion of the type prescribed, ready for use by the KCATA, be provided by Contractor. Any items omitted from the documents which are clearly necessary for the full operation and use of such equipment or improvements and its appurtenances shall be considered a portion of such work or equipment, although not directly specified or called for in these documents.

(5) All parts shall be new and in no case will used (except for testing), reconditioned or obsolete parts be accepted. Any one part shall be an exact interchangeable duplicate in manufacture and design and furnished as specified, but where brand names are used, consider the term "or approved equal" to follow.

(6) Bids shall be firm and final. Bids shall be net and shall reflect any available discount. KCATA is exempt from federal excise, federal transportation and state sales tax and such taxes shall not be included in price quotations. KCATA will provide the successful bidder with a project Tax Exemption Certificate.

(7) Bids shall be submitted on the Bid Response Form provided; bids submitted in any other form will be considered non-responsive and will be rejected. Do not change, add to, or delete from the wording on the Bid Response Form. Unauthorized conditions, limitations, or provisions attached to the Bid Response Form may cause the Bid to be considered non-responsive and, therefore rejected.

(a) Bid Response Forms shall be filled out by typewriter, electronically or manually in black or blue ink.

(b) Alterations by erasure or inter-lineation shall be initialed.

(8) Prior to bidding, each Offeror shall ascertain that they have received all Addenda issued and shall acknowledge their receipt in the space provided in the Bid Form. Any interpretation, change, or correction to the bid documents will be made by Addenda which will be issued to all bidders of record and all locations where bid documents are filed. Only written addenda will be binding. Bidders shall not rely on any interpretation, change, or correction given by any other method. Oral statements made at the pre-bid conference or bid opening are non-binding and for clarification only.

(9) Each bid shall be executed and signed by an authorized official and in the true name of the bidder. If the bid is made by an individual doing business under a fictitious name, the bid shall so state. If the bid is made by a partnership, the full names and addresses of all members of the partnership shall be given and the bid shall be signed by one principal member. If the bid is made by a corporation, it shall be signed in the corporate name by an authorized officer. If the bid is made by a joint venture, the full names and addresses of all members of the joint venture shall be given, and the bid shall be signed by one member authorized thereof.

(10) Bids shall be enclosed in a sealed envelope addressed as indicated in the Invitation for Bid, unless changed by addendum, with the name of the project and the name of the bidder on the outside of the envelope.

(11) Refer to Invitation for Bid for location, time, and date designated for receipt of bids.

(a) Bids received after the date and time designated for receipt of bids will not be accepted and will be returned to the bidder unopened.

(b) Telegraphic, facsimile, electronic, email or telephonic bids or modifications to bids will not be accepted.

(12) The bid price shall include all items of labor, materials, tools, equipment, transportation, and other costs necessary to fully complete the construction, delivery, assembly, installation, and drawings, if required, of the materials or services pursuant to these conditions.

(13) Conditional bids and any bid taking exception to these instructions or conditions, to the contract conditions or specifications, or to other contract requirements may be considered non-responsive and may be rejected.

(14) The documents specified to accompany the bid are enumerated on the Checklist Form and shall be included with the bid form. The bidder shall read all forms carefully before signing. Incomplete bids may be considered non-responsive.

(15) Each bid is to be submitted with the understanding that the acceptance in writing by KCATA of the bid to furnish the materials and services or any part thereof described therein shall

constitute a contract between the bidder and KCATA which shall bind the bidder to furnish and deliver at the given price and in accordance with the terms and conditions of said bid and these conditions.

(16) Kansas City Area Transportation Authority reserves the right to accept ADD Alternates for this bid only if the budget allows for acceptance. There is no guarantee to bidders that the alternates will be accepted or become a part of the contract.

(17) Alternates, if applicable, will be accepted at the discretion of KCATA's budget and bidder will be notified of acceptance with intent to award letter. Alternates pricing shall remain for a period of 60 days beyond bid due date.

03.01.06 Bid Security

(1) A bid bond in the amount of five percent (5%) of the total bid is required. Said bond shall be submitted with the bid response. The bond is required to assure that the bidder will, upon acceptance of its bid, meet the requirements of the bid. A bidder may submit a certified check or cashier's check in lieu of a bond. Failure to submit a bid bond, certified check, or cashier's check along with the bid may result in the bid being considered non-responsive. Bid bonds/checks will be returned to bidders, upon request, after execution of contractual documents and submittal of the required bonds by the successful bidder.

(2) Bidders requiring technical assistance on bonding may call the Kansas City Regional Small Business Administration's Minority Business Opportunity Center (MBOC) at (816) 513-6817, or the local Small Business Administration or MBOC in your city or state.

(3) The KCATA will have the right to retain the bid Security of any or all bidders until one of the following has occurred:

(a) The contract has been executed and required contract bonds are furnished.

(b) The specified time has elapsed so that bids may be withdrawn.

(c) All bids have been rejected by KCATA.

(4) If any bidder refuses to enter the contract or fails to furnish the required contract bonds, his bid security may be forfeited to the KCATA as liquidated damages, but not as penalty.

03.01.07 Withdrawal of Bids

(1) Bids may be withdrawn on written request received by the KCATA prior to the time fixed for bid opening. The bond or certified check of any bidder withdrawing its bid, in accordance with the foregoing condition, will be returned promptly.

(2) For this bid, no bids or unit prices may be withdrawn for a period of ninety (90) days after the actual date of the bid opening. Alternates pricing, if applicable, shall remain fixed, as submitted for bid, for nine (90) days after the actual date of bid opening.

03.01.08 Bid Consideration and Contract Award

(1) The KCATA intends to award a contract to the responsive and responsible bidder whose fair and reasonable bid conforming to this solicitation is the lowest in price. A responsive bid meets the requirements of the Invitation for Bid. KCATA expects bidders to demonstrate affirmatively that it and its proposed subcontractors qualify as responsible.

(2) In addition to being otherwise qualified and eligible to receive the contract award, a responsible contractor satisfies criteria including:

(a) Administrative and Technical Capacity. Has the necessary organization, experience, accounting and operational controls, and technical skills to successfully perform the contract?

(b) Financial Resources. Contractor has sufficient financial resources to perform the contract. KCATA reserves the right to request and inspect the last 2 years audited financials for Prime and Sub Contractors. Failure to provide the requested information may result in forfeiture of the bid.

(c) Production Capability. Has the necessary construction and technical equipment and facilities.

(d) Timeliness. Can meet the performance schedule, taking into consideration all existing business commitments.

(e) Performance Record. Can provide a satisfactory current performance record and a satisfactory past performance record to include sufficient resources, sufficient key personnel with appropriate experience, and key subcontractors with the required experience and satisfactory current and past performance.

(f) Experience. A minimum of five (5) years' experience in carrying out similar work with particular attention to management approach, staffing, timeliness, technical success, budgetary controls, and other specialized considerations, as described herein.

(g) Past Deficiencies Not the Fault of the Bidder. A bidder that is or recently has been seriously deficient in contract performance is presumed to be non-responsible unless KCATA determines that the circumstances were properly beyond the bidder's control or unless the bidder has taken appropriate corrective action. Past failure to pursue the work, perseverance, and effort to perform acceptably is strong evidence of non-responsibility.

(3) Bidders are required to submit for KCATA's approval, a list of subcontractors and material suppliers proposed for the project, also known as the schedule of participation, with all NAICS codes listed for each proposed subcontractor.

(4) Award of contract shall be based on the lowest responsible, responsive bid offering the lowest aggregate base bid amount. All bids will be evaluated on the same basis of bid items.

(5) The Authority may determine that a bid is unacceptable and non-responsive if the prices proposed are materially unbalanced between line items or sub-line items. A bid is materially unbalanced when it is based on prices significantly less than cost for some work and prices which are significantly overstated relative to cost for other work, and if there is a reasonable doubt that the offer will result in the lowest overall cost to the Authority even though it may be the low bid.

(6) It is understood that KCATA reserves the right to waive informalities or irregularities in bids, to reject any or all bids, to cancel this Invitation in part or in its entirety, to re-advertise for bid, and to award to other than the lowest bidder if it is in the best interest of the Authority. KCATA further reserves the right to accept or reject any or all alternates in any order or combination which, in its judgment, is in the best interest of the Authority. KCATA shall be the sole judge of what is in its best interest with respect to this Invitation for Bid.

(7) The successful bidder shall execute a contract with the KCATA within ten (10) calendar days from written Notice of Intent to Award. Before execution of the contract, the successful bidder shall deliver required bonds, insurance certificates and other specified documents to KCATA for approval.

03.01.09 Construction Bonds and Certificate of Insurance

(1) The successful bidder may be required to furnish and pay for a Performance Bond, a Payment Bond, and a Maintenance Bond each in the amounts listed in the Invitation for Bid, as stated herein and in accordance with the General Conditions as amended by the Supplementary Conditions. The cost of the bonds shall be included in the bid price. If required, the Maintenance Bond shall be for a two (2) year period effective as of the date of Substantial Completion.

(2) The Bidder shall warrant both workmanship and materials for a period of two (2) years pursuant to Article 3: Contractor, Section 3.5 Warranty or as amended by the Supplemental Conditions. The two (2) year maintenance bond (if required) becomes effective on the date of project acceptance as established by the Certificate of Substantial Completion.

(3) Bonds shall be issued by a surety acceptable to the KCATA and licensed to do business in the State of Missouri.

(4) The attorney-in-fact who executes the required bonds on behalf of the surety shall affix thereto a current copy of the power-of-attorney indicating the monetary limits of such power.

(5) The successful bidder shall submit Certificates of Insurance, verifying insurance coverage as stated herein, within the period time indicated in the Notice of Intent to Award.

(6) Failure or refusal to furnish bonds or insurance certificates in the time prescribed and in a form satisfactory to the KCATA may be cause for rejection of the bidder and forfeiture of the bid security.

03.01.10 List of Subcontractors and Material Suppliers

The successful bidder shall submit a complete list of all subcontractors and major material suppliers at the time of bid closing. The representative's name, address and telephone number shall be provided with the dollar amount of the contractor's/subcontractor's/vendor's involvement.

03.01.11 Debarment, Suspension and Other Responsibility Matters

(1) Each bid shall be accompanied by a Certificate of Primary Participant Regarding Debarment, Suspension, and Other Responsibility Matters.

(2) Submit a Certification Regarding Debarment, Suspension, And Other Ineligibility and Voluntary Exclusion for each lower tier subcontractor and major supplier.

03.01.12 Restrictions on Lobbying

(1) Each bid shall be accompanied by a signed Certification of Primary Participants Regarding Restrictions on Lobbying form.

(2) Submit a Certification of Certification of Primary Participants Regarding Restrictions on Lobbying for each lower tier subcontractor and major supplier

03.01.13 Federal Tax Liability

(1) Each bid shall be accompanied by a signed Certification of Primary Participant Regarding Federal Tax Liability and Recent Felony Convictions.

(2) Submit a Certification of Primary Participant Regarding Federal Tax Liability and Recent Felony Convictions. for each lower tier subcontractor and major supplier

03.01.14 Fraud and False or Fraudulent Statements or Related Acts

The Contractor acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 U.S.C. § 3801 et seq. and U.S DOT regulations, "Program Fraud Civil Remedies," 49 C.F.R. Part 31, apply to its actions pertaining to the project. Upon execution of this Contract, the Contractor certifies or affirms the truthfulness and accuracy of any statement it has made, it makes, or may make pertaining to the project covered under this Contract. In addition to other penalties that may be applicable, the Contractor further acknowledges that if it makes a false, fictitious, or fraudulent claim, statement, submission, or certification, the Federal government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986 on the Contractor to the extent the Federal government deems appropriate.

The Contractor also acknowledges that if it makes a false, fictitious, or fraudulent claim, statement, submission, or certification in connection with this Contract, the government reserves the right to impose on the Contractor the penalties of 18 U.S.C. § 1001 and 49 U.S.C. § 5307(n)(1), to the extent the Federal government deems appropriate.

03.01.15 Employee Eligibility Verification

(1) To comply with Section 285.500 RSMo, et seq., the Contractor is required by sworn affidavit and provision of documentation, to affirm its enrollment and participation in a federal work authorization program with respect the employees working in connection with the contracted services. The Contractor shall also affirm that it does not knowingly employ any person in connection with the contracted services who does not have the legal right or authorization under federal law to work in the United States as defined in 8 U.S.C. §1324a(h)(3). The Contractor is required to obtain the same affirmation from all subcontractors at all tiers. **The electronically signed and electronically generated Memo of Understanding (MOU) must be submitted by the Prime for the Prime Company and an MOU is to be submitted for each subcontractor with a work/contract value of $5,000 or greater in addition to the Certification document.**

(2) A federal work authorization program is any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security (E-Verify) or an equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, under the Immigration Reform and control Act of 1986 (IRCA), P.L.99-603.

03.01.16 Buy America

(1) The Contractor agrees to comply with 49 U.S.C. §5323(j), and 49 CFR. Part 661, which provide that federal fund may not be obligated unless steel, iron, and manufactured products used in FTA-funded projects are produced in the United States, unless a waiver has been granted by FTA or the product is subject to a general waiver. General waivers are listed in 49 CFR 661.7 and include final assembly in the United States for 15 passenger vans and 15 passenger wagons produced by Chrysler Corporation, microcomputer equipment & software. Separate requirements for rolling stock are set out at 5323(j) (2)(C) and 49 CFR Part 661.11. Rolling stock not subject to a general waiver must be manufactured in the United States and have a 70 percent domestic content.

(2) The Contractor further agrees to include these requirements in all subcontracts exceeding $150,000.

(3) In the event that ocean shipment is required for any material or commodity pursuant to this agreement, the Contractor agrees to utilize United States-Flag commercial vessels to ship at least fifty percent (50%) of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, to the extent such vessels are available at fair and reasonable rates for the United States-Flag commercial vessels.

(4) The Contractor further agrees to furnish within 20 working days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated "on board" commercial ocean bill-of-lading in English for each shipment of cargo described in the paragraph above to KCATA (through the Prime Contractor in the case of subcontractor bill-of-lading) and to the Office of Cargo Preference, Maritime Administration (MAR-590), 400 Seventh Street, S.W., Washington, DC, 20590.

(5) The Contractor further agrees to include these requirements in all subcontracts issued pursuant to this Contract when the subcontract may involve the transport of equipment, materials or commodities by ocean liner and exceeds $100,000.

(6) The Contractor agrees to comply with 49 U.S.C. 40118 (the "Fly America" Act) in accordance with the General Service Administration's regulations at 41 CFR Part 301-10, which provide that recipients and sub-recipients of federal funds and their Contractors are required to use U.S. Flag air carriers for U.S. Government-financed international air travel and transportation of their personal effects or property, to the extent such service is available, unless travel by foreign air carrier is a matter of necessity, as defined by the Fly America Act. The Contractor shall submit, if a foreign air carrier was used, an appropriate certification or memorandum adequately explaining why service by a U.S. flag air carrier was not available or why it was necessary to use a foreign air carrier and shall, in any event, provide a certificate of compliance with the Fly America requirements. The Contractor agrees to include the requirements of this section in all subcontracts that may involve international air transportation and exceed $100,000.

04 REQUIRED DOCUMENTS LIST FOR BID SUBMISSION

04.01 At Bid Submission

For any forms and documents that are submitted via printed sheet, please print single-sided.

The following forms and or items shall be submitted with the Bid:

- Bid/Proposal Response Forms – See Section 05 on Page 24
- Bid Bond (or if submitting cashier's check or certified check Ability to Bond form must accompany check)
- All firms (prime contractors, subcontractors, and suppliers) doing business with KCATA must complete a vendor registration process. KCATA uses an online vendor management system (B2GNow). *Vendors that have previously registered with KCATA must now also complete the online process with updated information.*

  To begin, you must set up an account at https://kcata.diversitycompliance.com where you will be given a temporary password. You will receive a confirmation email and be directed to change your password. You may follow the instruction guide to complete the process. B2GNow also conducts webinars that provide guided training on navigating the system and its available features.

  For questions regarding this process, please contact Denise Adams.

- Affidavit of Civil Rights Compliance, EEO-1/ KCATA Workforce Analysis/EEO 1 Report. EEO required for each PRIME CONTRACTOR. See ATTACHMENT B AFFIDAVIT OF CIVIL RIGHTS COMPLIANCE in Section 06 on Page 31
- Letter of Intent to Subcontract - The Bidder/Offeror will be required to submit the following information: (1) the names and addresses of DBE firms that will participate in the contract; (2) a description of the work that each DBE firm will perform, including the corresponding NAICS code; (3) the dollar amount of the participation of each DBE firm participating; (4) written documentation of the bidder/offeror's commitment to use a DBE subcontractor whose participation it submits to meet the contract goal; (5) each Letter of Intent must be signed and dated by the subcontractor; and (6) if the contract goal is not met, the contractor must present evidence of good faith efforts. Please note, the subcontractor(s) and dollar amounts listed on the final bid submission cannot be altered. KCATA will require a contractor to make good faith efforts to replace a DBE that is terminated or has otherwise failed to complete its work on a contract with another certified DBE, to the extent needed to meet the contract goal. KCATA will require the prime contractor to notify the DBE Liaison Officer immediately of the DBE's inability or unwillingness to perform and provide reasonable documentation. In this situation, KCATA will require the prime contractor to obtain prior approval of the substitute DBE and to provide copies of new or amended subcontracts, or documentation of good faith efforts. Prior written consent will only be provided where there is "good cause" for termination of the DBE firm, as established by Section 26.53(f)(3) of the DBE regulation. Please see the attachment for more information on "Good Faith Efforts." See ATTACHMENT C SCHEDULE OF PARTICIPATION BY CONTRACTOR & SUBCONTRACTORS in Section 07 on Page 33
- Schedule of Participation (S.O.P) by Contractor/Subcontractor - Include ALL SUBS/Lower Tier Participants to be used on project. No alterations to this document allowed when submitting 48-hour S.O.P.) KCATA will perform interim audits of contract payments to DBEs. The audit will review payments to DBE subcontractors to ensure that the actual amount paid to DBE subcontractors equals or exceeds the dollar amounts states in the schedule of DBE participation. See ATTACHMENT D LETTER OF INTENT TO SUBCONTRACT TO DBE in Section 08 on Page 35
- DBE Certification Verification (Submit copy of MRCC approval letter for all DBE contractors included in bid. DBE contractors not currently registered should contact the KCATA Grants and Disadvantaged Business

Enterprise Specialist at 816-346-0277 and complete registration prior to bid submittal.) Submit one form if Prime is a DBE and one form for each proposed DBE Subs/Lower Tier. See ATTACHMENT E CONTRACTOR UTILIZATION PLAN/REQUEST FOR WAIVER in Section 09 on Page 36

- Employee Eligibility Verification/MOU (form provided)
    - For Prime Contractor, see ATTACHMENT F.1 EMPLOYEE ELIGIBILITY AFFIDAVIT OF PRIMARY PARTICIPANTS in Section 10 on Page 39
    - For Lower Tier Participants, see ATTACHMENT F.2 EMPLOYEE ELIGIBILITY AFFIDAVIT OF LOWER-TIER PARTICIPANTS in Section 11 on Page 41
- Debarment Certification
    - For Prime Contractor, see ATTACHMENT G.1 CERTIFICATION OF PRIMARY PARTICIPANT REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS in Section 12 on Page 43
    - For Lower Tier Participants see ATTACHMENT G.2 CERTIFICATION OF LOWER-TIER PARTICIPANTS REGARDING DEBARMENT, SUSPENSION, AND OTHER INELIGIBILITY AND VOLUNTARY EXCLUSION in Section 13 on Page 44
- Buy America Certification (form provided) FOR PRIME CONTRACTOR – See form ATTACHMENT H.1 on Page 45
- Contractor's Relative Experience/Reference Form – See ATTACHMENT I REFERENCES in Section 15 on Page 46. Bidder may submit existing company reference sheet with same information in lieu of form – please label reference sheet at Attachment I – References.
- Non-Collusion Affidavit – See ATTACHMENT J NON-COLLUSION AFFIDAVIT in Section 16 on Page 47
- Certification Regarding Restrictions on Lobbying
    - For Prime Contractor, see ATTACHMENT L-1 CERTIFICATION OF PRIMARY PARTICIPANTS REGARDING RESTRICTIONS ON LOBBYING in Section 18 on Page 49
    - For Lower Tier Participants, see ATTACHMENT L-2 CERTIFICATION OF LOWER-TIER PARTICIPANTS REGARDING RESTRICTIONS ON LOBBYING in Section 19 on Page 50
- Certification Regarding Federal Tax Liabilit and Recent Felony Convictions
    - For Prime Contractor see ATTACHMENT N-1 CERTIFICATION OF PRIMARY PARTICIPANT REGARDING FEDERAL TAX LIABILITY AND RECENT FELONY CONVICTIONS in Section 20 on Page 51
    - For Lower Tier Participants, see ATTACHMENT N-2 CERTIFICATION OF LOWER-TIER PARTICIPANT REGARDING FEDERAL TAX LIABILITY AND RECENT FELONY CONVICTIONS in Section 21 on Page 52

04.02 Prior to NTP

After a request by KCATA, the follow shall be submitted by the Intended Awardee.

- Proposed Schedule & Labor
- Certificate of Insurance (to be submitted after Intent to Award Letter is issued to apparent low bidder per letter instructions)
- Performance Bond and Payment Bond – If Applicable (Submit within the number of days stated in Intent to Award Letter – applicable only to notified apparent low bidder)

04.03 During the Contract Term

During the term of the contract, the following may be requested or submitted.

- Request for Modification, Replacement or Termination of DBE Participation (Required to be submitted in advance of any project/bid modification for approval)

- Prime's Contracts with Subcontractors (KCATA reserves the right to request from Prime Contractor for review for duration of project term)
- Maintenance Bond (Submitted prior to final payment to successful Contractor. Effective date of Maintenance Bond shall be left blank and will be established by issue Date of Notice of Substantial Completion)
- Subcontractor Monthly Utilization Report and Certified Payroll Reports (Shall accompany each payment application)
- Compliance with Prevailing Wage Certification (Shall accompany each payment application)
- Prevailing Wage Affidavit – See ATTACHMENT K AFFIDAVIT – COMPLIANCE WITH PREVAILING WAGE LAW in Section 17 on Page 48

04.04 Administration Reconsideration 26.53(D)

The Bidder/Offeror must make a written request for administrative reconsideration within five (5) working days of the notification on their bid being deemed "non-responsive" for a lack of "good faith efforts." That notice must be mailed or emailed to:

Whitney Morgan - DBELO
KCATA
1350 East 17th Street
Kansas City, MO 64108
Telephone: (816) 346-0277
E-Mail: wmorgan@kcata.org

KCATA's Administrative Review Committee is comprised of the Deputy CEO, Director of Procurement, and the Chief Financial Officer (CFO). The DBELO will process the request, including providing documentation of the determination, and notify the Administrative Review Committee of the request for reconsideration determination. The reconsideration committee will not have played any role in the original determination that the Bidder/Offeror did not document sufficient good faith efforts. As part of the reconsideration, the bidder will have the opportunity to provide written documentation or argument to the Administrative Review Committee, concerning the issue of whether they met the goal or made adequate "good faith efforts." KCATA will notify the bidder, in writing of the decision on reconsideration, explaining the basis of finding that the bidder did or did not meet the goal, or make adequate "good faith efforts" to do so. The bidder may choose to meet in person with the Administrative Review Committee to discuss the findings. The result of the reconsideration process is not administratively appealable to the USDOT.

05 BID RESPONSE FORM

05.01 BID RESPONSE FORM

This proposal is submitted to:

Procurement Director
Kansas City Area Transportation Authority
1350 E. 17th Street
Kansas City, Missouri 64108

The undersigned Contractor proposes and agrees, if this Proposal is accepted, to enter into an agreement with OWNER in the form included in the Contract Documents to perform and furnish all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract duration indicated in this Proposal and in accordance with the other terms and conditions of the Contract Documents.

Contractor accepts all the terms and conditions of the Bidding Documents. This Proposal will remain subject to acceptance for Ninety (90) days after the final day Proposals may be received. Contractor will sign and submit the Agreement with the Bonds and other documents required by the Proposal Requirements within ten (10) business days after the date of OWNER'S Notice of Intent to Award.

In submitting this Proposal, Contractor represents, as more fully set forth in the Agreement, that:

Contractor has examined and carefully studied copies of all the Proposal Documents and of the following Addenda (receipt of all which is hereby acknowledged):

Addendum Number	Date
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Contractor has visited the site and become familiar with the nature and extent of the Contract Documents, Work site, locality, and all local and site conditions. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that in any manner may affect cost, progress, performance or furnishing of the Work.

Contractor has given Procurement personnel written notice of all conflicts, errors, or discrepancies that it has discovered in the Contract Documents and the written resolution thereof by Procurement personnel is acceptable to Contractor.

The Proposal is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization, or corporation.

Contractor has not directly or indirectly induced or solicited any other Contractor to submit a false or sham Proposal; Contractor has not solicited or induced any person, firm or corporation to refrain from submitting a Proposal; and

Contractor has not sought by collusion to obtain for itself any advantage over any other Contractor or over Owner.

Contractor has carefully studied all reports (if applicable) of explorations and tests of subsurface conditions at or contiguous to the site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site (except Underground Facilities) which have been identified. Contractor acknowledges that such reports and drawings are not Contract Documents and may not be complete for Contractor's purposes. Contractor has obtained and carefully studied (or assumes responsibility for having done so) all such additional or supplementary information concerning conditions at or contiguous to the site which may affect cost, progress, performance or furnishing of the Work. Contractor does not consider that any additional examinations, investigations, explorations, tests, studied or data are necessary for the determination of this Proposal for performance and furnishing of the Work in accordance with the time, price and other terms and conditions of the Contract Documents.

Contractor is aware of the general nature of Work to be performed by Owner and others at the site that relates to Work for which this Proposal is submitted as indicated in the Contract Documents.

05.02 PRICE PROPOSAL

The Contractor will complete the work and accept in full, payment for the work items listed, in accordance with the attached Bid Tab prices, as applicable.

Contractor acknowledges that in the case of a Unit Price Proposal, quantities are not guaranteed, and final payment will be based on actual quantities determined as provided in the Contract Documents.

Contractor acknowledges that in the case of a Stipulated Lump Sum Price Proposal, quantities are not guaranteed, and Owner reserves the right to add or delete work which is in the best interest of the Owner. Contractor agrees that final payment will be based on the Proposal Lump Sum Price adjusted by change orders regardless of actual quantities.

1. Contractor proposes that the Work will be completed in accordance with Contract Completion requirements noted in Section 02.02.01 on Page 3 of the Invitation For Bids. This Proposal is a binding offer and all required submittal documents are made a condition of this Proposal.
2. The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, national origin, or sex in connection with the performance of work under this contract.
3. Communications concerning this Proposal shall be addressed to the address of Contractor indicated below.
4. The terms used in this Proposal which are defined in the General Conditions of the Construction Contract included as part of the Contract Documents have the meaning assigned to them in the General Conditions.

05.03 Contractor Form of Business

Information regarding the Contractor's form of business shall be provided in the appropriate section below. (Each form of business signature page is included on a separate page – only one type of Form of Business page with signatures is required – submit (as appropriate) only the Individual, Partnership, Corporation, or Joint Venture completed signature page.)

05.03.01 An Individual:

_____	_____
By (Individual's Name)	(Business Name and Address)
	_____
	Business Phone and Fax Numbers

05.03.02 A Partnership:

_____	_____
By (Firm Name)	(Business Name and Address)
_____	_____
(General Partner)	Business Phone and Fax Numbers

(seal)

05.03.03 A Corporation:

By (Corporation Name)	Address
(State of Incorporation)	Business Phone and Fax Numbers
By (Printed Name and Title of Person Authorized to Sign)	(Signature)
Attest (Secretary)	Date of Qualification to do Business

(Corporate Seal)

05.03.04 A Joint Venture:

_____	_____
By (Name)	Address
_____	_____
By (Name)	Address
	_____
	Phone Number for Receipt of Official Communication
	_____
	Address for Receipt of Official Communication

(Each joint venture must sign. The manner of signing for each individual, partnership and corporation that is a party to the joint venture should be in the manner indicated above.)

05.04 Bid Form

See and use the Bid Form inserted after the title page of Book 1.

06 ATTACHMENT B AFFIDAVIT OF CIVIL RIGHTS COMPLIANCE

State of _____)

) SS.:

County of _____)

On this _____ day of _____, 20___, before me appeared _____, personally known by me or otherwise proven to be the person whose name is subscribed on this affidavit and who, being duly sworn, stated as follows: I am the _____ (title) of _____ (business entity) and I am duly authorized, directed or empowered to act with full authority on behalf of the business entity in making this affidavit.

I hereby swear or affirm that the business entity complies with the following:

06.01.01 **Nondiscrimination**. In accordance with Title VI of the Civil Rights Act, as amended, 42 U.S.C. § 2000d, section 303 of the Age Discrimination Act of 1975, as amended, 42 U.S.C. § 6102, section 202 of the Americans with Disabilities Act of 1990, 42 U.S. C. § 12132, and Federal transit law at 49 U.S.C. § 5332, the Contractor agrees that it will not discriminate against any employee or applicant for employment because of race, color, creed, national origin, sex, age, or disability. In addition, the Contractor agrees to comply with applicable Federal implementing regulations and other implementing regulations that the Federal Transit Administration (FTA) may issue.

06.01.02 **Equal Employment Opportunity.** The following equal employment opportunity requirements apply to this Contract:

(1) Race, Color, Creed, National Origin or Sex. In accordance with Title VII of the Civil Rights Act, as amended, 42. U.S.C. §2000e, *et seq*., and Federal transit laws at 49 U.S.C. §5332, the Contractor agrees to comply with all applicable equal opportunity requirements of the U.S. Department of Labor (U.S. DOL) regulations, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor" 41 C.F.R. Parts 60 et seq., (which implement Executive Order No. 11246, "Equal Employment Opportunity," as amended by Executive Order No. 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," 42 U.S.C. 2000e note), and with any applicable Federal statutes, executive orders, regulations, and Federal policies that may in the future affect activities undertaken in the course of the Contract. The Contractor agrees to take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, creed, sex, sexual orientation, gender identity, national origin, disability, or age. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

(2) Age. In accordance with Section 4 of the Age Discrimination in Employment Act of 1967, as amended, 29 U.S.C. § 623 and Federal transit law at 49 U.S.C. §5332, the Contractor agrees to refrain from discrimination against present and prospective employees for reason of age. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

(3) Disabilities. In accordance with section 102 of the Americans with Disabilities Act, as amended, 42 U.S.C. §12112, the Contractor agrees that it will comply with the requirements of U.S. Equal Employment Opportunity Commission, "Regulations to Implement the Equal Employment Provisions of the Americans with Disabilities Act," 29 C.F.R. Part 1630, pertaining to employment of persons with disabilities. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

_____ _____

Affiant (Printed Name and Title) Signature of Affiant

_____

Date

Subscribed and sworn to me before this _____ day of _____, 20___.

_____ _____

Notary Public My Commission Expires

(seal)

07 ATTACHMENT C SCHEDULE OF PARTICIPATION BY CONTRACTOR & SUBCONTRACTORS

This form shall be completed in its entirety and submitted at time of bid submission

PRIME CONTRACTOR					
Name and Address	Telephone No. Fax No.	Type of Work To Be Performed	NAICS Code	Value of Work	DBE % Participation
				$	%
PARTICIPATION BY SUBCONTRACTOR(S) AND MAJOR SUPPLIERS – DBE & NON-DBE					
Name and Address	Telephone No. Fax No.	Type of Work To Be Performed	NAICS Code	Value of Work	DBE % Participation
				$	%
				$	%
				$	%
				$	%
				$	%
				$	%

TOTAL VALUE OF WORK	$ _____
TOTAL CONTRACT VALUE OF WORK (from Bid Form)	$ _____
TOTAL DBE PARTICIPATION	$ _____
TOTAL PERCENTAGE OF DBE PARTICIPATION (Prime and Subcontractors)	_____%

The undersigned will enter into a formal agreement with the subcontractor(s) for the work listed on this schedule.

_____

By (Prime Contractor Name)

_____ _____

Printed Name of Authorized Official Signature and Title of Authorized Official

_____

Date

08 ATTACHMENT D LETTER OF INTENT TO SUBCONTRACT TO DBE

This form shall be completed for each DBE Subcontractor and is DUE AT TIME OF BID SUBMISSION) _____ ("Prime Contractor") agrees to enter a contractual agreement with _____ ("DBE Subcontractor"), who will provide the following goods/services in connection with the above-referenced contract:

(Insert a brief narrative describing the goods/services to be provided. Broad categorizations (e.g., "electrical," "plumbing," etc.) or the listing of the NAICS Codes in which DBE Subcontractor is certified are insufficient and may result in this Letter of Intent to Subcontract not being accepted.)

_____
_____
_____

for an estimated amount of $_____ or _____% of the total estimated contract value.

DBE Subcontractor is currently certified with the Missouri Regional Certification Committee (MRCC) to perform in the capacities indicated herein. Prime Contractor agrees to utilize DBE Subcontractor in the capacities indicated herein, and DBE Subcontractor agrees to work on the above-referenced contract in the capacities indicated herein, contingent upon award of the contract to Prime Contractor.

_____	_____
By (Printed Name of Prime Contractor Representative)	By (Printed Name of DBE Subcontractor Representative)
_____	_____
(Title of Prime Contractor Representative)	(Title of DBE Subcontractor Representative)
_____	_____
(Signature of Prime Contractor Representative)	(Signature of DBE Subcontractor Representative)
_____	_____
Date	Date

09 ATTACHMENT E CONTRACTOR UTILIZATION PLAN/REQUEST FOR WAIVER

# F23-5003-39A	Pkg 3 – Traction Power Substation (TPSS)
Project Number	Project Title

_____

Prime Contractor

State of _____)

) SS.:

County of _____)

I, _____, of lawful age and upon my oath state as follows:

This Affidavit is made for the purpose of complying with the provisions of the Disadvantaged Business Enterprise (DBE) submittal requirements on the above project and the DBE Program and is given on behalf of the Bidder/Proposer listed below. It sets out the Bidder/Proposer's commitment to utilize DBE contractors on the project.

The project goal for DBE Participation is **_____ %.** Bidder/Proposer assures that it will utilize a minimum of the following percentages of DBE participation in the above project:

BIDDER/PROPOSER DBE PARTICIPATION COMMITMENT: _____%

The following are the DBE subcontractors whose utilization Bidder/Proposer warrants will meet or exceed the above-listed Bidder/Proposer Participation. Bidder/Proposer warrants that it will utilize the DBE subcontractors to provide the goods/services described in the applicable Letter(s) of Intent to Subcontract, (copies of which shall collectively be deemed incorporated herein). ***All firms must currently be certified with the Missouri Regional Certification Committee (MRCC) under 49 CFR Part 26.*** *List additional DBEs, if any, on an additional page and attach to this form.*

a. Name of DBE Firm _____ % of Work _____

Address _____

Telephone No. _____

Taxpayer ID No. _____

b. Name of DBE Firm _____ % of Work _____

Address _____

Telephone No. _____

Taxpayer ID No. _____

c. Name of DBE Firm _____ % of Work _____

Address _____

Telephone No. _____

Taxpayer ID No. _____

TOTAL DBE $ AMOUNT ON PROJECT: $_____

TOTAL DBE % COMMITTED TO PROJECT: _____ %

Bidder/Proposer acknowledges that the monetary amount to be paid each listed DBE for their work, and which is approved herein, is an amount corresponding to the percentage of the total contract amount allocable to each listed DBE as calculated in the **Schedule of Participation by Contractor and Subcontractors** form. Bidder/Proposer further acknowledges that this amount may be higher than the subcontract amount listed therein as change orders and/or amendments changing the total contract amount may correspondingly increase the amount of compensation due a DBE for purposes of meeting or exceeding the Bidder/Proposer participation commitment.

Bidder/Proposer acknowledges that it is responsible for considering the effect that any change orders and/or amendments changing the total contract amount may have on its ability to meet or exceed the Bidder/Proposer participation. Bidder/Proposer further acknowledges that it is responsible for submitting a **Request for Modification or Substitution** form if it will be unable to meet or exceed the Bidder/Proposer participation set forth herein.

If Bidder/Proposer has not achieved the DBE commitment set for this Project, Bidder/Proposer hereby requests a waiver of the DBE commitment that Bidder/Proposer has failed to achieve.

Bidder/Proposer will present documentation of its good faith efforts, a narrative summary detailing its efforts and the reasons its efforts were unsuccessful when requested by KCATA.

I hereby certify that I am authorized to sign this Affidavit on behalf of the Bidder/Proposer named below and who shall abide by the terms set forth herein:

Bidder/Proposer Primary Contact: _____

Address: _____

_____

Phone Number: _____ Facsimile number: _____

E-mail Address: _____ ___

By _____

(Signature)

Title _____

Date _____

(Attach corporate seal if applicable)

NOTARY:

Subscribed and sworn to before me this _____ day of _____, 20__.

_____ _____

Notary Public My Commission Expires

(seal)

10 ATTACHMENT F.1 EMPLOYEE ELIGIBILITY AFFIDAVIT OF PRIMARY PARTICIPANTS

Compliance with Section 285.500 RSMO, et seq. Regarding employee eligibility verification

State of _____)

) SS.:

County of _____)

On this _____ day of _____, 20 _____, before me appeared _____, personally known by me or otherwise proven to be the person whose name is subscribed on this affidavit and who, being duly sworn, stated as follows: I am the _____ (title) of _____ (business entity) and I am duly authorized, directed or empowered to act with full authority on behalf of the business entity in making this affidavit.

I hereby swear or affirm that the business entity does not knowingly employ any person in connection with the contracted services who does not have the legal right or authorization under federal law to work in the United States as defined in 8 U.S.C. §1324a(h)(3).

I hereby additionally swear or affirm that the business entity is enrolled in an electronic verification of work program operated by the United States Department of Homeland Security (E-Verify) or an equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, under the Immigration Reform and Control Act of 1986, and that the business entity will participate in said program with respect to any person hired to perform any work in connection with the contracted services.

I have attached hereto documentation sufficient to establish the business entity's enrollment and participation in the required electronic verification of work program. I shall require that the language of this affidavit be included in the award documents for all sub-contracts exceeding $5,000.00 at all tiers and that all subcontractors at all tiers shall affirm and provide documentation accordingly.

_____ _____

By (Printed Name) Signature and Title of Affiant

_____

Date

Subscribed and sworn to before me this _____ day of _____, 20____

_____ _____

Notary Public My Commission Expires

(seal)

NOTE: An example of acceptable documentation is the E-Verify Memorandum of Understanding (MOU) – a valid, completed copy of the first page identifying the business entity and a valid copy of the signature page completed and signed by the business entity, the Social Security Administration and the Department of Homeland Security.

11 ATTACHMENT F.2 EMPLOYEE ELIGIBILITY AFFIDAVIT OF LOWER-TIER PARTICIPANTS

COMPLIANCE WITH SECTION 285.500 RSMO, ET SEQ.

REGARDING EMPLOYEE ELIGIBILITY VERIFICATION

State of _____)

) SS.:

County of _____)

On this _____ day of _____, 20 _____, before me appeared _____, personally known by me or otherwise proven to be the person whose name is subscribed on this affidavit and who, being duly sworn, stated as follows: I am the _____ (title) of _____ (business entity) and I am duly authorized, directed or empowered to act with full authority on behalf of the business entity in making this affidavit.

I hereby swear or affirm that the business entity does not knowingly employ any person in connection with the contracted services who does not have the legal right or authorization under federal law to work in the United States as defined in 8 U.S.C. §1324a(h)(3).

I hereby additionally swear or affirm that the business entity is enrolled in an electronic verification of work program operated by the United States Department of Homeland Security (E-Verify) or an equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, under the Immigration Reform and Control Act of 1986, and that the business entity will participate in said program with respect to any person hired to perform any work in connection with the contracted services.

I have attached hereto documentation sufficient to establish the business entity's enrollment and participation in the required electronic verification of work program. I shall require that the language of this affidavit be included in the award documents for all sub-contracts exceeding $5,000.00 at all tiers and that all subcontractors at all tiers shall affirm and provide documentation accordingly.

_____ _____

By (Printed Name) Signature and Title of Affiant

_____

Date

Subscribed and sworn to before me this _____ day of _____, 20____

Notary Public

My Commission Expires

(seal)

NOTE: An example of acceptable documentation is the E-Verify Memorandum of Understanding (MOU) – a valid, completed copy of the first page identifying the business entity and a valid copy of the signature page completed and signed by the business entity, the Social Security Administration and the Department of Homeland Security.

12 ATTACHMENT G.1 CERTIFICATION OF PRIMARY PARTICIPANT REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS

The Primary Participant (applicant for an FTA grant or cooperative agreement, or potential Contractor for a major third-party contract), _____certifies to the best of its knowledge and belief, that it and its principals:

1. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency.

2. Have not within a three-year period preceding this bid, been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

3. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (2) of this certification; and

4. Have not within a three-year period preceding this application/bid had one or more public transactions (Federal, State, or local) terminated for cause or default.

If the primary participant (applicant for FTA grant, or cooperative agreement, or potential third-party Contractor) is unable to certify to any of the statements in this certification, the participant shall attach an explanation to this certification.

THE PRIMARY PARTICIPANT (APPLICANT FOR AN FTA GRANT OR COOPERATIVE AGREEMENT, OR POTENTIAL CONTRACTOR FOR A MAJOR THIRD PARTY CONTRACT), _____ CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF THE CONTENTS OF THE STATEMENTS SUBMITTED ON OR WITH THIS CERTIFICATION AND UNDERSTANDS THAT THE PROVISIONS OF 2 CFR PART 1200; 2 CFR PART 180; AND 49 CFR PART 29, SUPBART C ARE APPLICABLE THERETO.

_____
Signature and Title of Authorized Official

_____
Date

13 ATTACHMENT G.2 CERTIFICATION OF LOWER-TIER PARTICIPANTS REGARDING DEBARMENT, SUSPENSION, AND OTHER INELIGIBILITY AND VOLUNTARY EXCLUSION

The Lower Tier Participant (potential sub-grantee or sub-recipient under an FTA project, potential third party Contractor, or potential subcontractor under a major third party contract) _____, certifies, by submission of this bid, that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

If the Lower Tier Participant (potential sub-grantee or sub-recipient under an FTA project, potential third-party Contractor, or potential subcontractor under a major third-party contract) is unable to certify to any of the statements in this certification, such participant shall attach an explanation to this bid.

THE LOWER-TIER PARTICIPANT (POTENTIAL SUB-GRANTEE OR SUB-RECIPIENT UNDER AN FTA PROJECT, POTENTIAL THIRD-PARTY CONTRACTOR, OR POTENTIAL SUBCONTRACTOR UNDER A MAJOR THIRD-PARTY CONTRACT),_____, CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF THE CONTENTS OF THE STATEMENTS SUBMITTED ON OR WITH THIS CERTIFICATION AND UNDERSTANDS THAT THE PROVISIONS OF 2 CFR PART 1200; 2 CFR PART 180; AND 49 CFR PART 29, SUPBART C ARE APPLICABLE THERETO.

_____

Signature and Title of Authorized Official

_____

Date

14 ATTACHMENT H.1 BUY AMERICA CERTIFICATION FORM FOR PRIME CONTRACTOR FOR STEEL OR MANUFACTURED PRODUCTS OTHER THAN ROLLING STOCK

The bidder shall certify one of the following two certifications.

14.01.01 Certificate of Compliance with Buy America Requirements

The bidder or offeror hereby certifies that it will comply with the requirements of 49 U.S.C. 5323(j)(1), and the applicable regulations in 49 CFR part 661.

Date: _____

Signature: _____

Company: _____

Name: _____

Title: _____

14.01.02 Certificate of Non-Compliance with Buy America Requirements

The bidder or offeror hereby certifies that it cannot meet the requirements of 49 U.S.C. 5323(j), but it may qualify for an exception to the requirements consistent with 49 U.S.C. 5323(j)(2) as amended, and the applicable regulations in 49 CFR 661.7.

Date: _____

Signature: _____

Company: _____

Name: _____

Title: _____

15 ATTACHMENT I REFERENCES

Please provide the firm name, primary contact person's name, business and cell phone number(s), and email address for references we may contact about your company's performance on similar scopes of work/projects. Name the project and approximate work value.

Failure to provide accurate information for KCATA to use in communicating with references may result in your bid being deemed non-responsive.

1._____
_____
_____
_____

2._____
_____
_____
_____

3._____
_____
_____
_____

4._____
_____
_____
_____

16 ATTACHMENT J NON-COLLUSION AFFIDAVIT

This form shall be executed by the Bidder and submitted with the bid.

State of _____)

) SS.:

County of _____)

_____ _____

Name and Title of Person Signing Name of Bidder

The above-named individual being first duly sworn, deposes and says that he or she is of the above Bidder and that all statements made, and facts set out in this bid for the Pkg 3 – Traction Power Substation (TPSS) are true and correct and that the bidder (firm, person, association, or corporation making the bid) has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with such bid or any contract which may result from its acceptance.

Affiant further certifies that bidder is not financially interested in or financially affiliated with, any other bidder for the project.

By _____ personally known to me or proved to me on the basis of satisfactory evidence to be the person(s) whose name(s)is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(is), and that by his/her/their signatures(s) on the instrument the person(s), or entity upon behalf of which the person(s) acted, executed the instrument.

Subscribed and sworn to before me on this _____day of_____,20____.

_____ _____

Notary Public My Commission Expires

17 ATTACHMENT K AFFIDAVIT – COMPLIANCE WITH PREVAILING WAGE LAW

This form shall be submitted with the Contractor's Request for Payment.

Before me, the undersigned Notary Public, in and for the County of _____, State of _____, personally came and appeared (name and title) _____ of (company name) _____, (a Corporation) (a Partnership) (a Sole Proprietor), and after being duly sworn did depose and say that all provisions and requirements set out in Chapter 290, Sections 290.210 through and including 290.340, Missouri Revised Statutes, pertaining to the payment of wages to workmen employed on the above-referenced project have been fully satisfied and there has been no exception to the full and complete compliance with said provisions and requirements with Annual Wage Order No. ___, Section _____, for Building Construction in Jackson County, Missouri and/or Federal Wage Decision No._____.

Subscribed and sworn to before me on this _____day of_____,20____.

_____ _____

Notary Public My Commission Expires

(seal)

18 ATTACHMENT L-1 CERTIFICATION OF PRIMARY PARTICIPANTS REGARDING RESTRICTIONS ON LOBBYING

I,_____ (Name and Title of Grantee Official or Potential Contractor for a Major Third-Party Contract), hereby certify on behalf of _____(Name of Grantee or Potential Contractor) that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance is placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering this transaction imposed by 31 U.S.C. 1352, 2 CFR § 200.450, 2 CFR Part 200 Appendix II (J) and 49 CFR Part 20. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Executed this _____day of _20_____

_____ _____

By (Printed Name) Signature and Title of Authorized Official

_____

Date

19 ATTACHMENT L-2 CERTIFICATION OF LOWER-TIER PARTICIPANTS REGARDING RESTRICTIONS ON LOBBYING

I, _____(Name and Title of Grantee Official or Potential Subcontractor under a Major Third-Party Contract), hereby certify on behalf of _____ (Name of Grantee or Potential Subcontractor) that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance is placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering this transaction imposed by 31 U.S.C. 1352, 2 CFR § 200.450, 2 CFR Part 200 Appendix II (J) and 49 CFR Part 20. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Executed this _____day of _20_____

_____ _____

By (Printed Name) Signature and Title of Authorized Official

_____

Date

20 ATTACHMENT N-1 CERTIFICATION OF PRIMARY PARTICIPANT REGARDING FEDERAL TAX LIABILITY AND RECENT FELONY CONVICTIONS

The Primary Participant (name of applicant for an FTA grant or cooperative agreement, or potential Contractor for a major third-party contract),

certifies to the best of its knowledge and belief, that:

1. Do not have any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and if there is a federal tax liability that it is being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability;

2. Was not convicted of the felony criminal violation under any Federal law within the preceding 24 months; and

3. Have not more than 90 days prior to certification been notified of any unpaid federal tax assessment for which the liability remains unsatisfied.

Contractor is described as any private corporation, partnership, trust, joint-stock company, sole proprietorship, or other business association.

If the primary participant (applicant for FTA grant, or cooperative agreement, or potential third-party Contractor) is unable to certify to any of the statements in this certification, the participant shall attach an explanation to this certification.

The Contractor agrees to include these requirements in all subcontracts at all tiers, regardless of value, and to obtain the same certification and disclosure from all subcontractors (at all tiers).

THE PRIMARY PARTICIPANT (APPLICANT FOR AN FTA GRANT OR COOPERATIVE AGREEMENT, OR POTENTIAL CONTRACTOR FOR A MAJOR THIRD-PARTY CONTRACT), _____ _____ CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF THE CONTENTS OF THE STATEMENTS SUBMITTED ON OR WITH THIS CERTIFICATION AND UNDERSTANDS THAT THE PROVISIONS OF 48 CFR PARTS 1, 22 AND 52 ARE APPLICABLE THERETO.

Executed this _____day of 20_____

_____ _____

By (Printed Name) Signature and Title of Authorized Official

_____

Date

21 ATTACHMENT N-2 CERTIFICATION OF LOWER-TIER PARTICIPANT REGARDING FEDERAL TAX LIABILITY AND RECENT FELONY CONVICTIONS

The Lower-Tier Participant (name of applicant for an FTA grant or cooperative agreement, or potential Subcontractor for a major third-party contract), _____certifies to the best of its knowledge and belief that:

1. The Contractor does not have any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and if there is a federal tax liability that it is being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability;
2. Was not convicted of the felony criminal violation under any Federal law within the preceding twenty-four (24) months; and
3. Have not more than ninety (90) days prior to certification been notified of any unpaid federal tax assessment for which the liability remains unsatisfied.

Contractor is described as any private corporation, partnership, trust, joint-stock company, sole proprietorship, or other business association.

If the Lower-Tier Participant (applicant for FTA grant, or cooperative agreement, or potential third-party Subcontractor) is unable to certify to any of the statements in this certification, the participant shall attach an explanation to this certification.

THE LOWER-TIER PARTICIPANT (APPLICANT FOR AN FTA GRANT OR COOPERATIVE AGREEMENT, OR POTENTIAL SUBCONTRACTOR FOR A MAJOR THIRD-PARTY CONTRACT), _____ _____ CERTIFIES OR AFFIRMS THE TRUTHFULNESS AND ACCURACY OF THE CONTENTS OF THE STATEMENTS SUBMITTED ON OR WITH THIS CERTIFICATION AND UNDERSTANDS THAT THE PROVISIONS OF 48 CFR PARTS 1, 22 AND 52 ARE APPLICABLE THERETO.

Executed this _____day of __20_____

_____ _____

By (Printed Name) Signature and Title of Authorized Official

_____

Date

22 GUIDELINES FOR WORKFORCE ANALYSIS FORM AA1, PART I

22.01 DEFINITIONS

Please use the following definitions to fill in 23 WORK FORCE ANALYSIS REPORT beginning on Page 55.

22.01.01 Racial/Ethnic

(1) **WHITE** (not of Hispanic origin): All persons having origins in any of the original peoples of Europe, North Africa, or the Middle East.

(2) **BLACK** (not of Hispanic origin): All persons having origins in any of the Black racial groups of Africa.

(3) **HISPANIC**: All persons of Mexican, Puerto Rican, Cuban, Central or South American origin, regardless of race.

(4) **ASIAN or PACIFIC ISLANDER**: All persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands. This area includes, for example, China, Japan, Korea, the Philippine Islands, and Samoa.

(5) **AMERICAN INDIAN or ALASKAN NATIVE**: All persons having origins in any of the original peoples of North America, and who maintain cultural identification through tribal affiliation or community recognition.

22.01.02 Job Categories

(1) **OFFICIALS and MANAGERS**: Includes chief executive officers, presidents, vice-presidents, directors, and kindred workers.

(2) **PROFESSIONALS**: Includes attorneys, accountants, and kindred workers.

(3) **TECHNICIANS**: Includes computer programmers and operators, drafters, surveyors, highway technicians, inspectors, and kindred workers.

(4) **SALES WORKERS**: Includes contract sales representatives, purchasing agents, customer relations representatives and kindred workers.

(5) **OFFICE and CLERICAL**: Includes secretaries, bookkeepers, clerk typists, payroll clerks, accounts payable clerks, receptionists, switchboard operators and kindred workers.

(6) **CRAFT WORKERS** (skilled): Includes mechanics and repairers, electricians, carpenters, plumbers, and kindred workers.

(7) **OPERATIVES** (semi-skilled): Includes bricklayers, plaster attendants, welders, truck drivers and kindred workers.

(8) **LABORERS** (unskilled): Includes laborers performing lifting, digging, mixing, loading, and pulling operations and kindred workers.

(9) **SERVICE WORKERS**: Includes janitors, elevator operators, watchmen, chauffeurs, attendants, and kindred workers.

23 WORK FORCE ANALYSIS REPORT FORM AA1, PART II

Report all permanent, temporary, or part-time employees including apprentices and on-the-job trainees.

Enter the appropriate figures on all lines and in all columns. All blank spaces will be considered zero.

Job Categories	Number of Employees (Report employees in only one category)														
	Race/Ethnicity														
	Hispanic or Latino		Not Hispanic or Latino												Total Col A-N
			Male						Female						
	Male	Female	White	Black or African American	Native Hawaiian or Other Pacific Islander	Asian	American Indian or Alaska Native	Two or more races	White	Black or African American	Native Hawaiian or Other Pacific Islander	Asian	American Indian or Alaska Native	Two or more races	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Executive/Senior-Level Officials and Managers															
First/Mid-Level Officials and Managers															
Professionals															
Technicians															
Sales Workers															
Administrative Support Workers															
Craft Workers															
Operatives															
Laborers and Helpers															

Service Workers															
TOTAL															
PREVIOUS YEAR TOTAL															

TYPE OF BUSINESS	☐ Manufacturing	☐ Wholesale	☐ Construction	☐ Regular Dealer	☐ Selling Agent	☐ Service Establishment	☐ Other

Signature of Certifying Official

Company Name

Printed Name and Title

Address/City/State/Zip Code

Date Submitted

Telephone Number/Fax Number

PROJECT BID DOCUMENTS

Book 2

Pkg 3 – Traction Power Substation (TPSS)

KCATA PROJECT NUMBER: # F23-5003-39A

ISSUE DATE: 1/18/2023

BID CLOSE DATE: 2/8/2023 2:00 PM Local Time

OWNER: Kansas City Area Transportation Authority 1200 E. 18th Street, Kansas City, Missouri 64108 Telephone: 816-346-0200
PROCUREMENT CONTACT: Denise Adams 1350 E. 17th Street Kansas City, MO 64108 Telephone: 816-346-0224 Email: dadams@kcata.org
PROJECT MANAGER Linda Clark, PE Kansas City Area Transportation Authority 1200 E. 18th Street, Kansas City, Missouri 64108 Email: lclark@kcata.org

Bookmark Summary

LIST OF INCLUDED ITEMS

INTRODUCTORY INFORMATION

CONTRACT DOCUMENTS

APPENDIX

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Bonding Requirements – Payment	GC – 11.4
Bonding Requirements – Performance	GC – 11.4
Bonding Requirements - Maintenance	GC – 3.5.4, 11.4
Breach of Contract	GC – 17.8
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Contractor's Personnel	GC – 17.20
Contractor's Responsibility	GC – 17.21
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Disclaimer of Federal Government Obligation or Liability	GC – 17.24
Incorporation of Federal Transit Administration (FTA) Terms	GC – 17.31
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Fraud and False or Fraudulent Statements	GC – 17.50
Governing Law	GC – 13.1
Headings	GC – 17.30
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Insurance	GC – 11

DRAFT **AIA® Document A101™ – 2017**

Standard Form of Agreement Between Owner and Contractor
where the basis of payment is a Stipulated Sum

AGREEMENT made as of the « » day of « » in the year «2023»
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

Kansas City Area Transportation Authority
1200 E. 18th Street
Kansas City, MO 64108
Telephone Number: 816-346-0224
Fax Number: 816-346-0336

(hereinafter referred to as "KCATA" or "Owner")

and the Contractor:
(Name, legal status, address and other information)

XX

for the following Project:
(Name, location, and detailed description)

XX
The Architect:
(Name, legal status, address and other information)

KCATA Project Management Office

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101™–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201™–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

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TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Bid Instructions, Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9. In the event Contractor discovers any conflict between or among the Contract Documents, the Contractor shall immediately notify, in writing, the Owner and request clarification. To assist in such clarification, and for purposes of resolving any conflicts or inconsistencies among the Contract Documents, the documents will be given the following order of precedence:

.1 Modifications or Change Orders issued after the execution of this Agreement;
.2 Addenda issued prior to the execution of this Agreement;
.3 This Agreement (AIA Document A101-2017 as modified) and its Exhibits, if any;
.4 Supplementary Conditions, if any;
.5 Final Drawings and Specifications;
.6 General Conditions of the Contract for Construction (AIA Document A201-2017 as modified); and
.7 Preliminary Drawings and Specifications.

Based on the nature of the Project, KCATA will also serve in the role of "Architect" referenced herein and the A201-2017.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work ("Commencement Date") shall be:
(Check one of the following boxes.)

[« »] The date of this Agreement.

[«X»] A date set forth in a Notice to Proceed ("NTP") issued by the Owner.

§ 3.2 The Contract Time shall be measured from the Commencement Date, as established in the preceding Section 3.1.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[»] Not later than » (») calendar days from .

[«X»] By the following date:

Substantial Completion shall be the date of Delivery and Acceptance of the Traction Power Substation (TPSS) by the Owner.

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date
Submittal of detailed shop drawings	Within four (4) months of issuance of NTP
Delivery and Acceptance of fabricated material	Within fourteen (14) months of NTP

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be « » ($ «$» subject to additions and deductions as provided in the Contract Documents.

§ 4.2.1 Alternates included in the Contract Sum:

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance
N/A		.

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price
N/A	

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)
N/A		

§ 4.5 Liquidated damages.

The Contractor acknowledges and agrees that if the Contractor fails to timely complete the project within the time set forth for Substantial Completion, as may be amended pursuant to the Agreement, the Owner will sustain extensive damages and loss as a result of such delay. The Parties agree that the exact amount of such damages and loss is not readily ascertainable at the time of the execution of this Agreement. Therefore, the Owner and the Contractor agree that, if the Contractor fails to achieve Substantial Completion of the Work, the Owner shall be entitled to retain or recover from the Contractor, as liquidated damages, and not as penalty, the following amounts:

Liquidated damages will be assessed at a rate of $3,200 per calendar day for that work is not Substantially Complete within the dates and parameters established in Section 3.3.2.

The liquidated damages rate will continue to accrue until the actual date of Substantial Completion. The amount of liquidated damages assessed by the Owner shall be deducted from any sums due the Contractor and, in the event that such liquidated damages exceed amount owed, the Contractor shall promptly pay Owner, upon demand, the amount of such excess.

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.) (Identify allowance and state exclusions, if any, from the allowance price.)

Item	Units and Limitations	Price Per Unit
None.		

« »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

§ 5.1.3 Provided that an Application for Payment is received (COMPLETE with all required documentation) by the Architect not later than the «5th » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the « 30th » day of the «same » month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than « thirty » («30») days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Contractor shall submit three (3) copies of each payment application and the payment application shall identify each subcontractor, supplier, and materialman on the Project, the amount paid to each subcontractor, supplier, and materialman for, and through and including the pay application period, and the cumulative pay out to date for each subcontractor, supplier and materialman on the Project. At Owner's election the pay applications may be submitted electronically in lieu of paper copies. Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such

form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule, unless objected to by the Architect, of values shall be used as a basis for reviewing the Contractor's Applications for Payment. Applications for payment also shall include any additional supporting data or documentation as required by the Owner/Architect and partial waivers and releases as referenced in the General Conditions. AIA A201, as amended.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of five (5) percent. Pending final determination of the cost to the Owner of Changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.9 of AIA Document A201, 2017, General Conditions of the Contract for Construction.;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation into the completed construction, (or, if approved in advance by the Owner, suitably stored offsite at a location agreed upon in writing) less retainage of five percent (5%); and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

.1 Subtract the aggregate of previous payment made by the Owner;

.2 Subtract amounts, if any, for Work that remains uncorrected and for which the Architect has withheld or nullified a Certificate for Payment as provided in Section 9.5 of AIA Document A201–2017;

.3 Any amount for which the Contractor does not intend to pay a Subcontractor, supplier, or materialman, unless the Work has been performed by others the Contractor intends to pay;

.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.6.3 The progress payment amount determined in accordance with Section 5.1.6 shall be further modified under the following circumstances:

.1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work, retainage applicable to such work and unsettled claims; and

.2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts payable in accordance with Section 9.10.3 of AIA Document A201–2017.

§ 5.1.7 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

five percent (5 %) »

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2007.

§ 5.1.8.1 Owner may permit a reduction in retainage in accordance with Section 9.3 of the General Conditions.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

« »

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

Published prime rate as exists on the date payment is due, as published by Bank of America, Kansas City Branch, plus one percent (1%) per annum.

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

« »
« »
« »
« »

§ 6.2 Binding Dispute Resolution

The method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[« »] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[« X »] Litigation in a court of competent jurisdiction

[« »] Other *(Specify)*

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

Linda Clark, Senior Project Manager
1200 East 18th Street
Kansas City, Missouri 64108
Phone: 816.346.0389
Fax: 816.346.0253
lclark@kcata.org

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten (10) days' written notice to the other party.

§ 8.5 The parties shall maintain and provide insurance and/or bonds as specified in Article 11 of AIA Document A201-2017, General Conditions of the Contract for Construction.

§ 8.6 Other provisions:

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Agreement Between Owner and Contractor as modified
.2 AIA Document A201™–2017, General Conditions of the Contract for Construction as modified

.4 Drawings

.5 Specifications

Section	Title	Date	Pages

.6 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.7 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

« »

[« »] The Sustainability Plan:

Title	Date	Pages

[« »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.8 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

« »

This Agreement entered into as of the day and year first written above.

KANSAS CITY AREA TRANSPORTATION AUTHORITY

OWNER *(Signature)*
Melissa Bynum, Chairman of the Board
(Printed name and title)

Louie Wright, Secretary to the Board
(Printed name and title)

CONTRACTOR *(Signature)*
(Printed name and title)

DRAFT

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

« »
«»

THE OWNER:
(Name, legal status, and address)

Kansas City Area Transportation Authority
1350 E. 17th Street
Kansas City, MO 64108
Telephone Number: 816-346-0224
Fax Number: 816-346-0336

(hereinafter referred to as "KCATA" or "Owner")

THE ARCHITECT:
(Name, legal status, and address)

«HDR Engineering, Inc.
10450 Holmes Road, Suite 600
Kansas City, MO 64131»

TABLE OF ARTICLES

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

INDEX
(Topics and numbers in bold are Section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. The Contract Documents do include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project. The Work includes, but is not limited to, delivery, unloading, uncrating, assembling, setting-in-place, leveling, adjust, completely installing, commissioning, and cleaning up.

§ 1.1.3.1 The ***Contractor warrants it has thoroughly investigated the Project conditions and, unless otherwise stated in the Contract Documents, has adequate information to fully construct the Project for the agreed upon terms.***

§ 1.1.3.2 ***The Contractor shall thoroughly investigate and conform to all local trade jurisdictional rules and/or rulings and all workforce requirements (including WBE/MBE) and is responsible for the settlement of any disputes or fines arising from fabrication, installation, or completion of the Work under this Contract.***

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location, and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker
The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.1.9 Alternate Security
Alternate Security means an irrevocable bank letter of credit, certificate of deposit, cash bond, or other type of asset or security of value equal to or exceeding the amount of retained funds, retention, or retainage. Alternate Security shall not include a performance or payment bond.

§ 1.2 Correlation and Intent of the Contract Documents
§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§1.2.4 Reference to standard specifications of any technical society, organization, or association, or to codes of local, state or federal authorities, shall mean the latest standard, code, specification, or tentative specification adopted and published at the date of bid issuance, unless specifically stated otherwise.

§ 1.2.5 Any materials, products, equipment, or systems that are not broadly recognized as normal, proven, industry-standard materials, practices, systems, or components shall not be used on the Project unless specifically reviewed and approved by Owner in writing.

§ 1.2.6 The Contractor shall notify the Architect in writing of any inconsistency found between the Specifications and Drawings. The Architect will then advise the Contractor whether the Specifications will control.

§ 1.2.7 The terms "this Contractor," "furnished under other Sections." "included as part of other Sections," "related work in other Sections," or similar description of segregation shall not be interpreted to limit the responsibility of any particular party involved in the work. The limitations of any subcontractor's work shall rest solely upon the agreement between the Contractor and the subcontractor, regardless of where the work is called for in the Contract Documents.

§ 1.2.8 Omissions in the Contract Documents of such words and phrases as "the Contractor shall," "shall consist of," "as indicated on the Drawings," "in accordance with," "shall," "and," "the," etc., are intentional. Such words and phrases shall be supplied by inference.

§ 1.2.9 The term "product" shall be understood to mean materials, systems, and equipment.

§ 1.2.10 The term "provide" shall be understood to mean "provide complete in place;" that is, "furnish and install."

§ 1.2.11 Whenever the words "necessary," "proper," or words of like effect are used in the Contract Documents with respect to the extent, conduct, or character of work specified, they shall mean that the said work shall be carried to the extent, must be conducted in a manner, or be of a character which is "necessary" or "proper" under the

circumstances in the opinion of the Architect, and the Architect's judgment in such matters shall be considered final.

§ 1.2.12 Whenever the words "as required," "as directed," "as permitted," and words of like effect are used in the Contract Documents, it is understood that the requirements, direction, or permission of the Architect are intended, unless otherwise stated; similarly, the words "approved," "acceptable," "satisfactory," or words of like import shall mean "approved by," "acceptable to," or "satisfactory to" the Architect, unless otherwise stated.

§ 1.2.13 Should discrepancies appear among Contract Documents Contractor shall request interpretation in writing before proceeding with the Work. If Contractor fails to make such request, no excuse will thereafter be entertained for failure to carry out Work in satisfactory manner. Should conflict occur in or between drawings and specifications, Contractor is deemed to have included the more expensive way of doing work in Contractor's Bid unless Contractor shall have asked for and obtained written decision before submission of Contractor's Bid Proposal as to which method or materials will be required.

§ 1.2.14 Where the words "KCATA" or "Owners" or "the Authority" is used in these documents reference is made to the Kansas City Area Transportation Authority.

§ 1.2.15 Where the words "Project Manual" or "Bid document" or "Contract Document" are used in the Project Manual, synonymous reference is made to the same instrument including any associated drawings or addenda issued prior to receipt of bids.

§ 1.2.16 Where the words "Architect" or "Engineer" are used in the documents the words are interchangeable as appropriate meaning a State of Missouri registered professional licensed to design unrestricted public and private facilities. In addition, "Architect" or "Engineer" may also mean KCATA Project Manager or designee to the extent applicable for the specific project that is the subject of this Agreement.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay, and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements that affect its ability to pay Contractor without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments, and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 If available and requested by Contractor, the Owner shall furnish surveys describing physical characteristics, legal limitations, and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3. The rights stated in this provision are not a limitation of any rights of the Owner expressed in the Contract Documents, or as provided in law or equity.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Owner may withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

§ 2.6 Owner's Right to Reject Work

The Owner has the right to reject any work that is defective or does not comply with the Contract Documents. If work is rejected it will be remedied by the Contractor at no cost to Owner.

§ 2.7 Architect's Compensation for Services to Remedy Defective Work

When additional services of the Architect are required because of defective Work, negligent, failure, deficiencies, or default by the Contractor, the Architect's compensation for such services shall be based on Architect's invoice to the Owner. The invoice, when approved by the Owner, along with other costs, damages, and liabilities incurred by the Owner or the Architect, shall be paid by Contractor and shall reduce the Contract Sum, by Change Order, or other appropriate means to compensate the Owner for its damages, including Architect's Additional Services.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require. If the Contractor performs any work when it involves a recognized nonconformity in the Contract Documents without such prior notice to Architect or Owner, the Contractor shall thereby assume responsibility for performance and bear the attributable cost for the correction.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.2.5 The Contractor shall do no Work without Drawings, Specifications or written instructions or interpretations.

§ 3.2.6 The Contractor's notices or reports to the Architect of errors, inconsistencies, or omissions shall be submitted in writing.

§ 3.2.7 Contractor questions regarding errors, format, inconsistencies, omissions, or interpretations of the Contract Documents shall be submitted in writing to the Architect and in a consistent format, referred to as a "Request for Information," numbered sequentially according to submission and dated.

§ 3.2.8 The Architect shall respond to written notices, reports, or Requests for Information in a timely fashion. The Contractor hereby acknowledges that (1) a timely response may require consultation and coordination with

consultants, and preparation of supplementary information or drawings and (2) no extension of Contract Time will be authorized because of failure to notify Architect sufficiently in advance of the Work to permit his timely review and response.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences, or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures but shall not proceed with that portion of the Work without further written instructions from the Architect or Owner.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.3.4 The Contractor, all Subcontractors, and delivery personnel associated with performing the Work of the Contract shall conduct themselves in accordance with all applicable Owner policies while on the job site or any Owner property. Applicable policies may include, but are not limited to, tobacco, drugs, language, weapons, and sexual harassment. Failure of a person to comply will be a cause for his or her immediate dismissal from the project.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 Contractor shall describe its policy or warranty in writing regarding both workmanship and material as it applies to the Work, along with the method of adjustment. Contractor shall assume responsibility and warrant for workmanship and materials whether the same are made by the Contractor or Subcontractor or purchased from an outside source.

§ 3.5.3 Bidder warrants workmanship and materials for a period of two (2) years from the date a "Notice of Substantial Completion of Work" is issued.

§ 3.5.4 At the Owner's option, the Contractor shall provide a two (2) year maintenance bond which becomes effective from the date of Substantial Completion.

§ 3.5.5 If Contractor fails to replace, correct, or repair Work which has failed because of faulty material or workmanship during the two (2) year warranty period; KCATA may replace, correct and repair subject work at

KCATA's expense and KCATA will seek recovery from Contractor's surety under maintenance Bond. In the event, the KCATA seeks payment against Contractor's maintenance Bond for Contractor's failure to replace, correct or repair subject work, Contractor agrees and will fully cooperate with KCATA to recover all its expenses related to the replacement, correction, or repair subject work to the KCATA's satisfaction. If KCATA is the prevailing party in any subsequent legal action to recover costs, Contractor agrees to pay, the cost of the work and reasonable administrative fees plus legal expenses.

§ 3.5.5 To the extent necessary, the Contractor shall assign to the Owner (at the time of final completion of the Work) any and all manufacturer's warranties relating to the Work and further agrees to preserve all such manufacturer's warranties.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15. Any claim not timely submitted by the Contractor is waived.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 Unless otherwise part of the Contract Documents, the Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be updated monthly to reflect the actual conditions of progress of the Project and, in the event of delays, shall provide the Owner an affirmative plan designed to correct the delay. In no event shall any progress update constitute an adjustment in the Contract Time period.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.10.4 In the event that the Owner determines that the performance of the Work has not progressed or reached the level of completion required by the Contract Documents, the Owner shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction. The Contractor shall not be entitled to an adjustment in the Contract Sum in connection with the performance of such corrective measures for delays caused by the errors or omissions of the Contractor, subcontractors, or materialmen.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's

responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment. Further, the Contractor shall use best efforts to minimize any interference with the occupancy or use of any areas of buildings adjacent to or near to the site of the Work.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor. Owner may offset costs incurred herein through payment applications when Contractor fails to timely reimburse Owner.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer

or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.17.1 OWNERSHIP, IDENTIFICATION, AND CONFIDENTIALITY OF WORK

.1 All reports, programs, documentation, designs, drawings, plans, specifications, schedules, and other materials prepared, or in the process of being prepared, for the services to be performed by Contractor shall be and are the property of KCATA and shall be identified in an appropriate manner by a title containing KCATA's name and address.

.2 KCATA shall be entitled access to and copies of these materials during the progress of the work.

.3 Any such material remaining in the possession or under the control of the Contractor or in the possession or under the control of a subcontractor upon completion or termination of the work, and for which KCATA has reimbursed the contractor, shall be immediately delivered to KCATA. If any materials are lost, damaged, or destroyed before final delivery to KCATA, the Contractor shall replace them at its own expense, and the Contractor assumes all risks of loss, damage, or destruction of or to such materials.

.4 The Contractor may retain a copy of all materials produced under this Agreement for its own internal use.

.5 Any KCATA materials to which the Contractor has access or materials prepared by the Contractor shall be held in confidence by the Contractor, who shall exercise all reasonable precautions to prevent the disclosure of confidential information to anyone except the officers, employees, and agents of the Contractor as necessary to accomplish the Scope of Services set forth in this Agreement.

.6 Access to or copies of any reports, information, data, etc., available to or prepared or assembled by the Contractor under this Agreement shall not be made available to any third party by the Contractor without the prior written consent of KCATA.

.7 Each tangible product resulting from work performed under this Agreement shall be labeled with information stating that the project has been financed with federal assistance provided by the U.S. Department of Transportation, Federal Transit Administration.

§ 3.17.2 PATENTS AND RIGHTS IN DATA AND COPYRIGHTS

.1 Rights in Data

.1 The term "subject data" used in this clause means recorded information, whether or not copyrighted, that is delivered or specified to be delivered under this Agreement. The term includes graphic or pictorial delineation in media such as drawings or photographs; test in specifications or related performance or design-type documents; machine forms such as punched cards, magnetic tape, or computer memory printouts, and information retained in computer memory. The term "subject data" does not include financial reports, cost analyses, and similar information incidental to contract administration.

.2 The following restrictions apply to all subject data first produced in the performance of this Agreement:

.1 Except for its own internal use, Contractor may not publish or reproduce subject data in whole or in part or in any manner or form, nor may Contractor authorize others to do so, without the written consent of

KCATA may have either released or approved the release of such data to the public.

.2 **In accordance with 2 C.F.R. part 200, Appendix II (F) and 37 C.F.R. part 401, F**ederal Government reserves a royalty-free, non-exclusive, and irrevocable license to reproduce, publish, or otherwise use, and to authorize others to use, for "federal government purposes."

.1 Any subject data developed under this Agreement, where or not Contractor or KCATA registered the copyright has been obtained; and

.2 Any rights or copyright purchased by KCATA or the Contractor using federal assistance in whole or in part provided by FTA.

As used in the previous sentence, "for Federal Government purposes," means use only for the direct purposes of the federal government.

.3 When FTA awards Federal assistance for experimental, developmental, or research work, it is FTA's general intention to increase transportation knowledge available to the public, rather than to restrict the benefits resulting from the work to participants in that work. Therefore, unless FTA determines otherwise, Contractor performing experimental, developmental, or research work, agrees to permit FTA to make available to the public, either FTA's license in the copyright to any subject data developed in the course of the Contract, or a copy of the subject data first produced under the Contract for which a copyright has not been obtained. If the experimental, developmental, or research work, which is the subject of the underlying Contract, is not completed for any reason whatsoever, all data developed under this Contract shall become subject data as defined previously and shall be delivered as the Federal Government may direct. This subsection, however, does not apply to adaptations of automatic data processing equipment or programs for the KCATA or Contractor's use whose costs are financed in whole or part with Federal assistance provided by FTA for transportation capital projects.

.4 Unless prohibited by state law, Contractor agrees to indemnify, save, and hold harmless KCATA and the Federal Government, its commissioners, officers, agents, and employees acting within the scope of their official duties (the "Indemnified Person") against any liability, including costs and expenses, resulting from any claim against Indemnified Person alleging misappropriation or infringement of intellectual property or proprietary rights, copyrights, or rights of privacy of a third party, arising out of the publication, translation, reproduction, delivery, use or disposition of any data or Work furnished under this Agreement. Contractor shall not be required to indemnify and Indemnified Person for any such liability arising out of the wrongful act of such Indemnified Person.

.5 Nothing contained in this Section of rights in subject data shall imply a license to the KCATA or to the Federal Government under any Contractor patent of be construed as affecting the scope of any license or other right granted to the Federal Government under any Contractor patent.

.6 Data that is developed by the KCATA or Contractor under this Agreement and financed entirely without using federal assistance provided by the Federal Government that has been incorporated into work required by this Agreement is exempt from the requirements of subsections (b), (c), and (d) of this Part (2) of this Section, provided that the KCATA or Contractor identifies that data in writing at the time of delivery of the contract work.

.7 Contractor agrees to include these requirements in each subcontract for experimental, developmental, or research work funded in whole or in part with federal assistance.

.2 Patent Rights. If any invention, improvement, or discovery of the Contractor is conceived or first actually reduced to practice in the course of work under this Agreement, and that intervention, improvement, or discovery is patentable under the laws of the United States of America or any foreign country, the Contractor agrees to notify KCATA immediately and provide a detailed report, who in turn shall ultimately notify the FTA. Unless the Federal Government later makes a contrary determination in writing, and irrespective of the Contractor's status (a large business, small business, state government or state instrumentality, local government, non-profit organizations, institution of higher education, individual), the KCATA and Contractor agree to take the necessary actions to provide, through FTA, those rights in that invention due the Federal Government as described in U.S. Department of Commerce regulations, "Rights to Inventions Made but Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," 37 C.F.R. Part 401 and 35 U.S.C. 2000 *et seq*.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall defend, indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, including consequential damages, caused in whole or in part by any act or omission of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 If any action at law or suit in equity is instituted by any third party against Contractor arising out of or resulting from the acts of Contractor in performing work under this Agreement, Contractor shall promptly notify KCATA of such suit.

§ 3.18.3 If any action at law or suit in equity is instituted by any third party against KCATA arising out of or resulting from the acts of Contractor in performing work under this Agreement, and if Contractor has failed to provide insurance coverage to KCATA against such action as required herein, KCATA shall have the right to conduct and control, through counsel of its choosing, the defense of any third party claim, action or suit, and may compromise or settle the same, provided that KCATA shall give the Contractor advance notice of any proposed compromise or settlement. Contractor will be bound to indemnify KCATA for the proposed settlement amount unless within 15 days of the notice, Contractor objects in writing. If the parties are unable to resolve Contractor's objections , KCATA will not be precluded from settling any claim, but Contractor will not be precluded from challenging its liability and the amount of KCATA's payment in any claim by KCATA and Contractor for indemnity. KCATA shall permit Contractor to participate in the defense of any such action or suit through counsel chosen by the Contractor, provided that the fees and expenses of such counsel shall be borne by Contractor. If KCATA permits Contractor to undertake, conduct and control the conduct and settlement of such action or suit, Contractor shall not consent to any settlement that does not include as an unconditional term thereof the giving of a complete release from liability with respect to such action or suit to KCATA. Contractor shall promptly reimburse KCATA for the full amount of any damages, including fees and expenses of counsel for KCATA, incurred in connection with any such action.

§ 3.18.4 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT/ENGINEER

§ 4.1 General

§ 4.1.1 The Owner may retain an Architect/Engineer lawfully licensed to practice architecture or engineering or an entity lawfully practicing architecture or engineering in the jurisdiction where the Project is located. The Architect/Engineer is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect/Engineer is terminated, the Owner shall employ a successor architect/engineer as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect/engineer.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect/Engineer will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect/Engineer issues the final Certificate for Payment. The Architect/Engineer will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect/Engineer will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect/Engineer will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect/Engineer will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences, or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect/Engineer will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect/Engineer will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect/Engineer will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect/engineer about matters arising out of or relating to the Contract. Communications by and with the Architect/engineer's consultants shall be through the Architect/engineer. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner. Architect/Engineer shall keep Owner informed of all relevant project information and communications that may potentially impact the project scope, cost, and schedule in any way.

§ 4.2.5 Based on the Architect/Engineer's evaluations of the Contractor's Applications for Payment, the Architect/Engineer will review and recommend the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect/Engineer has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect/Engineer considers it necessary or advisable, the Architect/Engineer will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed, or completed. However, neither this authority of the Architect/Engineer nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect/Engineer to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect/Engineer will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect/Engineer's action will be taken in accordance with the submittal schedule approved by the Architect/Engineer or, in the absence of an approved submittal schedule, with reasonable promptness while allowing

sufficient time in the Architect/Engineer's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect/Engineer's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect/Engineer's approval of a specific item shall not indicate approval of an assembly of which the item is a component. The Architect/Engineer's approval of a specific item shall not indicate approval of an assembly of which the item is a component. The Architect/Engineer shall notify and obtain approval from the Owner of any shop drawing edits that may potentially impact the project scope, cost, and schedule within 3 business days of the Architect/Engineer becoming aware of the need of a potential edit to the shop drawings.

§ 4.2.8 The Architect/Engineer will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect/Engineer will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4. The Architect/engineer shall notify and obtain approval from the Owner of any proposed minor changes that may potentially impact the project scope, cost, and schedule within three (3) business days of the Architect/engineer becoming aware of the need of a potential change in the work.

§ 4.2.9 The Architect/Engineer will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect/Engineer agree, the Architect/Engineer will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities, and limitations of authority of the Project representatives.

§ 4.2.11 The Architect/Engineer with direct input from Owner will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect/Engineer's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect/Engineer will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings.

§ 4.2.13 The Architect/Engineer's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect/Engineer will review and respond to requests for information about the Contract Documents. The Architect/Engineer's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect/Engineer will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the bidding requirements, the Contractor, shall furnish in writing to the Owner a list of all Subcontractors and major suppliers name, contact information and scope of work to the Contracting Officer (KCATA Procurement Staff) the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) within two (2) business days of receipt of Notice of Intent to Award. The Contracting Officer may reply within fourteen (14) business days to the Contractor in writing stating (1) whether the Owner or the Contracting Officer has reasonable objection to any such proposed person or entity or (2) that the Contracting Officer requires additional time for review.

§ 5.2.2 None of the work or services covered by this Agreement shall be subcontracted without the prior written approval of KCATA. The only subcontractors approved for this Contract, if any, are listed on an Appendix to this Contract. Any substitutions or additions of subcontractors must have the prior written approval of KCATA in its sole discretion. Contractor shall be solely responsible for reimbursing any subcontractors or service firms, and Owner shall have no obligation to them, provided KCATA has accepted and reimbursed Contractor for the subcontractors' or service firms' work. If Contractor fails to reimburse subcontractors or service firms after receiving reimbursement from KCATA for the subcontractors' or service firms' work, KCATA reserves the right to directly reimburse the subcontractor or service firm and withhold such payments directly from any future payments to Contractor, any retainage held by KCATA on this Contract, or draw down on any letter of credit provided in lieu of retainage under this Contract. KCATA requires lien waivers from all subcontractors before reimbursement is made to the Contractor. A breakdown of all payments to subcontractors shall be included with Contractor's payment requests submitted to KCATA.

§ 5.2.2.1 Prompt Payment. The Contractor shall establish procedures to ensure timely payment of amounts due pursuant to the terms of its subcontracts. The Contractor is required to pay its DBE and non-DBE subcontractors performing work related to this Contract for satisfactory performance of that work in accordance with the timing set forth in any applicable laws or no later than thirty (30) days, whichever is less, after the Contractor's receipt of payment for that work from the KCATA. Any delay of payment from the above-referenced time frame may occur only for good cause following the written approval of KCATA. A breakdown of all payments to DBE and non-DBE subcontractors shall be included with the Contractor's payment requested submitted to KCATA on the form titled, "Subcontractor Monthly Utilization Report."

§ 5.2.2.2 Prompt Payment Retainage. If retainage is withheld from subcontractors, Contractor is required to return any retainage payment to those DBE and non-DBE subcontractors with the timing set forth in any applicable laws or no later than thirty (30) days, whichever is less, from receipt of the retainage payment related to the subcontractor's work. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of KCATA.

§ 5.2.2.3 A breakdown of all payments to DBE and non-DBE subcontractors and major suppliers (project materials costing more than $10,000 or as otherwise approved by Owner) shall be included with Contractor's payment requests submitted to KCATA.

§ 5.2.2.4 Subcontract Provisions. Any subcontracts related to this Contract must contain adequate provisions to define a sound and complete Contract. In addition, all subcontracts shall contain contractual provisions or conditions that allow for:

.1 Administrative, contractual, or legal remedies in instances where subcontractors violate or breach contract terms, including sanctions and penalties as may be appropriate.

.2 Termination for cause and for convenience including the manner by which it will be effected and the basis for settlement.

.3 The following provisions if included in this Agreement:

Bonding
Breach of Contract; Remedies
Civil Rights
A. Nondiscrimination
B. Equal Employment Opportunity
C. Americans with Disabilities Act

D. ADA Access Requirements
Debarment and Suspension
Disadvantaged Business Enterprise (DBE)
Disclaimer of Federal Government Obligations or Liability
Dispute Resolution
Employee Protections
A. Construction Employee Protections
B. Employee Protections – General
Employee Eligibility Verification
Environmental
A. Clean Air
B. Recovered Materials/Recycled Products
C. Clean Water
D. Energy Conservation
Federal Changes
Federal Tax Liability and Convictions
Fraud and False or Fraudulent Statements or Related Acts
Governing Law; Choice if Judicial Forum
Incorporation of Federal Transit Administration Terms
Lobbying Restrictions
National Intelligent Transportation Systems Architecture & Standards
Ownership, Identification, and Confidentiality of Work
Patents and Rights in Data and Copyrights
Privacy Act Requirements
Prohibited Interests
Prohibited Weapons and Materials
Prohibition on Restricted Telecommunications and Surveillance Equipment
Record Retention & Access
Seat Belt Use Policy
Seismic Safety
Subcontractors
Termination
Texting While Driving and Distracted Driving
U.S. Product and Service Preference
A. Buy America
B. Cargo Preference
C. Fly America

.4 The Contractor will take such action with respect to any subcontractor or procurements as KCATA or the U.S. Department of Transportation may direct as means of enforcing such provisions.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.2.5 The Contactor at Owner's request shall timely provide at their cost any and all subcontracts associated with the project. The Contractor, as a material condition of this contract at Owner's request timely make any subcontract modifications the Owner deems appropriate. Time is of the essence for compliance with the provision; in no event shall any requested change take more than 30 days to complete by the Contractor and subcontractor(s). As determined by the Owner, failure of the Contractor to complete any requested subcontract change(s) shall result in the contract price being adjusted and decreased by the Owner in an amount equal to the total amount of federal

dollars received by the Owner for the project, which could exceed one hundred percent of the total contract value or price, which also includes all change orders.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction

schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 The Contractor shall assume all responsibility and costs in complying with federal, state, and local regulations for equal employment opportunity, anti-discrimination, safety, and other regulations. The Contractor shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, ethnic group, national origin, age, or sexual orientation. The Contractor shall take affirmative action to ensure that applicants are employed, and that applicants are treated during employment, without regard to that applicant's race, religion, color, sex, ethnic group, national origin, age, or sexual orientation. Such action shall include, but not limited to, employment, upgrading, demotion, transfer, recruitment, advertisement, layoff termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Contractor shall post in conspicuous places, available to employees and applicants for employment, notices setting forth the requirements of these non-discrimination provisions.

§ 6.1.5 The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex, ethnic group, national origin, age, or sexual orientation.

§ 6.1.6 The Contractor shall include all of Sections 6.1.4 through 6.1.5 in every subcontract or purchase order and shall require each Subcontractor and material and equipment supplier to include Sections 6.1.4 through 6.1.5 in each of their subcontracts and purchase orders, so that such provisions will be binding upon each Subcontractor, Sub-Subcontractor, and material and equipment supplier.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities, or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive, or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires approval by the Owner and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone. The parties agree any dispute over a Construction Change Directive will not delay the Project. Contractor shall perform the work as directed in the Construction Change Directive. The parties will work in good faith reach a resolution of any disputes arising from the Construction Change Directive. If the disputes cannot be resolved both parties reserve the right pursue a claim under Section 15.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.1.4 The bonds shall be automatically increased in amount and extended in time to cover full and faithful performance of the Contract in the event of Change Orders, regardless of the amount of time or money involved. It is the Contractor's responsibility to notify his Surety of any changes affecting the general scope of work or change in the Contract price or time.

§ 7.1.5 At any time during the continuance of the contract that the Surety on any bond becomes unacceptable to Owner for financial reasons, the Owner has the right to require additional and sufficient sureties which Contractor shall furnish to the satisfaction of the Owner within ten (10) days after notices to do so.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- **.1** The change in the Work;
- **.2** The amount of the adjustment, if any, in the Contract Sum; and
- **.3** The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 For any work for which unit prices have not been established, the Contractor shall prepare and submit for approval a proposal covering the changes required in the Work. The proposal shall cover all cost as defined, broken down as to labor, material, tool rental, and subcontracted work. To these items, if change order is for additional work, shall be added a percentage of the costs of labor, material, and equipment as the Contractor's fee for overhead and profit. Also included shall be a percent of value of subcontracted work. If the change order is for a decreased amount of work, credit to the KCATA shall be one hundred percent (100%) of the accrued savings.

§ 7.2.3 If the change order is for a decrease in the amount of work, credit to the KCATA shall include overhead and direct costs, unless the Contractor's fee for overhead and profit are fixed by competitive bid on the Bid Response Form.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- **.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- **.2** Unit prices stated in the Contract Documents or subsequently agreed upon;
- **.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- **.4** As provided in Section 7.3.4.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices may be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be incorporated into a subsequent Change Order.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect has authority order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

§ 7.4.2 Architect-initiated clarifications will be issued in, Architect's Supplemental Instructions (ASI). The Contractor, within 10 days of date of issuance of ASI, shall respond in either of the following ways:

.1 Accept the ASI as issued by signing, dating, and returning two copies.
.2 State in writing that the ASI is not acceptable because of a need to change the Contract Sum and/or Contract Time and issue a Contractor Proposal outlining changes.

§ 7.4.3 If neither response is received within 10 days, the conditions of the ASI shall become binding on all parties and accepted into the Contract Documents, and the Contractor shall waive his right to file a claim for an increase in Contract Sum and/or Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement. If the project start date is delayed due to permitting delays, the contract term shall be extended accordingly. The Contractor shall not be entitled to any additional costs for the delay. The Contractor shall pay for all building construction permits, including minor (e.g., grading permit, traffic control permit, street restoration permit) permit fees if required by the municipality.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine. Any claim for additional time must be submitted within seven (7) days of the event giving rise to the claim. Any claim not timely submitted is waived.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15. Contractor agrees that any delay period of three (3) months or less is not compensable and therefore waives any such claims. Claims made for delays lasting more than three (3) months at a time will be negotiated.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Owner and Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Owner or Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Owner and Architect and supported by such data to substantiate its accuracy as the Owner or Architect may require, and unless objected to by the Owner or Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents. The Form of Application for Payment shall be AIA Document G-702, 'Application and Certification for Payment,' supported by AIA Document G-702A, 'Continuation Sheet.' The Contractor shall submit "Certified Payroll Report" and partial lien waivers with each application for payment in a form acceptable to Owner.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.3.4 The full Contract retainage five (5%) may be reinstated if the manner of completion of the Work and its progress do not remain satisfactory to the Architect and the KCATA's Project Manager, or if the Surety withholds its consent, or for other good and sufficient reasons.

§ 9.3.5 The Contractor (and the Contractor's surety) shall be liable for and shall pay to the KCATA the liquidated

damage sums stipulated and fixed herein, according to the agreed liquidated damage sums for each calendar day the Work remains uncompleted after expiration of the Contract time.

§ 9.3.6 Applications for payment shall be submitted directly to KCATA's Procurement representative identified in this agreement. All invoices shall be numbered, dated, and contain full descriptive information of products, equipment, materials, work, or services furnished. All invoices and correspondence shall reference KCATA's Purchase Order number or Contract number. Separate invoices shall be submitted for each purchase order or work (task) order.

§ 9.3.7 Contractors utilizing subcontractors shall provide a detailed breakout by prime, majority subcontractor(s) and/or DBE Subcontractor(s) on each invoice submitted for payment. Invoice shall contain a summary section which shows current payment and cumulative. Contractor shall submit this information on the "Subcontractor Monthly Utilization Report" form. Contractor is required to pay its DBE and non-DBE subcontractors performing work related to this Contract for satisfactory performance of that work in accordance with the timing set forth in any applicable laws or no later than thirty days, whichever is less, after the Contractor's receipt of payment for that work from the KCATA. If retainage is withheld from subcontractors, Contractor is required to return any retainage payment to this DBE and non-DBE subcontractors with the timing set forth in any applicable laws or no later than 30 days, whichever is less from receipt of the retainage payment related to the subcontractor's work. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of KCATA. KCATA may perform random audits and contact DBE subcontractors to confirm the reported participation. Failure to meet the contracted goal without documented evidence of a good faith effort may result in the termination of this Agreement.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials, or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or a Separate Contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;

.7 repeated failure to carry out the Work in accordance with the Contract Documents;

.8 unsatisfactory prosecution of the Work by the Contractor.

.9 failure to submit Certified Payroll Receipts, partial lien waivers and other documents as may be required by the Architect on behalf of the KCATA's Project Manager.

§ 9.5.2 In addition, the Owner may withhold or cause to be withheld from the Contractor any amounts reasonably necessary a) to protect Owner from damages caused by Contractor b) to pay the laborers or mechanics, including apprentices and trainees, employed by the Contractor or Subcontractor on the Work the full amount of wages required by the Contract, and c) to satisfy any liability of any Contractor for delay damages and/or liquidated damages.

§ 9.5.3 If the Contractor or any Subcontractor fails to pay any laborer or mechanic, including apprentices and trainees, employed or working on the site of the Work, all or part of the wages required by the Contract, the Owner may, after written notice to the prime Contractor, take such action as may be necessary to cause suspension of any further payments or advances until such violations have ceased.

§ 9.5.4 Right to Offset; Payments Under Protest.

1. The Owner, without waiver or limitation of any rights, may deduct from any amounts due Contractor in connection with this contract, or any other Agreement between Contractor and Owner, any amounts owed by Contractor to Owner, including amounts owed by Contractor, as provided above, and/or to ensure Contractor's obligation to indemnify the Owner against third party claims arising out of Contractor's performance of Work under this Agreement.

.2 If any time a dispute shall arise as to any amount or sum of money to be paid by one party to the other party, under the provisions of this Agreement, the party against whom the obligation to pay the money is asserted shall have the right to make payment "under protest" and such payment shall not be regarded as a voluntary payment and there shall survive the right on the party of said party to institute permitted actions for the recovery of such protested sum, and if it shall be finally determined that there was no legal obligation on the part of said party to pay such sum or any part thereof, said party shall be entitled to recover such sum or so much thereof as it was not legally required to pay under the provisions of this Agreement, together with interest thereon at 1% per annum if paid to the other party. If at any time a dispute shall arise between the parties hereto as to any work to be performed by either of them under the provisions hereof, the party against whom the obligation to perform the work is asserted my perform such work and pay the cost thereof "under protest" and the performance of such work shall in no event be regarded as a voluntary performance and there shall survive the right on the part of said party to institute permitted actions for the recovery of the costs of such work, and if it shall be adjudged that there was no legal obligation on the party of said party to perform the same or any part thereof, said party shall be entitled to recover the cost of such work or the costs of so much thereof as said party was not legally required to perform under the provisions of this Agreement, together with interest thereon at 1% per annum.

§ 9.5.5 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.6 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 Immediately, upon receipt of each progress payment and upon receipt of the final payment as provided in Article 9 of these General Conditions, the Contractor shall provide Owner with a written statement, under oath, certifying that the Contractor has properly and fully paid Subcontractors and material and equipment suppliers the sums due and owing the Subcontractors as evidenced by the Application for Payment, together with a lien waiver from Contractor and all such Subcontractors and Suppliers. If the Contractor fails to furnish such evidence, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law. Contractor shall not be entitled to receive any further payments pursuant to the Contract unless and until Contractor is in compliance with the terms of this Section.

§ 9.6.6 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage, or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within thirty (30) days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution (subject to Contractor's compliance with the provisions of the Contract), then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the

amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when each and every component of the Work as itemized in the Schedule of Values, is at least 95% complete and operational or may be occupied in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use, including the issuance of a full certificate of occupancy. KCATA relies on Contractor's experience and knowledge to safely install/build the equipment or structure consistent with manufacturer's instruction unless otherwise unsafe. The Contractor is responsible for testing the equipment and confirm it is operationally safe and consistent with intended use prior to acceptance and substantial completion.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Contractor shall submit a request for Certificate of Substantial Completion to the Owner for written acceptance of responsibilities assigned to the Contractor in such Certificate. Upon Substantial Completion, all retainage shall be deemed a disputed payment until final acceptance, in accordance with RSMo 436.300, *et seq.* Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- **.1** employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 2 business days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition in writing. Failure to notify the Owner and/or proceeding with Work in the affected area after recognizing hazardous materials shall constitute a negligent act on the party or parties having actual knowledge of the existence of hazardous materials and shall indemnify the KCATA from litigation and acts, penalties, fines, and restrictions as may be imposed by the federal government or the State of Missouri.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of

persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor and KCATA from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

.1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;

.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;

.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

.4 Claims for damages insured by usual personal injury liability coverage;

.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

.6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance, or use of a motor vehicle;

.7 Claims for bodily injury or property damage arising out of completed operations; and

.8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified below or required by law, whichever coverage is greater, and shall include blanket contractual liability insurance under the

Liability and Indemnification sections in this Agreement. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents. The KCATA, its commissioners, officers and employees shall be named as additional insureds on all policies, except Professional Liability and Workers Compensations policies.

.1 Workers Compensation:

a. State: Statutory Kansas or Missouri
b. Applicable Federal (i.e. Longshoreman's): Statutory
c. Employer's Liability:

Bodily Injury by Accident $500,000 each incident
Bodily Injury by Disease: $500,000 each employee
Bodily Injury by Disease: $500,000 policy limit

The Contractor and any subcontractor shall maintain adequate worker's compensation insurance in conformance with the laws of the State of Missouri and/or Federal laws where applicable to cover all employees during performance of services, or during delivery, installation, assembly, or related services in conjunction with this Agreement. The Contractor and any subcontractor further agree to hold KCATA harmless from any costs due to accident or other liabilities that may be subject to the Worker's Compensation Law.

.2 Commercial General Liability (including Premises-Operations; Independent Contractor's Protective; Products and Completed Operation; Broad Form Property Damage, Broad Form CGL; Blanket Contractual; X, C, and U).

a. Bodily Injury:
Each Occurrence $1,000,000
Annual Aggregate $2,000,000

b. Property Damage:
Each Occurrence $1,000,000
Annual Aggregate $2,000,000

c. Personal Injury:
Annual Aggregate $2,000,000

d. Products Liability and Completed Operations Insurance to be maintained for one (1) year after final payment.

e. Property Damage Liability Insurance shall include X, C, or U coverage if exposure exists.

f. Broad Form Property Damage shall include Completed Blanket Operations.

.3 Umbrella/Excess Liability Policy $5,000,000.

.4 Blanket Contractual Liability:

a. Bodily Injury:
Each Occurrence $1,000,000
Annual Aggregate $1,000,000

b. Property Damage:
Each Occurrence $1,000,000
Annual Aggregate $2,000,000

.5 Comprehensive Automobile Liability (including owned, hired, and non-owned vehicles):

a.	Bodily Injury:	
	Each Occurrence	$1,000,000
	Annual Aggregate	$1,000,000
b.	Property Damage	$1,000,000 Each Occurrence

Contractor shall procure and maintain at all times during the term of this Agreement Commercial General Liability insurance for liability arising out of the operations of the Contractor and any subcontractor. The policy(ies) shall include Comprehensive Automobile Liability coverage for all vehicles, licensed or unlicensed, on or off KCATA premises, whether the vehicles are owned, hired or non-owned, covering use by or on behalf of the Contractor and any subcontractors during the performance of work under this Agreement. The policy(ies) shall include coverage for the Contractor's and its subcontractors' products and completed operations. The Contractor shall be responsible for all premiums associated with the requested policy(ies) and endorsements. The policy(ies) shall include coverage for the Contractor's and Subcontractors' products and completed operations for the duration of warranty terms or at least two (2) years following the project completion, longer, or as otherwise noted.

The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) coverage for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2)coverage for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

.6 Professional Liability Insurance: $1,000,000.00 Each Occurrence
$5,000,000.00 Annual Aggregate

Where applicable, Contractor shall procure and maintain professional liability insurance covering damages caused by any error, omission or any negligent acts of the Contractor or its employees with regard to Contractor's performance and arising from the work performed under the Purchase Order or this Agreement. Insurance for negligent acts, errors, or omissions committed or alleged to have been committed by Contractor and professional subcontractors shall be provided.

The Contractor will maintain the above Professional Liability coverage and limits for a minimum of two years beyond the expiration date of this Agreement and any extension thereof. In lieu of the foregoing, KCATA will accept a certified copy of the policy with an endorsement extending the discovery period for two years and that KCATA will receive written notice within thirty days of any change in the extended discovery period.

In lieu of providing professional liability coverage for professional subcontractors, Contractor may cause professional subcontractors to independently comply with this section.

.7 Pollution Liability $1,000,000 Each Occurrence
$5,000,000 Annual Aggregate

Where applicable, the Contractor shall obtain and keep in effect during the term of the KCATA Purchase Order or this Agreement, Pollution Liability Insurance including clean up and remediation costs arising out of the work or services to be performed under the purchase order or this Agreement. Coverage shall apply to the above for premises and operations, products and completed operations and automobile liability. Automobile liability coverage may be satisfied by utilizing ISO Endorsement CA 9948 or equivalent.

.8 The Insurer(s) for Contractor shall agree that its policy(ies) is primary insurance and that it shall be liable for the full amount of any loss up to and including the total limit of liability without right of contribution from any other insurance or self-insurance KCATA may have.

.9 Cyber Liability Policy $1,000,000 Each Occurrence

§ 11.1.3 Certificates of Insurance/Endorsements. The Contractor shall be required to furnish certificates of insurance prior to execution of the contract. The insurance should be written with companies acceptable to the KCATA, and the companies should have a minimum A. M. Best's insurance rating of A-(VIII). An exception to the minimum A. M. Best rating is granted for workers compensation exposures insured through the Builders Association Self Insurance Fund (BASIF).

.1 The Certificate and the policies shall state that the Kansas City Area Transportation Authority, its commissioners, officers, and employees are named as additional insureds on the policies covered by the certificate, except Professional Liability and Workers Compensation. The KCATA will be given a 30-day notice prior to any decrease in limits or cancellation of any policy covered by the certificate of insurance.

.2 In no event shall the total limit(s) of liability available for any one occurrence or accident be less than the amount shown above.

.3 An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required in this Agreement and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness. The certificate of insurance shall specifically state that blanket contractual liability is applicable. Explosion, collapse, and underground coverage shall be included when the exposure exists.

.4 In addition to the above certificates required herein, the Contractor shall furnish to the Owner copies of any endorsements that are subsequently issued amending coverage or limits. Pertaining to the "Other Insurance" clause in the Contractor's policy - the Insurance Certificate shall state that **"any coverage afforded the certificate holder as an additional insured shall apply as primary and not excess or contributing to any insurance issued in the name of the certificate holder."**

§ 11.1.4 Policies. The Contractor shall be required to furnish to KCATA copies of required insurance policies and relevant additional insured endorsements of insurance upon request If copies of the required insurance policies or endorsements are then available, the Contractor shall be required to furnish certificates of insurance prior to execution of the contract, and thereafter furnish copies of the policies and additional insured endorsements, from time to time, whenever reasonably requested by KCATA. The certificates (with the exception of Professional Liability and Workers Compensation coverage) shall specifically state that:

.1 Contractual liability coverage is applicable; and

.2 The Kansas City Area Transportation Authority, its commissioners, officers, and employees are named as additional insureds on the policies covered by the certificate; using this specific wording: "***Kansas City Area Transportation Authority, its commissioners, officers, and employees are named as additional insureds as respects general liability and where required by written contract. Any coverage afforded the certificate holder as an additional insured shall apply as primary and not excess or contributing to any insurance or self-insurance in the name of the certificate holder and shall include a waiver of subrogation.***"

§ 11.1.5 If the Owner is damaged by the failure of the Contractor to maintain the required insurance and to provide the required certificates to Owner, the Contractor shall bear all reasonable costs properly attributable thereto.

§ 11.1.6 Further, from time to time and whenever reasonably requested by KCATA, the Contractor shall represent and warrant to KCATA (1) the extent to which the insurance limits identified below have been, or may be, eroded due to paid or pending claims under the policies; and (2) the identity of other entities or individuals covered as an

additional insurer's obligation to pay defense costs under the policies is in addition to, and not part of the liability limits stated in the policies.

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§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall be responsible for purchasing and maintaining an Owner's Excess liability insurance.

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 The Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If this insurance is written with the stipulated amounts deductible under the terms of the policy, the Contractor shall pay the difference attributable to deductions in any payments made by the insurance carrier on claims paid by this insurance.

§ 11.3.1.3 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.4 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE

The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.4 WAIVERS OF SUBROGATION – NOT USED

§ 11.3.5 A loss insured under the Contractor's property insurance shall be adjusted by the Contractor as fiduciary and made payable to the Contractor as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.6 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Contractor's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Contractor shall deposit in a separate account proceeds so received, which the Contractor shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.7 The Contractor as fiduciary shall have the power to adjunct and settle a loss with insurers and any of the parties interested.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as well as statutory and a two (2) year Maintenance Bond. Bonds may be obtained through the Contractor's usual source, and the cost thereof shall be included in the Contract Sum. The amount of each bond shall be equal to one hundred percent (100%) of the Contract Sum unless otherwise stated in the INVITATION FOR BIDS (IFB). A cash deposit, certified check, irrevocable letter of credit (LOC), or other negotiable instrument may be accepted by KCATA in lieu of a payment bond. The form of any substitution in lieu of a payment and performance bonds must be approved by KCATA. The cash deposit, certified check, irrevocable LOC, or other negotiable instrument accepted in lieu of such bonds must remain valid and in effect for the full term of this Agreement.

§ 11.4.1.1 If used, the LOC shall be irrevocable, unconditional, and issued by an acceptable federally insured financial institution. The LOC must cover the entire period of performance or may be submitted with an initial expiration date, which is a minimum period of one year from the date of issuance, with a provision, which states that the LOC is automatically extended without amendment for one year from the expiration date, or any future expiration date, until the period of performance is completed. The period of performance shall not end until resolution of all claims filed against the payment bond during the one-year period following final payment.

§ 11.4.1.2 The Contractor shall deliver the required bonds to the KCATA not later than seven (7) calendar days following the date of the Notice of Intent to Award. A licensed surety company shall secure the payment and performance bonds and maintenance bond. The payment and performance bonds shall remain valid and in effect for the full term of this Agreement.

§ 11.4.1.3 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

§ 11.4.2 Prior to final payment, the Contractor shall furnish separate maintenance (or guarantee) bonds in form acceptable to KCATA written by the same corporate surety that provides the performance bond for this Agreement. The maintenance bond shall secure the Contractor's obligation to replace or repair defective products, equipment and materials and faulty workmanship for a minimum period of two (2) years after substantial completion and shall

be written in an amount equal to one hundred percent (100%) of the Contract Sum, as adjusted (if at all).

§ 11.4.2.1 The effective date of the two (2) year Maintenance Bond is the date of Substantial Completion.

§ 11.4.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 All work shall be inspected by Owner's representative prior to being covered or installed. If Contractor fails to properly inform Owner's representative prior to covering or installing work, it will be at Owner's discretion to require the Work to be removed and reinstalled under Owner's inspection and approval. If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed, or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within two year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the two-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5. After the two-year warranty period, if Owner discovers a recurrence of a problem previously identified during the warranty period, the Owner may require the Contractor to complete the repairs or make the corrections at the Contractor's expense.

§ 12.2.2.2 The two-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 Not used.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

This Agreement shall be deemed to have been made in, and be construed in accordance with the laws of the State of Missouri, except those pertaining to conflicts of laws. **ANY ACTION OF LAW, SUIT IN EQUITY, OR OTHER JUDICIAL PROCEEDING TO ENFORCE OR CONSTRUE THIS AGREEMENT, RESPECTING ITS ALLEGED BREACH, SHALL BE INSTITUTED ONLY IN THE CIRCUIT COURT OF JACKSON COUNTY, MISSOURI**.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to another public entity or a lender providing construction financing for the Project, if the public entity or the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Written Notice

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice. The Contractor has an affirmative duty to provide an active, current, and valid business address to the Owner where Contractor can receive notices under this contract.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall be required to coordinate with Owner's representative such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public entity. Copies of such test results and inspections shall be filed with the Architect and the KCATA. The Owner will select a testing laboratory and shall bear all costs of test, inspections, and approvals. The Contractor shall give the testing laboratory, the Architect and the KCATA's Project Manager timely notice of when

and where tests and inspections are to be made so that they may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements All work shall be tested and inspected by Owner's representative prior to being covered or installed. If Contractor fails to properly inform Owner's representative prior to covering or installing work, it will be at Owner's discretion to require the Work to be removed and reinstalled under Owner's inspection and approval.

§ 13.4.1.1 Pre-contract award inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of 1) Contractor until after bids are received or negotiations concluded; and (2) tests, inspections. or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor, and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of ninety (90) consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 150 percent of the total number of days scheduled for completion, or 180 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, completed, and accepted, including reasonable overhead and profit, and costs incurred by reason of such termination. Contractor shall not be entitled to project profit or overhead costs and expenses for uncompleted work.

§ 14.1.4 If the Work is stopped for a period of 90 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract and/or Contractor's right to perform or complete Work if the Contractor:

- **.1** refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract and/or Contractor's right to perform or complete the Work for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

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§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract and/or Contractor's right to perform or complete the Work; provided, that such payment shall not exceed the value of the Work actually completed and materials supplied as of the date of termination, and the Contractor shall not be entitled to anticipated profits or anticipated overhead upon the whole Contract or for other direct, indirect, or consequential damages arising out of or resulting from the Owner's termination.

§ 14.2.5 Funding Contingency. If this Agreement is subject to financial assistance provided by the U.S. Department of Transportation, the Contractor agrees that withdrawal or termination of such financial assistance by the U.S. DOT may require KCATA to terminate this Agreement in accordance with other provisions of this Agreement.

§ 14.2.6 Opportunity to Cure. KCATA in its sole discretion may, in the case of a termination for breach or default, allow the Contractor an appropriately short period of time in which to cure the defect. In such case, the written notice of termination will state the time period in which cure is permitted and other appropriate conditions.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include real costs incurred by Contractor during suspension. No adjustment shall be made to the extent

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause. Such termination shall be without prejudice to any Claims which Owner may have against the Contractor.

§ 14.4.1.1 The Owner may, at any time, terminate the Contract if the Owner determines that Owner does not have sufficient funds for the lawful purpose of paying obligations of Owner under the Contract between the Owner and Contractor. The Owner and Contractor acknowledge the provisions and limitations of the Missouri cash-basis law, Mo. Const. Art. 6, §26(a) and RSMo 67.010 *et seq.*, as amended, and agree that the Contract between Owner and Contractor will be deemed void *ab initio.*

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts, and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for work executed and costs incurred by reason of such termination. No compensation for overhead or profit will be made for work not executed.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims by Contractor

§ 15.1.3.1 Claims by Contractor must be initiated by written notice to Owner and to the Initial Decision Maker with a copy sent to the Architect if the Architect is not serving as the Initial Decision Maker. Claims by Contractor must be initiated within 7 days after occurrence of the event giving rise to such Claim or within 7 days after Contractor first recognizes the condition giving rise to the Claim, whichever is later. Notice shall include an estimated cost for the claim. Any claim not timely submitted is waived.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, timely notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4. Any claim not timely submitted is waived.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary. Any claim not timely submitted is waived.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction. For conditions of weather or conditions at the site, an average or usual number of inclement days when the Work cannot proceed are to be anticipated during the construction period and are not to be considered as warranting extension of time.

.1 Time Extensions for Unusually Severe Weather:

.2 Definitions:

.1 Adverse Weather: Atmospheric conditions or the impact thereof at a definite time and place which are unfavorable to construction activities such that they prevent work on critical activities for 50 percent (50%) or more of the Contractor's scheduled workday.

.2 Unusually Severe Weather: Weather which is more severe than the adverse weather anticipated for the season, location, or activity involved.

.3 In order for any request for time extension due to unusually severe weather to be valid, the Contractor must document both of the following conditions:

.1 The weather experienced at the project site during the Contract period is more severe than the adverse weather anticipated for the project location during any given month; and

.2 The unusually severe weather actually caused a delay to the completion of the project. The delay must be beyond the control and without fault or negligence by the Contractor.

.3 The following schedule of monthly anticipated adverse weather delays will constitute the baseline for monthly weather time evaluations. The Contractor's Progress Schedule must reflect these anticipated adverse weather delays in all weather affected activities:

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY
WORK DAYS BASED ON FIVE (5) DAY WORK WEEK

January	10	May	7	September	5
February	8	June	7	October	4

March	7	July	5	November	5
April	6	August	5	December	9

.4 Upon receipt of the Notice to Proceed, and continuing throughout the Contract, the Contractor shall record on their daily construction report, the occurrence of adverse weather and resultant impact to normally scheduled work.

.5 The number of actual adverse weather delay days shall include days impacted by actual adverse weather (even if adverse weather occurred in the previous month), and shall be calculated chronologically from the first to the last day of each month, and be recorded as full work days.

.6 If the number of actual adverse weather delay days in a given month exceeds the number of days anticipated above, the difference shall be multiplied by 7/5 to convert any qualifying work day delays to calendar days. The resulting number of qualifying lost days shall be added to the Contract Time.

.7 The determination that unusually severe weather occurred does not automatically mean an extension of time will be granted. The Contractor must substantiate the unusually severe weather delayed work activities on the critical path of the Progress Schedule.

.8 Full consideration for equivalent fair weather work days shall be given. If the number of actual adverse weather delays in a given month is less than the number of days anticipated as indicated above, the difference shall be multiplied by 7/5 to convert any work day increases to calendar days. The resulting number of qualifying extra days will be accumulated and subtracted from any future month's days lost due to unusually severe weather.

.9 The net cumulative total of extra days/lost days shall not result in a reduction of Contract Time and the Date of Substantial Completion shall not be changed as a result of unusually favorable weather.

.10 In converting work days to calendar days, fractions 0.5 and greater shall be rounded up to the next whole number. Fractions less than 0.5 shall be dropped.

.11 The Contractor shall summarize and report all actual adverse weather delay days for each month to the Architect by the tenth (10th) day of the following month. A narrative indicating the impact of adverse weather conditions on the scheduled critical activities shall be included.

.12 Any claim for extension of time due to unusually severe weather shall be submitted to the Architect within 15 days of the last day of the month in which the delay occurred. Resolution of any claim shall follow the procedures established by the General Conditions of the Contract for Construction and as prescribed above.

.13 The Contractor shall include and indicate the monthly anticipated adverse weather days, listed above, in their Progress Schedule.

.14 The Contractor shall indicate the approved adverse weather days (whether less or more than the anticipated delays) in their monthly Progress Schedule update.

§ 15.1.6.3 Bid unit prices shall be used for either increases or decreases in pricing of Change Orders. Contract price adjustment by Change Order requires all savings shall accrue one hundred percent (100%) to the KCATA. The Contractor will substantiate all "lump sum" bid prices by presentation of vendors or subcontractors invoices which will be price adjusted by the Contractor's fee for overhead and profit.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons;

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work; and

.3 the negligent acts of the Contractor or his subcontractors which cause additional expense to the Owner for rental, for loss of use, income, profit, financial business, and representation and for loss of management or employee productivity or of the services of such persons are exempt from this mutual waiver.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision

Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to litigation.

§ 15.2.6 If a claim has not been resolved after consideration of the foregoing, and of further evidence presented by the parties, or requested by the Architect, the dispute shall be decided by the Owner's Director of Procurement as Initial Decision Maker, who shall reduce this decision to writing and furnish a copy thereof to the Contractor. The decision of the Director of Procurement shall be final and conclusive unless within ten (10) days from the date of receipt of such copy, the Contractor furnishes a written appeal addressed to the KCATA's Chief Financial Officer (CFO) with copy to the Director of Procurement, for the determination of such appeals which shall be final and conclusive unless determined by a court of competent jurisdiction to have been fraudulent or capricious, or arbitrary, or so grossly erroneous as necessarily to imply bad faith, or not supported by substantial evidence. In connection with any appeal proceeding under this clause, the Contractor shall be afforded an opportunity to be heard and to offer evidence in support of its appeal. Pending final decision of a dispute hereunder, the Contractor shall proceed diligently with the performance of the Contract and in accordance with the Director of Procurement's decision.

§ 15.2.7 The duties and obligations imposed by this Agreement and the rights and remedies available hereunder shall be in addition to and not a limitation of any duties, obligations, rights, and remedies otherwise imposed or available by law or equity.

§ 15.2.8 No action or failure to act by the KCATA shall constitute a waiver of any right or duty afforded any of them under this Agreement, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing.

§ 15.2.9 This clause does not preclude consideration of questions of law in connection with decisions provided for above. On procurement items in which the Federal Transit Administration (FTA) funding is involved, the Contractor shall be aware of protest procedures with the FTA Regional Office.

§ 15.2.10 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.11 Any claim not resolved will be decided by litigation. Venue and jurisdiction for any lawsuit will be the locale of the Project.

ARTICLE 16 ADDITIONAL GOVERNMENTAL CONDITIONS

§ 16.1 ACCEPTANCE OF MATERIALS, ETC. – NO RELEASE

Acceptance of any portion of the products, equipment or materials prior to final acceptance shall not release the Contractor from liability for faulty workmanship or materials, or for failure to fully comply with all of the terms of this Agreement. KCATA reserves the right and shall be at liberty to inspect all products, equipment or materials and workmanship at any time during the manufacturing process, and shall have the right to reject all materials and workmanship which do not conform with the conditions, contract requirements and specifications; provided, however, that KCATA is under no duty to make such inspection, and no inspection so made shall relieve the Contractor from any obligation to furnish products, equipment or materials and workmanship in accordance with the instructions, contract requirements and specifications.

§ 16.2 AGREEMENT IN ENTIRETY

This Agreement represents the entire and integrated agreement between the parties and supersedes all prior negotiations, representations, or agreements, either written or oral. This Agreement may be amended only by written instrument signed by all parties.

§ 16.3 ASSIGNABILITY

The Contractor shall not assign any interest in this Agreement and shall not transfer any interest in the same (whether by assignment or novation), without the prior written consent of KCATA. In the event of KCATA's consent to assignment of this Agreement, all of the terms, provisions and conditions of the Agreement shall be binding upon and inure to the benefit of the parties and their respective successors, assigns and legal representative.

§ 16.4 AUDIT AND INSPECTION OF RECORDS

See § 16.41 for the Audit and Inspection of Records Provision

§ 16.5 BANKRUPTCY

In the event the Contractor enters into proceedings relating to bankruptcy, whether voluntary or involuntary, the Contractor agrees to furnish, by certified mail, written notification of the bankruptcy to the KCATA official identified in "Notification and Communication" regarding the contract document. This notification shall be furnished within five (5) days of the initiation of the proceedings relating to bankruptcy filing. This notification shall include the date on which the bankruptcy petition was filed, the identity of the court in which the bankruptcy petition was filed, and a listing of KCATA contract numbers against which final payment has not been made. This obligation remains in effect until final payment under this Agreement.

§ 16.6 BREACH OF CONTRACT; REMEDIES

§ 16.6.1 If the Contractor shall fail, refuse or neglect to comply with the terms of this Agreement, such failure shall be deemed a total breach of contract and the Contractor shall be subject to legal recourse by KCATA, plus costs resulting from failure to comply.

§ 16.6.2 The duties and obligations imposed by the Contract and the rights and remedies available hereunder shall be in addition to and not a limitation of any duties, obligations, rights, and remedies otherwise imposed or available by law. No action or failure to act by KCATA shall constitute a waiver of any right or duty afforded under the Agreement, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach hereunder, except as may be specifically agreed in writing.

§ 16.7 CHANGES

KCATA may at any time, by a written order, and without notice to the Contractor, make changes within the general scope of this Contract. No such changes shall be made by the Contractor without prior written approval by KCATA. If any such change causes an increase or decrease in the Contract sum, or the time required for performance of this Contract, whether changed or not changed by such order, an equitable adjustment shall be made by written modification. Any Contractor's claim for adjustment under this clause must be asserted within 30 days from the date of receipt by the Contractor of the notification of change. Nothing in this clause shall excuse the Contractor from proceeding with this Contract as changed.

§ 16.8 CHANGES TO FEDERAL REQUIREMENTS

Contractor shall at all times be aware and comply with all applicable Federal Transit Administration regulations, policies, procedures ,and directives, including without limitation, those listed directly or by reference in the Agreement between the Authority and Federal Transit Administration (FTA Master Agreement 30 dated November 2, 2022), as they may be amended or promulgated from time to time during the term of this Contract. Contractors' failure to so comply shall constitute a material breach of this Contract. Contractor agrees to include this clause in all subcontracts at any tier. It is further agreed that the clause shall not be modified, except to identify the subcontractors who will be subject to its provisions.

§ 16.9 CIVIL RIGHTS

§ 16.9.1 Non Discrimination – In accordance with Title VI of the Civil Rights Act, as amended, 42 U.S.C. § 2000e, section 303 of the Age Discrimination Act of 1975, as amended, 42 U.S.C. § 6102, section 202 of the Americans with Disabilities Act of 1990, 42 U.S. C. § 12132, and Federal transit law at 49 U.S.C. § 5332, the Contractor agrees that it will not discriminate against any employee or applicant for employment because of race, color, creed, age, sex, sexual orientation, gender identity, national origin or disability. In addition, the Contractor agrees to comply with applicable Federal implementing regulations and other implementing regulations that the Federal Transit Administration (FTA) may issue.

§ 16.9.2 Equal Employment Opportunity - The following equal employment opportunity requirements apply to the underlying contract.

§ 16.9.2.1 Race, Creed, Color, National Origin, Disability, Age or Sex - In accordance with Title VII of the Civil Rights Act, as amended, 42. U.S.C. §2000e, *et seq*.; 49 C.F.R. part 21; and Federal transit laws at 49 U.S.C. §5332, the Contractor agrees to comply with all applicable equal opportunity requirements of the U.S. Department of Labor (U.S. DOL) regulations, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity,

Department of Labor" 41 C.F.R. Parts 60 et seq., (which implement Executive Order No. 11246, "Equal Employment Opportunity," as amended by Executive Order No. 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," 42 U.S.C. 2000e note), U.S. Department of Justice (DOJ) 28 C.F.R. §; and with any applicable Federal statutes, executive orders, regulations, and Federal policies that may in the future affect construction activities undertaken in the course of the Contract. The Contractor agrees to take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, creed, age, sex, sexual orientation, gender identity or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff, or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

.1 The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by an appropriate agency of the Federal Government setting forth the requirements of these nondiscrimination provisions.

.2 The Contractor will state, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, that all qualified applicants will receive consideration for employment without regard to race, color, sex, religion, national origin, or age.

.3 The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding a notice to be provided by the Owner, advising the labor union or workers' representative of the Contractor's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, as amended, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

§ 16.9.2.2 Age. In accordance with the Age Discrimination in Employment Act, 29 U.S.C. §§ 621-634, U.S. Equal Employment Opportunity Commission (U.S.EEOC) regulations, "Age Discrimination in Employment Act," 29 C.F.R. part 1625, the Age Discrimination Act of 1975, as amended, 42 U.S.C. § 6101 *et seq*., and U. S. Department of Health and Human Services regulations, "Nondiscrimination on the Basis of Age in Programs or Activities Receiving Federal Financial Assistance," 45 C.F. R. part 90, and Federal transit law at 49 U.S.C. §5332, the Contractor agrees to refrain from discrimination against present and prospective employees for reason of age. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

§ 16.9.2.3 Disabilities. In accordance with section 504 of the Rehabilitation Act of 1973, as amended, 29 U.S.C. § 794, the Americans with Disabilities Act of 1990, as amended, 42 U.S.C. §12101 *et seq.,* the Architectural Barriers Act of 1968, as amended, 42 U.S.C. § 4151 *et eq.,* and the Federal transit law at 49 U.S.C. § 5332, the Contractor agrees that it will not discriminate against individuals on the basis of disability. In addition, the Contractor agrees to comply with any implementing requirements FTA may issue.

§ 16.9.3 ADA Access Requirements. In accordance with section 102 of the Americans with Disabilities Act, as amended; 49 C.F.R. part 27; 42 U.S.C. § 12112 and section 504 of the Rehabilitation Act of 1973, as amended, 29 U.S.C. § 794, the Contractor agrees that it will comply with the requirements of U.S. Department of Transportation regulations, "Transportation Services for Individuals with Disabilities (ADA)," 49 CFR Part 37; and U.S. Department of Transportation regulations, "Americans with Disabilities Accessibility Specifications for Transportation Vehicles," 36 CFR Part 1192 and 49 CFR Part 38, pertaining to facilities and equipment to be used in public transportation. In addition, the Contractor agrees to comply with the requirements of 49 U.S.C. § 5301 (d) which expresses the Federal policy that the elderly and persons with disabilities have the same right as other persons to use mass transportation services and facilities, and that special efforts shall be made in planning and designing those services and facilities to implement transportation accessibility rights for elderly persons and persons with disabilities. Contractor also agrees to comply with any implementing requirements FTA may issue.

§ 16.9.4 The Contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, as amended, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and shall permit access to his books, records, and accounts by an appropriate agency of the Federal Government and by the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

§ 16.9.5 In the event of the Contractor's noncompliance with the Equal Opportunity conditions of this Contract, KCATA shall impose such sanctions as it, or the U.S. Department of Transportation, may determine to be appropriate including, but not limited to withholding of payments to the Contractor under this Contract until the Contractor complies, and/or cancellation, termination, or suspension of the Contract, in whole or in part , and the Contractor may be declared ineligible for further Government contracts of Federally-assisted contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, as amended, and such other sanctions may be imposed and remedies invoked as provided in said Executive Order, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

§ 16.9.6 The Contractor will include all clauses 16.1.2.1 to 16.1.2.7 inclusive in every Subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, as amended, so that such provisions will be binding upon each Subcontractor or vendor. The Contractor will take such action with respect to any Subcontractor or vendor as the appropriate agency of the Federal Government may direct as a means of enforcing such provisions, including sanctions for noncompliance, provided, however, that in the event the Contractor becomes involved in, or is threatened with, litigation with a Subcontractor or vendor as a result of such direction by the appropriate agency of the Federal Government, the Contractor may request the united States to enter into such litigation to protect the interests of the United States.

§ 16.9.7 Exemptions to the requirements of the above Equal Opportunity conditions are construction Contracts and Subcontracts not exceeding $10,000, and Contracts and Subcontracts with regard to Work performed outside the United States by employees who were not recruited in the United States.

§ 16.10 COMPLETION AND LIQUIDATED DAMAGES

KCATA will suffer financial loss if the Work is not Substantially Complete on the date set forth in the contract documents. The Contractor and the Contractor's Surety shall be liable for and shall pay the Owner the sums previously stipulated, fixed and agreed. Liquidated damages (not a penalty) shall be for each day of delay until the Work is Substantially complete. The Owner is authorized to withhold from monies due the Contractor the sum as indicated above that has been assessed as liquidated damages (not a penalty).

§ 16.11 CONFLICTS OF INTEREST (ORGANIZATIONAL)

In accordance with 2 C.F.R. § 200.112, the Contractor certifies that it has no other activities or relationships that would make the Contractor unable, or potentially unable, to render impartial assistance or advice to KCATA, or that would impair the Contractor's objectivity in performing work under this Contract, or that would result in an unfair competitive advantage to Contractor or to another third party performing the Project work.

§ 16.12 CONTRACTOR'S PERSONNEL

All of the services required hereunder shall be performed by the Contractor or under its supervision and all personnel engaged in the services shall be fully qualified and authorized under state and local law to perform such services. Any change in the key personnel, as described in the contractor's proposal, shall be subject to the written approval of KCATA; such approval shall not be unreasonably withheld. The parties agree that at all times during the entire term of this Contract that the persons listed in Contractor's proposal shall serve as the primary staff person(s) of Contractor to undertake, render and oversee all of the services of this Contract subject to KCATA's right to remove personnel. KCATA reserves the right to require the Contractor to remove any personnel and or subcontractors for any cause provided such request for removal shall be documented in writing to Consultant.

§ 16.13 CONTRACTOR'S RESPONSIBILITY

No advantage shall be taken by the Contractor or its subcontractor of the omission of any part or detail which goes to make the equipment complete and operable for use by KCATA. In case of any variance, this specification shall take precedence over Contractor's or subcontractor's own specifications. The Contractor shall assume responsibility for all materials and services used whether the same is manufactured by the Contractor or purchased ready made from a source outside the Contractor's company.

§ 16.14 DEBARMENT AND SUSPENSION CERTIFICATION

§ 16.14.1 The Contractor shall comply and facilitate compliance with U.S. DOT regulations "Nonprocurement Suspension and Debarment," 2 C.F.R. Part 1200, which adopts and supplements the U.S. Office of Management and Budget & U.S. OMB) "Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement)," 2 C.F.R. part 180.

§ 16.14.2 The Contractor, its principals, and any affiliates, shall certify that it is not included in the "U.S. General Services Administration's List of Parties Excluded from Federal Procurement or Non-procurement Programs," as defined at 49 CFR Part 29, Subpart C.

§ 16.14.3 The Contractor agrees to refrain from awarding any subcontract of any amount (at any tier) to a debarred or suspended subcontractor, and to obtain a similar certification from any subcontractor (at any tier) seeking a contract exceeding $25,000.

§ 16.14.4 The Contractor agrees to provide KCATA a copy of each conditioned debarment or suspension certification provided by a prospective subcontractor at any tier, and to refrain from awarding a subcontract with any party that has submitted a conditioned debarment or suspension certification until FTA approval is obtained.

§ 16.15 DELIVERY

§ 16.15.1 Materials, products and/or equipment shall be delivered to Kansas City Area Transportation Authority, Central Receiving Facility, Building #1, 1350 East 17th Street, Kansas City, Missouri 64108. KCATA will assume custody of property at other locations, if so directed in writing by KCATA. Packing slips shall be furnished with the delivery of each shipment. KCATA reserves the right to inspect all deliveries or services before acceptance.

§ 16.15.2 All external components shall be wrapped for protection against damage during shipping and handling. Each specified unit shall be delivered to KCATA in first class condition and the Contractor shall assume all responsibility and liability for said delivery.

§ 16.15.3 KCATA reserves the right to extend delivery or installation, postpone delivery or installation, or reschedule delivery or installation in case the delivery or installation of products, equipment or materials under this Agreement shall be necessarily delayed because of strike, injunction, civil disturbance, government controls, or by reason of any cause of circumstance beyond the control of the Contractor, as detailed in writing by the Contractor. The time of completion of a delivery or installation shall be extended by a number of days to be determined in each instance by KCATA.

§ 16.16 DISADVANTAGED BUSINESS ENTERPRISE (DBE)

§ 16.16.1 It is the policy of KCATA and the United States Department of Transportation (USDOT) that Disadvantaged Business Enterprises (DBE's), as defined herein and in the Federal regulations published as 49 CFR Part 26, shall have an equal opportunity to participate in in DOT-assisted contracts. It is also the policy of KCATA to:

.1 Ensure nondiscrimination in the award and administration of DOT-assisted contracts;

.2 Create a level playing field on which DBE's can compete fairly for DOT-assisted contracts;

.3 Ensure that the DBE program is narrowly tailored in accordance with applicable law;

.4 Ensure that only firms that fully meet 49 CFR Part 26 eligibility are permitted to participate as DBE's;

.5 Help remove barriers to the participation of DBE's in DOT assisted contracts;

.6 To promote the use of DBE's in all types of federally assisted contracts and procurement activities; and

.7 Assist in the development of firms that can compete successfully in the marketplace outside the DBE program.

§ 16.16.2 This Contract is subject to the requirements of Title 49, Code of Federal Regulations, Part 26, Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs. The national goal for participation of Disadvantaged Business Enterprises (DBE's) is 10 percent. *KCATA's overall goal for DBE participation is 23.3 percent.* A separate contract goal of XXXXXX has been established for this procurement.

§ 16.16.3 The Contractor shall not discriminate on the basis of race, color national origin, or sex in the performance of this Contract. The Contractor shall carry out applicable requirements of 49 CFR. Part 26 in the award and administration of this DOT-assisted contract. Failure by the Contractor to carry out these requirements is a material breach of this Contract, which may result in the termination of this Contract or such other remedy as KCATA deems appropriate. Each subcontract the Contractor signs with a subcontractor must include the assurance in this paragraph (see 49 C.F.R. 26.13(b)).

§ 16.16.4 The Contractor may not substitute, remove, or terminate a DBE subcontractor without KCATA's prior written consent. Written consent of termination may only be given if the Contractor has demonstrated good cause. Before submitting its request to terminate or substitute a DBE subcontractor, the Prime Contractor must give notice in writing to the DBE subcontractor, with a copy to KCATA, of its intent to request to terminate and/or substitute, and the reason for the request. The Contractor must give the DBE five days to respond to the Contractor's notice and advise KCATA and the Contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why KCATA should not approve the Contractor's action. If required in a particular case as a matter of public necessity (e.g., safety), the response period may be shortened.

§ 16.16.4.1 Good Cause. Good cause includes the following circumstances:

.1 The listed DBE subcontractor fails or refuses to execute a written contract; or

.2 The listed DBE subcontractor fails or refuses to perform the work to its normal industry standards. Provided, however, that the good cause does not exist if the failure or refusal of the DBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the Prime Contractor; or

.3 The listed DBE subcontractor fails or refuses to meet the Prime Contractor's reasonable, nondiscriminatory bond requirements; or

.4 The listed DBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness; or

.5 The listed DBE subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant to 2 CFR Parts 180, 215 and 1200 or applicable state law; or

.6 The DBE subcontractor is not a responsible contractor; or

.7 The listed DBE subcontractor voluntarily withdraws from the project and provides the Prime Contractor written notice of its withdrawal;

.8 The listed DBE is ineligible to receive DBE credit for the type of work required;

.9 A DBE owner dies or becomes disabled with the result that the listed DBE contractor is unable to complete its work on the contract;

.10 Other documented good cause that compels KCATA to terminate the DBE subcontractor. Provided the good cause does not exist if the Prime contractor seeks to terminate a DBE it relied upon to obtain the contract so that the Prime Contractor can self-perform the work for which the DBE contractor was engaged or so that the Prime Contractor can substitute another DBE or non-DBE contractor.

§ 16.16.4.2 Before submitting its request to terminate or substitute a DBE subcontractor, the Prime Contractor must give notice in writing to the DBE subcontractor, with a copy to KCATA, of its intent to request to terminate and/or substitute, and the reason for the request. The Prime Contractor must give the DBE five days to respond to the Prime Contractor's notice and advise the KCATA and the Contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why KCATA should not approve the Prime Contractor's action. If required in a particular case as a matter of public necessity (e.g., safety), the response period may be shortened.

§ 16.16.5 DISCLAIMER OF FEDERAL GOVERNMENT OBLIGATION OR LIABILITY

The Contractor, and any subcontractors acknowledge and agree that, notwithstanding any concurrence by the Federal Government in or approval of the solicitation or award of this contract, absent the express written consent by the Federal Government, the Federal Government is not a party to this contract and shall not be subject to any obligations or liabilities to the Contractor, or any other party (whether or not a party to this Contract) pertaining to any matter resulting from this Contract. It is further agreed that the clause shall be included in each subcontract and shall not be modified, except to identify the subcontractor who will be subject to its provision.

§ 16.17 EMPLOYEE ELIGIBILITY VERIFICATION

§ 16.17.1 To comply with Section 285.500 RSMo, *et seq*., the Contractor is required by sworn affidavit and provision of documentation, to affirm its enrollment and participation in a federal work authorization program with respect to the employees working in connection with the contracted services. The Contractor shall also affirm that it does not knowingly employ any person in connection with the contracted services who does not have the legal right or authorization under federal law to work in the United States as defined in 8 U.S.C. §1324a(h)(3). The Contractor is required to obtain the same affirmation from all subcontractors at all tiers with contracts exceeding $5,000.

§ 16.17.2 A federal work authorization program is any of the electronic verification of work authorization programs operated by the United States Department of Homeland Security (E-Verify) or an equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, under the Immigration Reform and control Act of 1986 (IRCA), P.L.99-603.

§ 16.18 EMPLOYEE PROTECTIONS

§ 16.18.1 Construction Employee Protections.

.1 Davis-Bacon and Copeland Anti-Kickback Standards Acts.

.1 The Contractor agrees to comply and assures compliance with the requirements of 40 U.S.C. 3141-3144 and 3146-3148, *et seq.* and Section 1 of 18 U.S.C § 874, and Section 2 of 40 U.S.C. 3145, as amended and implementing U.S. Department of Labor regulations, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction (also Labor Standards Provisions Applicable to Non-Construction Contracts Subject to the Contract Work Hours and Safety Standards Act," 29 C.F.R. Part 5.

.2 Contractor shall comply with all rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 which are incorporated by reference in this Contract.

.3 The Contractor agrees to pay wages to laborers and mechanics performing Contract work at a rate not less than the minimum wages specified in a wage determination issued by the U.S. Secretary of Labor and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 C.F.R. Part 3)). The Contractor agrees to place a copy of the current prevailing wage determination issued by the U.S. DOL in each solicitation for subcontractor work under this project and agrees to refrain from awarding any affected contracts until the subcontractor agrees to the required wage determination.

.4 The KCATA shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this Contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or

working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the KCATA may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

.5 Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under Section 5.5(a)(3)(i) of the Regulations, 29 C.F.R. Part 5. The prime Contractor is responsible for the submission of copies of payrolls by all subcontractors.

.6 Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

.1 Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a state apprenticeship agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a state apprenticeship agency (where appropriate) to be eligible for probationary employment as an apprentice.

.2 Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination.

.7 The Contractor must submit a copy of all payrolls each week to KCATA's project manager. The copy is to be accompanied by a statement signed by the Contractor indicating that the payrolls are correct and complete, and that the wage rates contained therein are not less than those determined by the Secretary of Labor. Upon completion of the Contract, the Contractor is to submit to KCATA's project manager, a certificate concerning wages and classifications for laborers and mechanics.

.8 Subcontracts. The Contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the Federal Transit Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

.9 Contract Termination -- Debarment. A breach of the clauses in 29 CFR 5.5 may be grounds for termination of the Contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

.10 Disputes Concerning Labor Standards. Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general dispute clause of this Contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

.11 Certification of Eligibility. By entering into this Contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

.12 No part of this Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1). The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

.2 **Veterans Employment Preference.** Contractors working on a federally funded capital project shall give a hiring preference, to the extent practicable, to veterans (as defined in 5 U.S.C. § 2018) who have the requisite skills and abilities to perform the construction work required under the contract. This subsection shall not be understood, construed, or enforced in any manner that would require an employer to give preference to any veteran over any equally qualified applicant who is a member of any racial or ethnic minority, female, an individual with a disability, or former employee.

.3 **Special Equal Employment Opportunity (EEO) Provision for Construction Contracts.** During the performance of this Contract, Contractor agrees as follows:

.1 Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

.2 Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

.3 Contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

.4 Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

.5 Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

.6 Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

.7 In the event of Contractor's noncompliance with the nondiscrimination clauses of this Contract or with any of the said rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part and Contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

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

§ 16.18.2 **Employee Protections – General.**

.1 Contract Work Hours and Safety Standards Act.

.1 Overtime Requirements. No Contractor or subcontractor contracting for any part of the Contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek. (40 U.S.C. § 3701-3708 *et seq* and supplemented by Department of Labor (DOL) Regulations 29 CFR part 5)

.2 Violation; Liability for Unpaid Wages; Liquidated Damages. In the event of any violation of the clause set forth in Paragraph 1 of this section the Contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in Paragraph 1 of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard work week of forty

hours without payment of the overtime wages required by the clause set forth in Paragraph 1 of this section.

.3 Withholding for Unpaid Wages and Liquidated Damages. The KCATA shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same prime Contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in Paragraph 2 of this section.

.4 Safety Standards. No Contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic to work in surroundings or under conditions that are unsanitary, hazardous, or dangerous as prohibited by the safety requirements of section 107 of the Contract Work Hours and Safety Standards Act, 40 U.S.C. § 3704, and its implementing U.S. Department of Labor regulations, "Safety and Health Regulations for Construction," 29 CFR Part 1926.

.5 Subcontracts. The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in Paragraphs 1 through 5 of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in Paragraphs 1 through 4 of this section.

§ 16.19 ENVIRONMENTAL REGULATIONS

§ 16.19.1 Clean Air. The Contractor shall comply with all applicable standards, orders, or regulations issued pursuant to the Clean Air Act, as amended, 42, U.S.C. § 7401 *et seq*. The Contractor agrees to report, and to require each subcontractor receiving more than $100,000 from this Contract to report, any violation of these requirements resulting from any project implementation activity to KCATA. The Contractor understands that KCATA will, in turn, report each violation as required to assure notification to the FTA and the appropriate U.S. EPA Regional Office will be notified.

§ 16.19.2 Clean Water. The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq. The Contractor agrees to report, and require each subcontractor receiving more than $100,000 from this Contract to report any violation of these requirements resulting from any project implementation activity to the KCATA. The Contractor understands that the KCATA will, in turn, report each violation as required to assure notification to the FTA and the appropriate U. S. EPA Regional Office will be notified.

§ 16.19.3 Energy Conservation. The Contractor agrees to comply with mandatory standards and policies relating to energy efficiency, which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act. The Contractor agrees to include the requirements of this clause in all subcontracts under this Contract.

§ 16.19.4 Recovered Materials. o the extent practicable and economically feasible, the Contractor agrees to provide a competitive preference for products and services that conserve natural resources and protect the environment and are energy efficient. Examples of such products may include, but are not limited to, products described in U.S. Environmental Protection Agency guidelines at 40 CFR Part 247, which implements Section 6002 of the Resource Conservation and Recovery Act, as amended (42 U.S.C. 6962), and Executive Order 12873. The Contractor also agrees to include these requirements in each subcontract at every tier receiving more than $10,000.

§ 16.19.5 The Contractor also agrees to include these requirements in each subcontract exceeding $100,000 financed in whole or in part with Federal assistance provided by FTA.

§ 16.20 FEDERAL TAX LIABILITY AND RECENT FELONY CONVICTIONS

§ 16.20.1 Pursuant to 48 CFR Parts 1, 4, 9, 12 and 52 the Contractor affirmatively represents and certifies that:

.1 The Contractor does not have any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and if there is a federal tax liability that it is being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability;

.2 The Contractor was not convicted of the felony criminal violation under any Federal law within the preceding twenty-four (24) months; and

.3 Have not more than ninety (90) days prior to certification been notified of any unpaid federal tax assessment for which the liability remains unsatisfied.

§ 16.20.2 Contractor is described as any private corporation, partnership, trust, joint-stock company, sole proprietorship, or other business association.

§ 16.20.3 The Contractor agrees to include these requirements in all subcontracts at all tiers, regardless of value, and to obtain the same certification and disclosure from all subcontractors (at all tiers).

§ 16.21 FEDERAL PARTICIPATION NOTIFICATION

This project is a federal Department of Transportation/Federal Transit Administration grant funded project. Compliance with all applicable federal regulations is mandatory.

§16.22 FORCE MAJEURE

§16.22.1 Both Parties shall be excused from performing its obligations under this Contract during the time and to the extent that it is prevented from performing by an unforeseeable cause beyond its control (**"Excusable Delays"**) including, but not limited to: any incidence of fire, flood; acts of God or the public enemy; commandeering of material, products, plants or facilities by the federal, state or local government; national fuel shortage; acts of war; terrorism; strikes; any acts, restrictions, regulations, by-laws; prohibitions or measures of any kind on the part of any KCATA; freight embargoes; delays of Contractor's suppliers for like causes; contractual acts of either Party or a material act of omission by either Party; when satisfactory evidence of such cause is presented to the other Party, and provided further that such nonperformance is unforeseeable, beyond the control and is not due to the fault or negligence of the Contractor or KCATA. Contractor and KCATA shall use its best efforts to remove the cause of delay and resume work as soon as possible.

§16.22.2 If at any time, Contractor concludes that any of the Work hereunder will become subject to a delay beyond Contractor's control, including but not limited to any of the aforementioned causes, Contractor shall notify KCATA of the nature and detailed reasons and foreseeable extent of such delay and shall, once every seven (7) calendar days thereafter, notify KCATA whenever, to the best of Contractor's knowledge and belief, the nature or foreseeable extent of such delay shall change. Contractor shall provide this written notice within five (5) business days of Contractor's becoming aware of the facts or matters giving rise to such Excusable Delay. Both Parties shall keep in contact with each other as to the status of such Excusable Delay and shall agree in writing to a restart date when the facts or matters giving rise to such Excusable Delay have concluded and further delays are not foreseen. Upon reengagement of work, Contractor and KCATA will formulate and agree upon an update project schedule, taking into account the timeframe that has passed since the work stoppage, necessary time to resume or re-create any previously completed tasks due to damaged or missing equipment and any associated time periods for shipment and/or manufacture of equipment.

§ 16.23 FRAUD AND FALSE OR FRAUDULENT STATEMENTS OR RELATED ACTS

§ 16.23.1 The Contractor acknowledges that the provisions of the Program Fraud Civil Remedies Act of 1986, as amended, 31 U.S.C. § 3801 *et seq*. and U.S DOT regulations, "Program Fraud Civil Remedies," 49 CFR Part 31, apply to its actions pertaining to the Project. Upon execution of the Contract, the Contractor certifies and affirms the truthfulness and accuracy of any statement it has made, it makes, or may make pertaining to the project covered under this Contract. In addition to other penalties that may be applicable, the Contractor further acknowledges that if it makes a false, fictitious, or fraudulent claim, statement, submission, or certification, the Federal Government reserves the right to impose the penalties of the Program Fraud Civil Remedies Act of 1986 on the Contractor to the extent the Federal Government deems appropriate.

§ 16.23.2 The Contractor also acknowledges that if it makes, or causes to be made, a false, fictitious, or fraudulent claim, statement, submission, or certification to the Federal Government in connection with this Contract, the Government reserves the right to impose on the Contractor the penalties of 18 U.S.C. § 1001 and 49 U.S.C. § 5307(n)(1), to the extent the Federal Government deems appropriate.

§ 16.23.3 The Contractor agrees to include these clauses in each subcontract, and it is further agreed that the clauses shall not be modified, except to identify the subcontractor who will be subject to the provisions

§ 16.24 GENERAL PROVISIONS

§ 16.24.1 No Third-Party Beneficiaries. The parties do not intend to confer any benefit hereunder on any person, firm, or entity other than the parties hereto.

§ 16.24.2 Extensions of Time. No extension of time for performance of any Contractor obligations or acts shall be deemed an extension of time for performance of any other obligations or acts.

§ 16.24.3 Time of Essence. Time is of the essence in Contractor's performance of this Agreement.

§ 16.24.4 Time Periods. A "business day" is a business working day of KCATA administrative personnel which are days other than a Saturday, Sunday or legal holidays observed by the KCATA for administrative personnel. If the time period by which any right or election provided under this Contract must be exercised, or by which any act required hereunder must be performed, expires on a day which is not a business day, then such time period shall be automatically extended through the close of business on the next regularly scheduled business day.

§ 16.24.5 Binding Effect. This Contract shall bind and inure to the benefit of the legal representatives, successors, and permitted assigns of the parties.

§ 16.24.7 Counterparts. This Contract may be executed at different times and in two or more counterparts and all counterparts so executed shall for all purposes constitute one contract, binding on all the parties hereto, notwithstanding that all parties shall not have executed the same counterpart. And, in proving this Contract, it shall not be necessary to produce or account for more than one such counterpart executed by the party against whom enforcement is sought.

§ 16.24.8 Interpretation; Update of Citations. Unless otherwise specified herein, (a) the singular includes the plural and the plural the singular; (b) words importing any gender include the other genders; and (c) references to persons or parties include their permitted successors and assigns. The parties recognize and agree that many of the laws, regulations, policies, procedures, and directives stated as governing the Contractor's performance of its work or services, or the supplying of products, equipment, or materials, pursuant to this Contract are subject to updating, amendment or replacement. Therefore, all such references in this Contract are agreed by the parties to be deemed to refer to the then current updated, amended or replacement form of such laws, regulations, policies, procedures, and directives in effect at the applicable time during the term of this Contract and the same are hereby incorporated into this Contract by this reference.

§ 16.24.9 When Effective. Notwithstanding any provision contained in this Contract to the contrary, this Contract shall become effective only after the execution and delivery of this Contract by each of the parties hereto and no course of conduct, oral contract or written memoranda shall bind the parties hereto with respect to the subject matter hereof except this Contract.

§ 16.24.10 Further Actions; Reasonableness and Cooperation by Parties; Time for Certain Actions. Each party agrees to take such further actions and to execute such additional documents or instruments as may be reasonably requested by the other party to carry out the purpose and intent of this Contract. Except where expressly stated to be in a party's sole discretion, or where it is stated that a party has the ability to act in its sole judgment or for its own uses or purposes, wherever it is provided or contemplated in this Contract that a party must give its consent or approval to actions or inactions by the other party or a third party in connection with the transactions contemplated hereby, such consent or approval will not be unreasonably withheld or delayed. If no time period is set hereunder for a party to approve or consent to an action or inaction by the other party or a third party such approval shall be given or affirmatively withheld in writing within ten (10) business days after it is requested in writing or it shall be deemed given.

§ 16.24.11 Survival. In addition to any provisions expressly stated to survive termination of this Contract, all provisions which by their terms provide for or contemplate obligations or duties of a party which are to extend beyond such termination (and the corresponding rights of the other party to enforce or receive the benefit thereof) shall survive such termination.

§ 16.24.12 Authority of Signatories. Any person executing this Contract in a representative capacity represents and warrants that such person has the authority to do so and, upon request, will furnish proof of such authority in customary form.

§ 16.24.13 Notice of Legal Matters. If this project is federally funded and is expected to equal or exceed $25,000, KCATA agrees to notify the FTA Chief Counsel or FTA Regional VII legal counsel of a current or prospective legal matter that may affect the Federal government. Contractor agrees this affirmative notification provision will apply to subcontractors and suppliers and is to be included in all agreements at all tiers. Failure to include this notice may be deemed a material breach of contract.

§ 16.25 HEADINGS

The headings included in this Contract are inserted only as a matter of convenience and for reference, and in no way define, limit, or describe the scope of intent of any provision, and shall not be construed to affect, in any manner, the terms and provisions hereof of the interpretation or construction thereof.

§ 16.26 INCORPORATION OF FEDERAL TRANSIT ADMINISTRATION TERMS

The provisions in this Contract include certain standard terms and conditions required by the U.S. Department of Transportation (DOT), whether or not expressly set forth. All contractual provisions required by DOT, as set forth in FTA Circular 4220.1F or any revision thereto, are hereby incorporated by reference. Anything to the contrary herein notwithstanding, all FTA mandated terms shall be deemed to control in the event of a conflict with other provisions contained in the Contract. Contractor shall not perform any act, fail to perform any act, or refuse to comply with any KCATA requests that would cause KCATA to be in violation of the FTA terms and conditions. The Contractor agrees to include this clause in all subcontracts at any tier. It is further agreed that the clause shall not be modified, except to identify the subcontractors who will be subject to the provision.

§ 16.27 INDEPENDENT CONTRACTOR

§ 16.27.1 The parties agree that the Contractor is an independent contractor under this Contract. Under no circumstance shall the Contractor be considered an agent, employee, or representative of KCATA and KCATA shall not be liable for any claims, losses, damages, or liabilities of any kind resulting from any action taken or failed to be taken by the Contractor.

§ 16.27.2 The Contractor shall furnish adequate supervision, labor, materials, supplies, security, financial resources, and equipment necessary to perform all the services contemplated under this Contract in an orderly, timely, and efficient manner.

§ 16.28 INSPECTION OF SERVICES

§ 16.28.1 The Contractor shall provide and maintain an inspection system acceptable to the Authority covering the services provided in the performance of the Contract. "Services" as used in this clause, includes services performed, quality of the work, and materials furnished or used in the performance of services.

§ 16.28.2 The Contractor shall provide and maintain an inspection system acceptable to the Authority covering the project. Complete records of all inspection work performed by the Contractor shall be maintained and made available to the Authority during contract performance and for as long afterwards as the Contract requires.

§ 16.28.3 The Authority has the right to inspect and test all services called for by this Contract to the extent practicable at all times and places during the term of the Contract. The Authority shall perform inspection and tests in a manner that will not unduly delay the work.

§ 16.28.4 If any of the services performed do not conform to Contract requirements, the Authority may require the contractor to perform the services again in conformity with Contract requirements for no additional fee. When the defects in performance cannot be corrected by re-performance, the Authority may:

.1 Require the Contractor to take necessary action to ensure that future performance conforms to Contract requirements; or

.2 Reduce the Contract Sum accordingly.

§ 16.28.5 If the Contractor fails to promptly perform the services again or to take the necessary action to ensure future performance in conformity with contract requirements, the Authority may:

.1 By contract or otherwise, perform the services and charge to the Contractor any cost incurred by the Authority that is directly related to the performance of the work; or

.2 Terminate the Contract for default.

§ 16.29 LABOR DISPUTE CLAUSE

§ 16.29.1 All disputes concerning the payment of prevailing wage rates or classifications shall be promptly reported to the Owner for its referral to DOT for decision or, at the option of the Owner, DOT referral to the Secretary of Labor. The decision of DOT or the Secretary of Labor as the case may be, shall be final.

§ 16.29.2 All questions relating to the application or interpretation of the Copeland Act, the Contract Work Hours Standards Act, the Davis-Bacon Act, or Section 13 of the Act shall be sent to FTA for referral to the Secretary of Labor for ruling or interpretation, and such ruling or interpretation shall be final.

§ 16.29.3 Convict Labor. In connection with the performance of work under this Contract, the Contractor agrees not to employ any person undergoing service or imprisonment at hard labor. This does not include convicts who are on parole or probation.

§ 16.29.4 Minimum Wages:

.1 All mechanics and laborers employed or working directly upon the site of the Work shall be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Copeland Regulations (29 CFR Part 30), the full amounts due at time of payment computed at wage rates not less than the aggregate of the basic hourly rates and the rates of payments, contributions, or costs for any fringe benefits contained in the wage determination decision of the Secretary of Labor, which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor or Subcontractor and such laborers and mechanics, and the wage decision shall be posted by the Contractor at the site of the work in a prominent place where it can be seen by the workers.

.2 KCATA shall require that any class of laborers or mechanics, including apprentices and trainees, which is not listed in the wage determination and which is to be employed under the Contract shall be classified or reclassified conformably to the wage determination and a report of the action taken shall be sent to the appropriate Federal agency. If the interested parties cannot agree on the proper classification or reclassification of a particular class of laborers or mechanics, including apprentices and trainees, to be used, KCATA shall submit the questions together with his recommendation through the appropriate Federal agency to the Secretary of Labor for final determination.

.3 KCATA shall require, whenever the minimum wage rate prescribed in the Contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly wage rate and the Contractor is obliged to pay a cash equivalent of such a benefit, an hourly cash equivalent thereof to be established. In the event interested parties cannot agree upon a cash equivalent of the fringe benefit, the question, accompanied by the recommendation of the KCATA shall be referred to the Secretary of Labor for determination.

.4 If the Contractor does not make payments to a trustee or other third person, he may consider as part of the wages of any laborer or mechanic the amount of any costs expressly listed in the wage determination decision of the Secretary of Labor which is a part of this Contract:

provided, however the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account asset for the meeting of obligations under the plan or program.

§ 16.29.5 Miscellaneous Labor Provisions:

.1 **Final Labor Summary.** The Contractor and each Subcontractor shall furnish to the Owner, upon the completion of the Contract, a summary of all employment, indicating, for the completed project, the total hours worked, and the total amount earned.

.2 **Final Certificate.** Upon completion of the Contract, the Contractor shall submit to the Owner with the voucher for final payment for any work performed under the Contract, a certificate concerning wages including apprentices and trainees, employed on the project, in the following form:

"The undersigned, Contractor on _____ (Contract No.) hereby certifies that all laborers, mechanics, apprentices, and trainees employed by him or by a Subcontractor performing work under this Contract on the project have been paid wages at rates not less than those required by the contract provisions, and that the work performed by each such laborer, mechanic, apprentice, or trainee conformed to the classifications set forth in the Contract or training program provisions applicable to the wage rage paid.

Signature and Title:

_____

§ 16.29.6 Notice to the Owner of Labor Disputes. Whenever the Contractor has knowledge that any actual or potential labor dispute is delayed or threatens to delay the timely performance of this Contract, the Contractor shall immediately give notice thereof, including all relevant information with respect thereto, to the Owner.

§ 16.30 LIABILITY AND INDEMNIFICATION

§ 16.30.2 Contractor's Liability. Contractor shall be liable for all damages to persons (including employees of Contractor) or property of any type that may occur as a result of any act or omission by Contractor, any subcontractors, or sub-subcontractor, their respective agents or anyone directly employed by any of them or anyone.

§ 16.30.3 Subrogation. Contractor, its agents, and any subcontractor hereby waive and relinquish any right of subrogation or claim against KCATA, its commissioners, senior leaders and employees arising out of the use of KCATA's premises (including any equipment) by any party in performance of this Agreement.

§ 16.30.4 Indemnification.

.1 To the fullest extent permitted by law, Contractor agrees to and shall indemnify, defend and hold harmless KCATA, its Commissioners, officers and employees from and against any and all claims, losses, damages, causes of action, suits, liens and liability of every kind, (including all expenses of litigation, expert witness fees, court costs and attorney's fees whether or not suit be commenced) by or to any person or entity (collectively the "Liabilities") arising out of, caused by, or resulting from the acts or omissions of Contractor, subcontractors, or sub-subcontractors, their respective agents or anyone directly or indirectly employed by any of them in performing work under this Contract, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder, so long as such Liabilities are not caused by the sole negligence or willful misconduct of a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or otherwise reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this paragraph. Contractor shall also indemnify, hold harmless and defend the KCATA for any contractor or subcontractor action, tort, or violation of federal or state law or city ordinance.

.2 In claims against any person or entity indemnified under this section, by an employee or Contractor, or anyone directly or indirectly employed by any of them, the subcontractor or sub-subcontractor indemnification obligation shall not be limited by a limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor, subcontractor, or sub-subcontractor under worker's compensation acts, disability benefit acts or other employee benefit acts. If any action at law or suit in equity is instituted by any third party against Contractor arising out of or resulting from the acts of Contractor in performing work under this Contract, Contractor shall promptly notify KCATA of such suit.

.3 If any action at law or suit in equity is instituted by any third party against KCATA or its commissioners, officers or employees arising out of or resulting from the acts of Contractor, a subcontractor or sub-subcontractor, their respective agents or anyone directly or indirectly employed by any of them in providing products, equipment or materials, or in performing work or services under this Contract, and if Contractor has failed to provide insurance coverage to KCATA against such action as required herein or otherwise refuses to defend such action, KCATA shall have the right to conduct and control, through counsel of its choosing, the defense of any third party claim, action or suit, and may compromise or settle the same, provided that KCATA shall give the Contractor advance notice of any proposed compromise or settlement. Under these circumstances, KCATA retains the right to recover all costs of defense from the Contractor.

.4 KCATA shall permit Contractor to participate in the defense of any such action or suit through counsel chosen by the Contractor, provided that all fees and expenses of such counsel shall be borne by Contractor. If KCATA permits Contractor to undertake, conduct and control the conduct and settlement of such action or suit, Contractor shall not consent to any settlement that does not include as an unconditional term thereof the giving of a complete release from liability with respect to such action or suit to KCATA. Contractor shall promptly reimburse KCATA for the full amount of any damages, including fees and expenses of counsel for KCATA, incurred in connection with any such action.

§ 16.30.5 Release of Liability. Contractor, its officers, directors, employees, heirs, administrators, executors, agents and representatives and respective successors and assigns hereby fully release, remise, acquit and forever discharge the KCATA and its commissioners, officers, directors, attorneys, employees, agents, representatives and its respective successors and assigns from any and all actions, claims, causes of action, suits, rights, debts, liabilities, accounts, agreements, covenants, contracts, promises, warranties, judgments, executions, demands, damages, costs and expenses, whether known or unknown at this time, of any kind or nature, absolute or contingent, existing at law or in equity, on account of any matter related to this agreement, cause or thing whatsoever that has happened, developed or occurred before or after you sign and deliver this Contract to KCATA. This release will survive the termination of this Contract.

§ 16.31 LICENSING, LAWS, AND REGULATIONS

§ 16.31.1 The Contractor shall, without additional expense to KCATA, be responsible for obtaining any necessary licenses and permits, and for complying with all federal, state, and municipal laws, codes, and regulations applicable to the providing of products, equipment or materials, or the performance of the Services, under this Contract.

§ 16.31.2 The Contractor shall comply with all applicable and current rules, regulations, and ordinances of any applicable federal, state, county or municipal governmental body or authority, including but not limited to those as set forth by the Environmental Protection Agency, the Missouri Department of Natural Resources, the Kansas Department of Health and Environmental, the FTA, the Department of Transportation, and the City of Kansas City, Missouri.

§ 16.31.3 The Contractor shall be responsible for obtaining all required permits and licenses required to complete construction and installation of the work.

§ 16.32 LOBBYING RESTRICTIONS

§ 16.32.1 The Contractor is bound by its certification contained in its offer to the Authority regarding the use of federal or non-federal funds to influence, or attempt to influence any federal officer or employee regarding the award, execution, continuation, or any similar action of any federal grant or other activities as defined in 31 U.S.C. 1352, as amended; 2 C.F.R. § 200.450, 2 C.F.R. part 200 appendix II (J) and 49 CFR Part 20, to the extent consistent with 31

U.S.C. § 13532, as amended. The Contractor agrees to comply with this requirement throughout the term of the Contract.

§ 16.32.2 The Contractor agrees to include these requirements in all subcontracts at all tiers exceeding $100,000 and to obtain the same certification and disclosure from all subcontractors (at all tiers).

§ 16.33 NATIONAL INTELLIGENT TRANSPORTATION SYSTEM ARCHITECTURE AND STANDARDS

The contractor agrees to conform, to the extent applicable, to the National Intelligent Transportation Systems (ITS) Architecture and Standards as required by SAFETEA-LU § 5307(c), 23 U.S.C. § 512 note, and Contractor agrees to apply with FTA Notice, "FTA National ITS Architecture Policy on Transit Projects" *66 Fed. Reg. 1455*, January 8, 2001, and any further implementing directives, except to the extent FTA determines otherwise in writing.

§ 16.34 NOISE CONTROL

§ 16.34.1 All equipment shall be designed and selected to be free of objectionable noise and vibration. Hoists, compressors, and other machinery shall be housed in sound-attenuating enclosures.

§ 16.34.2 Engine-driven equipment shall be equipped with exhaust and, where appropriate, air intake silencers designed for the maximum degree of silencing. The type of silencer required is that for use in critical noise-problem locations such as high-density residential and hospital areas.

§ 16.35 NOTIFICATION AND COMMUNICATION

§ 16.35.1 Communications regarding technical issues and activities of the project shall be exchanged with (Name), KCATA's (Title), at (816) 346- or via e-mail at @kcata.org.

§ 16.35.2 Issues regarding the contract document, changes, amendments, etc. are the responsibility of KCATA's Procurement Department. All notices and communications on all matters regarding this Contract may be given by delivery or mailing the same postage prepaid, addressed to the following:

If to KCATA: Name, Title
Kansas City Area Transportation Authority
1350 East 17th Street
Kansas City, MO 64108

If to Contractor: _____
_____
_____

§ 16.35.3 The Contractor shall notify KCATA immediately when a change in ownership has occurred or is certain to occur.

§ 16.35.4 The addresses to which notices may be made may be changed from time to time by notice mailed as described above. Any notice given by mail shall be deemed given on the day after that on which it is deposited in the United States Mail as provided above.

§ 16.36 PAYROLLS AND BASIC RECORDS

§ 16.36.1 The Contractor shall maintain payrolls and basic records relating thereto during the course of the Work and shall preserve them for a period of three (3) years thereafter for all laborers and mechanics, including apprentices and trainees, working at the site of the Work. Such records shall contain the name and address of each employee, his correct classification, rate of pay (including rates of contributions for, or cost assumed to provide, fringe benefits), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Contract has obtained approval from the Secretary of Labor as provided in this Agreement, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits.

§ 16.36.2 The Contractor shall submit weekly a copy of all payrolls to the KCATA. The prime Contractor shall be responsible for the submission of copies of payrolls of all Subcontractors. Each such copy shall be accompanied by

a statement signed by the Contractor indicating that the payrolls are correct and complete, that the wage rates contained therein are not less than those determined by the Secretary of Labor, and that the classification set forth for each laborer mechanic, including apprentices and trainees, conform to the work he performed. Submission of the "Weekly Statement of Compliance" required under this Contract and the Copeland Regulations of the Secretary of Labor (29 CFR Part 3) shall satisfy the requirement for submissions of the above statement. The Contractor shall also submit a copy of any approval by the Secretary of Labor with respect to fringe benefits which is required by this Agreement.

§ 16.36.3 Contractors employing apprentices or trainees under approved programs shall include a notation on the first weekly certified payrolls submitted on the Owner that their employment is pursuant to an approved program and shall identify the program. Contractors and subcontractors may not employ "helpers" as the term is defined in DOL Memorandum No. 174, dated December 2, 1993, included in Section 4.2, Federal Wage Rates.

§ 16.36.4 The Contractor will make the records required under the labor standards clauses of the Contract available for inspection by authorized representatives of the Owner, the appropriate Federal agency, and the U.S. Department of Labor, and shall permit such representatives to interview employees during working hours on the job.

§ 16.37 PRIVACY ACT REQUIREMENTS

§ 16.37.1 The Contractor agrees to comply with, and assures the compliance of its employees and subcontractors with, the information restrictions and other applicable requirements of the Privacy Act of 1974, 5 U.S.C. § 552. Among other things, the Contractor agrees to obtain the express consent of the KCATA and/or the Federal Government before the Contractor or its employees operate a system of records on behalf of the KCATA or Federal Government.

§ 16.37.2 The Contractor understands that the requirements of the Privacy Act, including the civil and criminal penalties for violation of that Act, apply to all individuals involved, and that failure to comply with the terms of the Privacy Act may result in termination of the underlying Agreement.

§ 16.37.3 The Contractor agrees that strict privacy will be maintained in the collection, storage, use, transfer, access to and/or security of personnel information. Contractor agrees to protect such information, and to limit the use of the information to that required by the contract.

§ 16.37.4 Contractor shall be liable to each employee for loss of any private or personal information lost or left unsecure by Contractor. Contractor shall not have any personal employee information for any reason outside of this contract.

§ 16.38 PROHIBITED INTERESTS

§ 16.38.1 No board member, officer, employee or agent of KCATA or of a local public body who has participated or will participate in the selection, award, or administration of this Contract, nor any member of his or her immediate family, business partner or any organization which employs, or intends to employ any of the above during such period, shall have any interest, direct or indirect, in this Contract or the proceeds thereof, to any share or part of this Contract, or to any benefit arising there from. This shall not be construed to prevent any such person from owning stock in a publicly owned corporation.

§ 16.38.2 No member of, or delegates to, the Congress of the United States shall be admitted to any share or part of the Contract, or to any benefit arising there from. This shall not be construed to prevent any such person from owning stock in a publicly owned corporation.

§ 16.39 PROHIBITED WEAPONS AND MATERIALS

§ 16.39.1 Missouri Revised Statutes, Section 571.107 (RSMo §571.107) allows government units and businesses to prohibit persons holding a concealed carry endorsement from carrying concealed firearms on its premises. Accordingly, KCATA has adopted the following rules prohibiting weapons, whether concealed or not, and whether or not the individual carrying the weapon has an endorsement or permit to carry.

§ 16.39.2 No weapon, including firearms concealed or not, or other instrument intended for use as a weapon, or any object capable of inflicting serious bodily injury upon another person or property may be carried in or on any facility or property of KCATA, including vehicles of contractors parked on KCATA property or leased facilities, or vehicles used in transporting KCATA customers, even if a person has a permit to carry a concealed weapon, unless authorized in writing to do so by KCATA. For the purposes hereof, a weapon shall include, but not be limited to, a firearm, knife, sword, mace, or any instrument of any kind known as blackjack, billy club, club, sandbag, and metal knuckles.

§ 16.39.3 No explosives, flammable liquids, acids, fireworks, other highly combustible materials, radioactive materials, or biochemical materials may be carried on or in any KCATA property, facility, or vehicle, including vehicles of contractors parked on KCATA property or leased facilities, or vehicles used in transporting any KCATA customer, except as authorized in writing by KCATA.

§ 16.39.4 Any contractor, subcontractor, employee or agent thereof, who has a firearm or other weapon, including those used for recreational purposes, in his/her possession, including on his/her person, in a vehicle on an KCATA facility, in a vehicle carrying KCATA customers, or accessible such as in first aid kits, toolboxes, purses, lunch or carrying bags, etc., at any time while performing KCATA contracted services or on KCATA property, including parking lots, concealed or not, shall be immediately prohibited from performing any further KCATA work, even if the person has a permit to carry a concealed weapon.

§ 16.39.5 Any KCATA contractor, subcontractor, employee or agent thereof, while performing KCATA contracted services or on any KCATA property or facilities, who has in his/her possession, carries, transports, displays, uses, flourishes, or threatens another person with a weapon, radioactive material, biochemical material or other dangerous weapon, object or material, which has the capability of inflicting bodily injury, shall be immediately prohibited from performing any further KCATA work and reported to local law enforcement authorities.

§ 16.40 PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE EQUIPMENT

Contractor represents that it is and will be compliant at all times with 2 CFR § 200.216 and will not provide telecommunications and/or video surveillance services or equipment to the KCATA in the performance of any contract, subcontract or other contractual instrument resulting from a solicitation or RFP that have been manufactured by a supplier (including any subsidiary or affiliate of those entities) that is considered prohibited or not approved under this regulation. This statute is not limited to entities that use end-products produced by those companies; and also covers the use of any equipment, system, or services that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

§ 16.41 RECORD RETENTION AND ACCESS

§ 16.41.1 The Contractor agrees that, during the course of this agreement and any extensions thereof, and for three years thereafter, it will maintain intact and readily accessible all data, documents, reports, records, contracts, and supporting materials relating to this Contract in accordance with 2 CFR § 200.33, 49 U.S.C. § 5325(g) and 49 CFR part 633. In the event of litigation or settlement of claims arising from the performance of this Contract, the Contractor agrees to maintain same until such litigation, appeals, claims, or exceptions related thereto have been disposed of.

§ 16.41.2 The Contractor shall permit KCATA, the U.S. Secretary of Transportation, the Comptroller General of the United States, and, as applicable, any local municipality, to inspect all work, materials, construction sites, payrolls, and other data and records, and to audit the books, records, and accounts of the Contractor relating to its performance under this Contract.

§ 16.41.3 The Contractor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed, and to include this clause in all subcontracts.

§ 16.42 SEAT BELT USE POLICY

The Contractor agrees to comply with terms of Executive Order No. 13043 “Increasing Seat Belt Use in the United States” and is encouraged to include those requirements in each subcontract awarded for work relating to this Contract.

§ 16.43 SEISMIC SAFETY

The Contractor agrees that any new building or addition to an existing building will be designed and constructed in accordance with the Standards for Seismic Safety required in Department of Transportation (DOT) Seismic Safety Regulations 49 C.F.R. Part 41 and will certify to compliance to the extent required by the regulation. The Contractor agrees to ensure that all work performed under this contract, including work performed by a subcontractor, is in compliance with the standards required by the Seismic Safety regulations and the certification of compliance issued on the project.

§ 16.44 SEVERABILITY

If any clause or provision of this Agreement is declared to be invalid by any court of competent jurisdiction, then and in that event, the remaining provisions hereof shall remain in force. In lieu of each clause or provision of this Agreement that is illegal, invalid, or unenforceable, there shall be added as part of this Agreement, a clause or provision as similar in terms to such illegal, invalid, or unenforceable clause or provision as may be possible and be legal, valid, and enforceable.

§ 16.45 SUSPENSION OF WORK

KCATA may order the Contractor, in writing, to suspend, delay, or interrupt all or any part of the work under this agreement for the period of time that KCATA determines appropriate for the convenience of KCATA.

§ 16.46 SUBSTANCE ABUSE/DRUG ALCOHOL TESTING

The Contractor agrees to comply with U.S. DOT regulation "Drug Free Workplace Requirements (Grant)," 40 CFR, Part 29, Subpart F. In addition, Contractor will comply with all drug, alcohol and substance abuse testing requirements for the KCATA.

§ 16.47 TEXTING WHILE DRIVING AND DISTRACTED DRIVING

Consistent with Executive Order No. 13513, "Federal Leadership on Reducing Text Messaging While Driving," October 1, 2009, 23 U.S.C. Section 402 note, and DOT Order 3902.10, "Text Messaging While Driving," December 30, 2009, the Contractor agrees to promote policies and initiatives for its employees and other personnel that adopt and promote safety policies to decrease crashes by distracted drivers, including policies to ban text messaging while driving, and to encourage each subcontractor to do the same.

§ 16.48 UNAVOIDABLE DELAYS

§ 16.48.1 A delay is unavoidable only if the delay was not reasonably expected to occur in connection with or during the Contractor's performance, and was not caused directly or substantially by acts, omissions, negligence, or mistakes of the Contractor, the Contractor's suppliers, or their agents, and was substantial and in fact caused the Contractor to miss delivery dates and could not adequately have been guarded against by contractual or legal means.

§ 16.48.2 Notification of Delays. The Contractor shall notify the Director of Procurement as soon as the Contractor has, or should have, knowledge that an event has occurred which will cause an unavoidable delay. Within five (5) days, the Contractor shall confirm such notice in writing, furnishing as much as detail as is available.

§ 16.48.3 Request for Extension. The Contractor agrees to supply, as soon as such data is available, any reasonable proof that is required by the Director of Procurement to make a decision on any request for extension. The Director of Procurement shall examine the request and any documents supplied by the Contractor and shall determine if the Contractor is entitled to an extension and the duration of such extension. The Director of Procurement shall notify the Contractor of its decision in writing.

§ 16.48.4 It is expressly understood and agreed that the Contractor shall not be entitled to damages or compensation and shall not be reimbursed for losses on account of delays resulting from any cause under this provision, except to the extent the Contractor's delay was attributable to KCATA's non-performance of its duties herein.

§ 16.49 UNLAWFUL EMPLOYMENT PRACTICE

§ 16.49.1 The Contractor and each Subcontractor agrees to refrain from any unlawful employment practices as presently defined by Section 26.222, Revised Ordinances, City of Kansas City, Missouri, and that such person will post on his or its premises at the office of employment notices setting forth the provisions of Section 26.222, and further setting forth that such person agrees to abide by said provisions; that such person agrees to implement the Certificate of Compliance or Affirmative Action Program submitted by him in connection with this Contract, and that such person shall be bound by the terms of Section 26.233, Revised Ordinances, City of Kansas City, Missouri, and by the Rules and Regulations promulgated for the administration of Section 26.288 through 26.243.

§ 16.49.2 Every person subject to Section 26.233 is hereby deemed to agree to permit the authorized representative of the KCATA, the Director of Human Relations of the City of Kansas City, Missouri, or his duly authorized agents or employees, access at all reasonable times to all such persons, books, papers, records, reports, or accounts in the possession of or under the control of such person, as may be necessary to ascertain compliance with Section 26.233, and to furnish such further information as may be required of him, all within ten (10) days of the date requested in writing.

§ 16.49.3 If the Contractor shall fail, refuse, or neglect to comply with the terms of these Contract Conditions, such failure shall be deemed a total breach of this Contract; and such Contract may be terminated, canceled, or suspended, in whole or in part, and such Contractor may be declared ineligible for any further KCATA contracts for a period of up to one year. Provided, that if this Contract is terminated, canceled, or suspended for failure to comply with Section 26.231, the Contractor shall have no claims for damages against the KCATA or the City of Kansas City, Missouri, on account of such termination, cancellation, or suspension or declaration of ineligibility.

§ 16.49.4 All contracts executed by the Contractor with a Subcontractor and relating to this KCATA Contract, shall contain as a condition thereof, the provisions of Section 26.232, Revised Ordinances, City of Kansas City, Missouri, relating to contract conditions; and such subcontractor shall be subject to the provisions of Section 26.228 through 26.243.

§ 16.50 UNITED STATES PREFERENCE

§ 16.50.1 Buy America.

.1 The Contractor agrees to comply with 49 U.S.C. §5323(j), and 49 CFR. Part 661, which provide that federal funds may not be obligated unless steel, iron, and manufactured products used in FTA-funded projects are produced in the United States, unless a waiver has been granted by FTA or the product is subject to a general waiver. General waivers are listed in 49 CFR 661.7 and include final assembly in the United States for 15 passenger vans and 15 passenger wagons produced by Chrysler Corporation, microcomputer equipment & software. Separate requirements for rolling stock are set out at 5323(j)(2)(C) and 49 CFR Part 661.11. Rolling stock not subject to a general waiver must be manufactured in the United States and have a 70 percent (70%) domestic content.

.2 The Contractor further agrees to include these requirements in all subcontracts exceeding $150,000.

§ 16.50.2 Cargo Preference.

.1 In the event that ocean shipment is required for any material or commodity pursuant to this Agreement, the Contractor agrees to utilize United States-Flag commercial vessels to ship at least fifty percent (50%) of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, to the extent such vessels are available at fair and reasonable rates for the United States-Flag commercial vessels.

.2 The Contractor further agrees to furnish within 20 working days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated "ON BOARD" commercial ocean bill-of-lading in English for each shipment of cargo described in the paragraph above to KCATA (through the Prime Contractor or in the case of subcontractor bill-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, 400 Seventh Street, S.W., Washington, DC, 20590, marked with the appropriate identification of the Project.

.3 The Contractor further agrees to include these requirements in all subcontracts issued pursuant to this Contract when the subcontract may involve the transport of equipment, materials or commodities by ocean liner and exceeds $150,000.

§ 16.50.3 Fly America. In accordance with Section 5 of the International Air Transportation Fair Competitive Practices Act of 1974 (49 U.S.C. 40118 - the "Fly America" Act), and in accordance with the General Service Administration's regulations at 41 CFR Part 301-10, recipients and subrecipients of federal funds and their Contractors are required to use U.S. Flag air carriers for U.S. Government-financed international air travel and transportation of their personal effects or property, to the extent such service is available, unless travel by foreign air carrier is a matter of necessity, as defined by the Fly America Act. The Contractor shall submit, if a foreign air carrier was used, an appropriate certification or memorandum adequately explaining why service by a U.S. flag air carrier was not available or why it was necessary to use a foreign air carrier (based on the reasons found in FAR § 47.403) and shall, in any event, provide a certificate of compliance with the Fly America requirements. The Contractor agrees to include the

requirements of this section in all subcontracts that may involve international air transportation and exceed $150,000.

"General Decision Number: MO20230001 01/06/2023

Superseded General Decision Number: MO20220001

State: Missouri

Construction Types: Heavy and Highway

Counties: Missouri Statewide.

HEAVY AND HIGHWAY CONSTRUCTION PROJECTS

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2023.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number Publication Date
0 01/06/2023

CARP0002-002 05/01/2022

ST. LOUIS COUNTY AND CITY

	Rates	Fringes
Carpenters.....	$ 39.94	19.50

CARP0005-006 05/01/2021

CASS (Richards-Gebauer AFB ONLY), CLAY, JACKSON, PLATTE AND RAY COUNTIES

	Rates	Fringes
Carpenters:		
CARPENTERS & LATHERS.....	$ 41.37	18.90
MILLWRIGHTS & PILEDRIVERS...	$ 41.37	18.90

CARP0011-001 05/01/2022

	Rates	Fringes
Carpenter and Piledriver		
ADAIR, AUDRAIN (West of Hwy 19), BOONE, CALLAWAY, CHARITON, COLE, COOPER, HOWARD, KNOX,LINN, MACON, MILLER, MONITEAU,MONROE, OSAGE, PUTNAM, RANDOLPH, SCHUYLER, SHELBY AND SULLIVAN COUNTIES.....	$ 34.06	19.20
ATCHISON, ANDREW, BATES, CALDWELL, CARROLL,DAVIESS, DEKALB,GENTRY, GRUNDY, HARRISON, HENRY, HOLT, LIVINGSTON, MERCER, NODAWAY,ST. CLAIR, SALINE AND WORTH COUNTIES.....	$ 32.43	19.20
AUDRAIN (East of Hwy.19), RALLS, MARION, LEWIS, CLARK AND SCOTLAND COUNTIES.	$ 34.07	19.20
BARRY, BARTON, CAMDEN, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS, GREENE, HICKORY,JASPER, LACLEDE, LAWRENCE, MCDONALD, NEWTON, OZARK, POLK, STONE, TANEY, VERNON, WEBSTER AND WRIGHT COUNTIES.	$ 32.00	19.20
BENTON, MORGAN AND PETTIS...	$ 32.48	19.20
BOLLINGER, BUTLER, CAPE GIRARDEAU, DUNKLIN, MISSISSIPPI, NEW MADRID, PEMISCOT, PERRY, STE. GENEVIEVE, SCOTT, STODDARD AND WAYNE COUNTIES.....	$ 33.90	19.20
BUCHANAN, CLINTON, JOHNSON AND LAFAYETTE COUNTIES.....	$ 33.20	19.20
CARTER, HOWELL, OREGON AND RIPLEY COUNTIES.....	$ 32.77	19.20
CRAWFORD, DENT, GASCONADE, IRON, MADISON, MARIES, MONTGOMERY, PHELPS, PULASKI, REYNOLDS, SHANNON		

AND TEXAS COUNTIES	$ 33.89	19.20
FRANKLIN COUNTY	$ 37.59	19.20
JEFFERSON AND ST. CHARLES COUNTIES	$ 39.94	19.50
LINCOLN COUNTY	$ 35.91	19.20
PIKE, ST. FRANCOIS AND WASHINGTON COUNTIES	$ 34.74	19.20
WARREN COUNTY	$ 36.38	19.20

ELEC0001-002 07/17/2022

BOLLINGER, BUTLER, CAPE GIRARDEAU, CARTER, DUNKLIN, FRANKLIN, IRON, JEFFERSON, LINCOLN, MADISON, MISSISSIPPI, NEW MADRID, PEMISCOT, PERRY,REYNOLDS, RIPLEY, ST. CHARLES, ST. FRANCOIS, ST. LOUIS (City and County), STE. GENEVIEVE, SCOTT, STODDARD, WARREN, WASHINGTON AND WAYNE COUNTIES

	Rates	Fringes
Electricians	$ 43.56	29.10

ELEC0002-001 09/04/2022

ADAIR, AUDRAIN, BOONE, CALLAWAY, CAMDEN, CARTER, CHARITON, CLARK, COLE, COOPER, CRAWFORD, DENT, FRANKLIN, GASCONADE, HOWARD, HOWELL, IRON, JEFFERSON, KNOX, LEWIS, LINCON, LINN, MACON, MARIES, MARION, MILLER, MONITEAU, MONROE, MONTGOMERY, MORGAN, OREGON, OSAGE, PERRY, PHELPS, PIKE, PULASKI, PUTNAM, RALLS, RANDOLPH, REYNOLDS, RIPLEY, ST. CHARLES, ST. FRANCOIS, ST. LOUIS (City and County), STE. GENEVIEVE, SCHUYLER, SCOTLAND, SHANNON, SHELBY, SULLIVAN, TEXAS, WARREN AND WASHINGTON COUNTIES

	Rates	Fringes
Line Construction:		
Equipment Operator	$ 44.16	23.14
Groundman & Truck Driver	$ 33.74	19.34
Lineman & Cable Splicer	$ 51.45	25.81

ELEC0053-004 08/01/2021

	Rates	Fringes
Line Construction: (ANDREW, ATCHINSON, BARRY, BARTON, BUCHANAN, CALDWELL, CEDAR, CHRISTIAN, CLINTON, DADE, DALLAS, DAVIES,, DEKALB, DOUGLAS, GENTRY, GREENE, GRUNDY, HARRISON, HICKORY, HOLT, JASPER, LACLEDE, LAWRENCE, LIVINGSTON, MCDONALD, MERCER, NEWTON, NODAWAY, OZARK, POLK, ST. CLAIR, STONE, TANEY, VERNON, WEBSTER, WORTH AND WRIGHT COUNTIES)		
Groundman Powderman	$ 33.58	18.34
Groundman	$ 31.33	17.60
Lineman Operator	$ 45.60	22.48
Lineman	$ 50.31	24.11
Line Construction; (BATES,		

BENTON, CARROLL, CASS, CLAY,
HENRY, JACKSON, JOHNSON,
LAFAYETTE, PETTIS, PLATTE,
RAY AND SALINE COUNTIES)

	Rates	Fringes
Groundman Powderman	$ 33.58	18.34
Groundman	$ 31.33	17.60
Lineman Operator	$ 45.60	22.48
Lineman	$ 50.31	24.11

ELEC0095-001 06/01/2020

BARRY, BARTON, CEDAR, DADE, JASPER, LAWRENCE, MCDONALD, NEWTON,
ST CLAIR, AND VERNON COUNTIES

	Rates	Fringes
Electricians:		
Cable Splicers	$ 25.40	12.19
Electricians	$ 27.43	17.44

ELEC0124-007 09/28/2021

BATES, BENTON, CARROLL, CASS, CLAY, COOPER, HENRY, JACKSON,
JOHNSON, LAFAYETTE, MORGAN, PETTIS, PLATTE, RAY AND SALINE
COUNTIES:

	Rates	Fringes
Electricians	$ 41.79	23.67

ELEC0257-003 03/01/2021

AUDRAIN (Except Cuivre Township), BOONE, CALLAWAY, CAMDEN,
CHARITON, COLE, CRAWFORD, DENT, GASCONADE, HOWARD, MARIES,
MILLER, MONITEAU, OSAGE, PHELPS AND RANDOLPH COUNTIES

	Rates	Fringes
Electricians:		
Cable Splicers	$ 30.42	16.085
Electricians	$ 34.60	16.38

ELEC0350-002 12/01/2022

ADAIR, AUDRAIN (East of Highway 19), CLARK, KNOX, LEWIS, LINN,
MACON, MARION, MONROE, MONTGOMERY, PIKE, PUTNAM, RALLS,
SCHUYLER, SCOTLAND, SHELBY AND SULLIVAN COUNTIES

	Rates	Fringes
Electricians	$ 35.50	19.94

ELEC0453-001 09/01/2020

	Rates	Fringes
Electricians:		
CHRISITAN, DALLAS, DOUGLAS, GREENE, HICKORY, HOWELL, LACLEDE, OREGON, OZARK, POLK, SHANNON,		

WEBSTER and WRIGHT COUNTIES.	$ 28.10	15.81
PULASKI and TEXAS COUNTIES..	$ 32.76	16.27
STONE and TANEY COUNTIES....	$ 23.89	14.99

ELEC0545-003 06/01/2022

ANDREW, BUCHANAN, CLINTON, DEKALB, ATCHISON, HOLT, MERCER, GENTRY, HARRISON, DAVIESS, GRUNDY, WORTH, LIVINGSTON, NODAWAY, AND CALDWELL COUNTIES

	Rates	Fringes
Electricians:	$ 36.00	16.39

ELEC0702-004 12/30/2019

BOLLINGER, BUTLER, CAPE GIRARDEAU, DUNKLIN, MADISON, MISSISSIPPI, NEW MADRID, PEMISCOT, SCOTT, STODDARD AND WAYNE COUNTIES

	Rates	Fringes
Line Construction:		
Groundman - Class A	$ 30.31	29% + 7.75
Groundman-Equipment Operator Class II (all other equipment)	$ 38.46	29% + 7.75
Heavy-Equipment Operator Class I (all crawler type equipment D-4 and larger)	$ 43.88	29% + 7.75
Lineman	$ 53.51	29% + 7.75

ENGI0101-001 05/01/2020

ANDREW, ATCHISON, BATES, BENTON, BUCHANAN, CALDWELL, CARROLL, CHARITON, CLINTON, COOPER, DAVIESS, DEKALB, GENTRY, GRUNDY, HARRISON, HENRY, HOLT, HOWARD, JOHNSON, LAFAYETTE, LINN, LIVINGSTON, MERCER, NODAWAY, PETTIS, SALINE, SULLIVAN AND WORTH COUNITES

	Rates	Fringes
Power equipment operators:		
GROUP 1	$ 34.73	18.20
GROUP 2	$ 34.33	18.20
GROUP 3	$ 32.33	18.20

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Asphalt roller operator, finish; asphalt paver and spreader; asphalt plant operator; auto grader or trimmer or sub-grader; backhoe; blade operator (all types); boilers - 2; booster pump on dredge; bulldozer operator; boring machine (truck or crane mounted); clamshell operator; concrete mixer paver; concrete plant operator; concrete pump operator; crane operator; derrick or derrick trucks; ditching machine; dragline operator; dredge engineman; dredge operator; drill cat with compressor mounted (self-contained) or similar type self- propelled rotary drill (not air tract); drilling or boring machine (rotary-self-propelled); finishing machine operator; greaser; high loader-fork lift-skid loader (all types);

hoisting engineer (2 active drums); locomotive operator (standard guage); mechanics and welders (field and plants); mucking machine operator; pile drive operator; pitman crane or boom truck (all types); push cat; quad track; scraper operators (all types); shovel operator; sideboom cats; side discharge spreader; skimmer scoop operators; slip form paver operator (CMI, Rex, Gomeco or equal); la tourneau rooter (all tiller types); tow boat operator; truck crane; wood and log chippers (all types).

GROUP 2: A-frame truck operator; articulated dump truck; back filler operator; boilers (1); chip spreader; churn drill operator; compressor; concrete mixer operator, skip loader; concrete saws (self-propelled); conveyor operator; crusher operator; distributor operator; elevating grader operator; farm tractor (all attachments); fireman rig; float operator; form grade operator; hoisting engine (one drum); maintenance operator; multiple compactor; pavement breaker, self-propelled hydra-hammer (or similar type); paymill operator; power shield; pumps; roller operator (with or without blades); screening and washing plant; self-propelled street broom or sweeper; siphons and jets; straw blower; stump cutting machine; siphons and jets; tank car heater operator (combination boiler and booster); welding machine; vibrating machine operator (not hand held); welding machine.

GROUP 3: (a) Oiler;
(b) Oiiler driver
(c) Mechanic.

HOURLY PREMIUMS:
THE FOLLOWING CLASSIFICATIONS SHALL RECEIVE ($ .25) ABOVE GROUP 1 RATE: Dragline operator - 3 yds. & over; shovel 3 yds. & over; clamshell 3 yds. & over; Crane, rigs or piledrivers, 100' of boom or over (incl. jib.), hoist - each additional active drum over 2 drums

THE FOLLOWING CLASSIFICATIONS SHALL RECEIVE ($ .50) ABOVE GROUP 1 RATE: Tandem scoop operator; crane, rigs or piledrivers 150' to 200' of boom (incl. jib.)

THE FOLLOWING CLASSIFICATIONS SHALL RECEIVE ($ .75) ABOVE GROUP 1 RATE: Crane rigs, or piledrivers 200 ft. of boom or over (including jib.)

ENGI0101-005 04/01/2022

CASS, CLAY, JACKSON,PLATTE AND RAY COUNTIES

	Rates	Fringes
Power equipment operators:		
GROUP 1	$ 38.42	20.44
GROUP 2	$ 37.38	20.44
GROUP 3	$ 32.91	20.44
GROUP 4	$ 36.26	20.44

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Asphalt roller operator, finish; asphalt paver and spreader; asphalt plant operator; auto grader or trimmer or sub-grader; backhoe; blade operator (all types); boilers-2; booster pump on dredge; boring machine (truck or crane

mounted); bulldozer operator; clamshell operator; concrete cleaning decontamination machine operator; concrete mixer paver; concrete plant operator; concrete pump operator; crane operator; derrick or derrick trucks; ditching machine; dragline operator; dredge engineman; dredge operator; drillcat with compressor mounted (self-contained) or similar type self propelled rotary drill (not air tract); drilling or boring machine (rotary - self-propelled); finishing machine operator; greaser; heavy equipment robotics operator/mechanic; horizontal directional drill operator; horizontal directional drill locator; loader-forklift - skid loader (all types); hoisting engineer (2 active drums); locomotive operator (standard guage); master environmental maintenance mechanic; mechanics and welders (field and plants); mucking machine operator; piledrive operator; pitman crane or boom truck (all types); push cat; quad-track; scraper operators (all types); shovel operator; side discharge spreader; sideboom cats; skimmer scoop operator; slip-form paver (CMI, REX, Gomaco or equal); la tourneau rooter (all tiller types); tow boat operator; truck crane; ultra high perssure waterjet cutting tool system operator/mechanic; vacuum blasting machine operator/mechanic; wood and log chippers (all types)

GROUP 2: ""A"" Frame truck operator; back filler operator; boilers (1); chip spreader;churn drill operator; concrete mixer operator, skip loader; concrete saws (self-propelled); conveyor operator; crusher operator; distributor operator; elevating grader operator; farm tractor (all attachments); fireman rig; float operator; form grader operator; hoisting engine (1 drum); maintenance operator; multiple compactor; pavement breaker, self-propelled hydra- hammer (or similar type); power shield; paymill operator; pumps; siphons and jets; stump cutting machine; tank car heater operator (combination boiler and booster); compressor; roller operator (with or without blades); screening and washing plant; self-propelled street broom or sweeper; straw blower; tank car heater operator (combination boiler and booster); vibrating machine operator (not hand held)

GROUP 3: Oilers

GROUP 4: Oiler Driver (All Types)

FOOTNOTE:
HOURLY PREMIUMS FOLLOWING CLASSIFICATIONS SHALL RECEIVE ($1.00) ABOVE GROUP 1 RATE:
Clamshells - 3 yd. capacity or over; Cranes or rigs, 80 ft. of boom or over (including jib); Draglines, 3 yd. capacity or over;
Piledrivers 80 ft. of boom or over (including jib);
Shovels & backhoes, 3 yd. capacity or over.

ENGI0101-022 05/01/2019

BARRY, BARTON, CAMDEN, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS, GREENE, HICKORY, JASPER, LACLEDE, LAWRENCE, MCDONALD, NEWTON, OZARK, POLK, ST. CLAIR, STONE, TANEY, VERNON, WEBSTER AND WRIGHT COUNTIES and CITY OF SPRINGFIELD

	Rates	Fringes

Power equipment operators:

GROUP 1	$ 31.72	14.88
GROUP 2	$ 31.37	14.88
GROUP 3	$ 31.17	14.88
GROUP 4	$ 29.12	14.88

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Asphalt finishing machine & trench widening spreader; asphalt plant console operator; autograder; automatic slipform paver; backhoe; blade operator - all types; boat operator - tow; boilers-2; central mix concrete plant operator; clamshell operator; concrete mixer paver; crane operator; derrick or derrick trucks; ditching machine; dozer operator; dragline operator; dredge booster pump; dredge engineman; dredge operator; drill cat with compressor mounted on cat; drilling or boring machine rotary self-propelled; highloader; hoisting engine - 2 active drums; launch hammer wheel; locomotive operator; - standard guage; mechanic and welders; mucking machine; off-road trucks; piledriver operator; pitman crane operator; push cat operator; quad trac; scoop operator - all types; shovel operator; sideboom cats; skimmer scoop operators; trenching machine operator; truck crane.

GROUP 2: A-frame; asphalt hot-mix silo; asphalt plant fireman (drum or boiler); asphalt plant man; asphalt plant man; asphalt plant mixer operator; asphalt roller operator; backfiller operator; barber-greene loader; boat operator (bridges and dams); chip spreader; concrete mixer operator - skip loader; concrete plant operator; concrete pump operator; crusher operator; dredge oiler; elevating grader operator; fork lift; greaser-fleet; hoisting engine - 1; locomotive operator - narrow gauge; multiple compactor; pavement breaker; powerbroom - self-propelled; power shield; rooter; side discharge concrete spreader; slip form finishing machine; stumpcutter machine; throttle man; tractor operator (over 50 h.p.); winch truck.

GROUP 3: Boilers - 1; chip spreader (front man); churn drill operator; clef plane operator; concrete saw operator (self-propelled); curb finishing machine; distributor operator; finishing machine operator; flex plane operator; float operator; form grader operator; pugmill operator; roller operator, other than high type asphalt; screening & washing plant operator; siphons & jets; sub-grading machine operator; spreader box operator, self-propelled (not asphalt); tank car heater operator (combination boiler & booster); tractor operator (50 h.p. or less); Ulmac, Ulric or similar spreader; vibrating machine operator, not hand;

GROUP 4: Grade checker; Oiler; Oiler-Driver

HOURLY PREMIUMS:

The following classifications shall receive $ .25 above GROUP 1 rate:
Clamshells - 3 yds. or over; Cranes - Rigs or Piledrivers, 100 ft. of boom or over (including jib);
Draglines - 3 yds. or over; Hoists - each additional active drum over 2 drums; Shovels - 3 yds. or over;

The following classifications shall receive $ .50 above GROUP 1 rate:

Tandem scoop operator; Cranes - Rigs or Piledrivers, 150 ft. to 200 ft. of boom (including jib); Tandem scoop.

The following classifications shall receive $ .75 above GROUP 1 rate:
Cranes - Rigs or Piledrivers, 200 ft. of boom or over (including jib.).

ENGI0513-004 05/05/2022

FRANKLIN, JEFFERSON, LINCOLN, ST CHARLES, AND WARREN COUNTIES

	Rates	Fringes
Power equipment operators:		
GROUP 1	$ 38.36	28.93
GROUP 2	$ 38.36	28.93
GROUP 3	$ 37.06	28.93
GROUP 4	$ 36.61	28.93

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Backhoe, Cable; Backhoe, Hydraulic (2 cu yds bucket and under regardless of attachment, one oiler for 2 or 3, two oilers for 4 through 6); Backhoe, Hydraulic over 2 cu yds; Cableway; Crane, Crawler or Truck; Crane, Hydraulic - Truck or Cruiser mounted, 16 tons and over; Crane, Locomotive; crane with boom including jib over 100 ft from pin to pin; Crane using rock socket tool; Derrick, Steam; Derrick Car and Derrick Boat; Dragline, 7 cu yds and over; Dredge; Gradall, Crawler or tire mounted; Locomotive, Gas, Steam & other powers; Pile Driver, Land or Floating; Scoop, Skimmer; Shovel, Power (Electric, Gas, Steam or other powers); Shovel, Power (7 cu yds and over); Switch Boat; Whirley; Air Tugger with air compressor; Anchor Placing Barge; Asphalt Spreaker; Athey Force Feeder Loader, self-propelled; Backfilling Machine; Boat Operator - Push Boat or Tow Boat (job site); Boiler, High Pressure Breaking in Period; Boom Truck, Placing or Erecting; Boring Machine, Footing Foundation; Bullfloat; Cherry Picker; Combination Concrete Hoist and Mixer (such as Mixermobile); Compressor, Two 125 CFM and under; Compressor, Two through Four over 125 CFM; Compressor when operator runs throttle; Concrete Breaker (Truck or Tractor mounted); Concrete Pump (such as Pumpcrete machine); Concrete Saw (self-propelled); Concrete Spreader; Conveyor, Large (not selfpropelled) hoisting or moving brick and concrete into, or into and on floor level, one or both; Crane, Cimbing (such as Linden); Crane, Hydraulic - Rough Terrain, self-propelled; Crane, Hydraulic - Truck or Cruiser mounted - under 16 tons; Drilling machine - Self-powered, used for earth or rock drilling or boring (wagon drills and any hand drills obtaining power from other souces including concrete breakers, jackhammers and Barco equipmnet no engineer required); Elevating Grader; Engine Man, Dredge; Excavator or Powerbelt Machine; Finishing Machine, self- propelled oscillating screed; Forklift; Generators, Two through Six 30 KW or over; Grader, Road with power blade; Greaser; Highlift; Hoist, Concrete and Brick (Brick cages or concrete skips operating or on tower, Towermobile, or similar equipment); Hoist, Three or more drums in use; Hoist, Stack; Hydro-Hammer; Lad-A-Vator, hoisting brick or concrete; Loading Machine such as Barber-Greene; Mechanic on job site

GROUP 2: Air Tugger with plant air; Boiler (for power or heating shell of building or temporary enclosures in connection with construction work); Boiler, Temporary; Compressor, One over 125 CFM; Compressor, truck mounted; Conveyor, Large (not self- propelled); Conveyor, Large (not self- propelled) moving brick and concrete (distributing) on floor level; Curb Finishing Machine; Ditch Paving Machine; Elevator (outside); Endless Chain Hoist; Fireman (as required); Form Grader; Hoist, One Drum regardless of size (except brick or concrete); Lad-A-Vator, other hoisting; Manlift; Mixer, Asphalt, over 8 cu ft capacity; Mixer, one bag capacity or less; Mixer, without side loader, two bag capacity or more; Mixer, with side loader, regardless of size, not Paver; Mud Jack (where mud jack is used in conjenction with an air compressor, operator shall be paid $ .55 per hour in addition to his basic hourly rate for covering both operations); Pug Mill operator; Pump, Sump - self powered, automatic controlled over 2""; Scissor Lift (used for hoisting); Skid Steer Loader; Sweeper, Street; Tractor, small wheel type 50 HP and under with grader blade and similar equipment; Welding Machine, One over 400 amp; Winch, operating from truck

GROUP 3: Boat operator - outboard motor, job site; Conveyors (such as Con-Vay-It) regardless of how used; Elevator (inside); Heater operator, 2 through 6; Sweeper, Floor

GROUP 4: Crane type

HOURLY PREMIUMS:

Backhoe, Hydraulic 2 cu yds or less without oiler - $2.00;
Crane,climbing (such as Linden) - $.50;
Crane, Pile Driving and Extracting - $ .50
Crane with boom (including job) over
100 ft from pin to pin - add $.01 per foot
to maximum of $4.00);
Crane, using rock socket tool - $ .50;
Derrick, diesel, gas or electric hoisting material
and erecting steel (150 ft or more above ground) - $ .50;
Dragline, 7 cu yds and over - $ .50;
Hoist, Three or more drums in use - $ .50;
Scoop, Tandem - $.50;
Shovel, Power - 7 cu yds and over - $ .50;
Tractor, Tandem Crawler - $ .50;
Tunnel, man assigned to work in tunnel or
tunnel shaft - $ .50;
Wrecking, when machines are working on
second floor or higher - $ .50

ENGI0513-006 05/01/2022

ADAIR, AUDRAIN, BOLLINGER, BOONE, BUTLER, CALLAWAY, CAPE GIRARDEAU, CARTER, CLARK, COLE, CRAWFORD, DENT, DUNKLIN, GASCONADE, HOWELL, IRON, KNOX, LEWIS, MACON, MADISON, MARIES, MARION, MILLER, MISSISSIPPI, MONITEAU, MONROE, MONTGOMERY, MORGAN, NEW MADRID, OREGON, OSAGE, PEMISCOT, PERRY, PHELPS, PIKE, PULASKI, PUTNAM, RALLS, RANDOLPH, REYNOLDS, RIPLEY, ST. FRANCOIS, STE. GENEVIEVE, SCHUYLER, SCOTLAND, SCOTT, SHANNON, SHELBY, STODDARD, TEXAS, WASHINGTON, AND WAYNE COUNTIES

	Rates	Fringes

Power equipment operators:

GROUP 1	$ 33.24	28.75
GROUP 2	$ 32.89	28.75
GROUP 3	$ 32.69	28.75
GROUP 4	$ 29.04	28.75

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Asphalt finishing machine & trench widening spreader, asphalt plant console operator; autograder; automatic slipform paver; back hoe; blade operator - all types; boat operator tow; boiler two; central mix concrete plant operator; clam shell operator; concrete mixer paver; crane operator; derrick or derrick trucks; ditching machine; dozer operator; dragline operator; dredge booster pump; dredge engineman; dredge operator; drill cat with compressor mounted on cat; drilling or boring machine rotary self-propelled; highloader; hoisting engine 2 active drums; launchhammer wheel; locomotive operator standrad guage; mechanics and welders; mucking machine; piledriver operator; pitman crane operator; push cat operator; guad-trac; scoop operator; sideboom cats; skimmer scoop operator; trenching machine operator; truck crane, shovel operator.

GROUP 2: A-Frame; asphalt hot-mix silo; asphalt roller operator asphalt plant fireman (drum or boiler); asphalt plant man; asphalt plant mixer operator; backfiller operator; barber-greene loader; boat operator (bridge & dams); chip spreader; concrete mixer operator skip loader; concrete plant operator; concrete pump operator; dredge oiler; elevating graded operator; fork lift; grease fleet; hoisting engine one; locomotive operator narrow guage; multiple compactor; pavement breaker; powerbroom self-propelled; power shield; rooter; slip-form finishing machine; stumpcutter machine; side discharge concrete spreader; throttleman; tractor operator (over 50 hp); winch truck; asphalt roller operator; crusher operator.

GROUP 3: Spreader box operator, self-propelled not asphalt; tractor operator (50 h.p. or less); boilers one; chip spreader (front man); churn drill operator; compressor over 105 CFM 2-3 pumps 4"" & over; 2-3 light plant 7.5 KWA or any combination thereof; clef plane operator; compressor maintenance operator 2 or 3; concrete saw operator (self-propelled); curb finishing mancine; distributor operator; finishing machine operator; flex plane operator; float operator; form grader operator; pugmill operator; riller operator other than high type asphalt; screening & washing plant operator; siphons & jets; subgrading machine operator; tank car heater (combination boiler & booster); ulmac, ulric or similar spreader; vibrating machine operator; hydrobroom.

GROUP 4: Oiler; grout machine; oiler driver; compressor over 105 CFM one; conveyor operator one; maintenance operator; pump 4"" & over one.

FOOTNOTE: HOURLY PREMIUMS

Backhoe hydraulic, 2 cu. yds. or under Without oiler - $2.00
Certified Crane Operator - $1.50;
Certified Hazardous Material Operator $1.50;
Crane, climbing (such as Linden) - $0.50;
Crane, pile driving and extracting - $0.50;

Crane, with boom (including jib) over 100' from pin to pin add $0.01 per foot to maximum of $4.00;
Crane, using rock socket tool - $0.50;
Derrick, diesel, gas or electric, hoisting material and erecting steel (150' or more above the ground) - $0.50;
Dragline, 7 cu. yds, and over - $0.50;
Hoist, three or more drums in use - $0.50; Scoop, Tandem - $0.50;
Shovel, power - 7 cu. yds. or more - $0.50;
Tractor, tandem crawler - $0.50;
Tunnel, man assigned to work in tunnel or tunnel shaft - $0.50;
Wrecking, when machine is working on second floor or higher - $0.50;

ENGI0513-007 05/05/2022

ST. LOUIS CITY AND COUNTY

	Rates	Fringes
Power equipment operators:		
GROUP 1	$ 38.36	28.93
GROUP 2	$ 38.36	28.93
GROUP 3	$ 37.06	28.93
GROUP 4	$ 36.61	28.93

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Backhoe, cable or hydraulic; cableway; crane crawler or truck; crane, hydraulic-truck or cruiser mounted 16 tons & over; crane locomotive; derrick, steam; derrick car & derrick boat; dragline; dredge; gradall, crawler or tire mounted; locomotive, gas, steam & other powers; pile driver, land or floating; scoop, skimmer; shovel, power (steam, gas, electric or other powers); switch boat; whirley.

GROUP 2: Air tugger w/air compressor; anchor-placing barge; asphalt spreader; athey force feeder loader (self-propelled); backfilling machine; backhoe-loader; boat operator-push boat or tow boat (job site); boiler, high pressure breaking in period; boom truck, placing or erecting; boring machine, footing foundation; bull- float; cherry picker; combination concrete hoist & mixer (such as mixer mobile); compressor (when operator runs throttle); concrete breaker (truck or tractor mounted); concrete pump, such as pump-crete machine; concrete saw (self-propelled), concrete spreader; conveyor, large (not self-propelled), hoisting or moving brick and concrete into, or into and on floor level, one or both; crane, hydraulic-rough terrain, self-propelled; crane hydraulic-truck or cruiser mounted-under 16 tons; drilling machines, self-powered use for earth or rock drilling or boring (wagon drills nd any hand drills obtaining power from other sources including concrete breakers, jackhammers and barco equipment-no engineer required); elevating grader; engineman, dredge; excavator or powerbelt machine; finishing machine, self-propelled oscillating screed; forklift; grader, road with power blade; highlift. greaser; hoist, stack, hydro-hammer; loading machine (such as barber-greene); machanic, on job site; mixer, pipe wrapping machines; plant asphalt; plant, concrete producing or ready-mix job site; plant heating-job site; plant mixing-job site; plant power,

generating-job site; pumps, two through six self-powered over 2""; pumps, electric submersible, two through six, over 4""; quad-track; roller, asphalt, top or sub-grade; scoop, tractor drawn; spreader box; sub-grader; tie tamper; tractor-crawler, or wheel type with or without power unit, power take-offs and attachments regardless of size; trenching machine; tunnel boring machine; vibrating machine automatic, automatic propelled; welding machines (gasoline or diesel) two through six; well drilling machine

GROUP 3: Conveyor, large (not self-propelled); conveyor, large (not self-propelled) moving brick and concrete distributing) on floor level; mixer two or more mixers of one bag capacity or less; air tugger w/plant air; boiler, for power or heating on construction projects; boiler, temporary; compressor (mounted on truck; curb finishing machine; ditch paving machine; elevator; endless chain hoist; form grader; hoist, one drum regardless of size; lad-a-vator; manlift; mixer, asphalt, over 8 cu. ft. capacity, without side loader, 2 bag capacity or more; mixer, with side loader, regardless of size; pug mill operator; pump, sump-self-powered, automatic controlled over 2"" during use in connection with construction work; sweeper, street; welding machine, one over 400 amp.; winch operating from truck; scissor lift (used for hoisting); tractor, small wheel type 50 h.p. & under with grader blade & similar equipment; Oiler on dredge and on truck crane.

GROUP 4: Boat operator-outboard motor (job site); conveyor (such as con-vay-it) regardless of how used; sweeper, floor

HOURLY PREMIUMS:

Backhoe, hydraulic 2 cu. yds. or under without oiler	$2.00
Certified Crane Operator	1.50
Certified Hazardous Material Operator	1.50
Crane, climbing (such as Linden)	.50
Crane, pile driving and extracting	.50
Crane, with boom (including jib) over 100' (from pin to pin) add $.01 per foot to maximum of	4.00
Crane, using rock socket tool	.50
Derrick, diesel, gas or electric, hoisting material and erecting steel (150' or more above ground)	.50
Dragline, 7 cu. yds. and over	.50
Hoist, three (3) or more drums in use	.50
Scoop, Tandem	.50
Shovel, power - 7 cu. yds. or more	.50
Tractor, tandem crawler	.50
Tunnel, man assigned to work in tunnel or tunnel shaft	.50
Wrecking, when machine is working on second floor or higher	.50

IRON0010-012 04/01/2022

	Rates	Fringes
Ironworkers: ANDREW, BARTON, BENTON, CAMDEN, CEDAR, CHARITON, CHRISTIAN, COOPER, DADE, DALLAS, DAVIESS, DE KALB,		

GENTRY, GREENE, GRUNDY,
HARRISON, HICKORY, HOLT,
HOWARD, LACLEDE, LINN,
LIVINGSTON, MERCER,
MONITEAU, MORGAN, NODAWAY,
PETTIS, POLK, PUTNAM,
RANDLOPH, ST. CLAIR,
SULLIVAN, TANEY, VERNON,
WEBSTER, WRIGHT and WORTH
Counties and portions of
ADAIR, BOONE, MACON,
MILLER and RANDOLPH
Counties.....$ 32.50 32.68
ATCHISON, BATES, BUCHANAN,
CALDWELL, CARROLL, CASS,
CLAY, CLINTON, HENRY,
JACKSON, JOHNSON,
LAFAYETTE, PETTIS, PLATTE,
SALINE, AND RAY COUNTIES....$ 35.50 32.68

IRON0321-002 08/01/2022

DOUGLAS, HOWELL and OZARK COUNTIES

	Rates	Fringes
Ironworker	$ 23.50	19.96

IRON0396-004 08/04/2021

ST. LOUIS (City and County), ST. CHARLES, JEFFERSON, IRON, FRANKLIN, LINCOLN, WARREN, WASHINGTON, ST. FRANCOIS, STE. GENEVIEVE, and REYNOLDS Counties; and portions of MADISON, PERRY, BOLLINGER, WAYNE, and CARTER Counties

	Rates	Fringes
Ironworker	$ 36.71	28.96

IRON0396-009 08/04/2021

AUDRAIN, CALLAWAY, COLE, CRAWFORD, DENT, GASCONADE, MARIES, MONTGOMERY, OSAGE, PHELPS, PIKE, PULASKI, TEXAS and WRIGHT Counties; and portions of BOONE, CAMDEN, DOUGLAS, HOWELL, LACLEDE, MILLER, MONROE, OREGON, SHANNON and RALLS Counties

	Rates	Fringes
Ironworker	$ 32.24	28.96

IRON0577-005 06/01/2022

ADAIR, CLARK, KNOX, LEWIS, MACON, MARION, MONROE, RALLS, SCHUYLER, SCOTLAND, AND SHELBY COUNTIES

	Rates	Fringes
Ironworker	$ 28.80	25.05

IRON0584-004 06/01/2022

BARRY, JASPER, LAWRENCE, MCDONALD, NEWTON AND STONE Counties

	Rates	Fringes
Ironworkers:	$ 28.00	16.00

IRON0782-003 08/01/2022

CAPE GIRARDEAU, MISSISSIPPI, NEW MADRID, SCOTT, & STODDARD Counties; and portions of BOLLINGER, BUTLER, CARTER, DUNKLIN, MADISON, PEMISCOT, PERRY, RIPLEY, and WAYNE Counties

	Rates	Fringes
Ironworkers:		
Locks, Dams, Bridges and other major work on the Mississippi and Ohio River only	$ 35.13	28.27
All Other Work	$ 30.73	24.12

LABO0042-003 03/02/2022

ST. LOUIS (City and County)

	Rates	Fringes
LABORER		
Plumber Laborer	$ 35.80	16.77

LABO0042-005 03/02/2022

ST. LOUIS (City and County)

	Rates	Fringes
LABORER		
Dynamiter, Powderman	$ 35.80	16.77
Laborers, Flaggers	$ 35.80	16.77
Wrecking	$ 35.80	16.77

LABO0110-005 05/01/2022

Jefferson and Washington Counties

	Rates	Fringes
LABORER (Jefferson County)		
GROUP 1	$ 34.49	15.42
GROUP 2	$ 35.09	15.42
LABORER (Washington County)		
GROUP 1	$ 32.10	15.42
GROUP 2	$ 32.10	15.42

LABORERS CLASSIFICATIONS

GROUP 1 - General laborer-flagman, carpenter tenders; salamander Tenders; Dump Man; Ticket Takers; loading trucks under bins, hoppers, and conveyors; track man; cement handler; dump man on earth fill; georgie buggie man; material batch hopper man; spreader on asphalt machine; material mixer man (except on manholes); coffer dams; riprap pavers rock, block or brick; scaffolds over ten feet not self-supported from ground up; skip man on concrete paving; wire mesh setters on concrete paving; all work in

connection with sewer, water, gas, gasoling, oil, drainage pipe, conduit pipe, tile and duct lines and all other pipe lines; power tool operator; all work in connection with hydraulic or general dredging operations; form setters, puddlers (paving only); straw blower nozzleman; asphalt plant platform man; chuck tender; crusher feeder; men handling creosote ties or creosote materials; men working with and handling epoxy material; topper of standing trees; feeder man on wood pulverizers, board and willow mat weavers and cabelee tiers on river work; deck hands; pile dike and revetment work; all laborers working on underground tunnels less than 25 ft. where compressed air is not used; abutement and pier hole men working six (6) ft. or more below ground; men working in coffer dams for bridge piers and footing in the river; barco tamper; jackson or any other similar tamp; cutting torch man; liners, curb, gutters, ditch lines; hot mastic kettlemen; hot tar applicator; hand blade operator; mortar men or brick or block manholes; rubbing concrete, air tool operator under 65 lbs.; caulker and lead man; chain or concrete saw under 15 h.p.; signal Gan; Guard rail and sign erectors.

GROUP 2 - Skilled laborers - Vibrator man; asphalt raker; head pipe layer on sewer work; batterboard man on pipe and ditch work; cliff scalers working from bosun's chairs; scaffolds or platforms on dams or power plants over 10 ft. high; air tool operator over 65 lbs.; stringline man on concrete paving; sandblast man; laser beam man; wagon drill; churn drill; air track drill and all other similar type drills, gunite nozzle man; pressure grout man; screed man on asphalt; concrete saw 15 h.p. and over; grade checker; strigline man on electronic grade control; manhole builder; dynamite man; powder man; welder; tunnel man; waterblaster - 1000 psi or over; asbestos and/or hazardous waste removal and/or disposal

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LABO0579-005 05/01/2022

	Rates	Fringes
LABORER (ANDREW, ATCHISON, BUCHANAN, CALDWELL, CLINTON, DAVIESS, DEKALB, GENTRY, GRUNDY, HARRISON, HOLT, LIVINGSTON, MERCER, NODAWAY and WORTH COUNTIES.)		
GROUP 1	$ 28.29	16.34
GROUP 2	$ 28.64	16.34
LABORER (BARRY, BARTON, BATES, BENTON, CAMDEN, CARROLL, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS, GREENE, HENRY. HICKORY, JASPER, JOHNSON, LACLEDE, LAWRENCE, MCDONALD, MORGAN, NEWTON, OZARK, PETTIS, POLK, ST.CLAIR, SALINE, STONE, TANEY, VERNON, WEBSTER and WRIGHT COUNTIES)		
GROUP 1	$ 27.28	15.55
GROUP 2	$ 27.83	15.55
LABORER (LAFAYETTE COUNTY)		
GROUP 1	$ 28.83	15.80

GROUP 2.....$ 29.18 15.80

LABORERS CLASSIFICATIONS

GROUP 1: General Laborers - Carpenter tenders; salamander tenders; loading trucks under bins; hoppers & conveyors; track men & all other general laborers; air tool operator; cement handler-bulk or sack; dump man on earth fill; georgie buggie man; material batch hopper man; material mixer man (except on manholes); coffer dams; riprap pavers - rock, block or brick; signal man; scaffolds over ten feet not self-supported from ground up; skipman on concrete paving; wire mesh setters on concrete paving; all work in connection with sewer, water, gas, gasoline, oil drainage pipe, conduit pipe, tile and duct lines and all other pipe lines; power tool operator, all work in connection with hydraulic or general dredging operations; puddlers (paving only); straw blower nozzleman; asphalt plant platform man; chuck tender; crusher feeder; men handling creosote ties or creosote materials; men working with and handling epoxy material or materials (where special protection is required); rubbing concrete; topper of standing trees; batter board man on pipe and ditch work; feeder man on wood pulverizers; board and willow mat weavers and cable tiers on river work; deck hands; pile dike and revetment work; all laborers working on underground tunnels less than 25 feet where compressed air is not used; abutment and pier hole men working six (6) feet or more below ground; men working in coffer dams for bridge piers and footings in the river; ditchliners; pressure groutmen; caulker; chain or concrete saw; cliffscalers working from scaffolds, bosuns' chairs or platforms on dams or power plants over (10) feet above ground; mortarmen on brick or block manholes; toxic and hazardous waste work.

GROUP 2: Skilled Laborers - Head pipe layer on sewer work; laser beam man; Jackson or any other similar tamp; cutting torch man; form setters; liners and stringline men on concrete paving, curb, gutters; hot mastic kettleman; hot tar applicator; sandblasting and gunite nozzlemen; air tool operator in tunnels; screed man on asphalt machine; asphalt raker; barco tamper; churn drills; air track drills and all similar drills; vibrator man; stringline man for electronic grade control; manhole builders-brick or block; dynamite and powder men; grade checker.

LABO0660-004 05/01/2022

Clark, Knox, Lewis, Marion, Pike, Ralls, Scotland, Shelby Counties

	Rates	Fringes
LABORER		
GROUP 1	$ 32.10	15.42
GROUP 2	$ 32.10	15.42

LABORERS CLASSIFICATIONS

GROUP 1 - General laborer-flagman, carpenter tenders; salamander Tenders; Dump Man; Ticket Takers; loading trucks under bins, hoppers, and conveyors; track man; cement handler; dump man on earth fill; georgie buggie man;

material batch hopper man; spreader on asphalt machine; material mixer man (except on manholes); coffer dams; riprap pavers rock, block or brick; scaffolds over ten feet not self-supported from ground up; skip man on concrete paving; wire mesh setters on concrete paving; all work in connection with sewer, water, gas, gasoling, oil, drainage pipe, conduit pipe, tile and duct lines and all other pipe lines; power tool operator; all work in connection with hydraulic or general dredging operations; form setters, puddlers (paving only); straw blower nozzleman; asphalt plant platform man; chuck tender; crusher feeder; men handling creosote ties or creosote materials; men working with and handling epoxy material; topper of standing trees; feeder man on wood pulverizers, board and willow mat weavers and cabelee tiers on river work; deck hands; pile dike and revetment work; all laborers working on underground tunnels less than 25 ft. where compressed air is not used; abutement and pier hole men working six (6) ft. or more below ground; men working in coffer dams for bridge piers and footing in the river; barco tamper; jackson or any other similar tamp; cutting torch man; liners, curb, gutters, ditch lines; hot mastic kettlemen; hot tar applicator; hand blade operator; mortar men or brick or block manholes; rubbing concrete, air tool operator under 65 lbs.; caulker and lead man; chain or concrete saw under 15 h.p.; signal Gan; Guard rail and sign erectors.

GROUP 2 - Skilled laborers - Vibrator man; asphalt raker; head pipe layer on sewer work; batterboard man on pipe and ditch work; cliff scalers working from bosun's chairs; scaffolds or platforms on dams or power plants over 10 ft. high; air tool operator over 65 lbs.; stringline man on concrete paving; sandblast man; laser beam man; wagon drill; churn drill; air track drill and all other similar type drills, gunite nozzle man; pressure grout man; screed man on asphalt; concrete saw 15 h.p. and over; grade checker; strigline man on electronic grade control; manhole builder; dynamite man; powder man; welder; tunnel man; waterblaster - 1000 psi or over; asbestos and/or hazardous waste removal and/or disposal

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LABO0660-006 06/01/2022

Lincoln, Montgomery, St Charles and Warren Counties

	Rates	Fringes
LABORER (Common or General).....	$ 35.91	15.42

LABO0662-001 05/01/2022

Callaway, Cole, Miller and Moniteau Counties

	Rates	Fringes
LABORER		
GROUP 1.....	$ 32.10	15.42
GROUP 2.....	$ 32.10	15.42

LABORERS CLASSIFICATIONS

GROUP 1 - General laborer-flagman, carpenter tenders; salamander Tenders; Dump Man; Ticket Takers; loading trucks

under bins, hoppers, and conveyors; track man; cement handler; dump man on earth fill; georgie buggie man; material batch hopper man; spreader on asphalt machine; material mixer man (except on manholes); coffer dams; riprap pavers rock, block or brick; scaffolds over ten feet not self-supported from ground up; skip man on concrete paving; wire mesh setters on concrete paving; all work in connection with sewer, water, gas, gasoling, oil, drainage pipe, conduit pipe, tile and duct lines and all other pipe lines; power tool operator; all work in connection with hydraulic or general dredging operations; form setters, puddlers (paving only); straw blower nozzleman; asphalt plant platform man; chuck tender; crusher feeder; men handling creosote ties or creosote materials; men working with and handling epoxy material; topper of standing trees; feeder man on wood pulverizers, board and willow mat weavers and cabelee tiers on river work; deck hands; pile dike and revetment work; all laborers working on underground tunnels less than 25 ft. where compressed air is not used; abutement and pier hole men working six (6) ft. or more below ground; men working in coffer dams for bridge piers and footing in the river; barco tamper; jackson or any other similar tamp; cutting torch man; liners, curb, gutters, ditch lines; hot mastic kettlemen; hot tar applicator; hand blade operator; mortar men or brick or block manholes; rubbing concrete, air tool operator under 65 lbs.; caulker and lead man; chain or concrete saw under 15 h.p.; signal Gan; Guard rail and sign erectors.

GROUP 2 - Skilled laborers - Vibrator man; asphalt raker; head pipe layer on sewer work; batterboard man on pipe and ditch work; cliff scalers working from bosun's chairs; scaffolds or platforms on dams or power plants over 10 ft. high; air tool operator over 65 lbs.; stringline man on concrete paving; sandblast man; laser beam man; wagon drill; churn drill; air track drill and all other similar type drills, gunite nozzle man; pressure grout man; screed man on asphalt; concrete saw 15 h.p. and over; grade checker; strigline man on electronic grade control; manhole builder; dynamite man; powder man; welder; tunnel man; waterblaster - 1000 psi or over; asbestos and/or hazardous waste removal and/or disposal

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LABO0663-002 04/01/2022

CASS, CLAY, JACKSON, PLATTE AND RAY COUNTIES

	Rates	Fringes
LABORER		
GROUP 1	$ 33.05	16.81
GROUP 2	$ 34.26	16.81

LABORERS CLASSIFICATIONS

GROUP 1: General laborers, Carpenter tenders, salamander tenders, loading trucks under bins, hoppers and conveyors, track men and all other general laborers, air tool operator, cement handler (bulk or sack), chain or concrete saw, deck hands, dump man on earth fill, Georgie Buggies man, material batch hopper man, scale man, material mixer man (except on manholes), coffer dams, abutments and pier hole men working below ground, riprap pavers rock, black or

brick, signal man, scaffolds over ten feet not self-supported from ground up, skipman on concrete paving, wire mesh setters on concrete paving, all work in connection with sewer,water, gas, gasoling, oil, drainage pipe, conduit pipe, tile and duct lines and all other pipelines, power tool operator, all work in connection with hydraulic or general dredging operations, straw blower nozzleman,asphalt plant platform man, chuck tender, crusher feeder, men handling creosote ties on creosote materials, men working with and handling epoxy material or materials (where special protection is required), topper of standing trees, batter board man on pipe and ditch work, feeder man on wood pulverizers, board and willow mat weavers and cable tiers on river work, deck hands, pile dike and revetment work, all laborers working on underground tunnels less than 25 feet where compressed air is not used, abutment and pier hole men working six (6) feet or more below ground, men working in coffer dams for bridge piers and footings in the river, ditchliners, pressure groutmen, caulker and chain or concrete saw, cliffscalers working from scaffolds, bosuns' chairs or platforms on dams or power plants over (10) feet above ground, mortarmen on brick or block manholes, signal man.

GROUP 2: Skilled Laborer - spreader or screed man on asphalt machine, asphalt raker, grade checker, vibrator man, concrete saw over 5 hp., laser beam man, barco tamper, jackson or any other similar tamp, wagon driller, churn drills, air track drills and other similar drills, cutting torch man, form setters, liners and stringline men on concrete paving, curb, gutters and etc., hot mastic kettleman, hot tar applicator, hand blade operators, mortar men on brick or block manholes, sand blasting and gunnite nozzle men, rubbing concrete, air tool operator in tunnels, head pipe layer on sewer work, manhole builder (brick or block), dynamite and powder men.

LABO0840-011 05/01/2022

Crawford, Dent, Franklin, Gasconade, Howell, Maries, Oregon, Osage, Phelps, Pulaski, Shannon and Texas Counties

	Rates	Fringes
LABORER (Crawford, Dent, Gasconade, Howell, Maries, Oregon, Osage, Phelps, Pulaski, Shannon and Texas Counties)		
GROUP 1	$ 32.10	15.42
GROUP 2	$ 32.10	15.42
LABORER (Franklin County)		
GROUP 1	$ 34.44	15.42
GROUP 2	$ 35.04	15.42

LABORERS CLASSIFICATIONS

GROUP 1 - General laborer-flagman, carpenter tenders; salamander Tenders; Dump Man; Ticket Takers; loading trucks under bins, hoppers, and conveyors; track man; cement handler; dump man on earth fill; georgie buggie man; material batch hopper man; spreader on asphalt machine; material mixer man (except on manholes); coffer dams;

riprap pavers rock, block or brick; scaffolds over ten feet not self-supported from ground up; skip man on concrete paving; wire mesh setters on concrete paving; all work in connection with sewer, water, gas, gasoling, oil, drainage pipe, conduit pipe, tile and duct lines and all other pipe lines; power tool operator; all work in connection with hydraulic or general dredging operations; form setters, puddlers (paving only); straw blower nozzleman; asphalt plant platform man; chuck tender; crusher feeder; men handling creosote ties or creosote materials; men working with and handling epoxy material; topper of standing trees; feeder man on wood pulverizers, board and willow mat weavers and cabelee tiers on river work; deck hands; pile dike and revetment work; all laborers working on underground tunnels less than 25 ft. where compressed air is not used; abutement and pier hole men working six (6) ft. or more below ground; men working in coffer dams for bridge piers and footing in the river; barco tamper; jackson or any other similar tamp; cutting torch man; liners, curb, gutters, ditch lines; hot mastic kettlemen; hot tar applicator; hand blade operator; mortar men or brick or block manholes; rubbing concrete, air tool operator under 65 lbs.; caulker and lead man; chain or concrete saw under 15 h.p.; signal Gan; Guard rail and sign erectors.

GROUP 2 - Skilled laborers - Vibrator man; asphalt raker; head pipe layer on sewer work; batterboard man on pipe and ditch work; cliff scalers working from bosun's chairs; scaffolds or platforms on dams or power plants over 10 ft. high; air tool operator over 65 lbs.; stringline man on concrete paving; sandblast man; laser beam man; wagon drill; churn drill; air track drill and all other similar type drills, gunite nozzle man; pressure grout man; screed man on asphalt; concrete saw 15 h.p. and over; grade checker; strigline man on electronic grade control; manhole builder; dynamite man; powder man; welder; tunnel man; waterblaster - 1000 psi or over; asbestos and/or hazardous waste removal and/or disposal

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LABO0955-012 05/01/2022

Adair, Audrain, Boone, Chariton, Cooper, Howard, Linn, Macon, Monroe, Putnam, Randolph, Schuyler and Sullivan Counties

	Rates	Fringes
LABORER		
GROUP 1	$ 32.10	15.42
GROUP 2	$ 32.10	15.42

LABORERS CLASSIFICATIONS

GROUP 1 - General laborer-flagman, carpenter tenders; salamander Tenders; Dump Man; Ticket Takers; loading trucks under bins, hoppers, and conveyors; track man; cement handler; dump man on earth fill; georgie buggie man; material batch hopper man; spreader on asphalt machine; material mixer man (except on manholes); coffer dams; riprap pavers rock, block or brick; scaffolds over ten feet not self-supported from ground up; skip man on concrete paving; wire mesh setters on concrete paving; all work in connection with sewer, water, gas, gasoling, oil, drainage

pipe, conduit pipe, tile and duct lines and all other pipe lines; power tool operator; all work in connection with hydraulic or general dredging operations; form setters, puddlers (paving only); straw blower nozzleman; asphalt plant platform man; chuck tender; crusher feeder; men handling creosote ties or creosote materials; men working with and handling epoxy material; topper of standing trees; feeder man on wood pulverizers, board and willow mat weavers and cabelee tiers on river work; deck hands; pile dike and revetment work; all laborers working on underground tunnels less than 25 ft. where compressed air is not used; abutement and pier hole men working six (6) ft. or more below ground; men working in coffer dams for bridge piers and footing in the river; barco tamper; jackson or any other similar tamp; cutting torch man; liners, curb, gutters, ditch lines; hot mastic kettlemen; hot tar applicator; hand blade operator; mortar men or brick or block manholes; rubbing concrete, air tool operator under 65 lbs.; caulker and lead man; chain or concrete saw under 15 h.p.; signal Gan; Guard rail and sign erectors.

GROUP 2 - Skilled laborers - Vibrator man; asphalt raker; head pipe layer on sewer work; batterboard man on pipe and ditch work; cliff scalers working from bosun's chairs; scaffolds or platforms on dams or power plants over 10 ft. high; air tool operator over 65 lbs.; stringline man on concrete paving; sandblast man; laser beam man; wagon drill; churn drill; air track drill and all other similar type drills, gunite nozzle man; pressure grout man; screed man on asphalt; concrete saw 15 h.p. and over; grade checker; strigline man on electronic grade control; manhole builder; dynamite man; powder man; welder; tunnel man; waterblaster - 1000 psi or over; asbestos and/or hazardous waste removal and/or disposal

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LABO1104-005 05/01/2022

Bollinger, Butler, Cape Girardeau, Carter, Dunklin, Iron, Madison, Mississippi, New Madrid, Pemiscot, Perry, Reynolds, Ripley, Scott, St Francois, Ste Genevieve, Stoddard and Wayne Counties

	Rates	Fringes
LABORER		
GROUP 1	$ 32.10	15.42
GROUP 2	$ 32.10	15.42

LABORERS CLASSIFICATIONS

GROUP 1 - General laborer-flagman, carpenter tenders; salamander Tenders; Dump Man; Ticket Takers; loading trucks under bins, hoppers, and conveyors; track man; cement handler; dump man on earth fill; georgie buggie man; material batch hopper man; spreader on asphalt machine; material mixer man (except on manholes); coffer dams; riprap pavers rock, block or brick; scaffolds over ten feet not self-supported from ground up; skip man on concrete paving; wire mesh setters on concrete paving; all work in connection with sewer, water, gas, gasoling, oil, drainage pipe, conduit pipe, tile and duct lines and all other pipe lines; power tool operator; all work in connection with

hydraulic or general dredging operations; form setters, puddlers (paving only); straw blower nozzleman; asphalt plant platform man; chuck tender; crusher feeder; men handling creosote ties or creosote materials; men working with and handling epoxy material; topper of standing trees; feeder man on wood pulverizers, board and willow mat weavers and cabelee tiers on river work; deck hands; pile dike and revetment work; all laborers working on underground tunnels less than 25 ft. where compressed air is not used; abutement and pier hole men working six (6) ft. or more below ground; men working in coffer dams for bridge piers and footing in the river; barco tamper; jackson or any other similar tamp; cutting torch man; liners, curb, gutters, ditch lines; hot mastic kettlemen; hot tar applicator; hand blade operator; mortar men or brick or block manholes; rubbing concrete, air tool operator under 65 lbs.; caulker and lead man; chain or concrete saw under 15 h.p.; signal Gan; Guard rail and sign erectors.

GROUP 2 - Skilled laborers - Vibrator man; asphalt raker; head pipe layer on sewer work; batterboard man on pipe and ditch work; cliff scalers working from bosun's chairs; scaffolds or platforms on dams or power plants over 10 ft. high; air tool operator over 65 lbs.; stringline man on concrete paving; sandblast man; laser beam man; wagon drill; churn drill; air track drill and all other similar type drills, gunite nozzle man; pressure grout man; screed man on asphalt; concrete saw 15 h.p. and over; grade checker; strigline man on electronic grade control; manhole builder; dynamite man; powder man; welder; tunnel man; waterblaster - 1000 psi or over; asbestos and/or hazardous waste removal and/or disposal

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PAIN0002-002 09/01/2007

CLARK, FRANKLIN, JEFFERSON, LEWIS, LINCOLN, MARION, PIKE, RALLS, ST. CHARLES, ST. LOUIS (CITY & COUNTY), AND WARREN COUNTIES

	Rates	Fringes
Painters:		
Brush and Roller; Taper	$ 28.61	10.24
High work over 60 feet	$ 29.11	10.24
Lead Abatement	$ 29.36	10.24
Pressure Roller; High work under 60 ft	$ 28.86	10.24
Spray & Abrasive Blasting; Water Blasting (Over 5000 PSI)	$ 30.61	10.24
Taper (Ames Tools & Bazooka)	$ 30.21	10.24

PAIN0002-006 04/01/2020

ADAIR, AUDRAIN, BOONE, CALLAWAY, CHARITON, COLE, GASCONADE, HOWARD, KNOX, LINN, MACON, MONROE, MONTGOMERY, OSAGE, PUTNAM, RANDOLPH, SCHUYLER, SCOTLAND, SHELBY AND SULLIVAN COUNTIES and the City of Booneville.

	Rates	Fringes

Painters:
Bridges, Dams, Locks or Powerhouses.....$ 26.64 13.98
Brush and Roll; Taping, Paperhanging.....$ 24.64 13.98
Epoxy or Any Two Part Coating; Sandblasting; Stage or other Aerial Work - Platforms over 50 feet high; Lead Abatement.....$ 25.64 13.98
Spray; Structural Steel (over 50 feet).....$ 24.64 13.98
Tapers using Ames or Comparable Tools.....$ 25.39 13.98

PAIN0003-004 04/01/2019

CASS, CLAY, CLINTON, JACKSON, JOHNSON, LAFAYETTE, PLATTE & RAY COUNTIES

	Rates	Fringes
Painters:		
Bridgeman; Lead Abatement; Sandblast; Storage Bin & Tanks	$ 33.41	17.76
Brush & Roller	$ 30.54	17.76
Drywall	$ 31.74	17.76
Paper Hanger	$ 31.04	17.76
Stageman; Beltman; Steelman; Elevator Shaft; Bazooka, Boxes and Power Sander; Sprayman; Dipping	$ 32.41	17.76
Steeplejack	$ 36.98	17.76

PAIN0003-011 04/01/2019

BATES, BENTON, CALDWELL, CARROLL, COOPER, DAVIESS, GRUNDY, HARRISON, HENRY, LIVINGSTON, MERCER, MONITEAU, MORGAN, PETTIS & SALINE COUNTIES

	Rates	Fringes
Painters:		
Bridgeman; Lead Abatement; Sandblast; Storage Bin & Tanks	$ 26.73	17.76
Brush & Roller	$ 24.43	17.76
Drywall	$ 25.39	17.76
Paper Hanger	$ 24.83	17.76
Stageman; Beltman; Steelman; Elevator Shaft; Bazooka, Boxes and Power Sander; Sprayman; Dipping	$ 26.35	17.76
Steeplejack	$ 29.58	17.76

PAIN0203-001 04/01/2012

BARRY, BARTON, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS, GREENE, HICKORY, HOWELL, JASPER, LAWRENCE, MCDONALD, NEWTON, OZARK, POLK, ST. CLAIR, STONE, TANEY, VERNON, WEBSTER, and WRIGHT COUNTIES

	Rates	Fringes
Painters:		
Finisher	$ 20.18	11.33
Painter	$ 19.75	11.76
Sandblaster, High Man, Spray Man, Vinyl Hanger, Tool Operator	$ 21.18	11.33

PAIN1185-008 04/01/2022

CAMDEN, CRAWFORD, DENT, LACLEDE, MARIES, MILLER, PHELPS, PULASKI AND TEXAS COUNTIES

	Rates	Fringes
Painters:		
Brush and Roller	$ 31.28	14.58
Floor Work	$ 32.28	14.58
Lead Abatement	$ 32.28	14.58
Spray	$ 32.28	14.58
Structural Steel, Sandblasting and All Tank Work	$ 33.28	14.58
Taping, Paperhanging	$ 32.28	14.58

PAIN1292-002 09/01/2022

BOLLINGER, BUTLER, CAPE GIRARDEAU, CARTER, DUNKLIN, MISSISSIPPI, NEW MADRID, OREGON, PEMISCOT, PERRY, REYNOLDS, RIPLEY, SCOTT, SHANNON, STODDARD and WAYNE COUNTIES

	Rates	Fringes
Painters:		
Bridges, Stacks & Tanks	$ 33.93	15.36
Brush & Roller	$ 29.58	15.36
Spray & Abrasive Blasting; Waterblasting (over 5000 PSI)	$ 31.58	15.36

Height Rates (All Areas):
Over 60 ft. $0.50 per hour.
Under 60 ft. $0.25 per hour.

PAIN1292-003 09/01/2022

IRON, MADISON, ST. FRANCOIS, STE. GENEVIEVE and WASHINGTON COUNTIES

	Rates	Fringes
Painters:		
Bridges, Stacks & Tanks	$ 33.93	15.36
Brush & Roller	$ 29.58	15.36
Spray & Abrasive Blasting; Waterblasting (Over 5000 PSI)	$ 31.58	15.36

Height Rates (All Areas):
0ver 60 ft. $0.50 per hour
Under 60 ft. $0.25 per hour.

PAIN2012-001 04/20/2022

ANDREW, ATCHISON, BUCHANAN, DE KALB, GENTRY, HOLT, NODAWAY & WORTH COUNTIES

	Rates	Fringes
Painters:		
Brush & Roller	$ 33.35	18.73
Sandblaster	$ 37.27	18.73
Steeplejack	$ 40.84	18.73

PLAS0518-006 03/01/2022

BARRY, BARTON, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS, GREENE, HICKORY, JASPER, LACLEDE, LAWRENCE, MCDONALD, NEWTON, OZARK, POLK, ST. CLAIR, STONE, TANEY, VERNON, WEBSTER, AND WRIGHT COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 25.77	12.43

PLAS0518-007 04/01/2022

CASS (Richards-Gebaur AFB only), CLAY, JACKSON, PLATTE AND RAY COUNTIES

	Rates	Fringes
Cement Masons:	$ 35.12	18.30

PLAS0518-011 04/01/2022

ANDREW, ATCHISON, BATES, BUCHANNAN, CLINTON, DEKALB, GENTRY, HENRY, HOLT, JOHNSON, LAFAYETTE, NODAWAY & WORTH COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 34.93	20.50

PLAS0527-001 04/01/2021

	Rates	Fringes
CEMENT MASON		
FRANKLIN, LINCOLN AND WARREN COUNTIES	$ 34.79	19.58
JEFFERSON, ST. CHARLES COUNTIES AND ST.LOUIS (City and County)	$ 35.96	19.56

PLAS0527-004 06/01/2021

CRAWFORD, DENT, IRON, MADISON, MARION, PHELPS, PIKE, PULASKI, RALLS, REYNOLDS, ST. FRANCOIS, STE. GENEVIEVE, SHANNON, TEXAS,

WASHINGTON COUNTIES

	Rates	Fringes
CEMENT MASON.....	$ 30.30	19.48

PLAS0908-001 05/01/2021

BOLLINGER, BUTLER, CAPE GIRARDEAU, CARTER, DUNKLIN, HOWELL, MISSISSIPPI, NEW MADRID, OREGON, PEMISCOT, PERRY, RIPLEY, SCOTT, STODDARD, AND WAYNE COUNTIES

	Rates	Fringes
CEMENT MASON.....	$ 30.30	17.53

PLAS0908-005 05/01/2021

BENTON, CALDWELL, CALLAWAY, CAMDEN, CARROLL, COLE, DAVIESS, GASCONADE, GRUNDY, HARRISON, LIVINGSTON, MACON, MARIES, MERCER, MILLER, MONTGOMERY, MORGAN, OSAGE, PETTIS & SALINE COUNTIES

	Rates	Fringes
CEMENT MASON.....	$ 30.30	17.53

PLUM0008-003 06/01/2022

CASS, CLAY, JACKSON, JOHNSON, AND PLATTE COUNTIES

	Rates	Fringes
Plumbers.....	$ 51.28	23.29

PLUM0008-017 06/01/2022

BATES, BENTON, CARROLL, HENRY, LAFAYETTE, MORGAN, PETTIS, RAY, ST. CLAIR, SALINE AND VERNON COUNTIES

	Rates	Fringes
Plumbers.....	$ 51.28	23.29

PLUM0045-003 08/01/2022

ANDREW, ATCHISON, BUCHANAN, CALDWELL, CLINTON, DAVIESS, DEKALB, GENTRY, HARRISON, HOLT, NODAWAY AND WORTH COUNTIES

	Rates	Fringes
Plumbers and Pipefitters.....	$ 41.35	25.45

PLUM0178-003 11/01/2022

BARRY, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS, GREENE, HICKORY, LACLEDE, LAWRENCE, POLK, STONE, TANEY, WEBSTER AND WRIGHT COUNTIES

	Rates	Fringes

Plumbers and Pipefitters.....$ 35.75 15.32

PLUM0178-006 11/01/2022

BARTON, JASPER, MCDONALD AND NEWTON COUNTIES

	Rates	Fringes
Plumbers and Pipefitters		
Projects $750,000 & under...	$ 32.78	15.32
Projects over $750,000.....	$ 35.75	15.32

PLUM0533-004 06/01/2022

BATES, BENTON, CARROLL, CASS, CLAY, HENRY, HICKORY, JACKSON, JOHNSON, LAFAYETTE, MORGAN, PETTIS, PLATTE, RAY, SALINE, ST. CLAIR AND VERNON COUNTIES

	Rates	Fringes
Pipefitters.....	$ 51.43	23.35

PLUM0562-004 07/01/2022

ADAIR, AUDRAIN, BOLLINGER, BOONE, BUTLER, CALLAWAY,CAMDEN, CAPE GIRARDEAU,CARTER, CHARITON, CLARK, COLE, COOPER, CRAWFORD, DENT, DUNKLIN, FRANKLIN, GASCONADE, GRUNDY, HOWARD, HOWELL, IRON, JEFFERSON, KNOX, LEWIS, LINCOLN, LINN, LIVINGSTON, MACON, MADISON, MARIES, MARION, MERCER, MILLER, MISSISSIPPI, MONITEAU, MONROE, MONTGOMERY, NEW MADRID, OREGON, OSAGE, PEMISCOTT, PERRY, PHELPS, PIKE, PULASKI, PUTNAM, RALLS, RANDOLPH, REYNOLDS, RIPLEY, ST. CHARLES, ST.FRANCOIS, STE. GENEVIEVE, ST. LOUIS, SCHUYLER, SCOTLAND, SCOTT, SHANNON, SHELBY, STODDARD, SULLIVAN, TEXAS, WARREN, WASHINGTON,AND WAYNE COUNTIES.

	Rates	Fringes
Plumbers and Pipefitters		
Mechanical Contracts including all piping and temperature control work $7.0 million & under.....	$ 44.66	21.49
Mechanical Contracts including all piping and temperature control work over $7.0 million.....	$ 44.66	21.49

PLUM0562-016 07/01/2022

CAMDEN, COLE, CRAWFORD, FRANKLIN, JEFFERSON, MARIES, MILLER, MONITEAU, OSAGE, PHELPS, PULASKI, ST. CHARLES, ST. LOUIS (City and County), WARREN and WASHINGTON COUNTIES

	Rates	Fringes
Plumbers		
Mechanical Contracts including all piping and temperature control work $7.0 million & under.....	$ 44.66	21.49
Mechanical Contracts		

including all piping and temperature control work over $7.0 million.....$ 44.66 21.49

TEAM0013-001 05/01/2022

	Rates	Fringes
Truck drivers (ADAIR, BUTLER, CLARK, DUNKIN, HOWELL, KNOX, LEWIS, OREGON, PUTNAM, RIPLEY, SCHUYLER AND SCOTLAND COUNTIES)		
GROUP 1	$ 32.44	14.75
GROUP 2	$ 32.60	14.75
GROUP 3	$ 32.59	14.75
GROUP 4	$ 32.71	14.75
Truck drivers (AUDRAIN, BOLLINGER, BOONE, CALLAWAY, CAPE GIRARDEAU, CARTER, COLE, CRAWFORD, DENT, GASCONADE, IRON, MACON, MADISON, MARIES, MARION, MILLER, MISSISSIPPI, MONROE, MONTGOMERY, NEW MADRID, OSAGE, PEMISCOT, PERRY, PHELPS, PIKE, PULASKI, RALLS, REYNOLDS, ST. FRANCOIS, STE. GENEVIEVE, SCOTT, SHANNON, SHELBY, STODDARD, TEXAS, WASHINGTON AND WAYNE COUNTIES)		
GROUP 1	$ 33.17	14.75
GROUP 2	$ 33.33	14.75
GROUP 3	$ 33.32	14.75
GROUP 4	$ 33.44	14.75
Truck drivers (FRANKLIN, JEFFERSON and ST. CHARLES COUNTIES)		
GROUP 1	$ 35.53	14.75
GROUP 2	$ 35.64	14.75
GROUP 3	$ 35.68	14.75
GROUP 4	$ 35.75	14.75
Truck drivers (LINCOLN and WARREN COUNTIES)		
GROUP 1	$ 35.18	14.75
GROUP 2	$ 34.29	14.75
GROUP 3	$ 35.33	14.75
GROUP 4	$ 34.40	14.75

TRUCK DRIVERS CLASSIFICATIONS:

GROUP 1: Flat Bed Trucks, Single Axle; Station Wagons; Pickup Trucks; Material Trucks, Single Axle; Tank Wagon, Single Axle

GROUP 2: Agitator and Transit Mix Trucks

GROUP 3: Flat Bed Trucks, Tandem Axle; Articulated Dump Trucks; Material Trucks, Tandem Axle; Tank Wagon, Tandem Axle

GROUP 4: Semi and/or Pole Trailers; Winch, Fork & Steel Trucks; Distributor Drivers and Operators; Tank Wagon, Semi-Trailer; Insley Wagons, Dumpsters, Half-Tracks, Speedace, Euclids and other similar equipment; A-Frame and

Derrick Trucks; Float or Low Boy

TEAM0056-001 05/01/2020

	Rates	Fringes
Truck drivers (ANDREW, BARTON, BATES, BENTON, CALDWELL, CAMDEN, CARROLL, CEDAR, CHARITON, CHRISTIAN, CLINTON, COOPER, DADE, DALLAS, DAVIESS, DEKALB, DOUGLAS, GREENE, HENRY, HICHKORY, HOWARD, JASPER, LACLEDE, LAWRENCE, LINN, LIVINGSTON, MONITEAU, MORGAN, NEWTON, PETTIS, POLK, RANDOLPH, ST. CLAIR, SALINE, VERNON, WEBSTER AND WRIGHT COUNTIES)		
GROUP 1	$ 31.37	14.25
GROUP 2	$ 31.53	14.25
GROUP 3	$ 31.52	14.25
GROUP 4	$ 31.64	14.25
Truck drivers: (ATCHISON, BARRY, GENTRY, GRUNDY, HARRISON, HOLT, MCDONALD, MERCER, NODAWAY, OZARK, STONE, SULLIVAN, TANEY AND WORTH COUNTIES)		
GROUP 1	$ 30.64	14.25
GROUP 2	$ 30.80	14.25
GROUP 3	$ 30.79	14.25
GROUP 4	$ 30.91	14.25
Truck drivers; (BUCHANAN, JOHNSON AND LAFAYETTE COUNTIES)		
GROUP 1	$ 32.58	14.25
GROUP 2	$ 32.69	14.25
GROUP 3	$ 32.73	14.25
GROUP 4	$ 32.80	14.25

TRUCK DRIVER CLASSIFICATIONS

GROUP 1: Flat bed trucks single axle; station wagons; pickup trucks; material trucks single axle; tank wagons single axle.

GROUP 2: Agitator and transit mix-trucks.

GROUP 3: Flat bed trucks tandem axle; articulated dump trucks; material trucks tandem axle; tank wagons tandem axle.

GROUP 4: Semi and/or pole trailers; winch, fork & steel trucks; distributor drivers & operators; tank wagons semi-trailer; insley wagons, dumpsters, half-tracks, speedace, euclids & other similar equipment; A-frames and derrick trucks; float or low boy.

TEAM0245-001 03/26/2012

BARRY, BARTON, CAMDEN, CEDAR, CHRISTIAN, DALLAS, DENT, DOUGLAS,

GREENE, HICKORY, HOWELL, JASPER, LACLEDE, LAWRENCE, MCDONALD, MILLER, NEWTON, OZARK, PHELPS, POLK, PULASKI, SHANNON, STONE, TANEY, TEXAS, VERNON, WEBSTER AND WRIGHT COUNTIES

	Rates	Fringes
Truck drivers:		
Traffic Control Service		
Driver	$ 20.45	0.00

PAID HOLIDAYS: New Year's Day, Decoration Day, July 4th, Labor Day, Thanksgiving Day, Christmas Day, employee's birthday and 2 personal days.

TEAM0541-001 04/01/2022

CASS, CLAY, JACKSON, PLATTE AND RAY COUNTIES

	Rates	Fringes
Truck drivers:		
GROUP 1	$ 34.71	16.75
GROUP 2	$ 34.14	16.75
GROUP 3	$ 33.62	16.75

TRUCK DRIVERS CLASSIFICATIONS

GROUP 1: Mechanics and Welders, Field; A-Frame Low Boy-Boom ruck Driver.

GROUP 2: Articulated Dump Truck; Insley Wagons: Dump Trucks, Excavating, 5 cu yds and over; Dumpsters; Half-Tracks: Speedace: Euclids & similar excavating equipment Material trucks, Tandem Two teams; Semi-Trailers; Winch trucks-Fork trucks; Distributor Drivers and Operators; Agitator and Transit Mix; Tank Wagon Drivers, Tandem or Semi; One Team; Station Wagons; Pickup Trucks; Material Trucks, Single Axle; Tank Wagon Drivers, Single Axle

GROUP 3: Oilers and Greasers - Field

TEAM0682-002 05/01/2017

ST LOUIS CITY AND COUNTY

	Rates	Fringes
Truck drivers:		
GROUP 1	$ 33.30	13.79+a+b+c+d
GROUP 2	$ 33.50	13.79+a+b+c+d
GROUP 3	$ 33.60	13.79+a+b+c+d

a. PENSION: 5/1/2012 - $182.20 per week.

b. HAZMAT PREMIUM: If Hazmat certification on a job site is required by a state or federal agency or requested by project owner or by the employer, employees on that job site shall receive $1.50 premium pay.

TRUCK DRIVERS CLASSIFICATIONS

GROUP 1 - Pick-up trucks; forklift, single axle; flatbed

trucks; job site ambulance, and trucks or trailers of a water level capacity of 11.99 cu. yds. or less

GROUP 2 - Trucks or trailers of a water level capacity of 12.0 cu yds. up to 22.0 cu yds. including euclids, speedace and similar equipment of same capacity and compressors

GROUP 3 - Trucks or trailers of a water level capacity of 22.0 cu. yds & over including euclids, speedace & all floats, flatbed trailers, boom trucks, winch trucks, including small trailers, farm wagons tilt-top trailers, field offices, tool trailers, concrete pumps, concrete conveyors & gasoline tank trailers and truck mounted mobile concrete mixers

FOOTNOTE FOR TRUCK DRIVERS:

c. PAID HOLIDAYS: Christmas Day, Independence Day, Labor Day, Memorial Day, Veterans Day, New Years Day, Thanksgiving Day

d. PAID VACATION: 3 days paid vacation for 600 hours of service in any one contract year; 4 days paid vacation for 800 hours of service in any one contract year; 5 days paid vacation for 1,000 hours of service in any one contract year. When such an employee has completed 3 years of continuous employment with the same employer and then works the above required number of hours, he shall receive double the number of days of vacation specified above. When such an employee has completed 10 years of continuous employment with the same employer and then works the above required number of hours, he shall receive triple the number of days of vacation specified above. When such an employee has completed 15 years of continuous employment with the same employer and then works the above required number of hours, he shall receive 4 times the number of days of vacation specified above.

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

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within

the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in

the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISIO"

Missouri

Division of Labor Standards

WAGE AND HOUR SECTION

MICHAEL L. PARSON, Governor

Annual Wage Order No. 29

Section 048

JACKSON COUNTY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by
Todd Smith, Director
Division of Labor Standards

Filed With Secretary of State: **March 10, 2022**

Last Date Objections May Be Filed: **April 11, 2022**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$67.05
Boilermaker	$37.33*
Bricklayer	$59.20
Carpenter	$60.21
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	$54.35
Plasterer	
Communications Technician	$58.66
Electrician (Inside Wireman)	$66.21
Electrician Outside Lineman	$64.01
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	$37.33*
Glazier	$56.84
Ironworker	$66.35
Laborer	$49.04
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	$54.39
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	$60.71
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	$50.15
Plumber	$74.12
Pipe Fitter	
Roofer	$57.93
Sheet Metal Worker	$71.70
Sprinkler Fitter	$61.32
Truck Driver	$47.50
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.
**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in Section 290.210 RSMo.

Heavy Construction Rates for
JACKSON County

Section 048

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$60.95
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$84.43
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$49.28
General Laborer	
Skilled Laborer	
Operating Engineer	$58.78
Group I	
Group II	
Group III	
Group IV	
Truck Driver	$50.64
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title as shown on the Building Construction Rate Sheet.

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in Section 290.210 RSMo.

OVERTIME
and
HOLIDAYS

OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, **"overtime work"** shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

HOLIDAYS

January first;
The last Monday in May;
July fourth;
The first Monday in September;
November eleventh;
The fourth Thursday in November; and
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

PROJECT BID DOCUMENTS

Book 3

Pkg 3 – Traction Power Substation (TPSS)

KCATA PROJECT NUMBER: # F23-5003-39A

ISSUE DATE: 1/18/2023

BID CLOSE DATE: Tuesday, 2/8/2023 2:00 PM Local Time

OWNER: Kansas City Area Transportation Authority 1200 E. 18th Street Kansas City, Missouri 64108	**PROCUREMENT CONTACT:** Denise Adams 1350 E. 17th Street Kansas City, MO 64108 Telephone: 816-346-0224 Email: dadams@kcata.org
PROJECT MANAGEMENT OFFICE CONTACT: Linda Clark, PE Kansas City Area Transportation Authority 1200 E. 18th Street Kansas City, Missouri 64108 Email: lclark@kcata.org	**ENGINEER:** HDR, Inc. Nick Stadem, PE 10450 Holmes Rd Suite 600 Kansas City MO 64131 763-591-5444

Contents

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:

Plan Sheets	See BATES Numbered Sheets 302794 - 302821
Specifications	See BATES Numbered Sheets 302593 – 302793
TPSS Responsibility Matrix	See BATES Numbered Sheets 304351 – 304352

01 GENERAL REQUIREMENTS

01.01 PROJECT

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

Project Title: **Pkg 3 – Traction Power Substation (TPSS)**

01.02 PROJECT DESCRIPTION

The proposed projects generally include:

Pkg 3 – Traction Power Substation (TPSS)

The scope of work of this procurement includes the following material packages:

Provide Transit Power Substation (TPSS) for the Kansas City Riverfront Extension. Specifications and plans are included in Book 3 – see sheets numbered 302593–302793 and 302794-302821, respectively. This work also includes coordination shsubown in the TPSS Responsibility Matrix (see BATES 304351-304352).

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: **Pkg 3 – Traction Power Substation (TPSS)**

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

02.01 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 as a specific bid item shall be included in other bid items.

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

02.02 ROLES AND RESPONSIBILITIES

Not applicable.

02.03 CONSTRUCTION SCHEDULE REQUIREMENTS

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

(1) Either change or keep the “no known” text below.

(2) Schedule Considerations: No known schedule considerations.

02.03.02 Contract completion date shall be adjusted when adverse weather delays exceed the “anticipated adverse weather delay days” as outlined below:

January 10	May 7	September.....5
February..... 8	June 7	October 4
March.....7	July.....5	November.....5
April.....6	August.....5	December.....9

02.03.03 Contractor shall provide monthly schedule and workforce documentation.

(1) Key delivery dates - Contractor shall adhere to the following:

(a) Submit detailed shop drawings for acceptance within four months of NTP

(b) Deliver fabricated material within 14 months of NTP

02.04 TECHNICAL SPECIAL PROVISIONS

02.04.01 See BATES numbered sheets as outlined in PROJECT DESCRIPTION in Section 01.02 on Page 1

02.05 SYSTEM INTEGRATION TESTING PLAN

02.05.01 None

02.06 EXTENDED WARRANTIES

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 30 of the General Provisions for additional Warranty Information.

02.07 ANTICIPATED PERMITS

02.07.01 No known.

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) For this contract, the Contractor shall not have access to the use of Right-of-Way.

03.01.04 CONSTRUCTION STAGING

(1) 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.

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.

(b) Review of Work progress.

(c) Field observations, problems, and decisions.

(d) Identification of problems which impede planned progress.

(e) Review of submittals schedule and status of submittals.

(f) Review of off-site fabrication and delivery schedules.

(g) Maintenance of progress schedule.

(h) Corrective measures to regain projected schedules.

(i) Planned progress during succeeding work period.

(j) Coordination of projected progress.

(k) Maintenance of quality and work standards.

(l) Effect of proposed changes on progress schedule and coordination.

(m) 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 adhere to OSHA and its own safety requirements for the fabrication of this work.

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 PROVIDED MATERIAL

(1) Eight sections of (nominal) 39-foot 112 Tram rail (312 rail feet) shall be allocated for the Contractor's use in the fabrication of the completed joints.

(2) This material will be available for pick up in the Kansas City metropolitan area in February 2023. The Contractor shall transport this material from Kansas City to its facility as needed. No additional payment shall be made for this transportation.

03.09.02 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.

03.09.03 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.

03.09.04 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.

03.09.05 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.

03.09.06 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.

03.11.05 SYSTEM INTEGRATION TESTING

(1) The Contractor shall furnish one (1) unit of any specialized test equipment needed to test and/or set up their equipment as required to test the functionality of the installed system and its integration with the KCATA equipment and systems. This equipment shall include all software installed into the equipment and accessories to be delivered complete and ready for operation.

(2) A detailed testing and integration plan is included in Section 03 – "Project Special Provisions". Contractor shall provide all necessary equipment and shall perform the designated tests in accordance with the System Integration Plan.

(3) The Contractor shall notify the KCATA seven (7) calendar days prior to performing the test. The test shall not commence without approval by the KCATA. Contractor shall submit test results to the KCATA. The results submittal shall demonstrate that the functionality of the proposed equipment is directly applicable to the KCATA System.

END OF SECTION

04 STANDARD TECHNICAL SPECIFICATIONS

04.01 ADMINISTRATION & MANAGEMENT

(1) See Section 03.01.02 ADMINISTRATION & MANAGEMENT.

04.02 PROJECT PHOTOGRAPHS

(1) The Contractor shall take and store photographs of the project's progression. These photos shall be made available to the KCATA upon request.

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

05.01.01 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.

05.01.02 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.

05.02 ADMINISTRATION AND MANAGEMENT

05.02.01 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. The total cost for Administrative and Management shall not exceed 8% of the total Contract Value.

05.03 MATERIAL FABRICATION

05.03.01 Material Fabrication shall be paid:

(1) Upon receipt of invoiced raw material used for the fabrication of delivered material and included with the Contractor's monthly estimate. Prior to payment for raw material, photographs or other Owner-accepted proof shall be received that indicates the material stored in a secure area away from other raw materials.

(2) Design work shall be paid at a four-month prorated lump sum value with the total amount of design work not to exceed 18% of the Contract Value.

(3) At a prorated value of the remaining value of the contract over the scheduled months of fabrication (after four-month design timeframe to delivery of materials)

05.04 PROJECT PHOTOGRAPHS

05.04.01 No separate payment will be made for "Project Photographs". All costs pertaining thereto shall be included in the contract prices for other items listed in the bid form.

SECTION 34 21 05P
COMMON WORK RESULTS FOR TRACTION ELECTRIFICATION SYSTEM (TES) SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Summary of Work for TES.
   2. General electrical requirements for materials, assembly, and installation.
   3. Labeling and listing of electrical equipment and products, and field evaluation for products not listed.
   4. Delivering, picking, and setting prepackaged TES substations on site.
   5. Coordinating with Evergy for TES substations.
   6. Temporary power for TES substation HVAC.

B. Requirements of this Section apply to all 34 21 xx and 34 22 xx sections.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

A. SECTION 01 43 00 – Systems Quality Assurance

B. SECTION 01 60 01 – Buy America Requirements

C. SECTION 34 21 06P – TES Common Work Results for Metals

D. SECTION 34 21 17P – TES Substation Design and Assembly

E. SECTION 34 21 31P – TES Substation Automation System (SAS)

F. SECTION 34 22 05P – TES Common Work Results for Conductors and Cable

1.3 DEFINITIONS

A. Authority Having Jurisdiction (AHJ): As defined in NFPA 70, Article 100, Definitions.

B. Engineer: Owner's representative.

1.4 REFERENCED STANDARDS

A. Institute of Electrical and Electronics Engineers (IEEE):
   1. IEEE C2, National Electrical Safety Code

B. International Conference of Building Officials:
   1. International Building Code (IBC)

C. National Electrical Vendors Association (NECA):
   1. NECA 1, Standard Practice of Good Workmanship in Electrical Construction

D. National Electrical Manufacturers Association (NEMA):
   1. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum)

E. National Fire Protection Association (NFPA):
   1. NFPA 70, National Electrical Code (NEC)
   2. NFPA 130, Fixed Guideway Transit and Passenger Rail Systems

1.5 SUBMITTALS

A. Procedures: SECTION 01 33 00 – Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. TES Specific Requirements:
   1. Schedule submittals such that the project schedule is not delayed:
      a. Submit product data and samples not less than 30 days before scheduled procurement. Submit shop drawings not less than 30 days before work involving such drawings is to be performed.
      b. Vendor shall bear the risk when products, equipment, or materials are procured before approval of submittals or work is started before approval of shop drawings.
   2. On each submittal, indicate the relevant Specification Section by section number, paragraph number, and subparagraph number.
   3. For submittals requiring resubmittal, resubmit with title identical to the original submittal and clearly indicate the revision number.
   4. Stamp and sign submittals as reviewed and approved by the Vendor before submission.

D. Product Data: Submit manufacturer's product data for products specified in this Section if not submitted under another Section:
   1. Sealing strip.
   2. Padlocks.

E. Schedule of padlocks with keying.

F. Submit for information only:
   1. Substation setting plan, including diagram showing position of truck and crane and description of steps involved.
   2. Substation anchoring design. Installation Contractor shall utilize and provide a complete design sealed by a structural engineer registered in the State of Missouri.

G. Seismic Calculations: Submit sealed seismic design and bracing calculations that include equipment and raceways in each Section of these Specifications.

1.6 COORDINATION

A. Coordinate delivery of prefabricated substation with Engineer:
   1. Before picking substation off truck, obtain approval to partially or completely restrict a city street, sidewalk, or alley with KCMO.

B. Electric Utility, Evergy:
   1. Contact Evergy to obtain Evergy-furnished metering equipment:
      a. Meter socket.
      b. CTs and PTs.

1.7 QUALITY ASSURANCE

A. Quality assurance planning, implementation and reporting shall be in conformance with SECTION 01 43 00 – Systems Quality Assurance, except as modified herein.

B. Regulatory Requirements: Comply with current federal, state, and local requirements.

C. Compliance with Standards:
   1. Where equipment or materials are specified to conform to the standards of organizations such as ANSI, ASTM, IEEE, and NEMA, submit evidence of conformance for review and record purposes.
   2. The label or listing will be acceptable as sufficient evidence that the materials and equipment do conform to the specified standards.
   3. Wherever a code or standard is specified, it shall be understood that amendments to the specified standard by the state, county, city, or other authority having jurisdiction shall apply to the Work.

4. Submit evidence of compliance to seismic safety requirements of the International Building Code and NFPA 70.
5. Perform Work in compliance with the following industry standards and regulations:
   a. NFPA 70, National Electrical Code.
   b. NFPA 130, Standard for Fixed Guideway Transit and Passenger Rail Systems.
   c. NECA 1, Standard for Good Workmanship in Electrical Construction.
   d. IEEE C2, National Electrical Safety Code.

D. Qualifications:
1. Workers shall be experienced in the type of work they are performing.
2. TES Substation: Modifications or testing performed in substations after delivery to the site shall be supervised by a TES Substation Supervisor representing the substation manufacturer. The supervisor must be located at the site, not at a remote location.
3. Welding: Performed only by welders qualified as stated in Section 34 21 06P, TES Common Work Results for Metals.
4. Ensure workers performing field work meet the qualification and licensing requirements of the State.

E. General Performance Requirements:
1. Provide electrification equipment proven in similar railroad, rail transit, or heavy industrial service and make use of this experience to prepare a suitable and proven design for this application.
2. Systems Integration: Integrate TES elements such that specified requirements are achieved without conflict or error within or between specified elements.
3. Provide replacement spare parts that are functionally and physically interchangeable for each product class as specified in other TES sections.

1.8 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems, except as modified herein.

B. Obtain written permission from the Engineer before shipping substation.

PART 2 - PRODUCTS

2.1 TRACTION ELECTRIFICATION SYSTEM (TES) SUMMARY OF WORK

A. Assemblies, Material, Equipment, Products, Installation, and Related Submittals:
1. One prefabricated TES mainline substations.
2. Grounding for TES substations at each substation site. Procurement shall facilitate grounding connections.
3. Grounding for surge arresters at each substation site. Procurement shall facilitate grounding connections.
4. Blue lights on TES substations and OCS poles, if required.
5. Configuration between TES substations for transfer trip.
6. TES spare parts and special tools.

B. Coordination with Evergy for metering and equipment requirements via specifications.

C. Special Submittals:
1. TES Operation & Maintenance Manual.
2. As-built drawings.
3. TES Training Manual.

D. Factory testing of TES substation, cable, and other installed equipment and systems.

E. Training of Owner's personnel.

2.2 SEISMIC DESIGN

A. Equipment provided under this Contract shall meet seismic requirements specified in the International Building Code (IBC).

B. Submit calculations and design for suitable anchorage and bracing performed and sealed by a structural engineer registered in the State of Missouri.

2.3 MATERIALS AND PRODUCTS

A. General Requirements:
   1. Material shall be new and in first class condition, of design, sizes, and ratings as indicated, and suitable for the use intended.
   2. Products shall be the manufacturer's latest standard design and discontinued materials or products shall not be used.
   3. Materials and equipment shall be standard products of manufacturers regularly engaged in the production of such material and equipment.
   4. Methods of fabrication, assembly, and installation shall comply with specified standards.
   5. Where two or more units of the same class of material or equipment are required, provide products of a single manufacturer.
   6. Similar component parts of different larger assemblies are not required to be the products of the same manufacturer.
   7. Each type of material and equipment shall be of the same manufacture and quality throughout the Work.

B. Environmental Requirements:
   1. Material and equipment shall be designed to ensure satisfactory operation and life in the environmental conditions that exist where the material or equipment is installed.
   2. Material and equipment shall be suitable for its intended environment.
      a. Wet locations: NEMA 250 Type 4X corrosion resistant stainless steel enclosures.
      b. Indoor damp locations: NEMA 250 Type 12 enclosures fabricated from painted-galvanized or stainless steel.
      c. Wet or damp locations: Corrosion resistant fittings or supports, hot-dip galvanized or as otherwise specified.
      d. Exposed dry locations: Corrosion resistant painted finishes may be used for equipment and enclosures as approved by Engineer.

C. Finish Requirements:
   1. Ferrous Metal: Above Grade: Hot-dip galvanized, galvannealed, or powder coated. Refer to Galvanizing or Shop Applied Coatings in Section 34 21 06P, TES Common Work Results for Metals.
   2. Galvanizing: Wherever "galvanized" or "hot-dip galvanized" is called out in these Specifications, the material shall be coated in accordance with galvanizing requirements in Section 34 21 06, TES Common Work Results for Metals.

D. Fasteners, Hardware:
   1. Fasteners: Stainless steel. Double-sided tape shall not be used for attachment of channel or wire supports.
   2. Hardware:
      a. Corrosion resistant.
      b. Suitable for the use and environment intended by the manufacturer.
      c. Unplated steel shall not be used.

E. Cable ties (tie wraps): Comply with requirements of Section 34 22 05P, TES Common Work Results for Conductors and Cable.

F. Sealing Strip: Water and humidity resistant moisture barrier:
   1. Neoprene rubber pad, durometer hardness Shore A 60, tensile strength 900 psi, elongation 300 percent, 1/4 inch by 6 inches.
   2. Acceptable Manufacturer/Product: Biltrite Commercial Neoprene, Style 10.

2.4 PADLOCKS

A. Key as directed by Engineer.

B. All locks keyed alike for each application, unless directed otherwise by the Engineer.

C. Indoor:
   1. Heavy duty, rekeyable padlock, with minimum 3/8-inch diameter boron-alloy shackle with 2-inch clearance.

D. Outdoor:
   1. Same as interior but outdoor-type with weather cover.
   2. Acceptable Manufacturer/ Product: Master Lock, Master Pro Series 6121KALJ.

2.5 FACTORY ASSEMBLY

A. Torquing:
   1. Torque bolted connections in accordance with manufacturer's recommendations.
   2. Use a torque wrench calibrated within the past 12 months and bearing a calibration sticker.
   3. Torque busses and bus connections per manufacturer's recommendations or according to the following table:

Silicon Bronze Bolt Standard Dry Torque		
Bolt Size Inches	**Threads/ inch**	**Inch Pounds**
1/4	20	68.8
	28	87
5/16	18	123
	24	131
3/8	16	219
	24	240
7/16	14	349
	20	371
1/2	13	480
	20	502
9/16	12	632
	18	697
5/8	11	1030
	18	1154
3/4	10	1416
	16	1382

   4. Torque cable connections per manufacturer's recommendations, or according to the following table:

Steel Bolt Standard Dry Torque in Foot Pounds							
		SAE Grade					
Bolt Size Inches	Course Threads/ inch	0-1-2	3	5	6	7	8
1/4	20	6	9	10	12.5	13	14
5/16	18	12	17	19	24	25	29
3/8	16	20	30	33	43	44	47
7/16	14	32	47	54	69	71	78
1/2	13	47	69	78	106	110	119
9/16	12	69	103	114	150	154	169
5/8	11	96	145	154	209	215	230
3/4	10	155	234	257	350	360	380

B. Apply torque mark after torquing connection.

PART 3 - EXECUTION

3.1 FIELD INSTALLATION – BY INSTALLATION CONTRACTOR

A. Requirements of Article titled "Factory Assembly" apply to field installation.

B. Seal equipment enclosures against dust, whenever dusty conditions are present inside the rooms or outside, during the construction period.

C. Provide seismic anchorage and bracing in accordance with submitted design and calculations.

3.2 INSTALLATION OF TES SUBSTATION AT PROJECT SITE – BY INSTALLATION CONTRACTOR

A. Comply with requirements of KCMO, including but not limited to the following:
   1. Obtain any required permits.
   2. Comply with installation requirements at the site.
   3. Obtain required inspections and approval.

B. Before setting substation in place, provide a sealing strip between substation base and concrete slab.

C. Anchor substation to slab using Vendor-furnished design sealed by a structural engineer registered in the State of Missouri.

3.3 TEMPORARY POWER AND HEAT – BY INSTALLATION CONTRACTOR

A. Provide temporary heat within 24 hours of setting substation to prevent condensation inside the substation until permanent power is connected.

B. Provide sufficient heat to maintain substation at 65 degrees, day and night.

C. Provide temporary power to heater.

D. A portable generator may be used as an alternate to temporary utility power.

3.4 INSTALLATION OF EXTERIOR BLUE LIGHT ON OCS POLE – BY INSTALLATION CONTRACTOR

A. Provide blue light on remote OCS pole at locations indicated on Contract Drawings.

B. Connect blue light to associated TES substation, as indicated on Contract Drawings, such that it illuminates for alarms indicated in Section 34 21 31, TES Substation Automation System (SAS).

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes:
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 06P
COMMON WORK RESULTS FOR METALS
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Galvanizing.
   2. Welding.
   3. Shop-applied powder coat.
   4. Shop-applied paint coating system.

1.2 DEFINITIONS

A. Hot-dip galvanizing: Dipping steel members and assemblies into molten zinc for lasting, or long-term corrosion protection. Resultant zinc coating fuses permanently with base steel material.

B. Galvanneal: Zinc-iron alloy coating created on sheet steel by a continuous hot-dipping process followed by heat treatment in an annealing furnace.

1.3 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

1.4 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. The American Society for Nondestructive Testing (ASNT):
   1. ASNT CP-105, Standard Topical Outlines for Qualification of Nondestructive Testing Personnel
   2. Recommended Practice No. SNT-TC-1A: Personnel Qualification and Certification in Nondestructive Testing

C. American Welding Society (AWS):
   1. AWS A5 Series, Filler Metal Specifications
   2. AWS B1.10M/B1.10, Guide for the Nondestructive Examination of Welds
   3. AWS D1.1/D1.1M, Structural Welding Code - Steel
   4. AWS D1.3/D1.3M, Structural Welding Code - Sheet Steel
   5. AWS QC1, Standard for AWS Certification of Welding Inspectors
   6. AWS QC7, Standard for AWS Certified Welders

D. ASTM International (ASTM):
   1. ASTM A53/A53M, Pipe, Steel, Black and Hot-Dipped Zinc-Coated, Welded and Seamless
   2. ASTM A123/A123M, Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
   3. ASTM A143/143M, Safeguarding against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
   4. ASTM A153/A153M, Zinc Coating (Hot-Dip) on Iron and Steel Hardware
   5. ASTM A384/A384M, Safeguarding against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies

6. ASTM A385/A385M, Providing High-Quality Zinc Coatings (Hot Dip)
7. ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
8. ASTM A780/A780M, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
9. ASTM B6, Standard Specification for Zinc
10. ASTM B117, Standard Practice for Operating Salt Spray (Fog) Apparatus
11. ASTM D522, Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings
12. ASTM D523, Standard Test Method for Specular Gloss
13. ASTM D610, Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces
14. ASTM D714, Standard Test Method for Evaluating Degree of Blistering of Paints
15. ASTM D968, Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
16. ASTM D1308, Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes
17. ASTM D2247, Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
18. ASTM D2248, Standard Practice for Detergent Resistance of Organic Finishes
19. ASTM D2485, Standard Test Methods for Evaluating Coatings For High Temperature Service
20. ASTM D2794, Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
21. ASTM D3170, Standard Test Method for Chipping Resistance of Coatings
22. ASTM D3359, Standard Test Methods for Measuring Adhesion by Tape Test
23. ASTM D3363, Standard Test Method for Film Hardness by Pencil Test
24. ASTM D3451, Standard Guide for Testing Coating Powders and Powder Coatings
25. ASTM D4060, Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
26. ASTM D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
27. ASTM D4585, Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation
28. ASTM D4798, Standard Practice for Accelerated Weathering Test Conditions and Procedures for Bituminous Materials (Xenon-Arc Method)
29. ASTM D5894, ASTM D6132, Standard Test Method for Nondestructive Measurement of Dry Film Thickness of Applied Organic Coatings Using an Ultrasonic Gage
30. ASTM D6132, Standard Test Method for Nondestructive Measurement of Dry Film Thickness of Applied Organic Coatings Using an Ultrasonic Gage
31. ASTM D6695, Standard Practice for Xenon-Arc Exposures of Paint and Related Coatings
32. ASTM D7091, Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals
33. ASTM D7803, Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating
34. ASTM E94, Guide for Radiographic Testing
35. ASTM E164, Practice for Ultrasonic Contact Examination of Weldments
36. ASTM E165, Standard Test Method for Liquid Penetrant Examination
37. ASTM E709, Guide for Magnetic Particle Examination
38. ASTM E1032, Method for Radiographic Examination of Weldments
39. ASTM G151, Standard Practice for Exposing Nonmetallic Materials in Accelerated Test Devices that Use Laboratory Light Sources
40. ASTM G155, Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

E. The Society for Protective Coatings (SSPC):

1. SSPC-PA 1, Shop, Field, and Maintenance Painting of Steel
2. SSPC-PA 2, Procedure for Determining Conformance to Dry Coating Thickness Requirements
3. SSPC-PS 13.01, Epoxy Polyamide Painting System
4. SSPC-SP6, Commercial Blast Cleaning
5. SSPC-SP8, Pickling

1.5 SUBMITTALS

A. Procedures: SECTION 01 33 00 – Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Galvanizing:
   1. Certification:
      a. Notarized certificates of compliance with ASTM requirements specified in this Section.
      b. Certification that galvanizing is in conformance with this Section, signed by the galvanizer; include a detailed description of all material and methods used.
      c. Certification of membership in American Galvanizers Association, signed by the galvanizer.
   2. Product Data:
      a. Materials used for shop applied galvanizing.
      b. Materials for field repair of shop applied galvanizing demonstrating conformance with specified standard. Include manufacturer's written directions for storage, handling, and application.
   3. Testing:
      a. Source Quality Control inspection and test reports
      b. Field Quality Control inspection and test reports

D. Welding:
   1. Certification: Furnish notarized certificates of compliance with ASTM requirements specified in this Section.
   2. Welder Qualifications:
      a. Submit record of AWS qualification for each welder to be employed in the Work.
      b. Submit certified copies of qualification test records for each welder, welding operator and tack welder to be employed in the Work.
      c. Submit welders' identification marks (I.D.) for each welder along with qualifications.
   3. Welding Procedures:
      a. Before welding, submit the procedure that will be used for qualifying welding procedures.
      b. For procedures other than those prequalified in accordance with AWS D1.1/D1.1M, submit a copy of procedure qualification test records in accordance with the qualification requirements of AWS D1.1/D1.1M.
   4. Welding Records and Data:
      a. Submit records of ultrasonic testing to the Engineer upon completion.
      b. If field welding is permitted, submit descriptive data for field welding equipment.

E. Shop-Applied Powder Coat:
   1. Certification:
      a. Certification that galvanizer is a member of Powder Coating Institute (PCI).
      b. Certification that the finish is in conformance with this Section, signed by the applier.
      c. Certification that the applicator has been authorized to provide the coating formulator's warranty.
   2. Product Data:
      a. Descriptive and technical data sheets describing products proposed for use.
      b. Documentation of application process.
   3. Qualifications Submittals (for each applicator) minimum 60 days before work is scheduled:

a. Evidence that powder coat applicator is PCI 3000 or PCI 4000 Certified.
b. Evidence that the applicator is an approved and authorized applicator of the coating formulator's products.
c. Evidence that the applicator is experienced in applying powder coat successfully to the specified substrate (e.g. galvanneal with minimum coating weight A25).
d. Applicator's quality control procedures.

4. Powder Coat Samples: Submit for each color and substrate one 12-inch square of heavy gage sheet metal with the primer, top coat, and graffiti coat applied. Stagger each coat such that the Engineer's can view each.
5. Testing: Certified test results evidencing compliance of applied coatings with the application and testing requirements specified in this Section.
6. Repair:
   a. Manufacturer recommended repair procedures and materials procedures for field touchup of marred or damaged coatings using air-drying spray materials in matching colors.
   b. If repair is necessary, submit repair sample after salt spray testing.
7. Maintenance Information: Manufacturer's recommended maintenance materials and procedures.

F. Shop-Applied Paint Coating System:
1. Certifications:
   a. Certification that the finish is in conformance with this Section, signed by the applier.
   b. Certification that the applicator has been authorized to provide the coating formulator's warranty.
2. Product Data:
   a. Performance characteristics: For each substrate used, the tested performance characteristics of the coating.
   b. Documentation of application process.
3. Paint Coating System Samples: Submit for each color and substrate one 12-inch square of heavy gage sheet metal with the primer, top coat, and graffiti coat applied. Stagger each coat such that the Engineer's can view each.

1.6 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 Systems Quality Assurance.

B. Single Source for Galvanized and Finished Metal Fabrications:
1. Use products of one manufacturer on each specific item to ensure exact color match and finish appearance.

C. Galvanizing:
1. Galvanizing firm shall be member of American Galvanizers Association Inc. (AGA).
2. Inspection and Tests:
   a. Inspections, test and samples shall conform with ASTM Specifications and Standards.
   b. Inspection rights and privileges, procedures and acceptance or rejection of galvanized steel materials shall conform with ASTM A123/A123M.

D. Welding:
1. Welder Qualifications:
   a. Welding shall be done by qualified, certified welders who make only those welds for which they have been qualified in accordance with AWS, or other approved qualifying procedures.
   b. Welders, Welding operators, and tack welders shall be certified in accordance with AWS D1.1/D1.1M.
   c. For sheet steel, welders shall be qualified in accordance with AWS QC7 and AWS D1.3/D1.3M, Qualification Section.

d. Records of welder qualification tests shall be made available for review upon the Engineer's request.

2. Welding Procedure Qualification:
   a. Welding procedures shall be prequalified or qualified in accordance with AWS D1.1/D1.1M.
   b. For sheet steel, proposed welding procedures shall be qualified in accordance with AWS D1.3/D1.3M. Prequalification is not applicable to sheet steel.
3. Welding Inspector Qualifications:
   a. Welds to be inspected by the Vendor shall be inspected and certified by an AWS Certified Welding Inspector (CWI).
   b. CWI shall be certified in accordance with AWS QC1.
4. Nondestructive Testing Personnel Qualifications:
   a. Qualified and certified in accordance with SNT-TC-1A and ASNT CP-105.
   b. Certified for NDT Level I and working under a person or persons certified for NDT Level II or Level III.
5. Welding Records:
   a. Retain mill certificates and certified copy of reports for analyses and tests required by referenced ASTM and AWS specifications.
   b. Retain radiographs upon completion of fabrication.
   c. Retain certifications that magnetic particle and dye-penetrant inspections have been satisfactorily completed.

E. Shop-Applied Powder Coating:
1. Powder coating firm shall be member of the Powder Coating Institute (PCI).
2. Applicator Qualifications:
   a. Engage an experienced coating applicator that is PCI 3000 or PCI 4000 certified.
   b. Applicator shall have demonstrated the ability to properly apply the coating to the specified substrate and have quality control procedures firmly established in its shop.
   c. Engineer may, at his option, visit the applicator's facility to confirm adherence to quality control procedures.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems, except as modified herein.

1.8 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20, except as modified herein.

B. Scope: Warranty applies to the following:
1. Coating applied to shop welds.
2. Shop-applied powder coat.
3. Shop-applied paint coating system.

C. Warranty Period: 5 years.

D. Furnish written warranty starting on date of conditional acceptance stating that shop-applied coating will not blister, peel, crack, chalk, change color or have other forms of degradation during warranty period.

E. Coating failure:
1. In the event that coating failure occurs within warranty period, replace item indicating coating failure, including full cost of labor and materials for such replacement.
2. Replacement items shall be new and finished with same type coating meeting requirements of this Section.
3. Replacement items shall match adjacent members.

F. The Engineer may permit field repairs in lieu of replacement, provided coating failure is minor in scope and field repair material and method employed match its adjacent member. Repairs shall be compatible with original surface.

PART 2 - PRODUCTS

2.1 SHOP-APPLIED GALVANIZING

A. General:
1. Wherever materials are called out as "hot-dip galvanized" or "galvanized," provide a zinc coating after fabrication in accordance with ASTM A123/A123M.
2. Hardware items such as bolts or other threaded fasteners shall be hot-dip galvanized after fabrication in accordance with A153/A153M.
3. Specified materials or products that are not readily available in the specified hot-dip finish, shall be custom hot dipped after manufacture by an independent galvanizer.

B. Selection, Design, and Fabrication Before Galvanizing:
1. Verify with supplier or fabricator that material is chemically suitable for galvanizing.
2. Warpage: Design assemblies as recommended in ASTM A384/A384M to limit warpage and distortion during hot-dip galvanizing.
   a. Notify the Engineer of potential warpage problems that require modification in design before proceeding with steel fabrications.
   b. Costs for alternative designs shall be performed at no additional cost to Owner.
3. Design and fabricate assemblies requiring shop fabrication using methods recommended in ASTM A385/A385M to obtain high quality hot-dip galvanized coating.
4. Embrittlement: Select proper steel, design assemblies, and thermally treat before galvanizing as recommended in ASTM A143/A143M to withstand normal galvanizing operations without embrittlement.
5. Galvanizer Coordination Drawings: Furnish shop drawings to galvanizer of non-standard fabrications, tubular fabrications, and fabrications with materials of different thicknesses.
6. Inspect iron and steel hardware before galvanizing and verify suitability for galvanizing. Replace items that are not suitable for galvanizing.
7. When the item to be galvanized incorporates threaded assemblies, make provisions in thread size to accommodate galvanizing and galvanize disassembled.
8. Weld, drill, and assemble galvanized members before galvanizing.

C. Hot-Dip Galvanizing Material:
1. Galvanizing bath shall contain 0.05 to 0.09 percent nickel by weight.
2. Zinc for galvanizing: Conform to ASTM B6, as specified in ASTM A123/A123M.

D. Preparation:
1. Remove all welding slag, splatter, and burrs.
2. Clean all surfaces in conformance with SSPC SP6, Commercial Blast Cleaning.
3. Pickle all surfaces in conformance with SSPC SP8, Pickling.
4. Safeguard against increasing the likelihood of steel embrittlement during pickling in accordance with ASTM A143/A143M.
5. Mask galvanized members that are to be field or shop welded after galvanizing to a distance of 1 inch from weld line before galvanizing.

E. Hot-Dip Galvanizing:
1. Select a galvanizer with galvanizing kettle large enough to accommodate the largest member or assembly requiring hot-dip galvanizing. Progressive dipping shall not be used.
2. Hot-dip galvanize structural steel and metal fabrications as indicated in conformance with ASTM A123/A123M.
3. Hot-dip galvanize bolts or other threaded fasteners after fabrication in accordance with A153/A153M.

4. Thickness of zinc coating: Conform to requirements of ASTM A123/A123M or ASTM A153/A153M, whichever is applicable.
5. Finish, uniformity, and adherence of coating: Conform to requirements of ASTM A123/A123M or ASTM A153/A153M, whichever is applicable.
6. Galvanized members on which powder coat or paint will be applied shall not be quenched by the galvanizer.
7. Galvanizer's Stamp: Galvanized materials shall be marked with the galvanizer's stamp.

F. Mechanical Galvanizing shall not be used.

2.2 WELDING

A. Weldability of Steel: For structural steel requiring impact test qualification and for corrosion resistant structural steel, establish weldability of steel and procedures for welding it by qualification in accordance with AWS D1.1/D1.1M, to match the notch toughness and weathering characteristics of the base metal.

B. Rod/Electrodes:
1. Electrodes for structural plate, shapes, pipe, tubes, and bars shall conform to AWS A5 Series Standards and shall be coated rods or wire of size and classification number as recommended by their manufacturers for the conditions of actual use.
2. Electrodes for sheet steel shall conform to AWS A5 Series Standards and shall be coated rods or wire of size and classification number, as recommended by their manufacturers for the conditions of actual use.
3. Matching filler metal requirements shall conform to AWS D1.1/D1.1M, Table 3.1.

C. Stud Shear Connectors: Only products of manufacturers qualified in accordance with AWS D1.1/D1.1M will be accepted for this Work.

D. Shop Welding:
1. Perform shop welding as indicated in accordance with AWS D1.1/D1.1M, and AWS D1.3/D1.3M, as applicable to the Work.
2. Welders shall mark adjacent to completed welds their welder I.D., using metal stamp, metal engraving, keel, paint stick, or other appropriate marking material.
3. Welding of stud shear connectors shall conform to AWS D1.1/D1.1M, Section 7. "Stud Welding," and the stud manufacturer's instructions.

E. Coating Shop Welds:
1. Coat shop welds made after hot-dip galvanizing and areas masked to permit welding as follows:
   a. Provide an inorganic ethyl silicate primer containing 85 percent zinc by weight in the dry film.
   b. Prepare surface in strict compliance with manufacturer's recommended procedures.
   c. Apply a single coat of 75 microns dry film thickness in strict accordance with manufacturer's application instructions.
   d. Top coat is required only if surrounding surface is painted, or if necessary to match color of surrounding area.
   e. Where top coating is required, provide a compatible product and apply according to manufacturer's instructions to achieve good cohesion and prevent pin-holing.
2. Color: Match color of surrounding area.

2.3 SHOP-APPLIED POWDER COAT

A. Provide shop-applied polyester triglycidyl isocyanurate (T.G.I.C.) coatings, thermo-cured color finish systems based on dry, powdered resins, commonly known as "powder coat."

B. Powder coat system shall meet the requirements listed below in the Article titled "Source Quality Control" in the Paragraph titled "Shop-Applied Powder Coating Testing," when applied on the specified substrate, e.g. hot dip galvanized steel or galvannealed sheet steel.

C. Preparation before coating:
   1. Hot-dip galvanized per ASTM A123/A123M: Prepare surface in accordance with ASTM D7803.
   2. Galvannealed per ASTM A653/A653M: Prepare surface in accordance with ASTM D7803
   3. Cleaning:
      a. Clean surfaces to be coated as follows:
         1) Remove all dust, dirt, and other surface debris by vacuuming, wiping dry with clean cloths or compressed air.
         2) Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
         3) Allow surfaces to drain completely and allow to thoroughly dry.
         4) Use water blasting only when necessary for extreme cases of contamination by oily residue and where hand washing is impractical.
         5) If the above procedures do not clean the substrate surfaces, clean the surfaces with high pressure water washing.

   4. Pretreatment:
      a. Wash parts in a four stage iron-phosphate washer for steel or zinc-phosphate washer for galvanized steel, or in accordance with primer manufacturer's recommendations.
      b. Dry parts before application of power coating.
      c. Treatment of the substrate: ASTM D3451.

D. Powder Coat:
   1. Primer: Apply primer compatible with powder top coat, as confirmed by powder coat manufacturer.
   2. Top Coat: Acceptable Manufacturer/Product: Tiger Drylac, or approved equal.
   3. Anti-Graffiti Coating:
      a. Apply as final coat on exterior surfaces.
      b. Powder coating intended for easy removal of typical spray paint used for graffiti.
      c. Compatible with top coat.

E. Dry Film Thickness:
   1. Primer: 3.5 mils minimum.
   2. Top coat: 3.5 mils minimum.
   3. Anti-graffiti coating: As recommended by manufacturer.

F. Perform mechanical processing such as sawing, drilling, milling, cutting, and bending before applying shop applied coatings.

G. Coating shall meet the testing requirements of ASTM D3451 and other standards indicated below:
   1. Physical Properties of Powder Coatings:
      a. Measurement of film thickness: ASTM D6132 or ASTM D7091.
      b. Abrasion resistance: ASTM D968.
      c. Adhesion: ASTM D3359, Method B, 5B.
      d. Elongation (flexibility): Mandrell Bending Test, ASTM D522, equal to or greater than 3 mm.
      e. Household chemical resistance: ASTM D1308.
      f. Detergent resistance: ASTM D2248.
      g. Chip resistance: ASTM D3170.
      h. Gloss:
         1) Interior: 25 to 40 percent reflective gloss.
         2) Exterior: ASTM D523, 80 to 90 plus.
      i. Pencil hardness:
         1) Interior: ASTM D3363, F minimum.
         2) Exterior: ASTM D3363, 4H (minimum).
      j. Impact resistance: ASTM D2794, 80 (in/lb), no appearance of cracks.

2. Accelerated Artificial Weathering: ASTM D6695, ASTM G151, ASTM G155.
3. Accelerated Environmental Exposure:
   a. Salt spray:
      1) Interior: ASTM B117, maximum undercut failure of 1/16 inch at scribed test lines; no blistering.
      2) Exterior: ASTM B117, 500 hours, maximum undercut failure 1 (mm); no blistering.
   b. Humidity Resistance: ASTM D2247, 500 hours, maximum undercutting 1 mm, no blistering.

H. Perform mechanical processing such as sawing, drilling, milling, cutting, and bending before applying shop applied coatings.

I. Cleaning:
1. Clean surfaces to be coated as follows:
   a. Remove all dust, dirt, and other surface debris by vacuuming, wiping dry with clean cloths or compressed air.
   b. Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
   c. Allow surfaces to drain completely and allow to thoroughly dry.
   d. Use water blasting only when necessary for extreme cases of contamination by oily residue and where hand washing is impractical.
   e. If the above procedures do not clean the substrate surfaces, clean the surfaces with high pressure water washing.

J. Pretreatment:
1. Wash parts in a four stage iron-phosphate washer for steel or zinc-phosphate washer for galvanized steel, or in accordance with primer manufacturer's recommendations.
2. Dry parts before application of power coating.
3. Treatment of the substrate: ASTM D3451.

K. Application:
1. Edges: Treat and finish as required to ensure specified minimum dry film coating thickness is achieved. Precoating of edges may be required.
2. Apply primer in accordance with manufacturer's written application instructions.
3. Apply top coat in accordance with manufacturer's written application instructions.
4. Allow surfaces to cure for time period in accordance with manufacturer's cure curves.
5. Inspect parts after cooling.

L. Color:
1. TES Substation Enclosure Exterior: Color will be provided by the Engineer.
2. TES Substation Enclosure Interior: RAL 9010, Pure White.
3. Electrical Equipment: Munsell Color System 8.3G 6.1/0.5 (ANSI 61 grey).

2.4 SHOP-APPLIED PAINT COATING SYSTEM

A. General Requirements:
1. Coatings must be certified VOC compliant and conform to applicable regulations and EPA standards.
2. Material Compatibility:
   a. Provide primers, finish coat materials and related materials that are compatible with one another and the steel substrate.
   b. Furnish documentation from manufacturer demonstrating compatibility in both application and service based on testing and field experience.
3. Material Quality:
   a. Provide highest grade of coatings as regularly manufactured by acceptable coating manufacturers.
   b. Materials not displaying manufacturer's identification as a best-grade product will not be acceptable.

4. Coating system shall meet the requirements listed below in the Article titled "Source Quality Control" in the Paragraph titled "Shop-Applied Paint Coating System Testing," when applied on the specified substrate, e.g. hot dip galvanized steel or galvannealed sheet steel.

B. Primer: Polyamide epoxy, 4-6 mils DFT.

C. Top Coat:
1. High solids, pigmented, aliphatic polyurethane, minimum 4 mils DFT.
2. Color: As specified, as indicated, or as directed by the Engineer.

D. Anti-Graffiti Coat:
1. Clear, aliphatic polyurethane non-sacrificial coating designed to resist graffiti and protect the underlying substrate.
2. From the same manufacturer and compatible with approved top coat.

E. Acceptable Manufacturers/Brands:
1. AkzoNobel/ICI Paints/Devoe High Performance Coatings.
2. Carboline.
3. PPG Protective and Marine Coatings.
4. Tnemec; or approved equal.

F. Shop-Applied Paint Coating Application:
1. Prepare steel in accordance with paint manufacturer's recommendations.
   a. Verify with paint manufacturer that proposed surface cleaner is compatible with approved paint coating system.
   b. Apply paint as soon as possible after surface preparation.
2. Primer:
   a. Shop-apply in accordance with SSPC-PA 1, SSPC-PA 2, SSPC-PS 13.01, and manufacturer's instructions.
   b. Verify DFT in accordance with SSPC-PA 2.
3. Top coat: Shop-apply in accordance with manufacturer's instructions.
4. Graffiti coat: Shop apply two coats in accordance with manufacturer's instructions.

2.5 SOURCE QUALITY CONTROL

A. Shop Inspections and Tests by the Engineer:
1. Galvanizing, shop applied coatings, and welds are subject to inspections and tests by the Engineer.
2. The Engineer will make test results available to the Vendor.

B. Galvanizing:
1. Shop Galvanizing Inspection and Test:
   a. Inspect and test galvanizing for full coverage and adhesion to steel in accordance with ASTM A123/A123M or ASTM A153/A153M, whichever is applicable.
   b. Inspection and test shall include the following:
      1) Visual examination of samples and finished products.
      2) Tests to determine weight or mass of zinc coating per square foot of steel surface.
      3) Tests to determine distribution and uniformity of zinc coating.
      4) Tests to determine thread fittings of units, washers to bolts.
   c. Test hardware or assemblies susceptible to embrittlement in accordance with ASTM A143/A143M. The Engineer will make the final determination on whether embrittlement testing is required.
   d. Shop Galvanizing Repair:
      1) Grind rough areas to produce a uniform surface.
      2) Repair steel grinding, scratches and other damage, in accordance with ASTM A780/A780M.

3) Sprayed Zinc: Clean and preheat to assure freedom from loose material, moisture, oil grease, or other foreign matter before applying zinc. Apply zinc coating by metallizing spray to clean and dry surfaces.
4) Zinc-Based Solders and Wire:
a) Clean to remove loose material and contaminates, and heat to approximately 572 degrees F.
b) Apply zinc-alloy repair compound by spreading material over heated surface in accordance with compound manufacturer's instructions.
c) Remove repair compound residues with damp cloth or by rinsing with water.
5) Organic cold galvanizing coating:
a) Minimum 95 percent metallic zinc by weight in dried film.
b) Approved Manufacturer: ZRC Products Company, or approved equal.

2. Dry film thickness of applied repair materials: Not less than galvanized coating thickness required by ASTM A53/A53M, A123/A123M, or A153/A153M.

C. Welding Inspections and Tests by the Vendor:
1. Visual Inspection:
a. All welds shall be visually examined in accordance with AWS D1.1/D1.1M.
b. Quality of welds and standards of acceptance shall be in accordance with AWS D1.1/D1.1M.

2. Inspection and Testing Type Requirements:
a. Nondestructive Testing: Conform to AWS B1.10M/B1.10.
b. Liquid Penetrant Inspection: Liquid dye penetrant inspection of welds shall conform to ASTM E165.
c. Magnetic Particle Inspection: Magnetic particle inspection of welds shall conform to ASTM E709.
d. Ultrasonic Testing: Comply with AWS D1.1/D1.1M and ASTM E164, as applicable.
e. Radiographic Testing: Comply with AWS D1.1/D1.1M and ASTM E94 and ASTM E1032, as applicable.
3. Inspect complete and partial joint penetration groove welds and fillet welds using magnetic particle inspection as follows:
a. One out of five (20 percent) of complete joint penetration groove welds of tee and corner joints.
b. One out of ten (ten percent) of partial joint penetration groove welds and fillet welds.
4. Random Testing: Randomly test 10 percent of welds by either liquid penetrant inspection or magnetic particle inspection.
5. Additional Testing: If random testing reveals possible flaws, test the welds in question, and additional welds if directed by the Engineer, using ultrasonic or radiographic testing. Requirement for this additional testing shall be at no additional cost to the Owner and shall be at the sole discretion of the Engineer.
6. Test complete joint penetration groove welds by radiographic testing as follows:
a. One out of ten (ten percent) with thickness equal to or less than 3/4 inch.
b. One out of two (50 percent) with thickness greater than 3/4 inch and equal to or less than 1.5 inches.
c. 100 percent for thickness greater than 1.5 inches.
d. Complete joint penetration groove welds not accessible for radiographic testing shall be subjected to ultrasonic testing. The extent shall be the same as specified for radiographic testing.
7. Inspection and Test Results:
a. Forward test result information to the Engineer immediately after test results are available.
b. State the acceptance or rejection of fabricated components, so that repairs and reinspection or testing may be performed as soon as possible.
8. Repairs:

a. Repair unacceptable welds in accordance with AWS D1.1/D1.1M.
b. Reinspect or retest repaired or corrected welds as specified for the original weld.

D. Shop-Applied Powder Coating Testing:
1. Coating shall meet or exceed the following testing requirements and performance criteria of ASTM D3451 and other standards indicated below.
2. Physical Properties of Powder Coatings:
a. Measurement of film thickness: ASTM D6132 or D7091.
b. Abrasion resistance: ASTM D968.
c. Adhesion: ASTM D3359, Method B, 5B.
d. Elongation (flexibility): Mandrell Bending Test, ASTM D522, equal to or greater than 3 mm.
e. Household chemical resistance: ASTM D1308.
f. Detergent resistance: ASTM D2248.
g. Chip resistance: ASTM D3170.
h. Gloss:
1) Interior: 25 to 40 percent reflective gloss.
2) Exterior: ASTM D523, 80 to 90 plus.
i. Pencil hardness:
1) Interior: ASTM D3363, F minimum.
2) Exterior: ASTM D3363, 4H (minimum).
j. Impact resistance: ASTM D2794, 80 (in/lb), no appearance of cracks.
3. Accelerated Artificial Weathering: ASTM D6695, ASTM G151, ASTM G155.
4. Accelerated Environmental Exposure:
a. Salt spray:
1) Interior: ASTM B117, maximum undercut failure of 1/16 inch at scribed test lines; no blistering.
2) Exterior: ASTM B117, 500 hours, maximum undercut failure 1 (mm); no blistering.
b. Humidity Resistance: ASTM D2247, 500 hours, maximum undercutting 1 mm, no blistering.

E. Shop-Applied Paint Coating System Testing:
1. Primer shall meet or exceed the following testing requirements and performance criteria of the standards indicated below:
a. Abrasion Resistance per ASTM D4060 (CS17 Wheel, 1,000 grams load), 1 kg Load: 200 mg loss.
b. Adhesion per ASTM D4541: 1050 psi.
c. Corrosion Weathering per ASTM D5894, 13 Cycles, 4,368 Hours: Rating 10 per ASTM D714 for blistering; Rating 7 per ASTM D610 for rusting.
d. Direct Impact Resistance per ASTM D2794: 160 inch pounds.
e. Flexibility per ASTM D522, 180 degree Bend, 1 inch Mandrel: Passes.
f. Pencil Hardness per ASTM D3363: 3B.
g. Moisture Condensation Resistance per ASTM D4585, 100 degrees F, 2000 Hours: Passes, no cracking or delamination.
h. Dry Heat Resistance per ASTM D2485: 250 degrees F.
2. Top Coat shall meet or exceed the following testing requirements and performance criteria of the standards indicated below:
a. Abrasion Resistance per ASTM D4060, CS17 Wheel, 1,000 Cycles 1kg Load: 87.1 mg loss.
b. Adhesion per ASTM D4541: 1050 psi.
c. Direct Impact Resistance per ASTM D2794: Greater than 28 inch pounds.
d. Indirect Impact Resistance per ASTM D2794: 12-14 inch pounds.
e. Dry Heat Resistance per ASTM D2485: 200 degrees F.
f. Salt Fog Resistance per ASTM B117 9,000 Hours: Rating 10 per ASTM D714 for blistering.

g. Flexibility per ASTM D522, 180 Degree Bend, 1/8 Inch Mandrel: Passes.
h. Pencil Hardness per ASTM D3363: 2H.
i. Moisture Condensation Resistance per ASTM D4585, 100 degrees F, 1000 Hours: No blistering or delamination.
j. Xenon Arc Test per ASTM D4798: Pass 300 hours.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Field Welding: Shall be performed as specified for shop welding.

3.2 SITE QUALITY CONTROL

A. Galvanizing: After delivery of substation, inspect and repair damage to galvanizing.
   1. Repair field cutting of metal, welds, steel grinding, scratches and other damages, and coat masked areas, in accordance with ASTM A780/A780M.
   2. Dry film thickness of applied repair materials: Not less than galvanized coating thickness required by ASTM A53/A53M, A123/A123M, or A153/A153M.

B. Shop Applied Coating: After delivery of substation, inspect and repair damage to shop applied coating.
   1. Repair minor film scratches and other blemishes in film surfaces in accordance with coating manufacturer's recommended procedures and materials:
      a. Submit recommended procedures and materials.
      b. Prepare a sample demonstrating the proposed repair procedures and materials, and subject to salt spray test per ASTM B117.
      c. Submit the sample after testing.
   2. Finished repairs shall match original finish for color and gloss, shall adhere to original finish, and shall exhibit no removal of coating film or blistering during dry adhesion testing when tested in accordance with ASTM D3359.
   3. Remove coated items damaged beyond repair and replace with newly fabricated and coated items.

C. Welding Inspections and Tests:
   1. Perform tests of field welds as specified for shop welds.
   2. Engineer will perform visual inspections of field welds as specified for shop welds.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes:
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 08P
TES DIELECTRIC EPOXY FLOORING
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes trowel-applied, dielectric, epoxy-resin flooring for TES substation floors.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 34 21 90P – TES Testing

1.3 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. ASTM International (ASTM):
   1. ASTM D149, Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
   2. ASTM D695, Standard Test Method for Compressive Properties of Rigid Plastics
   3. ASTM D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
   4. ASTM F2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

1.4 SUBMITTALS

A. Procedures: SECTION 01 33 00 – Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Product Data:
   1. Epoxy flooring materials and performance characteristics.
   2. Preparation and installation instructions.

D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements in Article titled “Quality Assurance.”

E. Operation and Maintenance Data:
   1. Submit manufacturer's cleaning and maintenance instructions.
   2. Submit immediately after approval of product data.

1.5 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 Systems Quality Assurance.

B. Installer Qualifications:
   1. Engage an installer who is certified in writing by epoxy flooring manufacturer as qualified to install manufacturer's products.

2. Workers performing installation must be skilled and experienced in the installation of the approved product.

1.6 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems.

B. Deliver materials to assembly site in supplier's original wrappings and containers, labeled with source's or manufacturer's name, material or product brand name, and lot number.

C. Store materials in their original, undamaged packages and containers, inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Provide flooring capable of the following when applied at 1/4-inch thickness:
1. Dielectric service, in accordance with ASTM D149: 58,000 Vdc.
2. Bond strength to concrete in accordance with ASTM D4541: 400 psi minimum.
3. Abrasion Resistance: Not more than 0.5 grams loss when tested with Tabor abrader with 1000 gram load for 1000 cycles.
4. Compressive strength per ASTM D695: 8500 psi.

B. Performance of In-Place Flooring: Capable of withstanding testing conditions specified in 34 21 90, TES Testing without arcing or passing current beyond specified limit.

2.2 EPOXY-RESIN FLOORING

A. Epoxy-Resin Flooring: Subject to compliance with requirements, provide Hallemite Dielectric Grey Amazite by RBC Industries, Inc., or approved equal.
1. Thickness: 1/4 inch nominal.
2. Color: Manufacturer's standard grey.

B. Materials:
1. Epoxy-Resin Matrix: Manufacturer's standard recommended for use indicated.
2. Aggregates: Silica sand in gradation recommended by resin manufacturer.

2.3 SHOP APPLICATION

A. Application Conditions:
1. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting flooring installation.
2. Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during flooring installation.
3. Close spaces to traffic during flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

B. Preparation:
1. Clean substrates of substances, including oil, grease, and curing compounds, that might impair flooring bond. Provide clean, dry, and neutral substrate for flooring application.
2. Rough sand metallic floors as recommended by manufacturer to insure adhesion.
3. Apply masking at stop points and at adjacent surfaces that are not to be coated, so that the flooring will finish at clean lines.

C. Epoxy-Resin Flooring Installation:

1. Apply the epoxy to the area shown on Contract Drawings.
2. Place and finish flooring according to manufacturer's written instructions.
3. Installation Tolerance: Limit variation in flooring surface from level to 1/4 inch in 10 feet; non-cumulative.
4. Where the edge joins the bare floor, taper the material from the full thickness to the height of the floor over a minimum of a 6-inch wide area.
5. Ensure that matrix components and fluids from grinding operations do not stain flooring by reacting with divider and control-joint strips.
6. Primer: Apply to flooring substrates according to manufacturer's written instructions.
7. Install epoxy floor coating to a minimum thickness of 1/4 inch as a one piece surface.
8. Where the epoxy floor covering meets a wall insulating panel, the floor covering shall completely fill gap to a minimum thickness of 1/4 inch.

2.4 PROTECTION

A. During equipment installation, provide protective covering to keep the epoxy floor clean and free from damage.

2.5 SOURCE QUALITY CONTROL

A. Inspect floor for cracks and joints. Repair in accordance with manufacturer's recommendations.

B. Cut out and replace flooring areas that evidence lack of bond with substrate.

C. Cut out flooring areas in panels defined by strips and replace to match adjacent flooring, or repair panels according to manufacturer's written recommendations, as approved by the Engineer.

D. Testing: Test in accordance with Section 34 21 90P, TES Testing. If flooring fails to provide specified level of electrical insulation, apply additional layers of epoxy until specified levels are achieved.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Inspection: After delivery, inspect floor for shipping damage.

B. Testing:
   1. Prefabricated Substations: After delivery to site, Installation Contractor shall test in accordance with Section 34 21 90P, TES Testing, to ensure that floor has not been damaged during shipping.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes:
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 10P
TES SELF-CONTAINED EYEWASH EQUIPMENT
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes self-contained eyewash equipment for installation in TES substations.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

1.3 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. American National Standards Institute (ANSI)
   1. ANSI Z358.1, Standard for Emergency Eyewash and Shower Equipment

1.4 SUBMITTALS

A. Submittals shall be in accordance with the requirements of SECTION 01 33 00, Submittal Requirements, except as modified herein.

B. Product Data:
   1. Eyewash station.
   2. Eyewash solution cartridge.

C. Operation and Maintenance Data:
   1. Submit manufacturer's operating and maintenance instructions on products specified in this Section.

1.5 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 Systems Quality Assurance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems.

1.7 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Eyewash Stations:
   1. Self-contained eyewash station meeting the requirements of ANSI Z358.1 using factory-sealed cartridges of eyewash solution.
   2. Eyewash stations shall be suitable for wall mounting at locations indicated on Contract Documents and incorporate a fluid reservoir for discharged solution.

B. Eyewash Saline Assembly:

1. Factory-sealed cartridge assembly containing contaminant-free, pH-balanced saline solution with integral nozzle(s) for solution delivery in a gentle flow meeting ANSI Z358.1 requirements.
2. Cartridge assemblies shall have a two-year shelf life from date of manufacture.

2.2 MANUFACTURER

A. Provide eyewash station and cartridges that are products of a single manufacturer.

B. Acceptable Manufacturer/ Product: Honeywell Safety Products, Fendall Pure Flow 1000 or approved equal.

2.3 FACTORY ASSEMBLY

A. Provide one eyewash station complete with eyewash fluid in each substation.

B. Install eyewash station in accordance with manufacturer instructions immediately adjacent to battery installation. Locations shall meet requirements of ANSI Z358.1.

C. Install eyewash solution cartridge(s) in accordance with manufacturer instructions.

D. Provide translucent 6-mil polyethylene sheeting as a secure and dust-proof, temporary cover over each completed eyewash station.

PART 3 - EXECUTION

3.1 FIELD INSTALLATION

A. Requirements of Article titled "Factory Assembly" apply to field installation.

B. Provide factory-sealed eyewash saline assembly upon delivery of substation to site. Assembly shall have minimum 22-months shelf life remaining at time of delivery.

3.2 SITE QUALITY CONTROL

1. Remove temporary cover after final commissioning of substation and verify that eyewash station is clean and ready to use.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes:
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer’s option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 12P
LOW-VOLTAGE PANELBOARDS
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Circuit breaker panel boards, including dc distribution panelboard.
   2. Enclosed circuit breakers.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 34 21 05P – Common Work Results for TES

E. SECTION 34 21 06P – TES Common Work Results for Metals

1.3 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. ASTM International (ASTM)
   1. ASTM B187, Specification for Copper Bar, Bus Bar, Rod and Shapes

C. National Electrical Manufacturers Association (NEMA)
   1. NEMA PB 1, Panelboards
   2. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum)

D. National Fire Protection Association (NFPA)
   1. NFPA 70, National Electrical Code (with City of El Paso amendments)

E. Underwriters Laboratories Inc. (UL)
   1. UL 67, Panelboards
   2. UL 489, Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

1.4 SUBMITTALS

A. Procedures: Section 01 33 00.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Product Data:
   1. Circuit breakers.
   2. Circuit breaker identification.

D. Shop Drawings:
   1. Submit shop drawings and electrical diagrams as follows:
      a. Panelboards and Load Centers:
         1) Show general arrangement, location and identification of the enclosure.
         2) Identify each circuit.
         3) Show location and identification of terminals.
         4) Show location of barriers.

5) Furnish wiring diagrams.

b. Circuit Breakers: Show circuit for which intended, voltage ratings, insulation level, current rating and interrupting ratings.

E. Spare Parts and Special Tools:
1. Submit a list of special tools to be provided under this Section, as defined in Section 34 21 80, TES Spare Parts and Special Tools.
2. Submit at the same time as product data.

F. Operation and Maintenance Data:
1. Submit manufacturer's operating and maintenance instructions on products specified in this Section, including the following:
a. Description of the switchboard and its components.
b. Manufacturer's operating and maintenance instructions, parts list, illustrations and diagram for components.
c. Recommended list of spare parts.
d. Wiring diagram.
e. Electrical characteristics of each component including relays or solid-state circuitry.

G. Factory Test Reports: Submit copies of certified reports of factory tests performed in accordance with the applicable referenced standards and specification requirements.

1.5 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 Systems Quality Assurance, except as modified herein.

B. Qualifications: Manufacturer that has been regularly engaged in the manufacture of similar equipment and meets UL requirements.

C. Conform to UL 489, NEMA PB 1, and NFPA 70, as applicable.

D. Components of the same type, size, rating, functional characteristics and manufacture shall be interchangeable.

E. Each item shall be UL labeled.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems, except as modified herein.

B. Ship each unit securely wrapped, packaged and labeled for safe handling in shipment and to avoid damage or distortion.

C. Store in secure and dry storage facility.

1.7 SPARE PARTS

A. Provide spare parts in accordance with Section 34 21 80P, TES Spare Parts and Special Tools.

1.8 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

PART 2 - PRODUCTS

2.1 PANELBOARDS AND LOAD CENTERS

A. Comply with NEMA PB 1 and UL 67.

B. Enclosure:

1. NEMA 250 Type 1, fabricated from galvanized steel, surface-mounted unless otherwise indicated, tamperproof.
2. Gutter size:

Main Bus Rating (Amperes)	End Gutter Size (Inches)	Side Gutter Size (Inches)
225 and below	6	5
400 and over	8	8

3. Provide backplate of reinforced steel for mounting of interior components.
4. Provide device or mechanism for enclosure grounding.
5. Dead-front type.

C. Cover and Trim:
1. Designed for surface mounting.
2. Door:
   a. Hinged, fitted with a combination latch and door lock, accommodating a master key.
   b. Provide one flat key tumbler cylinder-type, nickel-plated door lock conforming to the station master key system, two keys per lock.
3. Circuit Directory: Provide a directory frame with acrylic plastic face mounted on the back of the door.
4. Finish: Powder coat as specified in Section 34 21 06P, TES Common Work Results for Metals.

D. Bus Bars:
1. ASTM B187, 98 percent conductivity copper, with silver-plated contact surface.
2. Provide neutral bus of the same rating as that of phase bus.
3. Provide a full-rated separate grounding bus.

E. Circuit Breakers: Bolt-on type complying with UL 489.

F. Additional Requirements for TES Substation Ac Auxiliary Panel:
1. Provide main breaker in panel.
2. If panel is not located on face of switchgear, provide an additional main breaker accessible from the front of switchgear without opening a compartment.

G. Additional Requirements for Dc Panelboards:
1. Designed for two-wire, 125 Vdc ungrounded power distribution service.
2. Circuit breakers: Two-pole, 10,000 A interrupting rating at 250 Vdc minimum.

H. Identification: Provide nameplate or other machine-made permanent identification for each circuit breaker, giving each a unique sequential number.

2.2 ENCLOSED CIRCUIT BREAKERS

A. Molded case, bolt-on type, quick-make quick-break, with thermal-magnetic type overload trip, interchangeable unit for frame rated 125 A and above, complying with UL 489.

B. Enclosure: NEMA 250 Type 12, fabricated from galvanized steel, surface-mounted unless otherwise indicated.

C. Finish: Powder coat as specified in Section 34 21 06P, TES Common Work Results for Metals.

2.3 FACTORY ASSEMBLY

A. Mounting Height: Locate top 6 feet, 6 inches above finished floor and the bottom not less than 12 inches above finished floor, unless specifically indicated otherwise.

B. Anchor in accordance with seismic requirements in Section 34 21 05, Common Work Results for TES.

C. Identification:
   1. Mount sequential numbers directly on each circuit breaker or on the cover or trim adjacent to each breaker.
   2. Provide each panelboard and load center with an accurate, printed circuit directory.
      a. Identify each circuit, spare breakers, and spaces.
      b. Numbers on circuit directory must correspond to sequential numbers mounted on each breaker.
      c. Install in the factory provided directory frame mounted on the back of the door.

2.4 SOURCE QUALITY CONTROL

A. In addition to the manufacturer's standard tests, as a minimum perform the following tests at the manufacturer's plant:
   1. 60 Hz dielectric tests
   2. Mechanical operations tests
   3. Electrical operation tests.

PART 3 - EXECUTION

3.1 FIELD INSTALLATION

A. Requirements in Article titled "Factory Assembly" apply to field installation.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes:
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer’s option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 14P
TES MEDIUM-VOLTAGE AC CIRCUIT-BREAKER SWITCHGEAR
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Metal-clad, medium-voltage ac circuit breaker switchgear for TES substation primary protection.
   2. Incoming fusible, load break disconnect switch.
   3. Utility metering equipment.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 34 21 06P – TES Common Work Results for Metals

E. SECTION 34 21 17P – TES Substation Design and Assembly

F. SECTION 34 21 18P – TES Lighting

G. SECTION 34 21 31P – TES Substation Automation System (SAS)

H. SECTION 34 21 80P – TES Spare Parts and Special Tools

I. SECTION 34 21 90P – TES Testing

J. SECTION 34 21 95P – TES Operation and Maintenance Data

1.3 DEFINITIONS

A. Intelligent Electronic Device (IED): Refers to any digital or numerical-based protection, metering, control, or monitoring device that has processing, recording and reporting capabilities and a local human machine interface (HMI); used in electrical switchgear.

1.4 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. American National Standards Institute (ANSI):
   1. ANSI C39.1, Requirements for Electrical Analog Indicating Instruments

C. Institute of Electrical and Electronics Engineers (IEEE):
   1. IEEE 242, Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
   2. IEEE 1653.2, Standard for Uncontrolled Traction Power Rectifiers for Substation Applications Up to 1500 Vdc Nominal Output
   3. IEEE C37.06, Standard for Ac High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis-Preferred Ratings and Related Required Capabilities for Voltages Above 1000 V
   4. IEEE C37.09, Standard Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis
   5. IEEE C37.12, Guide for Specifications of High-Voltage Circuit Breakers (over 1000 Volts)
   6. IEEE C37.20.2, Standard for Metal-Clad Switchgear

7. IEEE C37.20.3, Standard for Metal-Enclosed Interrupter Switchgear
8. IEEE C37.46, Standard Specifications for High Voltage (> 1000 V) Expulsion and Current-limiting Power Class Fuses and Fuse Disconnecting Switches
9. IEEE C37.90, Standard for Relays and Relay Systems Associated with Electric Power Apparatus
10. IEEE C37.90.1, Standard Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus
11. IEEE C57.13, Standard Requirements for Instrument Transformers

D. Evergy:
1. Evergy S3, Point of Delivery Requirements for Privately Owned Substations, 15 kV Class
2. Evergy S8, Metering Transformer Installation in Metal-Clad Switchgear – 15 kV and Below

E. National Electrical Contractors Association (NECA):
1. NECA 430, Standard for Installing Medium-Voltage Metal-Clad Switchgear

1.5 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Product Data: Catalog data and other pertinent information concerning design and application ratings, service performance, and reliability, including the following:
1. Complete details of circuit breakers, drawout mechanism, manual racking handle, and interface with drawout mechanism.
2. Relays.
3. Control switches.
4. Indicating lamps.
5. Protective devices.
6. Surge arresters.
7. Cubicle heaters and humidistat.
8. Protection devices with coordination curves and setting procedures.

D. Spare Parts and Special Tools:
1. Submit a list of spare parts to be provided under this Section.
2. Submit at the same time as product data.
3. Provide part numbers for each part, including a detailed break down of each spare part assembly and set, as defined in Section 34 21 80P, TES Spare Parts and Special Tools.
4. Submit a list of special tools to be provided under this Section, as defined in Section 34 21 80P, TES Spare Parts and Special Tools.

E. Shop Drawings:
1. Manufacturer's detailed, dimensioned drawings for each type of switchgear assembly.
2. Manufacturer's schematic wiring and interconnection diagrams.

F. Operation and Maintenance Data:
1. Manufacturer's operating and maintenance instructions, parts list, illustrations and diagram for components.
2. Recommended list of spare parts.
3. Submit immediately after approval of product data

1.6 SPARE PARTS

A. Provide spare parts in accordance with Section 34 21 80P, TES Spare Parts and Special Tools.

B. List below applies to items in this Specification Section:
1. Ac circuit breaker, complete with truck: Provide 1 spare.
2. Circuit breaker operating mechanism charging motor: Provide 1 spares.

3. Circuit breaker operating mechanism spring: Provide 1 spare assemblies.
4. Circuit breaker solenoids: Provide 1 spare sets.
5. Metering current transformers: Provide 1 spare set.
6. Protection current transformers: Provide 1 spare set.
7. Potential transformers: Provide 1 spare set.
8. Potential transformer primary and secondary fuses: Provide 1 spare set.
9. Ac protective relays (non-IED): Provide 1 spare set.
10. Ac switchgear IEDs: Provide 1 spare set.
11. Ac ammeter and voltmeter: Provide 1 spare set if separate from IEDs.
12. Ac switchgear control circuit mini-breakers: Provide 1 spare sets.
13. Transducers: Provide 1 spare set.
14. Indicating LEDs, including those for trip circuit monitor: Provide 1 spare set.

1.7 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 Systems Quality Assurance.

B. The ac metal clad switchgear shall be UL labeled or shall be furnished with a Field Evaluation label in accordance with Section 34 21 17P, TES Substation Design and Assembly.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems, except as modified herein.

B. Obtain written permission from the Engineer before shipping substation.

1.9 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

PART 2 - PRODUCTS

2.1 GENERAL

A. Ac switchgear shall form a line-up of dead-front, totally enclosed, free-standing switchgear suitable for indoor service, and include an incoming disconnect switch, utility metering, and a circuit breaker to feed rectifier transformer.

B. Switchgear shall be metal-clad and conform to the requirements of IEEE C37.20.2, except as otherwise indicated.

2.2 RATINGS

A. Ac switchgear shall have the following ratings:
1. Nominal Voltage: 13.2 kV.
2. Maximum Voltage: 15 kV rms.
3. Frequency: 60 Hz.
4. Insulation Level, 60 Hz Withstand: 36 kV.
5. Insulation Level, Impulse Withstand: 95 kV.
6. Continuous Current: 1200 A.
7. Rated Short Circuit Current: 25 kA.
8. Maximum Dimensions: 36 inches wide, 96 inches deep, 95 inches high or as indicated.

2.3 AC SWITCHGEAR STRUCTURE

A. Construction:
1. Rigid, self-supporting, and self-contained.
2. Structural elements electrically welded or bolted together.
3. Sheet steel, minimum 11 gage.

4. Shall support equipment under normal loads, short-circuit conditions, and specified seismic conditions.
5. Ac switchgear enclosure shall be divided, barriered, and partitioned into separate vertical sections.
6. Finish: Powder coat in accordance with Section 34 21 06P, TES Common Work Results for Metals.

B. Circuit Breaker Compartments:
1. Design to allow draw-out circuit breakers to be easily drawn in or out of their housing.
2. Provide guide rails or cradles for positioning the removable elements as an integral part of the equipment. Guides shall ensure proper alignment.
3. Provide self-aligning, self-coupling, primary and secondary disconnecting devices that allow the draw-out breakers to connect or disconnect from the buses and auxiliary circuits.
4. Connection of control wiring to the ac breaker shall be by sliding contacts. A plug-style disconnect is acceptable, provided the breaker cannot be mechanically racked into the connected position with the plug disconnected.
5. Provided automatic protective shutters to cover live medium-voltage terminals and prevent accidental contact with live parts as the removable element of breaker is drawn out of the cubicle.
6. Provide a manual racking mechanism for horizontal draw-out of each circuit breaker:
   a. Mechanism shall have three circuit breaker positions: Disconnected, test, and connected.
   b. Provide positive stops to prevent over-travel at each position with labels clearly identifying the breaker's position.
   c. Mechanism shall be designed for racking of circuit breaker in and out of connected and disconnected position with the compartment front door in the closed and latched position.
      1) With door closed and latched, the socket for insertion of manual racking handle shall be within 1 inch of face of door for ease of use. An extension on the socket may be provided to satisfy this requirement.
      2) An arrangement that makes it difficult to align the manual racking handle with the socket without opening the door is not acceptable.
   d. Manual racking handle:
      1) Handle shall be designed such that it does not require a user with special skills to insert or operate.
      2) Provide a universal joint if necessary to prevent the user from knocking his knuckles on the floor while racking a breaker.
      3) Engineer may reject manual racking handle after delivery if it has not been designed for ease of use. If rejected, provide a handle that addresses the use issues at no additional cost to the City.
      4) Provide one at each switchgear location.
7. Breaker case and frame shall be grounded when the breaker is in the connected and test positions by means of positive contact with a copper ground bus.
8. Provide the following interlocks:
   a. Prevent either electrical or manual operation of the breaker unless it is in the connected or test position.
   b. A positive mechanical interlock shall prevent racking in or out unless the breaker is in the OPEN position.
   c. Circuit breaker, complete with the operating mechanism shall be capable of being removed from the enclosure only in the disconnected position.

C. Control/ Terminal Board Compartment:
1. Controls, including programmable controllers, instrumentation, control relays, terminal boards, control wiring and control devices shall be housed in a separate control/terminal board compartment.
   a. Compartment shall be barriered from the power wiring and buswork compartments.

b. Exception: Where controls and terminal boards are dedicated to circuit breaker function, they may be located in the circuit breaker compartment.

2. Protective relays, meters, instruments and control devices shall be mounted on front compartment doors and shall be located such that meters and displays can be operated and read by a person standing at floor level.

D. Access Doors:
1. Access to all components shall be from the front and the rear.
2. Equipment access panels located on the side or top of the enclosures are prohibited.
3. Provide each compartment with separate hinged front and rear access doors for servicing.
4. Opening of any front door shall not expose circuits in adjacent compartments.
5. Construction:
a. Sheet steel, 11 gage minimum.
b. Reinforce against distortions using suitable flanges and stiffening members.
6. Hinges: Stainless steel heavy-duty type.
7. Latches:
a. Doors shall be securely fastened in the closed position with a three point latch easily opened without the use of tools.
b. Two latches will be allowed if front panel consists of more than one full-length door.
8. Handles: Provide each door with a heavy duty-handle with provisions for a padlock.
9. Door Stops: Provide each door with a heavy-duty stop to hold it securely in the open position.

E. Heaters: Provide two strip-type heaters in each switchgear cubicle to prevent condensation.
1. Operating voltage for heating strips shall not exceed 50 percent of heater rated voltage.
2. Provide an individual humidistat in each cubicle to control heaters.
3. Locate humidistat in an area of each cubicle so that it can measure the average humidity in the cubicle.
4. Provide a digital heater ammeter on the front of each cubicle enclosure to indicate current and operation of heaters.

F. Lights: Provide a light in each cubicle in accordance with Section 34 21 18P, TES Lighting.

G. Warning Signs:
1. Front Access Doors: Sign on each stating "DANGER: LIVE PARTS" and "DANGER: HIGH VOLTAGE."
2. Rear Access Doors: Sign on each stating "DANGER: LIVE PARTS" and "DANGER: HIGH VOLTAGE."

2.4 BUSES AND CONNECTIONS

A. Power Bus:
1. Material: Silver-plated, electrical grade copper.
2. Continuous current rating: Minimum 1200 A for main bus and circuit breaker connections.

B. Ground Bus:
1. Material: Electrical grade copper.
2. Size: Minimum 2 inch by 1/4 inch.
3. Extend the full length of ac switchgear assembly and bond to each switchgear section by solidly bolting the bus to a non-removable structural member.

C. Main Bus:
1. Extend three-phase horizontal bus the full length of ac switchgear assembly.
2. Insulate entire length of main bus, including joints, with 30 kV, flame-retardant, non-hygroscopic, track-resistant insulation free from internal voids.
3. Corona Prevention:
a. There must not be air gaps between the bus and the bus insulation.
b. Where bus passes through cubicle barriers, there must not be air gaps between the bus insulation and the opening through which it passes.

D. Connections:
   1. Silver-plated, electrical grade copper bus.
   2. Connections include but are not limited to bus taps, circuit breaker connections, CT and PT connections, transformer connections, and surge arrester connections.
   3. Join with a minimum of two bolts per joint and Belleville washers. Hardware shall be silicon bronze.
   4. Cable connections are not permitted.

E. Buses and bus connections shall be adequate to withstand thermal and mechanical stresses associated with short-circuit currents equal to the momentary and three-second rating of the circuit breaker.

2.5 INCOMING DISCONNECT SWITCH SECTION

A. Description: Load break, fusible, airbreak disconnect switch, meeting the requirements of Evergy S3.

B. Switch Cubicle:
   1. Mechanical Interlock:
      a. The switch must be open before the door can be opened.
      b. The door must be closed before the switch can be closed.
   2. Observation Window: Ample sized, high-impact, gasketed, positioned so that position of all three switches can easily be seen through the closed door.
   3. Safety Barrier: Metal, grounded, bolted closed in front of switch to prevent inadvertent contact with live parts; barrier must allow full-view inspection of the switch blade position.
   4. Operating Mechanism Cover: Hinged, with quarter turn nylon latches, to discourage casual tampering.
   5. Switch Position Indicators:
      a. Green LED with label "OPEN"
      b. Red LED with label “CLOSED"
   6. Locking Provisions: Suitable for padlocking switch in the open or closed position.

C. Switch:
   1. Switching mechanism:
      a. Three-pole, gang-operated.
      b. Manual quick-make, quick-break over-toggle type not requiring use of chain or cable
      c. Heavy-duty coil spring to provide opening and closing energy.
      d. Normal Operation: Opening and closing speed independent of the operator; not possible to tease switch into intermediate position.
      e. Maintenance Operation: Slow closing possible to check switch blade engagement; slow opening possible to check operation of arc-interrupting contacts.
   2. Contacts: Separate main and break contacts for maximum endurance during fault-close and load-interrupting duty.
   3. Barriers:
      a. Insulating barriers between each phase and between the outer phases and the enclosure.
      b. Isolating barrier between operating chain and switch blades.
   4. Grounds:
      a. Positive beryllium copper grounds on each phase with switch in open position.
      b. Grounds shall be visible through viewing window.
   5. Switch shall be removable from the structure as a complete operational component.

D. Fuses:
   1. Provide fault protection using fuses with continuous ratings as determined based on load served.
   2. Provide UL certification for fuse/switch integrated momentary and fault close ratings.

E. Service Entrance:

1. Make provisions for bottom (underground) service entrance and termination of the 13.2 kV incoming service cables. Conductors will be installed and terminated by Evergy during field installation.
2. Verify conduit entry locations to ensure proper termination of utility incoming cables.
3. Provide a copper ground conductor equivalent to 2/0 copper minimum around the inside of the enclosure walls in the cable termination compartment and solidly ground to the ac switchgear ground bus. Provide a grounding horn for use with portable grounds.

2.6 UTILITY METERING SECTION

A. Section shall meet requirements of Evergy S8, referenced codes and standards, and additional requirements of Evergy, whether published or not.

B. Coordinate with Evergy via the Engineer to verify requirements before preparing shop drawings.

C. Submit switchgear shop drawings to Evergy via the Engineer in accordance with Evergy S8 and as directed by Evergy. If clarification of submittal requirements is needed, contact Evergy directly.

D. Submit shop drawings to Engineer at the same time as submittal to Evergy and obtain approval from both Evergy and Engineer before starting manufacturing.

E. Obtain Evergy-furnished PTs and CTs from Evergy and install in switchgear in accordance with Evergy S8 and as directed by Evergy.

F. Furnish and install terminal blocks and PT and CT secondary wiring in accordance with Evergy S8 and as directed by Evergy.

G. Enclosure access doors:
1. Interior and exterior: Hinged on one side except as otherwise indicated with a two-point latch mechanism padlockable by Evergy.
2. Access doors on enclosures containing revenue metering equipment shall be labeled, "UTILITY METERING CUBICLE: NO CUSTOMER EQUIPMENT."

2.7 MEDIUM-VOLTAGE CIRCUIT BREAKER SECTION

A. General:
1. Circuit breaker shall be a draw-out type and utilize vacuum interrupters having load and fault break capabilities and shall conform to or exceed the requirements of IEEE C37.06 and IEEE C37.12.
2. Circuit breakers shall be identical and physically and electrically interchangeable.
3. Circuit breaker frame shall be provided with a full front metal shield to prevent access to any live primary bus or load terminals when the circuit breaker is in the connected position.
4. Provide a truck or fifth wheel at each switchgear location to facilitate one-person breaker removal and turning.
5. Provide means for padlocking the ac breaker in the open position.
6. Circuit breaker insulation:
   a. Noncombustible, non-hygroscopic and track-resistant.
   b. Mechanical strength and physical characteristics shall match the stresses imposed by the circuit breaker rated momentary current.

B. Minimum ratings:
1. Nominal System Voltage: 13.2 kV 3-phase.
2. Maximum Voltage: 15 kV rms.
3. Frequency: 60 Hz.
4. Insulation Level, 60 Hz: 36 kV, rms.
5. Insulation Level, impulse: 95 kV, crest.
6. Continuous Current: 1200 A.
7. Short Circuit Current at Maximum Voltage: 25 kA rms.
8. Fault Clearing Time: Five cycles max.

C. Circuit Breaker Operating Mechanism:
   1. Motor-charged and spring-operated unless otherwise approved by Engineer.
   2. Mechanism shall be designed to prevent overcharging.
   3. The mechanism shall ensure that the release of stored energy for closing the circuit breaker main contacts is prevented unless the mechanism has been fully charged.
   4. The stored-energy closing mechanism shall automatically charge itself within 15 seconds after closing of the breaker.
   5. Energy storage shall be sufficient for an open-close-open cycle at maximum rated short circuit current.
   6. Provide manual cranking capability to permit spring charging in the event motor power is unavailable. Provide one manual crank at each switchgear location.
   7. Provide manual trip and close buttons on front of circuit breaker.
   8. Withdrawal of circuit breaker from enclosure:
      a. Provide an interlock to prevent withdrawal when the mechanism is fully charged.
      b. Alternately, provide automatic controlled discharge of the stored energy when the circuit breaker is withdrawn from or inserted into the enclosure.
   9. Circuit breaker shall be electrically and mechanically trip free. The operating mechanism shall be non-pumping.
   10. Operation counter: Four-digit, non-resettable, register-type mechanical operations counter. Provide on each circuit breaker to record each close/open cycle.

D. Circuit Breaker Control Voltage:
   1. Control voltage: 125 Vdc.
   2. Closing mechanism voltage range: Plus or minus 15 percent of the nominal dc control voltage.
   3. Tripping mechanism voltage range: Plus or minus 25 percent of the nominal dc control voltage.

E. Circuit Breaker Control Switches:
   1. Open/Close: Switch located on breaker HMI and SAS HMI touch screen (see Section 34 21 31, Substation Automation System (SAS)).
   2. SAS HMI control switch shall permit open and close operations when the circuit breaker is in the connected position.
   3. Breaker HMI control switch shall permit open and close operations when the circuit breaker is in the test position.
   4. Provide a switch for resetting the circuit breaker after a trip and provide a mechanical trip indication at the control switch.

F. Auxiliary contacts:
   1. Provide a minimum of six electrically separate sets of reversible auxiliary contacts, in addition to those required for the circuit breaker control circuit.
   2. Auxiliary contacts shall be operated by the breaker mechanism in both the "connected" and "test" positions.
   3. Spare auxiliary contacts shall be wired to the outgoing terminal blocks.

G. Indicating LEDs:
   1. Provide indicating LEDs on the front of the circuit breaker enclosure to indicate the state of the circuit breaker:
      a. Closed breaker: Red LED.
      b. Tripped or open breaker: Green LED.
   2. Provide an amber LED above each local/remote switch which shall be illuminated when switch is in local position.
   3. Provide a white LED indicating light on the front of the circuit breaker enclosure to indicate the stored-energy closing mechanism is charged.

2.8 PROTECTIVE RELAYS

A. General Requirements:

1. Conform to the applicable sections of IEEE C37.90.
2. Cases: Rustproof metal or high-impact plastic rectangular cases with test switches, panel-mount form factor.
3. Contacts: Silver-to-silver non-welding.
4. Non-IED Relays: Self-resetting with seal-in, hand-resetting targets indicating relay operation.
5. Arrangement:
    a. Devices including switches, relays, indicating lights and test plugs shall be conveniently accessible and easily visible.
    b. The grouping shall be modular and place related functions in proximity.
    c. Devices of the same general type shall be manufactured by the same company and shall be similarly arranged and mounted.
6. Mounting:
    a. Flush mounted, plumb and square with the lines of the panels and as recommended by the manufacturer, with wiring connections on the back of the relay.
    b. Mount on hinged or removable panels and not on a fixed portion of the switchgear.
7. Color: Match color of switchgear. See Section 34 21 06P, TES Common Work Results for Metals for color.

B. Provide the following protective and monitoring devices at a minimum, as shown in the Contract Drawings. Additional protective devices recommended by Vendor or equipment manufacturers may be installed with Engineer approval.

C. Ac Protective Relay - Intelligent Electronic Device (IED):
1. For each medium-voltage ac breaker provide a multi-function protective relay IED and related transducers:
    a. IED must capture real-time voltage and current for a triggered event with pre- and post-trigger sampling data useful for analyzing trip information, and store in non-volatile memory.
    b. IED shall communicate with the SAS via protocol specified in Section 34 21 31P, TES Substation Automation System (SAS).
2. Provide the following functions, at minimum:
    a. Ac undervoltage (ANSI Device 27):
        1) Primary function: Trip and annunciate when the ac input voltage drops to 80 percent of nominal voltage.
        2) Relay shall also trip and annunciate upon loss of voltage due to utility outage.
        3) Relay shall contain field adjustable time delay.
    b. Phase sequence relay (ANSI Device 47):
        1) Three-phase voltage protective relay connected to provide open phase protection.
        2) This relay shall contain a field adjustable time delay.
    c. Ac overvoltage (ANSI Device 59):
    d. Phase fault time overcurrent (ANSI Device 50/51).
        1) Primary function shall be to provide overload and fault protection for loads served.
        2) Relay shall be designed to compile a composite time overcurrent characteristic curve which shall best match the normal and overload requirements of the load and to match the thermal and mechanical withstand of transformers.
        3) Relay shall provide for both instantaneous and time delay overcurrent protection.
    e. Ground fault time overcurrent (ANSI Device 50N/51N):
        1) A residual instantaneous and time delay relay connected to provide sensitive ground fault detection.
        2) This relay shall be field adjustable.
    f. Control/Position of ac breaker (ANSI Device 52).
    g. Reverse Power (Device 32):
        1) Provide in incoming feeder cubicle connecting to utility service switchgear.

2) This device shall trip and lock-out associated circuit breaker when it detects a flow of power from substation back toward the utility.

h. Local/Remote control (Device 43)

3. Device shall have chart recording features with PC software used for downloading and analyzing faults. Transient fault recording function shall capture analog and digital pre-fault and post-fault waveforms and data.

D. Provide the following additional ac protective relay:

1. Lockout (Device 86H):
   a. Provide on the ac circuit breaker compartment.
   b. Reset switch handle:
      1) Heavy-duty switchboard type pistol-grip handle.
      2) Acceptable Manufacturer: Electroswitch or approved equal.
   c. Provide indication of "lockout" and "normal" at the reset switch.
   d. When the main ac circuit breaker is tripped by the lockout relay, the following sequence of events shall occur:
      1) Dc feeder circuit breakers shall be opened for TES substations.
      2) Ac breaker shall remain locked out until manually reset.

E. Trip Circuit Monitors:

1. Provide a trip circuit monitor for monitoring the trip coil on each of the following:
   a. Medium voltage ac circuit breaker.
   b. Lockout relay.
2. Indication and Operation:
   a. Green LED that illuminates when the trip coil is energized and turns off when the coil is de-energized.
   b. NO and NC Form C contacts for indication of a failed trip coil.
   c. Red LED that illuminates upon failure of the trip coil.
   d. 200 millisecond delay to allow for auxiliary contacts to transfer.
   e. LEDs: Plug-in replaceable with a life of 100,000 hours; protected against reverse polarity by a diode.
   f. Control Power: 125 Vdc.
   g. Manufacturer: E-max RAW-1D or approved equal.

F. Protective device coordination: Installation Contractor shall be required to perform a coordination study for the ac system in accordance with Section 34 21 73, TES Studies.

2.9 INSTRUMENTS AND METERS

A. Analog instruments and meters ANSI C39.1.

1. Provide analog switchboard type ammeter and voltmeter, with 250 degrees scales, rated for use with corresponding transformer.
2. Cases shall be dust proof and covered with a non-reflecting glass window.
3. The accuracy of all indicating instruments shall be within 1 percent of full scale reading.
4. Voltmeters and ammeters shall be rated for use with the corresponding transformer.
5. Scales shall be of a suitable range, equal to the associated potential or current transformer primary rating.
6. Provide incoming line phase selector switches for connection to the line transformers for the ammeter and voltmeter.

2.10 INSTRUMENT TRANSFORMERS

A. Instrument transformers shall conform to IEEE C57.13, with the additional requirements indicated below.

B. Current transformers:

1. Shall be capable of withstanding thermal and mechanical ratings of the circuit breaker.
2. Molded-rubber or epoxy construction, wound-type or bushing-mounted.
3. Wound-type current transformers:

a. Provide separate compartment isolated from the control panel and all other equipment.
b. Provide a mounting frame which bolts securely to the switchgear frame.
c. Full-wave impulse insulation level: 125 kV.
d. Secondary terminal blocks shall have covers with integral shorting bars and secondary wiring shall be run to readily identifiable terminal block points in the control compartment.
e. Terminal block points shall also have integral shorting bars for the current transformer leads.

4. Bushing-type current transformers: Low-voltage, ring-core, high-accuracy type designed for secure mounting on the primary contact support bushings.
5. Accuracy: Relaying accuracy classification, under the burdens imposed by the specified devices.

C. Potential transformers (PTs):
1. Drawout-type, molded-rubber or epoxy construction.
2. Transformers shall have full-wave impulse insulation level of 125 kV.
3. Primary and secondary circuits of potential transformers shall be fused by means of non-renewable cartridge-type fuses meeting requirements of IEEE C37.46.
4. Grounding of trunion: Trunion or other conveyance mechanism on which drawout PTs are mounted shall be continuously grounded in the fully inserted position, while being withdrawn, and when in the fully withdrawn position.
5. Grounding of PT: Primary of PT shall be grounded, as soon as the primary circuit is disconnected, while the PT is being withdrawn and in the fully withdrawn position.
a. Grounds shall be beryllium copper.
b. Provide a viewing window in the PT drawer for viewing grounds. Grounding in the fully withdrawn position shall be visible from the exterior of the switchgear, without removing panels or parts, by a person standing on the floor.

6. Fuses:
a. Primary fuses shall be completely disconnected before a person can access the transformer or its high-voltage fuses.
b. Secondary circuit fuses shall be installed in the low-voltage circuits and shall be located to permit replacement when the switchgear is in operation.
7. Rating: Adequate for the burden requirements of the accuracy classification and capable of carrying rated load continuously without excessive heating or damage.

2.11 SOURCE QUALITY CONTROL

A. Factory Design Tests:
1. Tests shall consist of all Design Tests as specified in IEEE C37.20.2.
2. Perform tests on the ac switchgear assembly and each component of the ac switchgear.
3. The main ac circuit breaker test shall be performed in accordance with the design tests as described in IEEE C37.09.

B. Factory Production Tests:
1. Ac Circuit Breaker: Prior to mounting inside ac switchgear, perform the following on each ac circuit breaker in accordance with IEEE C37.09:
a. Nameplate check.
b. Control and secondary wiring checks.
c. Clearance and mechanical adjustment check tests.
d. Mechanical operation tests.
e. Timing tests.
f. Stored energy system tests.
g. Conductivity of the current path test.
h. Low-frequency withstand voltage tests on major insulation components.
i. Current transformer.
j. Resistors and coils.

2. Ac switchgear: Perform production tests as part of TES Substation Factory Acceptance Tests, as specified in Section 34 21 90P, TES Testing.

2.12 MANUFACTURE

A. Manufacture switchgear in accordance with the referenced ANSI and IEEE standards.

2.13 INSTALLATION

A. Install switchgear in TES substation enclosure in accordance with manufacturer's installation instructions and NECA 430.

2.14 SURGE ARRESTERS

A. Provide surge arresters in Service Switchgear.

B. Connect the surge arrester ground terminals directly to the switchgear ground bus connected to the station grounding electrode (by Installation Contractor).

2.15 TRANSFER TABLE

A. Provide transfer table at each substation for removing and lowering PTs and draw-out fuse trunions.

B. Table shall be capable of being raised and lowered hydraulically from floor to trunion levels.

PART 3 - EXECUTION

3.1 INSTALLATION

1. Install ac switchgear in accordance with Section 34 21 17P, TES Substation Design and Assembly, and Contract Drawings.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes:
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer’s option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 16P
TES SUBSTATION ENCLOSURES
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Prefabricated enclosures for TES substations.
   2. HVAC for prefabricated enclosures.
   3. Testing of prefabricated enclosures.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 34 21 05P – Common Work Results for TES

E. SECTION 34 21 06P – TES Common Work Results for Metals

F. SECTION 34 21 08P – TES Dielectric Epoxy Flooring

G. SECTION 34 21 17P – TES Substation Design and Assembly

H. SECTION 34 21 31P – TES Substation Automation System (SAS)

I. SECTION 34 21 80P – TES Spare Parts and Special Tools

J. SECTION 34 21 90P – TES Testing

K. SECTION 34 22 26P – TES Grounding and Bonding

1.3 DEFINITIONS

A. Galvanneal: As defined in Section 34 21 06P, TES Common Work Results for Metals.

1.4 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. American Institute of Steel Construction (AISC):
   1. AISC 303, Code of Standard Practice for Steel Buildings and Bridges
   2. AISC 360, Specification for Structural Steel Buildings

C. ASTM International (ASTM):
   1. ASTM A384/A384M, Standard Practice for Safeguarding Against Warpage and Distortion During Hot Dip Galvanizing of Steel Assemblies
   2. ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
   3. ASTM E136 , Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C

D. Institute of Electrical and Electronics Engineers (IEEE):
   1. IEEE 1653.2, Standard for Uncontrolled Traction Power Rectifiers for Substation Applications Up to 1500 V DC Nominal Output
   2. IEEE C37.20.1, Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear

E. International Code Council (ICC):
   1. International Building Code
   2. International Mechanical Code
   3. International Energy Conservation Code

F. National Electrical Manufacturers Association (NEMA):
   1. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum)
   2. NEMA ICS 6, Industrial Control and Systems: Enclosures

G. National Fire Protection Association (NFPA):
   1. NFPA 70, National Electrical Code

1.5 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Product Data:
   1. Seam caulking.
   2. Thermal and acoustical insulation, including weather stripping.
   3. Entry doors, including material, construction, and sealing gasket material.
   4. Door hardware, including hinges, handles, locks, panic bars, and door closer.
   5. Exterior equipment access door hardware including latches, hinges, gaskets, and door stops.
   6. HVAC units.
   7. HVAC control unit and thermostat.

D. Spare Parts:
   1. Submit a list of spare parts to be provided under this Section.
   2. Submit at the same time as product data.
   3. Provide part numbers for each part, including a detailed break-down of each spare part assembly and set, as defined in Section 34 21 80P, TES Spare Parts and Special Tools.

E. Shop Drawings:
   1. Structural and architectural plans to scale including the following:
      a. Plans, elevations, and sections, including HVAC, door frames and openings, equipment mounting, lifting and anchorage details, and lighting.
   2. Drawings for fabrication including the following:
      a. Floor plan showing framing and floor plate; equipment outlines and weights; floor openings; and welds and bolted connections.
      b. Wall plans including framing, posts, beams, and other structural members; welds and bolted connections; interior and exterior wall panel details including interlocking, assembly of wall panels, and caulking; and connection of wall panel to base showing required z-type channel and wall panel lapped over floor seam.
      c. Roof plan showing framing; welds and bolted connections; roof panel details including interlocking and rain cap, assembly of roof panels, and caulking; details of roof penetrations and the means used to prevent ingress of water; and connection of roof to walls.
      d. Details of construction of doors, frames, welds, bolted connections and the means used to prevent ingress of water.
      e. Penetrations for cable, conduit, ventilation, or other purposes.
      f. Clear indication on each drawing of each type of material, including type of galvanized finish, if any; and dimensions, gauge or thickness.
   3. Enclosure equipment grounding details, including proposed ground grid connections.

F. Compliance Certificates: For enclosure materials and performance.

G. Calculations:
   1. Structural:

a. Design calculations for the enclosure including analysis calculations for equipment, roof, wind, and seismic loadings, and for any temporary supports, certified by a structural engineer registered in the State of Missouri.
b. Design calculations for anchorage and supports, certified by a Professional Engineer registered in the State of Missouri.

2. HVAC:
a. Sizing of heating, ventilating, and air conditioning units, including tabulation of interior equipment heat gains, infiltration gains/losses, conductive gains/losses and solar gains, certified by a mechanical engineer registered in the State of Missouri.

H. Testing:
1. Submit test procedures that meet the requirements of Section 34 21 90P, TES Testing for the following:
a. Factory Design Tests.
b. Factory Production Tests.
2. Submit test reports that meet the requirements of Section 34 21 90P, TES Testing for the following:
a. Factory Design Tests.
b. Factory Production Tests.

I. Operations and Maintenance Data:
1. Submit manufacturer's operating and maintenance instructions on products specified in this Section, including the following requirements:
a. Repair procedure for powder coat finish.
2. Submit immediately after approval of product data.

1.6 SPARE PARTS

A. Provide spare parts in accordance with Section 34 21 80P, TES Spare Parts and Special Tools.

B. List below applies to items in this Specification Section.
1. Lock cylinders: Keyed for TES substation doors; provide 1 spare.
2. Padlocks: Keyed for TES substation equipment access doors: Provide 2 spare.
3. HVAC:
a. Complete units, including all sub-assemblies; Provide 1 spare.
b. HVAC fan; Provide 1 spare.
c. HVAC controller; Provide 1 spare.

1.7 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 – Systems Quality Assurance.

B. Qualifications:
1. Manufacturer of the pre-fabricated metal buildings shall be a company regularly engaged in the production of pre-fabricated galvannealed steel buildings with a powder coat finish, and as approved by Engineer.
a. Manufacturer shall have constructed at least 50 similar buildings in the last 10 years.
b. Manufacturer shall be experienced in forming galvanneal conforming to ASTM A653/A653M with minimum coating weight A25.
c. Once a manufacturer is approved, it shall not be discharged or otherwise replaced by the Vendor without the written approval of Engineer.
d. Personnel working on metal buildings shall be experienced, skilled, and familiar with building construction, including installing air conditioning, heating and ventilation systems.
2. Where engineering calculations are called out, they shall be performed by a professional engineer registered in the State of Missouri.

3. Welding shall be performed by Certified Welders. Refer to Section 34 21 06P, TES Common Work Results for Metals, for detailed requirements.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems, except as modified herein.

B. Obtain written permission from the Engineer before shipping substation.

1.9 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Each substation enclosure shall be a shop assembled, free-standing, self supporting, steel building, utilizing channel perimeter framework and rigidly braced with channel and angle cross members.

B. Completed assembly shall be designed for shipment for installation at site.

C. The enclosure shall be a totally integrated weatherproof unit that houses the indicated substation equipment. The enclosure shall provide a dry, vermin proof, condensation free, stable internal ambient temperature environment.

D. Provide a false brick façade for substation enclosure. Provide samples/colors for KCMO final selection. Vendor to propose material meeting the following requirements:

- Resistant to fade or discoloration
- Brick façade not required on doors
- Shall not impede access or door/equipment operation
- Fire resistant
- Secured in a suitable manner for the TPSS service lifespan

2.2 ENCLOSURE DESIGN

A. Design enclosures and components for the service life specified in Section 34 21 17P, TES Substation Design and Assembly.

B. Design enclosure in accordance with AISC 303, AISC 360, International Building Code, and local building codes to withstand live roof loading, wind loading, and seismic loading based on the service conditions specified in Section 34 21 17P, TES Substation Design and Assembly, and the stresses caused during loading, transportation, unloading and installation.

C. Access to the substation equipment will be from the sides and the rear. Enclosure design must allow the removal of all major equipment from outside or inside of the substation enclosure without disassembly of the equipment.

D. Design enclosure for securing to a reinforced concrete slab as indicated on the Contract Drawings.

E. Ratings:
1. Complete enclosure shall have a NEMA 250 Type 4 rating.
2. Doors, removable panels, joints, walls, roofs, floors, vents, louvers and outdoor accessories shall be weatherproof under environmental conditions specified in 34 21 17P, TES Substation Design and Assembly.

F. Structural design engineering calculations and drawings shall be sealed by a professional engineer registered in the State of Missouri.

2.3 BASE

A. Fabricate from welded structural steel beams, rigidly braced with steel cross members to provide adequate strength for lifting the complete assembly, including all equipment.

B. Structural steel:
   1. Hot-dip galvanized before welding in accordance with Section 34 21 06P, TES Common Work Results for Metals.
   2. Avoid using structural steel members with nonsymmetrical sections to minimize warpage and distortion during hot-dip galvanizing, as recommended by ASTM A384/A384M.

C. Welds:
   1. Mask steel in weld areas before galvanizing in accordance with Section 34 21 06P, TES Common Work Results for Metals.
   2. Touch up welds as required in Section 34 21 06P, TES Common Work Results for Metals.

2.4 ACCESS STEP

A. Provide a single fabricated steel step assembly at each entry door.

B. Design:
   1. Design such that water may not become trapped on or in the structure.
   2. Comply with the IBC and 29 CFR 1910.24.
   3. Include in structural design engineering calculations sealed by a professional engineer registered in the State of Missouri.
   4. If design includes bolted attachment, bolt heads must be on the interior and nuts on the exterior, with bolt heads tack welded on the interior so they cannot turn if tightening is required.

C. Dimensions:
   1. Step depth: Minimum 10 inches, measured from outer edge of door threshold.
   2. Step width: As indicated on drawings.
   3. Height: 7 inches below interior finished floor height, plus or minus 1/2 inch.

D. Material:
   1. Support structure: Steel.
   2. Step: Steel grating, non-skid.

E. Finish:
   1. Hot-dip galvanized after fabrication in accordance with Section 34 21 06P, Common Work Results for Metals.
   2. If step is welded to base, mask steel in weld areas before galvanizing in accordance with Section 34 21 06P, TES Common Work Results for Metals.
   3. Coat welds made after hot-dip galvanizing in accordance with Section 34 21 06P, TES Common Work Results for Metals.

2.5 FLOOR

A. Fabricate from steel plate stitch-welded to the base, with cutouts as indicated or required.

B. Steel plate: Minimum 1/4 inch.

C. The floor shall withstand the weight of the heaviest circuit breaker, rectifier transformer or other equipment item which may have to be moved along the floor, without significant deflection.

D. Indicate in engineering calculations the piece of equipment that may be moved along the floor that was used for floor calculations.

E. Cutouts:

1. Provide access to cables or conduits that penetrate floors as indicated on Contract Drawings or as otherwise necessary.
2. Provide insulated protection on edges for cable penetrations to prevent damage to cable insulation.
3. Provide removable cover plates for openings:
   a. Ac switchgear: 11 gage steel with stainless steel hardware to latch it in place.
   b. Dc switchgear: 1/4-inch glastic with non-metallic hardware to latch it in place.
   c. Other penetrations: 1/4-inch glastic with non-metallic hardware to latch it in place.

2.6 WALLS

A. Exterior walls:
   1. Material: Sheet steel panels, of a grade to be determined by Vendors structural design engineer.
   2. Coating:
      a. Galvanneal meeting the requirements of ASTM A653/A653M with minimum coating weight A25.
      b. Galvanneal shall not be quenched by the steel manufacturer or galvanizer or chemically treated in a way that inhibits powder coating.
   3. Thickness:
      a. Minimum 11-gauge.
      b. The specified minimum thickness shall apply to the base metal only.
   4. Interlock adjoining panels with J-type interlocking, as indicated in Figure 1, below.
   5. Seal seams with manufacturer recommended caulking.

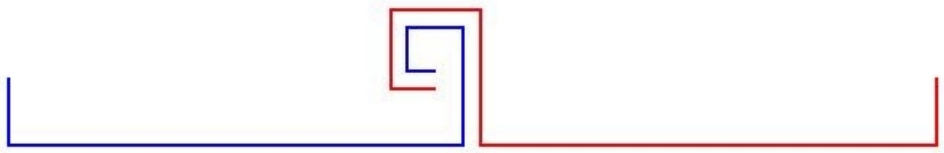


Figure 1: Cross Section Wall Panels J-Type Interlocking

6. At wall-panel base, provide Z-type channel and lap exterior wall panel over the floor seam to prevent drain back, as illustrated in Figure 2, below.

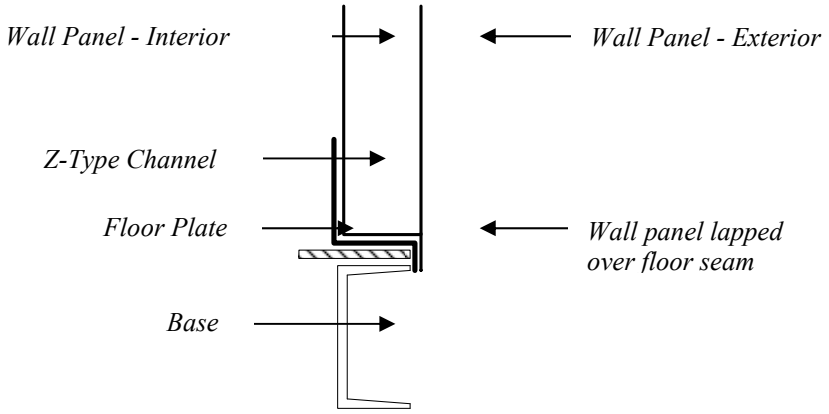


Figure 2: Cross Section Wall-Panel Base Z-Type Channel

B. Interior walls:
   1. Material: Same as exterior walls, above.
   2. Coating: Same as exterior walls, above.
   3. Thickness:
      a. Minimum 14-gauge.
      b. The specified minimum thickness shall apply to the base metal only.

2.7 ROOF

A. Shed type, with pitch as shown on Contract Drawings, fabricated from interlocking sheet steel panels.
   1. Material: Same as exterior walls, above.
   2. Coating: Same as exterior walls, above.
   3. Thickness: Same as exterior walls, above.
   4. Interlocking: J-type, with standing seams and rain caps over seams, as indicated in Figure 3, below.
   5. Seal seams with manufacturer recommended caulking.

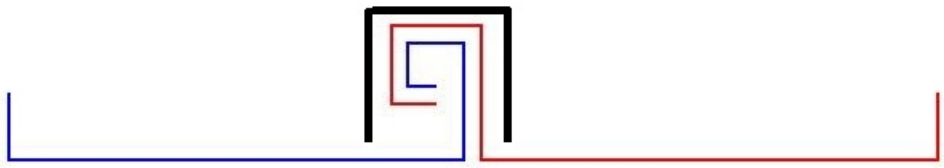


Figure 3: Cross Section Roof Panels Standing Seams With Rain Cap

B. Roof penetrations:
   1. Shall be used only with approval of the Engineer.
   2. If used, shall be minimal, with each flashed and waterproofed.

2.8 THERMAL AND ACOUSTICAL INSULATION

A. General Requirements:
   1. Insulating materials shall have a certified classification of "non combustible" as defined by ASTM E136.
   2. Flame proofing of insulating materials will not be acceptable. Proof of certification shall be by one of the following:
      a. UL label or listing.
      b. National Bureau of Standards test results.
      c. Certified test report from a nationally recognized testing laboratory.

B. Thermal Insulation:
   1. Enclosure thermal insulation shall comply with International Energy Conservation Code.
   2. Floor: Solid insulating panels.

C. Acoustical insulation: Provide where needed to control continuous sound levels outside substations.

2.9 ENTRY DOORS

A. Provide a minimum of two entry doors, located as indicated on the Contract Drawings.

B. Material: Minimum 14 gauge sheet steel, galvannealed in accordance with ASTM A653/A653 with minimum coating weight A40.

C. Insulation: R value in accordance with applicable energy code.

D. Size: Not smaller than shown on Contract Drawings.

E. Door Hardware:
   1. Hinges: Stainless steel with stainless steel hinge pins.
   2. Panic hardware: One or three point crash-bar safety latches to permit opening doors from within under all conditions.
   3. Door Handles: Shaped such that they are easy to grasp with one hand and do not require tight grasping, pinching, or twisting of the wrist to operate. Door knobs are not acceptable.
   4. Locks: Self-locking, tamper proof, integrated with entry handles.
      a. Locks all keyed alike.
      b. Owner to provide keying requirements.
      c. Provide two keys for each substation enclosure.
   5. Door Closer:
      a. Heavy duty, highly corrosion resistant; all external body components of aluminum, zinc alloy or stainless steel material with stainless-steel fasteners.
      b. Shall close door firmly and have hold-open position.

F. Sealing:
   1. Doors shall be tightly sealed with neoprene gaskets.
   2. Secure seals to the doors so as to allow easy replacement.
   3. Design of doors shall prevent intrusion of water around the seams.

2.10 EXTERIOR EQUIPMENT ACCESS DOORS

A. Provide hinged doors where shown on Contract Drawings:
   1. Equipment doors shall allow access to the rear of the ac switchgear, rectifier transformer, rectifier, and dc switchgear from the outside of the substation for regular maintenance.
   2. Opening the rectifier transformer rear double doors shall allow removal of the transformer as a unit from the outside of the substation.

B. Material: Minimum 11 gauge sheet steel, galvannealed in accordance with ASTM A653/A653M with minimum coating weight A25.

C. Provide stiffening members as required.

D. The exterior equipment access doors shall meet or exceed the requirements of NEMA ICS 6 for weatherproof NEMA 250 Type 4 enclosures.

E. Latches:
   1. Three-point, padlockable, heavy-duty stainless steel switchgear type.
   2. Handle shall be located at working height referenced to actual final grade elevation at site.

F. Hinges:
   1. Stainless steel, with stainless steel hinge pins and hardware.
   2. Provide a minimum of three concealed hinges.

G. Door gaskets: Neoprene. Secure seals to doors to allow easy replacement.

H. Door stop: Provide one for each door to hold it in the open position

I. Padlock: Provide one padlock complying with Section 34 21 05, Common Work Results for TES, for each external door.

2.11 GROUNDING PADS

A. Provide four copper grounding pads, bonded to the steel base of the enclosure at the corners as indicated on the Contract Drawings, for connection of 2-hole cable lugs.
   1. Grounding pads shall be on the interior of the base.
   2. Coordinate location of ground pads with location of access holes and adjust location of ground pads on switchgear side of the enclosure, if necessary, to make them accessible.

B. Provide openings in floor for access, with removable cover plates as described above in Article titled " Floor."
   1. Size: Minimum 10 inches x 12 inches.
   2. Location: Coordinate access openings with equipment layout such that no part of the minimum size opening will be obstructed by the equipment. Openings in equipment provided for cable entrance may also be used for access to grounding pads.

C. Connect enclosure grounding pads to enclosure interior perimeter ground specified in Section 34 22 26, TES Grounding and Bonding.

2.12 HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

A. Interior Environment: Provide thermostatically controlled HVAC system to prevent condensation and maintain the interior temperature between 65 degrees F and 77 degrees F under all operating conditions.

B. General Requirements:
   1. HVAC system shall comply with the International Mechanical Code.
   2. HVAC units shall be controlled by the same thermostat and control unit.
   3. High Temperature Alarm:
      a. If substation interior temperature reaches 85 degrees F send alarm to SAS. See Section 34 21 31, TES Substation Automation System (SAS).
      b. Alarm temperature set point shall be field adjustable.
   4. Supply voltage: Either 120 Vac or 208/240 Vac, single-phase.
   5. Finish color: Match finish color of substation enclosure.
   6. HVAC Units: Unitary, packaged, wall-mounted type, hermetically-sealed compressors, UL listed, AHRI performance certified, with economizer cycle, meeting minimum efficiency requirements of the International Energy Conservation Code.

C. Ventilation and Air Conditioning: Design system for heat gain in the substation under the following simultaneous conditions.
   1. Maximum loading of the rectifier transformer per IEEE 1653.2 for Heavy Duty Traction Service.
   2. Exterior design conditions per International Energy Conservation Code.
   3. Maximum solar heat gain.

D. Ventilation system shall provide sufficient air changes to prevent battery-evolved hydrogen gases from exceeding a 1 percent concentration level.

E. Heating: Design based on conduction and infiltration heat loss with exterior design conditions per International Energy Conservation Code and substation de-energized (no heat gain from interior equipment).

F. Air Intakes:
   1. Grill: Provide over filter to prevent entrance of foreign objects.
   2. Filters: Provide micro-glass, high-efficiency disposable filters in filter frames.
   3. Exterior: Provide tamper-proof hardware for filters located on exterior of enclosure.

G. Provide two HVAC units for each substation enclosure with each unit capable of maintaining the interior environment specified above.

H. Economizer Cycle Cooling:
   1. Provide HVAC units in conjunction with an exhaust fan to allow cooling using only exterior air when that air is less than 60 degrees F.
   2. Equip inlet and exhaust ducts for economizer cooling with gasketed, motorized dampers to seal the enclosure when economizer cooling is not possible.
   3. Economizer design shall maintain zero or slightly positive pressure within the substation enclosure at maximum ventilation rate.

I. Redundant Operation:
   1. HVAC units shall operate with one unit on standby.
   2. Failure of the operating unit shall cause the other unit to commence operation automatically.
   3. Provide controls to manually and automatically alternate the units to minimize wear on each unit.

2.13 FINISHES

A. Exterior metal surfaces:
   1. Roof and walls: Powder coat in accordance with Section 34 21 06P, TES Common Work Results for Metals.
   2. Floor bottom and support structure: Shop-applied paint coating system in accordance with Section 34 21 06P, TES Common Work Results for Metals.
   3. Color: See Section 34 21 06P, TES Common Work Results for Metals.

B. Interior metal walls and ceiling:
   1. Powder coat in accordance with Section 34 21 06P, TES Common Work Results for Metals.
   2. Color: See Section 34 21 06P, TES Common Work Results for Metals.

C. Interior floor surfaces:
   1. Shop-applied paint coating system in accordance with Section 34 21 06P, TES Common Work Results for Metals.
   2. Dielectric epoxy floor, where indicated on Contract Drawings, in accordance with Section 34 21 08P, TES Dielectric Epoxy Flooring.
   3. Floor shall have a non-skid finish.
   4. Color: Shop-applied paint coating system shall match color of dielectric epoxy flooring. See Section 34 21 08P, TES Dielectric Epoxy Flooring.

2.14 SOURCE QUALITY CONTROL

A. Factory Design Tests:
   1. Coating qualification test: Perform in accordance with IEEE C37.20.1.

B. Factory Production Tests:
   1. Rain test for outdoor LV switchgear:
      a. Perform on each substation in accordance with IEEE C37.20.1. An existing design test will not be accepted; this test will not be waived.
      b. In addition to IEEE C37.20.1 requirements, address HVAC systems as follows:

1) Test first with HVAC systems installed but not operating.
2) If HVAC systems have louvered openings that open when the system is in operation, retest with all such openings in the fully open position.

C. Replace IEEE C37.20.1 satisfaction of test requirements with the following: the enclosure shall have satisfactorily met the requirements of this test if during the visible inspection no water is found.

PART 3 - EXECUTION

3.1 INSTALLATION

A. As necessary, installation of HVAC units after substation delivery shall comply with the following:
   1. International Mechanical Code.
   2. NFPA 70.

B. Provide condensate drain pipe for HVAC units.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes:
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 17P
TES SUBSTATION DESIGN AND ASSEMBLY
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following
   1. Designing and assembling prefabricated TES substations.
   2. Miscellaneous materials, equipment, and components including but not limited to wiring devices and cover plates, smoke detector, blue light, Knox box, mobile work station, fire extinguisher, relays, switches, pushbuttons, indicating lights, terminal blocks, ac and dc breaker test stations, ETS buttons and enclosures, corrosion control junction box, communications rack, electrical insulating materials, signage and identification materials.
   3. Software to upload and download settings for intelligent electronic devices (IEDs).

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 27 05 01 – SCADA and Control System Functions

E. SECTION 34 21 05P – Common Work Results for TES

F. SECTION 34 21 08P – TES Dielectric Epoxy Flooring

G. SECTION 34 21 14P – TES Medium-Voltage Ac Circuit-Breaker Switchgear

H. SECTION 34 21 18P – TES Lighting

I. SECTION 34 21 19P – TES Dc Switchgear

J. SECTION 34 21 31P – TES Substation Automation System (SAS)

K. SECTION 34 21 80P – TES Spare Parts and Special Tools

L. SECTION 34 22 05P – TES Common Work Results for Conductors and Cable

M. SECTION 34 22 33P – TES Raceway and Boxes

1.3 DEFINITIONS

A. Intelligent Electronic Device (IED): Refers to any digital or numerical-based protection, metering, control, or monitoring device that has processing, recording and reporting capabilities and a local human machine interface (HMI).

1.4 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. American National Standards Institute (ANSI):
   1. ANSI Z535.2, Environmental Facility and Safety Signs

C. Code of Federal Regulations (CFR):
   1. 29 CFR 1926.200, Accident Prevention Signs and Tags
   2. 47 CFR Part 15, Radio Frequency Devices

D. Federal Transit Administration (FTA):
   1. FTA QA/QC Guidelines FTA-IT-90-5001-02.1.

E. Institute of Electrical and Electronics Engineers (IEEE):
   1. IEEE C37.90, Standard for Relays and Relay Systems Associated with Electric Power Apparatus
   2. IEEE C37.90.2, Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers

F. International Organization of Standards (ISO):
   1. Quality Management Systems - Fundamentals and Vocabulary - ISO 9000
   2. Quality Management Systems - Requirements - ISO 9001

G. National Electrical Contractors Association (NECA):
   1. NECA 1, Standard Practice of Good Workmanship in Electrical Construction

H. National Electrical Manufacturers Association (NEMA):
   1. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum)
   2. NEMA WD 1, General Requirements for Wiring Devices
   3. NEMA WD 5, Specific-Purpose Wiring Devices

I. National Fire Protection Association (NFPA):
   1. NFPA 70, National Electrical Code (NEC)

1.5 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Product Data: Submit manufacturer's product data for products specified in this Section if not submitted under another Section:
   1. Wiring devices.
   2. Cover plates.
   3. Smoke detectors.
   4. Exterior blue light.
   5. Knox box.
   6. Mobile work station.
   7. Fire extinguisher.
   8. Relays.
   9. Switches.
   10. Pushbuttons.
   11. Indicating lights.
   12. Terminal blocks.
   13. Ac and dc breaker test stations.
   14. ETS buttons and enclosures.
   15. Corrosion control junction box.
   16. Communications rack.
   17. Electrical insulating laminate.
   18. Identification:
      a. Baked porcelain enameled steel signs,
      b. Vinyl signs,
      c. Conduit identification labels,
      d. Nameplates.

D. Samples:
   1. “While in use” wet or damp location cover.
   2. Each type of identification product

E. Identification Schedule: Submit a schedule of proposed nameplates and labels, including material, size, color, text, and location, before ordering.

F. Submit a request for permission to perform a Field Evaluation for equipment that is not labeled or listed.

G. Shop Drawings:
   1. Comply with Owner's drafting standards.
   2. Drawing Scale:
      a. Use only standard architectural or engineering scale. Non-standard scales, such as 15 inches equals 1 foot, will not be accepted.
      b. Drawings must be properly converted to pdf format such that scalability is maintained.
   3. Provide each of the drawing types listed below for TES substations.
   4. One-line Diagrams: Provide for each substation.
   5. Three-line Diagrams: Provide for each substation.
   6. Schematic Diagrams:
      a. Format by subsystem, using identical device symbols and wire designators for each subsystem.
      b. Clearly delineate interfaces, from page to page and subsystem to subsystem.
      c. These drawings shall include at least the following information:
         1) Wire connections, terminations and identification.
         2) Nominal voltages, equipment and equipment ratings, currents, frequencies, significant resistance values, and the rating of all loads.
         3) All low voltage dc control circuits.
         4) Schematic location (page number, for example) of the energization portion of each device (such as the coil in a relay) noted adjacent to the operating portions (such as relay interlocks) of the device.
   7. Wiring diagrams: Provide a set for each substation:
      a. Show all wiring, raceways, conduits, and connections.
      b. Provide equipment connection, intra-cubicle, and inter-cubicle wiring diagrams.
      c. Connection diagrams: Show the internal wiring and terminal block arrangement within each piece of equipment and identify each outgoing power and control connection and wire.
      d. Interconnection diagrams: Show wiring from the equipment terminal blocks, to external equipment connections, terminal blocks, and devices.
      e. Show nominal voltages, equipment and equipment ratings, currents, frequencies, significant resistance values, and the rating of all loads.
      f. Label devices identical to the actual device and show their locations on panels.
      g. Each terminal block and device shall have its own unique numbers and letters for identification.
      h. As a minimum, provide the following information for each wire segment:
         1) Wire code (schematic designation).
         2) Origin (FROM device and terminal).
         3) Destination (TO device and terminal).
         4) Wire size.
   8. Substation Equipment and Raceway Drawings: Show actual equipment to be provided and raceways, with all drawn to scale.
   9. Panel schedules: Submit for each panel to be provided.
   10. Equipment arrangement drawings:
      a. Show actual equipment to be provided and details of installation, drawn to scale, using layout provided in Contract Drawings.
      b. Alternate substation equipment layouts may be proposed by Vendor, subject to Engineer’s approval.
      c. Provide the following drawings:
         1) Certified substation footprint with locations of openings for incoming and outgoing feeders within 45 days of NTP.
         2) Substation plans and elevations showing the equipment layout, including equipment numbers, locations, and dimensions.

3) Equipment front elevations and wall elevations showing the location of each piece of equipment and dimensions.
4) Installation and mounting details for all equipment, including installation of the transformer enclosure partitions, method of anchorage for each piece of equipment, and method for providing electrical isolation for the dc switchgear.
5) Raceway layout plans showing cable trays, conduits, including numbers, locations, and dimensions.

11. Signage drawings to scale with text:
    a. Exterior substation number designation and location.
    b. Warning signs and locations.
    c. Interior manufacturer's identification and location, if any.

H. Substation ANSI Device Table:
1. Provide a set of device tables for substation ANSI devices in a single section in the schematic book.
2. Arrange the table in a logical fashion by system device type.
3. Provide data for all system and subsystem components including, but not limited to the following:
    a. Electrical control and power components (groups, panels, pc cards, contactors, relays, circuit breakers, capacitors, inductors, resistors, specialized modules, rectifiers, diodes, fuses and other components, as appropriate).
    b. Electrical equipment (rectifiers, transformers, switchgear, substation automation system (SAS), interface terminal board, and the like).
4. Include the following data:
    a. Equipment and associated number where a device is located.
    b. Elementary schematic drawing number where the device appears.
    c. A brief description of the device.
    d. Manufacturer's model or style number.
    e. Manufacturer's name and type number of the device.
    f. Device rating.
    g. Number, rating, and types of contacts on device, if applicable.
    h. Remarks on any other relevant features of the device.

I. Bill of Materials (BOM): Provide the following in spreadsheet format:
1. Contract number.
2. Supplier number.
3. Column for Owner's store number.
4. Other data required for procurement of materials used in the construction of all parts of the electrification system.
5. Cross-reference between related drawings and the BOMs.
6. Generic description or specification.
7. Brand name, where applicable.
8. Manufacturer's part number.
9. Original manufacturer or supplier, including address, telephone number, e-mail address, FAX number, and contact person.
10. Notation on parts that are custom manufactured only upon request.

J. Software:
1. Provide interface and configuration software for uploading settings to and downloading event history from intelligent electronic device (IED).
2. Include software license for Owner.

K. Operations and Maintenance Materials:
1. Submit manufacturer's operating and maintenance instructions on products specified in this Section.
2. Submit immediately after approval of product data.

L. Substation History Books:
   1. The substation "history book" shall contain a complete record for each substation, shall be kept up to date throughout the manufacturing process, and may be inspected by the Engineer at any time.
   2. Format:
      a. Furnish a table of contents at the front of the book indicating the page number for each type of information included.
      b. Separate major sections with tabs.
      c. Furnish with consecutive numbering on each page.
   3. Provide a history book for each substation, with the following information at a minimum:
      a. Copy of approved plan review, if plan review is required by state law or city ordinance.
      b. Factory production test reports.
      c. Description and completion dates of substation modifications, and a list of modifications pending with expected completion dates.
      d. A record of abnormalities that occur during the manufacture of the substation or its subsystems, including their authorized repair procedures.
      e. List of substation defects that were identified by the Vendor's QA or the Engineer during assembly, commissioning, and testing, and the disposition of each as verified by inspection.
      f. List of serial-numbered apparatus.
      g. Shipping documents.
      h. Field acceptance test reports.
      i. Integrated testing reports.
      j. Final relay settings.
      k. Copy of final rail voltage monitoring and grounding system settings.
      l. Copy of permit signed off by the issuing department.
      m. Open items status list.
   4. Changes in recorded data that are made during performance of the Contract shall be clearly identified and justified to the satisfaction of the Engineer.

1.6 SPARE PARTS

A. Provide spare parts in accordance with Section 34 21 80P, TES Spare Parts and Special Tools.

B. List below applies to items in this Specification Section.
   1. Blue light: Provide 1 spare.

1.7 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 – Systems Quality Assurance.

B. Quality Assurance (QA) Requirements for TES Substation Manufacturer:
   1. Assign a QA Manager responsible for managing and with authority for acting on all quality matters relate to TES substation manufacture and assembly, and who has the following qualifications:
      a. Minimum 5 years overall quality experience.
      b. Minimum 2 years prior experience as a QA Manager, on transit project(s) of comparable complexity to this Contract.
      c. Minimum 2 years as a Quality Control (QC) Manager or Supervisor, Quality Engineer, Quality Auditor or QC Inspector.
   2. Quality Plan:
      a. Submit a Quality Plan that addresses the 15 quality elements identified in FTA QA/QC Guidelines FTA-IT-90-5001-02.1.
      b. Provide descriptions of, and references to Quality procedures and work instructions, including specified requirements unique to this Contract, that relate to quality system elements defined in Quality Management Systems - Fundamentals and Vocabulary ISO 9000 and Quality Management Systems - Requirements ISO 9001.

c. Include the following elements in the Quality Plan:
    1) QA/QC Organization and staff, including job description and an organizational chart showing relationship between Vendor's General Manager, Project Manager, Quality Manager, Vendors, and consultants.
    2) Documented Quality System.
    3) Design Control.
    4) Document Control and Submittal Management.
    5) Vendor, Consultant and Supplier Control.
    6) Identification, Traceability and Receiving, Handling, Storage and Control of Products, Materials and Equipment.
    7) Process Control and control of special fabrication processes, e.g. welding and powder coating.
    8) Inspection and Testing.
    9) Control of measuring and test equipment.
    10) Inspection and Test Reporting.
    11) Identification, Control and Correction of Non-conforming Conditions.
    12) Corrective Actions.
    13) Quality Records.
    14) Training.
    15) Configuration control for software.
    16) Change control for factory drawings, fabrications, assembly, wiring, testing, and as-built drawings.

C. Qualifications:
    1. Electrical work at TES substation manufacturer's plant shall be performed by electrical workers skilled in the installation of electrical equipment and knowledgeable in the requirements of NFPA 70 and NECA 1, as certified by manufacturer's Quality Plan.

D. Performance Requirements:
    1. Each component, subassembly and assembly provided for TES substations shall be of a proven design with a history of at least 5 years successful operation at the time of Contract award in similar railroad or rail transit service.
    2. Use off-the-shelf service-proven equipment and hardware approved by the Engineer.
    3. TES Substation Expected Service Life: 30 years in continuous service, 24 hours a day, 365 days a year.

E. Listed and Labeled Equipment and Material:
    1. Provide wherever standards for these products have been established.
    2. Materials that are not listed or labeled require approval by Engineer before use.
    3. Products that have not been tested or certified for the use intended shall not be used when equivalent listed or labeled materials are available.
    4. The label or listing will be acceptable as sufficient evidence that the materials and equipment do conform to the specified standards.
    5. Electrical equipment and material not listed or labeled shall be furnished with a Field Evaluation label provided by an approved Testing Laboratory, and certifying that the equipment conforms to the requirements of UL and ANSI.
        a. This product evaluation may be performed in the factory or on-site as approved by Engineer.
        b. A request for permission to perform a Field Evaluation in the factory or onsite shall be submitted to Engineer for approval.

F. TES Substation Systemic Failure:
    1. Monitor substation component failures during the commissioning, testing, and warranty phase.
    2. Systemic Failure: Failure of 10 percent or more of the same components used for the same function during this time period.

3. Within 30 days of receiving notification of systemic failure, begin a program to repair or replace all components of the type involved in the systemic failure.
4. Develop the repair or replacement for the components to remedy the nature and probable cause of the component failure.
5. Submit proposed repair or replacement to the Engineer for approval.
6. Components shall be replaced at no cost to the Owner.

1.8 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

PART 2 - PRODUCTS

2.1 TES SUBSTATION DESIGN

A. General:
1. Design prefabricated and built-in-place substations that comply with the requirements of the Contract Documents.
2. Submit product data, shop drawings, and samples, as specified, for Engineer approval before starting procurement or manufacturing.
3. The proposed substation equipment must fit within the space as shown in Contract Drawings.

B. Prefabricated Substations:
1. Furnish shop drawings that show the layout of every aspect of prefabricated substation such that each substation built from the shop drawings is identical to the others in every respect.
2. Substations shall have identical electrical equipment, traction power equipment, and appurtenances; and identical layout of equipment, appurtenances, raceways, wiring, terminal blocks and wiring connections.
3. Equipment shall be fully interchangeable without modification.
4. Changes made to the design after manufacturing has started must be documented and implemented in every substation.

C. Maintainability: Conveniently locate devices requiring regular calibration, resetting or operation within easy reach of personnel.

D. Noise Compliance: Design substation to comply with applicable noise regulations with substation equipment operating at rated full load capacity, and sound measured from outside substation on all sides.

E. Radio Frequency Interference:
1. Design substation equipment, protective relays meters, instruments and devices to minimize the radio frequency generated in accordance with 47 CFR Part 15.
2. Design substation equipment, protective relays, meters, instruments and devices such that they are immune to mis-operations caused by ambient radio frequency signals, in accordance with IEEE C37.90.2.

F. Design Conference:
1. TES substation design conference will be held at substation manufacturer's facility within 60 days after NTP. Substation design personnel and a representative of the Vendor are required to attend. The following will be discussed:
   a. Basic substation layouts.
   b. One-line diagram.
   c. Proposed basic substation parts.
   d. Proposed sequence of substation work.
   e. Design, production and field testing procedures.
   f. Submittal list.

2.2 TES SUBSTATION DESCRIPTION AND DESIGN CRITERIA

A. Prefabricated TES Substation General Parameters:
   1. Provide complete factory assembled TES substation in weatherproof enclosure.
   2. Substation rating: 500 KW, heavy traction service.
   3. Substations will be unattended.
   4. Dc System Voltage:
      a. 750 Vdc at rated load.
      b. Maximum Voltage with Regeneration: 900 Vdc.
      c. Regulation: 4.5 percent between 1 percent and 200 percent load.

B. Environmental Requirements: Provide substation suitable for operation without impairments at its standard ratings throughout the range of worst values listed below:
   1. Ambient Outdoor Temperature: Minus 25 degrees F to 115 degrees F.
   2. Maximum Ambient Outdoor Humidity: 100 percent.
   3. Design Wind Speed: 110 mph.
   4. Accumulated Snow: 30 inches.
   5. Accumulated Ice: 3 inches.
   6. Seismic: Comply with Section 34 21 05, Common Work Results for TES.
   7. Altitude: 1,026 feet above sea level.

C. Utility Data: Power to the TES substations will be supplied from Evergy at 13.2 kV. Other required utility data may be obtained from Evergy.

2.3 UTILITY METERING

A. Utility Metering Section: See Section 34 21 14P, TES Medium-Voltage Ac Circuit-Breaker Switchgear.

B. Meter base: Furnished by Evergy.

2.4 WIRING DEVICES AND COVER PLATES

A. General Requirements:
   1. Type: NEMA WD 1, heavy-duty general-use type.
   2. Color: Grey, or as selected by Engineer.
   3. Wiring: Back or side wired.
   4. Terminals: Screw type or combination screw-clamp type.
   5. Terminal screws: No. 8 or larger, captive or terminal type.

B. Switches:
   1. Tumbler-type toggle switches that operate in any position.
   2. Voltage rating: 120-277 Vac.
   3. Fully enclosed with entire body and cover of molded phenolic, urea, or melamine. Do not use fiber, paper, or similar flammable insulating material for body or cover.
   4. Mounting yoke: Metal with plaster ears, insulated from the mechanism and fastened to the switch body by bolts, screws, rivets, or other substantial means.
   5. Switch contacts: Silver or silver alloy.
   6. Applications:
      a. Lighting: Fully-rated 20 A at 120 V or 277 V.
      b. Straight resistance loads: May be snap switches as specified in this Section, of the proper rating up to 30 A at 120-277 V.
   7. Testing: Capable of withstanding tests as outlined in NEMA WD 1. If requested by Engineer, submit evidence that the types of switches proposed have satisfactorily withstood these tests.

C. Convenience Receptacles:
   1. Bodies and Bases: Fire-resistant, nonabsorptive, hot-molded phenolic.
   2. Plaster ears: Metal, integral with supporting member.
   3. Configuration: 20R, single- or duplex-type as indicated.

4. Contacts: Double-grip bronze type with spring steel backup clips so that both sides of each male prong of the plug will be in firm contact. Applies also to grounding contact.

D. Locking-blade Receptacles: NEMA WD 5.

E. GFCI Receptacles: Duplex receptacles, 120 V, 60 Hz, 20 A with built-in test, reset buttons, and ground fault tripped indication.
   1. Trip: Interrupt the circuit within 1/30 second on a 5 milliampere earth leakage current.
   2. Use GFCIs designed for end of run installation or with provisions for feeding through to protect other outlets on the circuit.

F. Cover Plates:
   1. Interior cover:
      a. Device covers: Raised, galvanized steel.
      b. Provide multi-gang plates where required. Segmented cover plates are not acceptable.
   2. Exterior and wet or damp location cover:
      a. NEC-compliant “while-in-use” cover.
      b. Heavy-duty, die-cast aluminum, powder coated.
      c. Listed for wet locations, rated NEMA 250 Type 3R, with neoprene gasket.
      d. Padlockable.
      e. Depth: Minimum 3-1/4 inches.
      f. Submit sample for approval.

2.5 SMOKE DETECTORS

A. Ionization photoelectric type.

B. Plug-in unit with mounting plate hard wired.

C. Integrally self-monitoring, self-diagnostic, with visual trouble indication.

D. Designed to reduce false alarms from dust, insects, radio frequency interference (RFI), and external light.

2.6 EXTERIOR BLUE LIGHT

A. LED blue color light, 360 degrees illumination, suitable for wet locations.

B. Light shall incorporate a failsafe circuit with an annunciator indicating failure of the LED, power supply, or fuse.

C. Approved Manufacturer/Product: Federal Signal LED Pulsator 212650-3, or approved equal.

2.7 KNOX BOX WITH LOCK

A. 6 inches by 6 inches by 4 inches.

2.8 MOBILE WORKSTATION

A. Construction:
   1. Heavy-duty structural foam.
   2. Capacity: 750 pounds.

B. Features:
   1. Wheels: Four 5-inch casters.
   2. Drawers: Four, with ball bearing door slides.
   3. Cabinet with adjustable shelf.
   4. Built-in drawer lock.

C. Nominal Dimensions:
   1. Width: 49 inches.
   2. Depth: 26 inches.
   3. Height: Nominal 38 inches.

D. Approved Manufacturer/Product: Rubbermaid TradeMaster, Model 4533-88 or approved equal.

2.9 FIRE EXTINGUISHER

A. CO2, 20 pound.

B. Portable, appropriate for equipment provided.

2.10 CIRCUIT BREAKERS AND DISCONNECT SWITCHES

A. Provide breakers and switches with auxiliary contacts where position indications from circuit breakers or disconnect switches are required.

B. Auxiliary relays are not acceptable to monitor position indication of circuit breakers or disconnect switches.

2.11 RELAYS

A. Drop-out Voltage: 80 V.

B. Contacts:
   1. Current rating: Based on continuous, inrush, or interrupting requirements for the duty category, whichever is most stringent, and then derated by at least a factor of four.
   2. Voltage rating: Contacts shall be rated for a minimum of twice the applied voltage.
   3. Select materials for the actual loads and not solely on the device rating. Silver bifurcated contacts and gold alloy bifurcated cross-bar contacts are preferred on low level and dry circuits, respectively.

C. Coils:
   1. Coils of all devices shall be suppressed, except where performance may be affected.
   2. Unsuppressed coils are permitted only with written approval of the Engineer.

D. Service Life: Relays shall have a guaranteed mechanical service life of at least 50 years.

E. Protective relays: IEEE C37.90, utility grade, immune from inadvertent operation due to ambient EMI, including radio frequency signals.

F. Auxiliary and control relays:
   1. Heavy duty, UL listed.
   2. Mechanical durability: Minimum 50,000 cycles.
   3. Electrical durability: Minimum 100,000 cycles for resistive load.

2.12 SWITCHES

A. Control Switches: Selector switch type, heavy duty rated, with metal operator.

B. Position Switches (Device 33): Roller-plunger type switch, rated heavy or medium duty, brass or steel plunger, metallic enclosure, rated for 20,000 operations, minimum.

C. Cubicle Lighting Door Switches: Roller-plunger type switch, rated heavy or medium duty, brass or steel plunger, metallic enclosure, voltage and current rating suitable for approved luminaires, rated for 20,000 operations, minimum.

D. Cubicle Lighting External Switches: Panel-mount rocker type; rated heavy or medium duty; voltage and current rating suitable for approved luminaires; rated for 20,000 operations, minimum; “on” and “off” positions indicated on the switch by “1” and “0”.

E. Intrusion Detection Door Switches: Magnetic, rated heavy or medium duty, metallic case, screw mounted.

2.13 PUSHBUTTONS

A. Heavy duty, 600 V, 30 mm size,

B. Momentary contact or latching, as indicated or as appropriate for design.

2.14 INDICATING LIGHTS

A. Long-life, high-brightness using LED arrays and integral current limiting resistors.

B. Indicators shall be selected to permit maximum visibility in direct sunlight from all viewing angles.

2.15 TERMINAL BLOCKS

A. Heavy-duty molded nylon, DIN rail mounted, 600 V, minimum current rating equal to overcurrent protective device, spring-loaded captive screws with pressure plates,

B. Acceptable Manufacturer/ Product: GE CR151K Series or approved equal.

2.16 AC AND DC BREAKER TEST STATIONS

A. Ac: Capable of tripping ac breaker.

B. Dc: Capable of tripping dc breaker.

C. Umbilical cord:
   1. For connecting to breaker.
   2. Provide strain relief where cord connects to cabinet.
   3. Provide means to conveniently stow umbilical cord when not in use.

2.17 EMERGENCY TRIP STATIONS (ETS)

A. ETS Buttons:
   1. Heavy duty, industrial grade, pushbutton operator and contact block, rated for the load, minimum 2-inch diameter mushroom head, red.
   2. TES Substations: Momentary contact.

B. Protective cover: Provide cover or shield to prevent inadvertent activation. Engineer will determine whether proposed protective cover is suitable for the intended purpose.

C. Enclosure:
   1. Substation Interior: NEMA 250, Type 1.
   2. Substation Exterior: NEMA 250 Type 4X, stainless steel, gasketed, hinged, lockable. Provide padlock complying with Section 34 21 05, Common Work Results for TES.

2.18 CORROSION CONTROL JUNCTION BOX

A. Box:
   1. Hinged cover electrical cabinet complying with Section 34 22 33, TES Raceway and Boxes.
   2. Size box to allow easy access for testing.

B. Test Jacks: Panel-mount with recessed closed entry design.
   1. Body material: Nylon.
   2. Color:
      a. Negative bus: Black
      b. Earth ground: Green
   3. Contact Material: Berylium copper silver plate.
   4. Size: Accepts 0.080 tip.
   5. Terminal: Brass, tin plated.
   6. Current rating: 10 A.
   7. Breakdown Voltage: 5700 A
   8. Acceptable Manufacturer/ Product: Keystone Electronics, fully insulated panel mount test jacks, deluxe.

C. Labeling: Comply with Article below titled “Identification.”
   1. Provide “Corrosion Control Junction Box” nameplate on cabinet.
   2. Provide “Negative Bus” and “Earth Ground” labels under test jacks according to colors, above.

2.19 COMMUNICATIONS RACK

A. Steel, fully enclosed, 19 inch, with adjustable front and rear rackmount rails, and removable side panels.

B. Wall-mountable, with hinged wall bracket that allows cabinet to swing out from wall.

C. Height: 18 U

D. Front Door: Ventilated, removable, with means for locking.

E. Side Panels: Ventilated, removable, locking.

F. Capacity: 250 lbs.

G. Provide 1 U horizontal cable manager.

H. Provide grounding lug.

I. Acceptable Manufacturer/Product: Tripp Lite Smartrack Series, SRW18US, or approved equal.

2.20 ELECTRICAL INSULATING MATERIALS

A. Wherever "electrical insulating laminates", "laminates" or "glastic barrier" are called out in the Contract Documents, use the following:
   1. Acceptable Manufacturer/Product: Roehling Glastic Composites, Glastic 1494, or approved equal.
   2. Thickness: 1/4 inch.

B. Electrically Insulated Floor Covering: Specified in Section 34 21 08, TES Dielectric Epoxy Flooring.

C. Prohibited insulating materials.
   1. Electrical insulating paper, also called "fish paper".
   2. Electrical tape of any type.

2.21 MISCELLANEOUS PRODUCTS

A. Cable ties: See Section 34 22 05P, TES Common Work Results for Systems Conductors and Cable.

B. Metallic fasteners: See Section 34 21 05P, Common Work Results for TES.

2.22 SOFTWARE

A. Provide interface and configuration software for uploading settings to and downloading event history from intelligent electronic device (IED).

B. Provide software that will work with each type of IED provided under a Division 34 specification section.

C. Software shall work on a standard laptop with Microsoft Windows 10 operating system.

2.23 SIGNAGE

A. Substation Number Sign: Provide on two sides of the enclosure in location approved by Engineer.
   1. Sign material: Baked porcelain enameled steel, with the porcelain enamel forming a complete ceramic envelope around the steel plate.
   2. Color: Black lettering on a white background, or as directed by Engineer.
   3. Number designation: "TES Substation - XX," where "XX" is a number that will be provided by the Engineer.
   4. Lettering height: 6 inches, minimum.
   5. Location: As approved by Engineer.
   6. Attachment hardware: Stainless steel.

B. Warning Signs:
   1. Material:
      a. Exterior locations: Baked porcelain enameled steel (see above under "Substation Number Sign."
      b. Interior locations: 3.5 mil adhesive backed vinyl film with digital or screen-printed images.
   2. Color: Compliant with 29 CFR 1926.200 and ANSI Z535.2.
   3. Text:
      a. Substation Entry doors: "DANGER; HIGH VOLTAGE" and "DO NOT ENTER."
      b. Substation Exterior equipment access doors: "DANGER: LIVE PARTS" and "DANGER HIGH VOLTAGE."
      c. Substation Cubicles with 750 V or above: "DANGER: LIVE PARTS" and "DANGER HIGH VOLTAGE."
      d. Locations where there are live parts after ac main breaker is opened: Submit language appropriate to the specific location for approval.
   4. Location:
      a. Substation Entry doors: Exterior of door.
      b. Substation Exterior equipment access doors: Exterior of door and front of removable panel inside exterior door, if any.
      c. Substation Cubicles with 750 V or above: Front, rear, and side access doors.

C. Manufacturer's Name: Shall not be placed on the exterior of the enclosure. It will be allowed on the interior of the enclosure but shall be approved by the Engineer.

2.24 IDENTIFICATION

A. Equipment Identification
   1. Provide a number for each piece of equipment such as switchgear sections and circuit breakers, and for devices such as relays, control switches, LED indications, meters, relays, and displays.
      a. Prefix: TES substation number, as indicated on Contract Drawings.
      b. Suffix: Indicates the type of equipment or device.
   2. Use the Owner's numbering scheme on submitted Vendor drawings and submittals.
   3. Place the Owner's part number on as-built drawings.
   4. Engineer will furnish numbering standard.

B. Wire and Cable:
   1. Develop an identification scheme for wires and cables for use on Vendor drawings.
   2. For wire sleeve and cable tag requirements, see Section 34 22 05, TES Common Work Results for Conductors and Cable.

C. Conduit Identification Labels: Laminated, machine-printed labels with high-strength adhesive, black letters on yellow background.
   1. 2-inch and smaller conduits: Nominal 3/4-inch wide
   2. 2-1/2-inch and larger conduits: Nominal 1-inch wide labels.
   3. Approved Manufacturer/Product: Brother TZ-series tape, or approved equal.
   4. Use label printer compatible with chosen tape.

D. Nameplates:
   1. Engraved three-layer melamine laminated plastic, not less than 3/32-inch thick. Provide nameplates with black letters on a white background unless otherwise noted.
   2. Equipment nameplates: 1-5/8 inches high with 7/8-inch high characters minimum.
   3. Device nameplates: 7/8-inch high and have 1/4-inch high characters.
   4. Other equipment nameplates shall be sized and lettered according to the equipment and application as approved by the Engineer.

E. Permanently identify equipment with engraved metal labels containing the following:
   1. Supplier's name.

2. Part number.
3. Revision level.

F. Serial Numbers:
1. Assign discrete serial numbers in sequential, numerical order for the total quantity of each component, including spares.
2. Serial numbers are subject to the Engineer's approval.
3. Duplicate serial numbers shall not be used within the type or model.
4. Present to the Engineer as each portion of the installation is completed or when spare components are received.
5. Track serial number transfers and prepare a list of all serial-numbered apparatus installed in each substation for inclusion in the substation history book.
6. At a minimum, the following equipment shall have serial numbers applied:
a. Ac main breaker.
b. Rectifier transformer.
c. Rectifier assemblies.
d. Interphase transformers.
e. Dc feeder breakers.
f. Auxiliary power transformer.
g. Substation alarm panel HMI.
h. Motors within equipment.
i. Electronic cards.
j. Enclosures.
k. Manually-operated disconnect switches.

G. Identification Schedule: Submit a proposed schedule of nameplates and labels including material, size, color, text, and location, before ordering.

2.25 FACTORY ASSEMBLY

A. General Requirements:
1. Provide products in accordance with product listings, manufacturer's recommendations, relevant codes and regulations, and standard industry practice for electrical installations.
2. Provide electrical materials, equipment, appurtenances, and accessories in locations as indicated and in accordance with NECA 1.
3. Provide supporting members, fastenings, framing, hangers, bracing, brackets, straps, bolts, and angles as required to set and connect the Work rigidly.
4. Control erection tolerance requirements so as to not impair the strength, safety, serviceability, or appearance of the installations.
5. Complete installation: Contract Drawings show electrical equipment diagrammatically and do not show all accessories or fittings that may be required. Provide complete and operable electrical systems and installations in conformance with these Specifications.

B. Anchoring and Support:
1. Do not weld electrical materials for attachment or support.
2. Provide anchor bolts and anchorage items as required to comply with Vendor's seismic design.

C. Installation of Wiring:
1. Provide wiring systems complete as indicated and required for proper service.
2. Provide ample slack wire for motor loops, service connections, and extensions.

D. Installation of Utility Metering:
1. Install Evergy-furnished meter socket on exterior of substation enclosure per Evergy requirements.
2. Provide conduit to meter socket and wire per Evergy requirements.

E. Installation of Wiring Devices and Cover Plates:

1. Install switches, receptacles, special purpose outlets, and cover plates complete in accordance with NECA 1, NFPA 70, and local electrical codes.
2. Locate wiring devices at heights in accordance with NECA 1, except as otherwise indicated.
3. Provide GFCI duplex receptacles on the interior and exterior of prefabricated substation enclosures and where indicated.
4. Provide a cover plate for each switch, receptacle, and special purpose outlet.
5. Exterior and damp locations:
    a. Provide cast metal outlet boxes with threaded hubs as specified in Section 34 22 33, TES Raceway and Boxes.
    b. Provide with weatherproof cover plate, as specified above.

F. Installation of Smoke Detectors:
1. Operation: Provide alarm contact to operate lockout trip relay, ANSI Device 86 upon detection of smoke.
2. Location: Provide at strategic locations to detect smoke or products of combustion such that operation of the circuit breakers will not activate smoke detection system.

G. Installation of Exterior Blue Light: Blue Light shall illuminate for alarms indicated in Section 34 21 31, Substation Automation System (SAS).

H. Installation of Knox Box:
1. Provide two on the exterior of each substation as indicated on Contract Drawings.
2. Obtain keying requirements from Kansas City Fire Department.
3. Provide substation key in each Knox box.

I. Installation of Mobile Workstation: Provide one in each substation.

J. Installation of Fire Extinguisher:
1. Provide two per substation.
2. Mount to the inside wall of the substation enclosure near each entry door.

K. Installation of Relays:
1. Wire Terminations: Terminate a maximum of two wires on relay or contactor terminals.
2. Orientation: Mount and orient relays and contactors as recommended by the supplier or manufacturer.

L. Installation of Switches:
1. Provide position switches (Device 33) at the following door locations to trip and lock out the ac main breaker and annunciate the opening of a door:
    a. Top and bottom of the rectifier interior enclosure doors.
    b. Top and bottom of the transformer interior enclosure doors.
    c. Top of positive and negative disconnect switch interior enclosure doors.
    d. Top of each exterior equipment door that does not provide access to live parts after the ac main breaker is opened.
    e. Separate control compartments do not require Device 33.
2. Provide position switches (Device 33) at the following door locations to annunciate the opening of a door, only, without tripping the ac main breaker:
    a. Top of each exterior equipment door where there is the possibility of access to live parts even after the ac main breaker is opened, such as from utility power or dc power backfeeding from another substation.
    b. In these locations, provide a glastic barrier inside the exterior door to protect personnel, and attach a warning sign to the glastic cautioning against the specific threat.
3. Provide position switches (Device 33) at the following locations to indicate switch position:
    a. Positive switch.
    b. Negative switch.
4. Cubicle Lighting Door Switches: Provide a door switch to switch cubicle lighting for each cubicle with interior cubicle lighting, as specified in Section 34 21 18P TES Lighting.

5. Cubicle Lighting External Switches: Provide an external switch wired in parallel with the door switch at each location where the lighted cubicle has a viewing window.
6. Intrusion Detection Door Switches:
    a. Provide at each entry door and at each exterior equipment access door.
    b. Wire on two separate zones as follows:
        1) Zone One: Entry doors.
        2) Zone Two: Exterior equipment access doors.

M. Installation of Pushbuttons: Provide where indicated or as required.

N. Installation of Indicating Lights:
1. Position Indication:
    a. Breaker Closed: Illuminated red light.
    b. Breaker Open: Illuminated green light.
    c. Lockout relay normal position: Illuminated red light.
    d. Lockout relay tripped: Illuminated green light.
2. Indicating lights: LEDs used on the switchgear sections shall be of the same manufacturer and model.

O. Installation of Terminal Blocks:
1. Provide wherever there is a wiring connection or splice within switchgear or other electrical equipment.
2. No other type of splice may be used within switchgear or other electrical equipment.

P. Installation of Ac and Dc Breaker Test Stations:
1. Provide one ac and one dc wall mounted unit per substation.
2. Install each test station in close proximity to circuit breakers to be tested.

Q. Installation of Substation Emergency Trip Stations:
1. Provide four for each substation, two on the interior of each TES substation enclosure next to each entrance and two on the exterior, as shown on Contract Drawings.
2. Wire emergency trip station pushbuttons in a loop circuit of series wired contacts that energize a summary relay.
3. Interruption of the series circuit shall cause the substation to shut down by:
    a. Tripping and locking out the main ac breaker.
    b. Tripping and locking out all dc feeder breakers.
4. Depressing the exterior emergency trip pushbutton shall cause transfer tripping of the adjacent substations.
5. See Section 34 21 19P, TES DC Switchgear, for additional transfer trip requirements.

R. Installation of Corrosion Control Junction Box:
1. Provide in each TES substation.
2. Locate such that access does not require shutting down substation.
3. Connect test jacks to dc negative bus and earth ground:

S. Installation of Communications Rack: Provide one in each TES substation in location indicated on Contract Drawings.

T. Installation of Insulating Materials:
1. Insulate the following with electrical insulating laminate:
    a. Walls:
        1) If the clearance between the dc switchgear and wall is less than 6 feet, cover wall to full height.
        2) Exception: Omit electrical insulating laminate on inside surfaces of rear equipment access doors.
    b. HVAC ducts: Cover all parts of duct with clearance from dc switchgear less than 6 feet.
    c. Between rectifier transformer and rectifier:

1) Provide a continuous piece of laminate to isolate the rectifier transformer from the rectifier, as indicated on Contract Drawings.
2) Extend full height barrier into the room far enough to make it physically impossible for a person to touch both the rectifier transformer and the dc equipment at the same time.
3) Reinforce edge with a non-metallic angle or channel fastened to the floor and ceiling for stiffness.

d. Between rectifier and negative cubicle.
e. Between negative cubicle and dc feeder breakers.
f. Metallic surfaces:
1) Within 6 feet of rectifier or dc switchgear.
2) For metallic surfaces not suitable for electrical insulating laminates, such as curved surfaces, provide an alternate, such as sheet rubber or an insulated shield over the surface.
g. Arc chutes: Provide a continuous piece of laminate on the ceiling over arc chutes of dc breakers if conductive surfaces are within 3 feet of top of dc switchgear.

2. Fasteners: Secure laminate in place using non-metallic, non-conductive fasteners, in accordance with manufacturer's instructions.

U. Installation in Vicinity of Rectifier and Dc Distribution Equipment:
1. Within 6 feet of dc rectifier, dc switchgear, and dc distribution equipment, provide non-metallic raceways, boxes, covers, equipment, and supports.
2. Alternatively, provide substantial insulating barriers to prevent simultaneous contact with dc equipment enclosures and adjacent metal surfaces.

V. Installation of Cable Ties (tie wraps):
1. Secure cable tie mounting blocks with a screw.
2. Adhesive type mounting blocks shall not be used unless secured with a screw.

W. Installation of Dissimilar Material Connections:
1. Not permitted at electrical connections or connections requiring disassembly for maintenance or for removal and replacement of equipment.
2. Not permitted except at permanent connections.
3. Provide suitable electrochemical isolation.
4. Isolation treatments shall be permanent and not require maintenance or replacement for the life of the equipment or installation.

X. Torque bolted connections in accordance with Section 34 21 05P, Common Work Results for TES.

Y. Installation of Equipment Identification:
1. Provide nameplates for equipment specified in other Sections.
2. Provide a nameplate with a unique number for each piece of equipment such as switchboard sections, panelboards, circuit breakers, and devices.
3. Where multiple devices are enclosed in one cubicle, section, or enclosure, provide a nameplate for each individual device, located on the interior or exterior of the cubicle, section, or enclosure, as approved by Engineer.
4. Where locations of nameplates cannot be adequately described in the identification schedule specified above in the Part 2 Article titled “Identification”, provide shop drawings showing the location of each label.
5. Obtain approval for material, size, color, text, and location of nameplates and labels before installing.
6. Fasten nameplates to the equipment or device enclosure door with stainless steel machine screws.

PART 3 - EXECUTION

3.1 FIELD INSTALLATION – BY INSTALLATION CONTRACTOR

A. Requirements of Article, above, titled “Factory Assembly” apply to field installation.

B. Seal equipment enclosures against dust, whenever dusty conditions are present inside the rooms or outside, during the construction period.

C. Provide seismic anchorage and bracing in accordance with seismic design and calculations submitted under Section 34 21 05P, Common Work Results for TES.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes:
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer’s option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 18P
TES LIGHTING
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Interior substation overhead and emergency lighting.
   2. Exterior substation lighting.
   3. Lighting inside equipment enclosures.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 34 21 17P – TES Substation Design and Assembly

E. SECTION 34 21 25P – TES DC Control Power

1.3 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. Institute of Electrical and Electronics Engineers (IEEE)
   1. IEEE C62.41, Guide on Surge Voltages in AC Power Circuits Rated up to 600V

C. National Fire Protection Association (NFPA)
   1. NFPA 70, National Electrical Code

D. Underwriters Laboratories Inc. (UL)
   1. UL 8750, Light Emitting Diode (LED) Equipment for Use in Lighting Products

1.4 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Product Data:
   1. Document that proposed luminaires, ballast and lamps fully comply with Contract Documents.
   2. Indicate luminaire construction, photometric performance, installation, and maintenance requirements.
   3. Include clear and legible product specifications, drawings and illustrations of sufficient detail to describe the following:
      a. Luminaire housing, hardware, and finishes.
      b. Light controlling elements.
      c. Electrical components, including lampholders, ballast, and provision for conduit entry.
      d. Support details. Indicate weight of luminaire, complete with lamps.
   4. Include procedures for installation of the complete lighting unit in its final service location.

D. Shop Drawings: Lighting layout with proposed luminaires indicated by manufacturer and model number.

E. Calculations: Show that specified lighting levels are achieved with proposed luminaires.

F. Operations and Maintenance Data:
   1. Submit manufacturer's operating and maintenance instructions on products specified in this Section, including the following:
      a. Materials and components clearly indicated in the parts list.
      b. Relamping methods.
      c. Special tools required.
      d. Frequency of inspection, tightening, or other service recommended for preventative maintenance.
   2. Submit immediately after approval of product data.

1.5 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 Systems Quality Assurance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems.

1.7 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

PART 2 - PRODUCTS

2.1 PERFORMANCE CRITERIA

A. Each substation shall have interior and exterior lighting to provide the specified minimum light levels.

B. Minimum Lighting Levels:
   1. Interior: 70 footcandles at 30 inches horizontal above the aisle floor.
   2. Exterior: 2 footcandles, measured at ground level.
   3. Emergency Lighting: Minimum 2 footcandles at floor level.
   4. Minimum lighting levels shall be maintained throughout the substation. Average lighting level shall not be used to meet this requirement.

2.2 COMPONENTS

A. Drivers:
   1. Mount drivers securely inside luminaire to obtain the necessary heat dissipation.
   2. Drivers for LED-lamps shall match the characteristics of the lamps, and have the following characteristics:
      a. Operate lamps at a frequency of 20 kHz or higher without visible flicker.
      b. Listed Class P.
      c. Total Harmonic Distortion: Less than 10 percent at 277 V.
      d. Current crest factor: Less than 1.5.
      e. Power factor: 0.98 minimum.
      f. Audible noise rating: Class A or better.
      g. Contain no Polychlorinated Biphenyls (PCBs).
      h. Transient protection: IEEE C62.41, Category A.
      i. Inherent thermal protection.
      j. Provide constant light output with input voltage fluctuation of plus or minus 5 percent.
      k. Provide instant-start for parallel wiring connection of lamps. Allow remaining lamps to maintain full output, in the event of lamp failure on multiple lamp luminaire.
      l. Provide reliable lamp starting at 50 degrees F for interior luminaires and 0 degrees F for exterior luminaires.

B. Lamps:

1. Provide lamps used in the illumination system of standard manufacture, readily available, and of the highest efficiency and life consistent with other requirements of the illumination system.
2. Ensure all lamps of each type are provided by a single manufacturer.
3. LED Lamps:
    a. Life: Ensure lamps have a rated minimum average life of 50,000 hours.
    b. Color Temperature: Minimum 3500 degrees K Correlated Color Temperature (CCT).
    c. Color Rendering Index (CRI): Minimum 80.

C. Reflector Material: Prefinished, copper-free aluminum alloy, minimum thickness 0.032 inch, Architectural Type 1 with Class M1 anodic coating providing 83 percent reflectivity.

2.3 LUMINAIRES

A. Interior of Substation Enclosure
1. Ceiling mounted, industrial LED luminaire with clear, prismatic diffuser complying with UL 8750.
2. Acrylic lens: Manufactured from virgin-acrylic extrusion or injection molding pellets.

B. Exterior of Substation Enclosure:
1. Wall-mounted, vandal-resistant, LED luminaire, full cut-off type.
2. UL listed for 40 degrees C. maximum ambient and wet locations with IP66 ingress rating. Luminaire shall comply with IES LM-79 and LM-80 and be DLC (Design Lights Consortium) qualified.
3. Housing: Die-cast aluminum, with a hinged door secured by captive stainless steel, tamper-resistant screw. Housing shall incorporate cooling fins specifically design for cooling LED light source and driver. Approximate dimensions of complete luminaire: 6"Wx7"Hx4"D including back-box. Provide with wire guard.
4. Finish: Epoxy or polyester powder-coat paint, white.
5. Optical: Sealed LED compartment with anodized, mirror-finish, forward-throw reflector, high-output bright-white (5000K CCT) LED, impact resistant tempered glass lens and silicone sealing gaskets. Luminaire shall deliver at least 1400 lumens, be rated full-cutoff with BUG rating B1-U0-G0 or better, and be suitable for wall-mounting 8 feet or greater above surrounding surface.
6. Electrical: Integrated electronic LED driver with integral surge protection shall be mounted to housing for effective cooling. Provide luminaires with integral photocontrol or a single NEMA-style, aimable photocontrol wired in luminaire circuit.
7. Acceptable Product: Lumark XTOR2A-WT-WG or approved equal.

C. Emergency Lighting:
1. Self-contained units containing lamps, battery, battery charger, controls, test switch, and status indicator.
2. Lighting Heads: High-output 4.5 W LED MR16 lighting heads; minimum two lamps per unit.
3. Battery:
    a. Nickel-cadmium, 12 V, rechargeable, sealed, maintenance-free.
    b. Capacity: Shall supply rated lamp load for 1-1/2 hours, minimum.
    c. Life expectancy: 10 years.
4. Battery charger:
    a. Solid-state, current-limited, temperature-compensated, short-circuit proof, and reverse-polarity protected with plus-or-minus 1 percent regulation.
    b. Charger shall automatically maintain battery in fully-charged float condition and be capable of providing full recharge in 12 hours.
5. Unit controls shall energize the lamps automatically upon failure of the ac power supply and disconnect load before battery low-voltage limit is reached.
6. Housing: UV-stabilized, high impact, clear 0.120-inch polycarbonate or 18-gage steel, with a baked enamel finish.

7. Listing: UL listed for emergency lighting.
8. Acceptable Product: Kenall METEL-series LED or approved equal.

2.4 LIGHTING INSIDE EQUIPMENT ENCLOSURES

A. Luminaire:
1. Ceiling and side mounted, LED strip luminaire with clear, prismatic diffuser complying with UL 1570.
2. Minimum illuminance: 30 fc at 1.5 feet.
3. Color Temperature: 6000 K
4. Minimum Length: 6 inches less than cubicle width.
5. MTBF: 40,000 Hours
6. Acceptable Product: LBFA Lux Bar LED light bar, or approved equal.

B. Power Supply:
1. UL listed, sized for load.
2. Input: 125 Vdc
3. Output: Compatible with luminaire voltage.

2.5 FACTORY ASSEMBLY

A. General:
1. Luminaires shall be supplied from the substation ac panelboard.
2. Comply with NFPA 70.
3. Luminaire quantities and locations shown on Contract Drawings are for illustration purposes only and may not be adequate to achieve specified lighting levels. Locate luminaires and provide a quantity sufficient to achieve specified lighting levels.

B. Interior Luminaires:
1. Locate to illuminate the vertical surfaces of equipment.
   a. Coordinate to avoid interference with overhead raceways or other major wiring or blocking of the light.
   b. Luminaires shall not be mounted directly above equipment.
2. Switches:
   a. Provide 3-way switches complying with requirements for switches in Section 34 21 17P, TES Substation Design and Assembly.
   b. Mount inside by each entry door.

C. Exterior luminaires: Locate on substation exterior walls to light all four sides of substation.

D. Emergency lighting:
1. Provide luminaires complete with lamps in place.
2. Wire unswitched.

E. Lighting inside equipment enclosures:
1. Comply with NFPA 70.
2. Supply luminaire power supplies from 125 Vdc power specified in Section 34 21 25P, TES Dc Control Power.
3. Power supplies shall not be wired in series. Luminaires shall not be wired in series.
4. Provide lighting for control and power cubicles within the ac switchgear, transformer, rectifier, and dc switchgear cubicles.
5. Locate on ceiling and sides to light the interior of each equipment enclosure.
6. Control cubicles: Provide two top or side mounted light bars directed towards the component and terminal mounting panel.
7. Transformer/rectifier enclosure: Provide two top mounted light bars for every 2 feet of enclosure width.
8. Switching:
   a. For each cubicle door, provide door switch as specified in Section 34 21 17P, TES Substation Design and Assembly.

b. For each cubicle door with a viewing window, provide an external switch as specified in Section 34 21 17P, TES Substation Design and Assembly, in addition to door switch.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Requirements of Article titled "Factory Assembly" apply to field installation.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes:
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 19P
TES DC SWITCHGEAR
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. DC switchgear for TES substations, including the following:
      a. Negative switch (89N) and positive switch (89P) sections
      b. Feeder breaker sections

B. Number of DC circuit breakers and the configuration of each TES substation are shown on the Contract Drawings.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 34 21 06P – TES Common Work Results for Metals

E. SECTION 34 21 08P – TES Dielectric Epoxy Flooring

F. SECTION 34 21 17P – TES Substation Design and Assembly

G. SECTION 34 21 18P – TES Lighting

H. SECTION 34 21 25P – TES Dc Control Power

I. SECTION 34 21 31P – TES Substation Automation System (SAS)

J. SECTION 34 21 80P – TES Spare Parts and Special Tools

K. SECTION 34 21 90P – TES Testing

1.3 DEFINITIONS

A. Intelligent Electronic Device (IED): See definition in Section 34 21 17P, TES Substation Design and Assembly.

1.4 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. Institute of Electrical and Electronics Engineers (IEEE)
   1. IEEE C37.14, Standard for Low-Voltage Dc Power Circuit Breakers Used in Enclosures
   2. IEEE C37.16, Standard for Preferred Ratings, Related Requirements, and Application Recommendations for Low-Voltage Ac (635 V and below) and Dc (3200 V and below) Power Circuit Breakers
   3. IEEE C37.20.1, IEEE Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
   4. IEEE C37.30.1, Standard Requirements for AC High-Voltage Air Switches Rated Above 1000 V
   5. IEEE C37.41, Standard Design Tests for High-Voltage (>1000 V) Fuses, Fuse and Disconnecting Cutouts, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Fuse Links and Accessories Used with These Devices
   6. IEEE C37.90, Standard for Relays and Relay Systems Associated with Electric Power Apparatus

C. International Electrotechnical Commission (IEC)
   1. IEC 60077-1, Railway applications - Electric equipment for rolling stock - Part 1: General service conditions and general rules
   2. IEC 60077-3, Railway applications - Electric equipment for rolling stock - Part 3: Electrotechnical components - Rules for d.c. circuit-breakers

1.5 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Product Data: Complete manufacturer's product descriptions and catalog data, including information on the following:
   1. Design and application ratings.
   2. Details of circuit breaker, internal components, arc chute, contacts, and closing and tripping mechanisms.
   3. Details of switchgear, drawout mechanism, interlocks, and shutters.
   4. Relays, controls, switches, indicators, load measuring devices, resistors and cubicle heaters.
   5. Key Operated Mechanical Interlock: Kirk key catalog data.
   6. Bus insulating material.
   7. Certified service performance, reliability and 5-year proven service history record, including a complete device history of the following:
      a. Multi-function relays.
      b. Circuit breakers.

D. Spare Parts and Special Tools:
   1. Submit a list of spare parts to be provided under this Section.
   2. Submit at the same time as product data.
   3. Provide part numbers for each part, including a detailed breakdown of each spare part assembly and set, as defined in Section 34 21 80, TES Spare Parts and Special Tools.
   4. Submit a list of special tools to be provided under this Section, as defined in Section 34 21 80, TES Spare Parts and Special Tools.

E. Shop Drawings:
   1. Arrangement drawings.
   2. Schematic wiring diagrams.
   3. Interconnection diagrams.
   4. Bus insulating drawings.

F. Complete details of transfer trip scheme.

G. Kirk key scheme, including description, and detailed arrangement drawings.

H. Testing:
   1. Submit test procedures that meet the requirements of Section 34 21 90P, TES Testing, for the following:
      a. Factory Design Tests.
      b. Factory Production Tests.
   2. Submit test reports that meet the requirements of Section 34 21 90P, TES Testing, for the following:
      a. Factory Design Tests.
      b. Factory Production Tests.

I. Operations and Maintenance Data:
   1. Submit manufacturer's operating and maintenance instructions on products specified in this Section, including the following:
      a. Manufacturer's operating and maintenance instructions, parts list, illustrations and diagram for components.

b. Wiring diagram.
2. Submit immediately after approval of product data.

1.6 SPARE PARTS

A. Provide spare parts in accordance with Section 34 21 73P, TES Spare Parts and Special Tools.

B. List below applies to items in this Specification Section:
1. Dc circuit breaker: Complete with truck and accessories. Provide 1 spares.
2. Main contacts for dc circuit breaker: Provide 1 spare assemblies.
3. Secondary contacts for dc circuit breaker: Provide 1 spare assemblies.
4. Dc circuit breaker charging motors: Provide 1 spares.
5. Dc circuit breaker solenoids: Provide 1 spares.
6. Dc circuit breaker springs: Provide 1 spares.
7. Dc protective relays (non-IED): Provide 1 spare set.
8. Dc switchgear IEDs: Provide 1 spare set.
9. Dc ammeter and voltmeter: Provide 1 spare set, if separate from IEDs.
10. Dc switchgear control and auxiliary relays: Provide 1 spare set.
11. Transducers: Provide 1 spare set.
12. Dc switchgear control circuit fuses (if used): Provide 1 spare sets.
13. Dc mini circuit breakers (if used): Provide 1 spare of each rating.
14. Mechanical interlocks: Provide 1 spare set.

1.7 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 Systems Quality Assurance.

B. DC Switchgear:
1. UL labeled or furnished with a Field Evaluation label in accordance with Section 34 21 17P, TES Substation Design and Assembly.
2. DC switchgear including circuit breaker shall have 5 years successful operation in service at a transit application.

C. Manufacturers of dc switchgear and components used in the dc switchgear shall be ISO 9001 certified.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems.

1.9 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

PART 2 - PRODUCTS

2.1 GENERAL

A. Dc Switchgear: Dead-front, self-ventilated, metal enclosed, free standing, sheet steel enclosures suitable for indoor service.

B. Circuit Breakers: Provide switchgear with individually enclosed, draw out type, high speed, power circuit breakers rated for use with the transformer-rectifier unit.

C. Rear Access:
1. Prefabricated TES Substation: Provide through exterior equipment doors and design such that positive feeder cables and negative return cables can be landed from the rear.

D. Front Access:

1. Prefabricated TES Substation: Provide access to removable components of the switchgear from the front.

E. Bus and Power Wiring:
   1. Prefabricated TES Substation: Locate in rear.

F. Complete Assembly: Include dc buses and connections, positive and negative feeder cable terminal connections, indicating lights, terminal blocks, protective and auxiliary relays, control circuitry, wiring and all other devices necessary to make a complete and operable switchgear assembly.

G. Workmanship: Avoid wiring congestion, train wires neatly, protect wiring from sharp edges.

H. Standards: Design, materials, construction, and tests shall be in accordance with IEEE C37.14, IEEE C37.20.1, and as further described or modified in this Section.

I. Finish: Powder coat and color in accordance with Section 34 21 06P, TES Common Work Results for Metals.

2.2 RATINGS

A. The switchgear assembly and circuit breakers shall have the following minimum ratings in accordance with IEEE C37.14 and IEEE C37.16:

Full-Load Voltage	750 Vdc (Nominal Voltage 800Vdc)
Maximum Voltage	1000 Vdc
Continuous Current	2000 A
Minimum Frame Size	2000 A
Insulation Level: 60 Hz withstand Short circuit rating	 3.7 kV rms 30 kA, peak

2.3 SWITCHGEAR ENCLOSURE

A. Switchgear Structure:
   1. Steel, rigid, self-supporting, self-contained, conforming to IEEE C37.20.1 and to requirements indicated below:
   2. Fabricated of electrically welded or bolted sheet steel, 11 gage minimum.
   3. Provide enclosures sufficiently rigid to support equipment under normal loads, short-circuit conditions, and specified seismic conditions.
   4. Apply coating to switchgear assembly in accordance with Section 34 21 06P, TES Common Work Results for Metals.

B. Doors: Sheet steel, 11 gage minimum, properly reinforced against distortion by suitable flanges and stiffening members.
   1. Hinges: Heavy duty stainless steel.
   2. Latches: Minimum of three latches shall securely fasten door in the closed position and shall be easily opened without the use of tools.
   3. Handle: Heavy duty, padlockable, opens all three latches, easily operated with one hand-motion, one for each door.
   4. Door stops: Heavy duty to hold door securely in the open position. Not easily bent if an attempt is made to close door without releasing door stop.

C. Heaters: Provide two thermostatically-controlled strip-type heaters in each switchgear cubicle to prevent condensation.
   1. Operating Voltage: Shall not exceed 50 percent of heater rated voltage.
   2. Thermostat:

a. Provide an individual thermostat for each cubicle.
b. Locate thermostat in a general area of each cubicle so that cool air at the lower portion of the enclosure can be sensed by the thermostat.

3. Digital Heater Ammeter: Provide on the front of each cubicle enclosure to indicate current and operation of heaters.
4. Power Source: 120 Vac auxiliary power system; use an isolation transformer.

D. Lights: Provide inside equipment enclosures, as specified in Section 34 21 18P, TES Lighting.

E. Warning Signs:
1. Comply with requirements for warning signs in Section 34 21 17P, TES Substation Design and Assembly.
2. Provide signs on front, rear, and side access doors of cubicles where 600/750 Vdc wiring is present: "DANGER: LIVE PARTS" and "DANGER: HIGH VOLTAGE."
3. Provide signs on removable rear access doors: "DANGER: HIGH VOLTAGE."

F. Dc circuit breaker cubicle:
1. Suitable for accommodation of drawout circuit breakers.
2. Supporting Guide Rails: Provide for positioning removable elements as an integral part of equipment.
3. Design such that circuit breakers are easily drawn in or out of their housings.
4. Include stationary disconnecting device contacts for the circuit breakers.
5. Breakers shall connect or disconnect from buses and auxiliary circuits by means of self-aligning, self-coupling, primary disconnecting devices.
6. Provide self alignment mechanisms such that misalignment of contact is not possible when circuit breaker elements make contact with stationary contacts.
7. Control Wiring: Connection to the dc breaker may be by movable contacts or by a plug-style disconnect.
a. Plug style disconnect:
1) It shall not be mechanically possible to rack breaker into the connected position with the plug disconnected.
2) Locate where easily accessible. Engineer will make final determination whether location is easily accessible.
3) Provide heavy-duty connection hardware not easily bent or broken due to mishandling.
8. Provide suitable shrouds or automatic safety shutters on devices to prevent accidental contact with live parts.
9. Provide each enclosure with protective shutters that cover live high-voltage terminals when the access door is opened or a dc feeder breaker is racked out of the cubicle.
10. Provide each compartment with a hinged door or full width drawout panel for front access to the circuit breakers, instruments and terminal blocks.
11. Provide rear access doors in prefabricated substations to facilitate access to the dc power bus. Doors shall swing fully open against the adjacent door or enclosures.
12. Provide connections to the dc feeder cables in the rear compartment.
13. Construct switchgear enclosures to allow for the dissipation of ionized gas from the circuit breaker arc chutes without hazard to personnel from the discharge of hot gas or other materials.
a. Release gas from the units to the outside of the switchgear enclosure by means of suitable stacks, louvered vent openings, or vent openings covered with grilles.
b. Provide adequate clearance to ground to prevent the possibility of establishing a conducting path to grounded structure or objects when interrupting maximum short-circuit energy at rated maximum voltage.
c. Line enclosure surfaces exposed to arcs or ionized gases with flame resistant, high dielectric insulating materials.
d. This paragraph is not intended to require the use of arc-resistant switchgear.
14. Stacking of dc circuit breakers in cubicles is not permitted.

G. Negative and Positive Switch Cubicles:
   1. Mount positive and negative switches in separate isolated cubicles, either stacked or side by side.
   2. Negative switch may be provided as part of rectifier but must be isolated from rectifier.
   3. Cubicles shall have a hinged door with a clear window for viewing negative or positive switch position.

H. Separate high voltage devices from low voltage controls:
   1. If high voltage devices and low voltage controls are located in the same cubicle, identify high and low voltage by color coding mounting panels.
   2. No controls are allowed in rear cable and bus compartment.

I. The control devices can share the same compartment with the protection devices.
   1. Control/protection compartment shall be dead-front and shall consist of hinged swinging panels mounted on the switchgear frame.
      a. Construct swinging panel doors to support flush and semi-flush mounted devices.
      b. Swinging panel doors shall not distort from a plane surface in any position.
      c. Swinging panel doors of control/protection compartment shall be supported by stainless steel hinges.
      d. Panel doors shall swing open and provide free access to the area behind the panel, the rear of the devices mounted on the panels, wiring, terminal blocks, and auxiliary devices mounted within the compartment.
      e. Secure swinging panel doors in the closed position with two positive latching or screwed fasteners that can be operated by hand without tools.
      f. Swinging panel doors shall open 90 degrees and be held with heavy duty stops.

2.4 BUS AND BUS CONNECTIONS

A. Main horizontal dc switchgear bus shall be an extension of the rectifier bus, run the length of the dc switchgear. Tap to serve each circuit breaker.

B. Bus: Electrical grade copper with high electrical conductivity, rated 2000 A.

C. Bolted bus connections: Silver-plated copper.
   1. All connections to the bus shall be bolted.
   2. Applies to bus taps, circuit breaker connections, cable connections, and connections of devices such as transducers and shunts.
   3. Bolts: Silicon bronze of sufficient number and size for application. Minimum two bolts per joint.
   4. Washers: Provide a Belville washer for each bolt, properly sized for the application.
   5. Conductivity: Each joint shall have conductivity at least equal to that of the bus bar and shall be so clamped that no loss of conductivity will occur during the life of the switchgear.

D. Insulation:
   1. Insulate main bus and feeder bus from each other by one of the following means:
      a. Electrical insulating laminate barrier that completely encloses bus on both sides and both edges.
      b. Insulating boot.
      c. Insulated coating.
      d. Other approved means.
   2. Insulate connections to the bus using a boot.
   3. Mount bus bars on barrier-type insulation or post-type insulators.

E. Strength: Bus, bus connections, and bus insulation shall withstand thermal and mechanical stresses resulting from maximum available short-circuit current or rms interrupting rating of circuit breakers whichever is greater, without damage or permanent distortion.

2.5 POSITIVE AND NEGATIVE DISCONNECT SWITCHES

A. Provide a negative dc disconnect switch (Device 89N) and a positive dc disconnect switch (Device 89P) in each substation dc switchgear assembly, as shown in Contract Drawings. Each switch shall meet the following requirements:
   1. Type: Manually-operated, single-pole, bolted-pressure type, solid copper blade with silver plated contacts.
   2. Rating: 2000 A continuous current at 1000 Vdc and withstand twice the expected rms bolted short circuit currents.
   3. Insulation level: Sufficient to pass 1 minute 60 Hz dry withstand test at 3.7 kV, rms.
   4. Handle: Provide an insulated operating handle.
   5. Switch Position Indication:
      a. Provide a green and a red indicating light on the front panel of cubicle for each switch:
         1) Green illuminated: Switch open.
         2) Red illuminated: Switch closed.
      b. Provide indication to SAS; see Section 34 21 31P, TES Substation Automation System (SAS).
      c. See Section 34 21 17, TES Substation Design and Assembly, for requirements for Device 33 position switch.
   6. Instructions: Provide a simple operation instruction nameplate on each cubicle door.

B. Negative Disconnect Switch - 89N:
   1. Connection: Install between the negative return cable and the rectifier negative pole.
   2. Interlock with Positive Switch:
      a. Provide key interlock with positive disconnect switch to ensure negative switch can be opened only when positive switch is open.
      b. Key removal from the negative disconnect switch shall be possible only when the negative disconnect switch is closed.
      c. Opening of negative disconnect switch shall require the key to be inserted in the negative disconnect switch.
   3. Interlock with Dc Circuit Breakers:
      a. If negative switch is in the open position it shall not be possible to close a dc circuit breaker.

C. Positive disconnect switch - 89P:
   1. Connection: Install between the rectifier output and the dc feeder breakers.
   2. Interlock with Negative Switch:
      a. Key interlock with the negative switch to prevent positive switch from closing when the negative disconnect switch is open.
      b. Key shall not be removable from the positive switch when the negative disconnect switch is closed.
      c. With the key removed from the positive switch it shall be mechanically locked open.
   3. Interlock with Ac Switchgear: Key interlock to ensure no-load opening.

2.6 CIRCUIT BREAKERS

A. Dc circuit breakers: Single-pole, air-break, high-speed, removable type.
   1. Manufacture in accordance with IEEE C37.14, and rate according to the preferred ratings listed in IEEE C37.16, except as indicated in this Section.
      a. As an alternate, provide dc circuit breakers tested according to IEC 60077-1 and IEC 60077-3.
   2. Suitable for local and remote supervisory control.
   3. Electrically operated and electrically and mechanically trip-free with the mechanism insuring full contact pressure until time of opening.
   4. Insulated to withstand 3.7 kV, rms at 60 Hz for 1 minute.
   5. Peak rated momentary current: 30 kA, minimum.

B. Instantaneous (Device 76): Provide each dc feeder circuit breaker with a direct-acting, bi-directional, instantaneous overcurrent tripping device adjustable between 150 percent and 350 percent of the breaker rating.

C. Contacts:
   1. Surfaces of the moving and stationary contact members of the main contacts shall be silver, non-welding silver alloy, or equivalent that combines high conductivity and necessary arc-resistant properties.
   2. Main and secondary contacts of breaker shall be removable for replacement.

D. Operating mechanism:
   1. Solenoid-operated or motor-charged stored-energy, spring-operated type.
      a. Connect solenoid operated mechanisms such that the control voltage is removed from the closing coil after a preset time.
      b. In the event the breaker does not close or the closing control circuit is not opened, a trip sequence shall be initiated to open the closing control circuit and restore all closing sequence relays to their normal position.
      c. Motor-charged and spring-operated mechanisms:
         1) Mechanism shall be designed to prevent overcharging.
         2) The mechanism shall ensure that the release of stored energy for closing the circuit breaker main contacts is prevented unless the mechanism has been fully charged.
         3) The stored-energy closing mechanism shall automatically charge itself within 15 seconds after closing of the breaker.
         4) Energy storage shall be sufficient for an open-close-open cycle at maximum rated short circuit current.
   2. Mechanism shall be non-pumping.
   3. Design shall ensure positive opening of the moving contacts and circuit interruption when the tripping impulse is received at the fully closed or any partially open position.
   4. Provide control with a shunt trip device with the necessary auxiliary control equipment.

E. Breaker Position: Make provisions for moving each breaker to a "connected", "test" and "disconnected" position with positive stops in each position.
   1. "Connected" position: Both the primary disconnecting devices and the secondary disconnecting devices shall be in full contact and the breaker shall be in position for normal operation.
   2. "Test" position: Primary disconnecting devices shall be open and separated by a safe distance and the secondary disconnecting devices shall be in full contact.
   3. "Disconnected" position: Both primary and secondary disconnecting devices shall be open and separated by a safe distance and shutter closed.
   4. Position Indicator: Provide an indicator to show the location of the circuit breaker in "connected," "test," or "disconnected" positions.

F. Mechanical and Electrical Interlocks:
   1. Mechanical:
      a. Provide interlock to prevent moving circuit breaker in or out of the "connected" position when circuit breaker main contacts are in the closed position.
      b. Provide interlock to prevent closing the circuit breaker manually unless the breaker is in the "test" or "disconnected" position.
   2. Electrical: Provide interlock to prevent closing circuit breaker electrically, unless the circuit breaker is in the "connected" position with the primary disconnecting devices in full contact, or in the "test" position.

G. Breaker Control:
   1. Breaker control switch: Incorporate into SAS HMI and dc breaker protective IED. For additional information on SAS HMI see Section 34 21 31, TES Substation Automation System (SAS), .
      a. Breaker in Connected Position: Breaker control by SAS HMI.

b. Breaker in Test Position: Breaker control by dc breaker IED HMI.
c. Request to close a dc feeder breaker shall be governed by the load measure reclose system. See Protective Devices article, below, for details of the load measure reclose system.
d. Provide sufficient logic to ensure that a response to an HMI or remote supervisory closure request will not result in an unsafe condition or cause damage to the substation or any of its components.

2. Bypass Load Measuring:
   a. Provide control on SAS HMI that allows an authorized operator to bypass load measure system when closing breaker.
   b. See Section 34 21 31P, TES Substation Automation System (SAS) for details of operation.
3. Manual trip:
   a. Provide each circuit breaker with mechanical means for manually tripping the circuit breaker in the "test" and "connected" positions.
   b. This function shall be available with the compartment door closed.
4. Control power: Provide from 125 Vdc control power system per Section 34 21 25P, TES Dc Control Power.

H. Indication:
1. Electrical:
   a. Provide red and green indicating lights on each breaker unit for electrical closing and opening of the breaker while in the "test" or "connected" positions.
      1) Red light illuminated: Breaker closed.
      2) Green light illuminated: Breaker open.
      3) Provide long life, high brightness and high visibility, LED array lights.
   b. Provide indication to SAS; see Section 34 21 31P, TES Substation Automation System (SAS).
2. Mechanical: Provide a mechanical indicator, visible when the door is closed, to show when the circuit breaker is in the "open" and "closed" condition.

I. Auxiliary Contacts:
1. Provide a minimum of four electrically separate sets of reversible auxiliary contacts, in addition to those required for the circuit breaker control circuit.
2. Auxiliary contacts shall be operated by the breaker mechanism in both the "connected" and "test" position.
3. Spare auxiliary contacts shall be wired to the outgoing terminal blocks.

J. Arc chutes:
1. Metal plate or magnetic coil type.
2. Suitable for bidirectional current flow.
3. Designed for positive interruption of currents from 0 A to circuit breaker maximum rating.
4. Provide with an air puffer device to extinguish low-current arcs.

K. Operations Counter: Provide four digit, non-resettable, register type mechanical operations counter on each circuit breaker to record tripping operations.

L. Lockout Provisions:
1. Provide means to permit padlocking the dc breaker in the open position to prevent inadvertent closure without having to withdraw the breaker element.
2. Padlocking means shall not allow breaker to be inserted further than the test position.

M. Breaker Truck Wheels:
1. Provide circuit breakers with approved wheels to remove element from cubicle.
2. Fifth Wheel:
   a. If breaker truck cannot be easily turned when outside the breaker cubicle, provide a fifth wheel.
   b. Engineer will make the determination whether breaker truck can be easily turned.

c. Wheels shall not damage epoxy floor coating.

N. Interchangeability:
1. Removable elements of the same type and rating shall be completely physically and electrically interchangeable.
2. Removable elements not of the same type of rating shall not be physically interchangeable.

2.7 TES SUBSTATION DC CABLE CONNECTIONS

A. Bottom or top feed for negative and positive dc feeders, as required.

B. Provide ample space for pulling and terminating the feeder cables entering or leaving the switchgear without requiring a less than specified cable bending radius.

C. Provisions shall be made for the termination of up to four 250 kcmil, 2 kV dc positive cables in each feeder breaker section.

D. Provide for the termination of up to eight 250 kcmil, 2 kV dc negative return cables on load side of the negative disconnect switch.

2.8 PROTECTIVE DEVICES

A. General Requirements:
1. Protective relays and multifunction relays provided in dc switchgear shall be Intelligent Electronic Devices (IED) equipped with communication function.
2. Built-in Functions:
a. Control.
b. Measurement.
c. Fault recording: Capture real-time voltage and current for a triggered event with pre- and post-trigger sampling data useful for analyzing trip information, and store in non-volatile memory.
3. Alarm Communication: Send alarms to SAS via protocol specified in Section 34 21 31P, TES Substation Automation System (SAS).
4. Screens: LCD.
5. Time Synchronization: Protective IEDs shall synchronize time with SAS.
6. Protective Device Coordination: Installation Contractor shall perform a coordination study for the dc system in accordance with Section 34 21 73P, TES Studies, to obtain preliminary relay settings.
7. Final Settings: Installation Contractor shall make final adjustments to relaying systems and protective devices during TES Substation Field Acceptance Testing and Integrated Testing specified in Section 34 21 90P, TES Testing.
8. Contact Wire Thermal Rise: Set instantaneous and sustained current curves to limit the contact wire thermal rise to less than 165 degrees F.
9. Complete Installation: Provide additional components such as auxiliary relays, isolating diodes and similar devices not shown in the Contract Drawings, but required for a complete installation.

B. Arrangement and Appearance:
1. Arrange devices such as auxiliary relays, indicating lights and test plugs to be conveniently accessible and easily visible.
2. IED meters and displays shall be located such that they are easy for a person standing at floor level to operate and read.
3. The grouping shall be modular and place related functions in proximity.
4. Mount devices plumb and square with the lines of the panels and mount as recommended by the manufacturer and approved by Engineer.
5. Auxiliary devices shall match the general appearance as far as possible with frames of a compatible approved color and finish.

6. Devices of the same general type shall be manufactured by the same company and shall be similarly arranged and mounted.
7. Refer to substation one-line diagram in the Contract Drawings for arrangement of protective relays and devices.

C. At a minimum, provide the following protective functions/devices as shown below and on the substation one-line diagram in the Contract Drawings. Additional protective functions/devices recommended by equipment manufacturers may be installed with Engineer approval.
   1. Dc Feeder Multifunction Relay IED:
      a. Acceptable Manufacturer/Product: Siemens Sitras Pro, or approved equal.
      b. Functions: Include the following at minimum:
         1) Overcurrent: At minimum, provide the following overcurrent protection functions, which shall operate in the forward and reverse current directions:
            a) Instantaneous Overcurrent Trip.
            b) Low Level Fault Trip and associated time delay.
            c) Timed Overcurrent Trip:
               (1) Provide timed overcurrent trip function with inverse time characteristic that can be graphed with the set current, Itmd, as the y-axis, and the time delay, TmdDel, as the x-axis.
               (2) Tripping shall be initiated when the load current exceeds the set current during the period of time t such that (t/ TmdDel) and (Iload/ Itmd) correspond to a point on the curve.
         2) Rate of Rise Trip: Shall be initiated if all of the following conditions are met:
            a) Current di/dt exceeds the trip limit, di/dt.
            b) Di/dt stays above the trip limit during the delay time, Delay.
            c) During the delay time current exceeds the current rise limit.
      c. Load Measure and Reclose:
         1) Provide each dc feeder cubicle with a set of automatic reclosing functions and equipment, including the following:
            a) Load measuring function (Device 82).
            b) Adjustable time delay reclosing function (Device 83).
            c) Load measuring resistors mounted on the top of the circuit breaker cubicle;
            d) Associated accessories.
         2) Initiate the load measuring and automatic reclosing cycle when either the dc circuit breaker receives a "close" command (from the local or remote control), or when the circuit breaker is tripped automatically and attempts to reclose.
         3) A "lockout" status or intentionally initiated trip of the dc lockout relay shall disable the load measuring and automatic reclosing cycle.
         4) Precede initiation of the load measuring cycle by an adjustable time delay to permit the faulted line section to become fully de-energized.
         5) At the commencement of the load measurement cycle, a voltage sensor shall determine whether there is no voltage on the section.
         6) If the voltage measuring circuit detects potential on the section, it shall reclose the associated circuit breaker immediately, providing that this potential is greater than a preset value.
            a) The pickup setting shall be adjustable over the range of 60 to 750 Vdc.
            b) Initially the pickup voltage shall be set to 560 Vdc.
         7) If the voltage measuring circuit detects no potential on the section, the load measuring function shall make repeated load measurements at suitable adjustable time intervals.
         8) If a load measurement determines that no fault is present, initiate automatic reclosing of the circuit breaker.
         9) A successful reclosure with no automatic trip within five seconds shall complete the measurement cycle and reset the devices to their initial state.

10) Make provision for selection of up to six attempts to complete a successful load measurement and automatic reclosing cycle at 15 second intervals, within a 3 minute period. Set initially at three attempts.
11) If no successful reclosure takes place in the three minute period, the automatic reclosing and load measuring system shall lock out the feeder breaker from closing.
12) Provide each automatic reclosing and load measuring function with test facilities that shall check the functioning of all devices.
    a) Initiate test cycle with a local "test" push-button, which shall be functional only when the circuit breaker removable element is in the "test" position.
    b) Circuit breaker shall not close until after completing automatic reclosing and load measuring test when the breaker is in the "connected" position.
13) Monitor condition of reclosure device.

d. Incomplete Sequence (Device 148):
1) This function shall detect the failure of a dc circuit breaker to clear a fault within a predetermined time.
2) This function shall actuate the ac lock-out relay (Device 86) when actuated.
3) This function shall actuate the dc lock-out relay (Device 186) when actuated.

e. Transfer Trip:
1) Provide two types of transfer trip:
    a) The first type shall be automatically resettable (Device 85). Automatic resetting shall be controlled by the load measure reclose relay and occurs on di/dt faults.
    b) The second type shall require manual resetting (Device 85L). It shall trip the dc lockout relay (Device 186H) in both the originating and receiving substations, and is required for dc instantaneous over-current, frame faults, rail-to-earth potential faults, incomplete sequence faults, and emergency shutdowns.
2) Configure TPSS SAS devices as required for full transfer trip functionality over a fiber optic connected communications network. Transfer trip function and network communications must be fully operational.
3) Provide communication function blocks or other programming required for relays and IEDs to establish relay-to-relay communication between substations.
4) Monitor the condition of the communication continuously.
5) Generate an alarm if a fault condition is detected.
6) Tripping of a dc breaker shall initiate tripping of the remote active breaker feeding the same power section. If a substation is bypassed, the local breaker shall send the transfer trip signal to the substation beyond the bypassed substation to de-energize the power section.
7) Transfer trip shall be integral to protection relays.
8) Communication for transfer trip must be configured using VLAN. See Section 34 21 31P, TES Substation Automation System.
9) Factory test network configuration and transfer trip functionality using fiber connectivity between each TPSS local area network. Testing shall demonstrate actual tripping of breakers between the transmitting and receiving IEDs such that the network and transfer trip functions will be ready upon connecting the fiber optic cable for the WLAN.

2. Reverse Current:
a. Provide reverse current detection (Device 32).
b. The protection shall detect current flow from the distribution bus into the rectifier unit and trip and lock out the dc feeder breakers and ac circuit breaker.
c. The trip level shall be initially set to 15 percent of the rated current or as approved by Engineer.

3. High Resistance Frame Fault:
a. Insulate dc switchgear enclosure from ground.

b. Single-point ground enclosure through a separate high resistance ground IED device 64HS (hot structure) and 64GS (grounded structure).
   1) Connect IED with insulated 4/0 AWG copper conductor directly to substation ground mat.
   2) The 64HS and GS relay shall be the only ground path to the enclosure.
   3) The occurrence of any other ground path must be detected and alarmed.

2.9 INSTRUMENTS AND METERS

A. Instruments and meters shall be integrated into intelligent electronic devices (IEDs).
   1. Voltmeters and ammeters shall be rated for use with the corresponding transducers.
   2. Scales shall be of a suitable range, equal to the associated potential or current transformer primary rating.

B. Provide instrument and metering IEDs with capability of communicating with SAS as specified in Section 34 21 31P, TES Substation Automation System (SAS).

C. Instruments and metering devices for measuring dc values shall receive their inputs from isolation converters that shall be provided within the bus compartment of the switchgear.
   1. Provide auxiliary devices required for operation of the converters.
   2. Provide suitable isolation and insulation in order to ensure safe operation in contact with personnel.

2.10 FACTORY ASSEMBLY

A. Completely insulate dc switchgear enclosure and rectifier from ground and from the rectifier transformer and the ac switchgear.
   1. Insulate and isolate dc switchgear and rectifier from the floor using an epoxy floor covering in accordance with Section 34 21 08P, TES Dielectric Epoxy Flooring.
   2. Insulate and isolate dc switchgear and rectifier from the transformer using electrical laminate in accordance with Section 34 21 17P, TES Substation Design and Assembly.
   3. Insulate walls using electrical laminate in accordance with Section 34 21 17P, TES Substation Design and Assembly, and as shown on Contract Drawings.

2.11 SOURCE QUALITY CONTROL

A. Factory Design Tests:
   1. Dc Switchgear: Perform Design Tests as specified in IEEE C37.20.1:
      a. Dielectric tests
      b. Rated continuous current tests
      c. Short-time withstand current tests
      d. Short-circuit current withstand tests
      e. Mechanical endurance tests
      f. Flame resistance tests
      g. Rod entry test
      h. Coating (paint) qualification test
   2. Dc Circuit Breaker: Perform Design Tests as specified in IEEE C37.14.
   3. Positive and Negative Disconnect Switches:
      a. Conduct a complete set of design tests on one switch of each type in accordance with IEEE C37.30.1 and IEEE C37.41.
      b. Tests to be performed with switch(es) in enclosure assembled in closed, final operational configuration.
   4. Dc Protection Relays and Control Devices:
      a. Perform in accordance with Design Tests in IEEE C37.90.
      b. Frame Fault Relay (Device 64 HS and GS): Following design tests are required.
         1) Continuous and maximum short circuit ratings: Demonstrate by test.
         2) Response time and maximum trip time: Demonstrate by test.
         3) Maximum trip time for this device shall not exceed 50 ms.

B. Factory Production Tests:
   1. Dc Switchgear: Perform during TES Substation Factory Acceptance Tests in accordance with Section 34 21 90P, TES Testing.
   2. Dc Circuit Breaker:
      a. Prior to mounting inside dc switchgear, perform the following on each dc circuit breaker in accordance with IEEE C37.14:
         1) Calibration test
         2) Control, secondary wiring and device check test.
         3) Dielectric withstand voltage test.
         4) No-load operation test.
      b. Perform additional testing on each dc circuit breaker after mounting in switchgear during TES Substation Factory Acceptance Tests in accordance with Section 34 21 90P, TES Testing.
   3. Positive and Negative Disconnect Switches: Perform during TES Substation Factory Acceptance Tests in accordance with Section 34 21 90P, TES Testing.
   4. Dc Protection Relays, Control Devices and Meters: Perform in accordance with production tests in IEEE C37.90.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Insulate dc switchgear in built-in-place substation as required in Part 2, above, in the article titled “Factory Assembly.”

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes:
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer’s option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 23P
TES TRANSFORMER-RECTIFIER UNIT
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes rectifier-transformers and rectifiers, which are referred to in this Section as the "Transformer-Rectifier Unit," for the TES substations.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 34 21 06 – TES Common Work Results for Metals

E. SECTION 34 21 08 – TES Dielectric Epoxy Flooring

F. SECTION 34 21 13 – TES Switchboards

G. SECTION 34 21 17 – TES Substation Design and Assembly

H. SECTION 34 21 18 – TES Lighting

I. SECTION 34 21 18 – TES Medium-Voltage Ac Switchgear

J. SECTION 34 21 31 – TES Substation Automation System (SAS)

K. SECTION 34 21 80 – TES Spare Parts and Special Tools

L. SECTION 34 21 90 – TES Testing

M. SECTION 34 22 10 – TES Low-Voltage Conductors and Cable

1.3 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. American Society for Testing and Materials (ASTM):
   1. ASTM D116, Vitrified Ceramic Materials for Electrical Applications

C. Institute of Electrical & Electronics Engineers (IEEE):
   1. IEEE 519, Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
   2. IEEE 1653.2, Standard for Uncontrolled Traction Power Rectifiers for Substation Applications Up to 1500 Vdc Nominal Output
   3. IEEE C37.20.3, Standard for Metal-Enclosed Interrupter Switchgear
   4. IEEE C57.12.01, General Requirements for Dry-Type Distribution and Power Transformers Including Those with Solid-Cast and/or Resin Encapsulated Windings
   5. IEEE C57.12.91, Standard Test Code for Dry-Type Distribution and Power Transformers
   6. IEEE C57.18.10, Standard Practices and Requirements for Semiconductor Power Rectifier Transformers

D. National Electrical Manufacturers Association (NEMA):
   1. NEMA TR 1, Transformers, Regulators and Reactors
   2. NEMA SG 6, Power Switching Equipment

1.4 SUBMITTALS

A. Procedures: SECTION 01 33 00 – Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Product Data: Manufacturer's product descriptions and catalog data for the following:
   1. Transformer-Rectifier Unit:
      a. Enclosures: Gauge of steel, finish, door hardware.
      b. Relays, protective devices, control switches, over temperature devices and failed diode indication device.
      c. Ratings.
      d. Internal wiring: Wire type and size.
      e. Information concerning design and application ratings.
      f. Information concerning service, performance and reliability.
      g. Documents confirming the substation system rating.
   2. Rectifier:
      a. Bus and bus insulators.
      b. Diodes
      c. Fuses
      d. Dc surge arresters
      e. Cooling fans
   3. Rectifier-transformer:
      a. Bus and bus insulators.
      b. Core steel.
      c. Transformer winding insulation system.
      d. Transformer Data: Weight, impedance, and primary and secondary BIL
      e. Transformer temperature monitor.
      f. Cooling fans
   4. Interphase transformer

D. Spare Parts and Special Tools:
   1. Submit a list of spare parts to be provided under this Section.
   2. Submit at the same time as product data.
   3. Provide part numbers for each part, including a detailed break down of each spare part assembly and set, as defined in SECTION 34 21 80 – TES Spare Parts and Special Tools.
   4. Submit a list of special tools to be provided under this Section, as defined in SECTION 34 21 80 – TES Spare Parts and Special Tools.

E. Shop Drawings:
   1. Transformer-Rectifier Unit:
      a. Detail drawings for transformer-rectifier unit, including interphase transformer, surge arrester arrangement, and connection between rectifier and transformer.
   2. Rectifier:
      a. Outline drawing showing dimensions, front, back and side elevations of enclosure, overall dimensions, and lifting lugs.
      b. Detail drawing of connection between rectifier and positive switch
      c. Rectifier enclosure and door latch details.
      d. Rectifier nameplate drawing.
      e. Wiring, schematic, and connection diagrams.
      f. Rectifier monitoring and protection schematic and wiring diagram.
      g. Bill of materials.
   3. Rectifier-Transformer:
      a. Outline drawing showing dimensions, front, back and side elevations of enclosure, overall dimensions, and lifting lugs.
      b. Detail drawing of connection between Ac main breaker and rectifier-transformer.

c. Transformer enclosure and door latch details.
d. Transformer nameplate drawing with nameplate details.
e. Wiring, schematic, and connection diagrams.
f. Insulation system details.
g. Transformer primary and secondary busing arrangements showing bus construction details
h. Transformer tap changer arrangement details.
i. Bill of materials.

4. Transformer temperature monitor/protection device schematic and wiring diagram including the location of the temperature sensor.

F. Calculations:
1. Transformer design calculations, including hottest spot temperature rise in accordance with IEEE C57.12.01.
2. Transformer calculation of winding temperature during a short circuit in accordance with IEEE C57.12.01.
3. Bus sizing calculations: Rectifier and rectifier-transformer.
4. Proof the transformer-rectifier unit design and construction conforms to IEEE 519.

G. Submit the following upon completion of transformer manufacture:
1. Measured present worth of transformer energy losses, including the following:
a. Table 1, with actual measured losses from the transformer.
b. Table 2 calculation, using the new value from Table 1.
2. Comparison of calculated and measured present worth of transformer energy losses, as described in the Article below titled "Transformer Design Optimization."

H. Submit test procedures that comply with Section 34 21 90, TES Testing.
1. Design Tests.
2. Production Tests.

I. Submit test reports that comply with Section 34 21 90, TES Testing.
1. Design Tests: Provide design test reports for each type of transformer-rectifier unit within 30 Days after completion of testing.
2. Production Tests: Provide production test reports for each transformer-rectifier unit within 30 Days after completion of testing.

J. Operations and Maintenance Data:
1. Submit manufacturer's operating and maintenance instructions on products specified in this Section, including the following:
a. Submit manufacturer's operating and maintenance instructions, parts list, illustrations and diagram for components for products specified in this Section.
b. Wiring diagram.
c. Diagram showing recommended safety grounding during maintenance.
2. Submit immediately after approval of product data.

1.5 SPARE PARTS

A. Provide spare parts in accordance with SECTION 34 21 80 – TES Spare Parts and Special Tools.

B. List below applies to items in this Specification Section.
1. Transformer temperature monitor complete with temperature sensors: Provide 1 spare assembly.
2. Rectifier diodes: Provide 2 spare.
3. Rectifier diode protection fuses: Provide 2 spare.
4. Rectifier over-temperature: Provide 1 spare assemblies.
5. Interphase transformer: Provide 1 spare.
6. Rectifier transformer cooling fans; Provide 1 spare.
7. Rectifier cooling fans; Provide 1 spare.

1.6 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 Systems Quality Assurance.

B. Rectifier-transformer shall be UL labeled or shall be furnished with a Field Evaluation label in accordance with Section 34 21 17, TES Substation Design and Assembly.

C. Rectifier shall be UL labeled or shall be furnished with a Field Evaluation label in accordance with Section 34 21 17, TES Substation Design and Assembly.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems, except as modified herein.

B. Obtain written permission from the Engineer before shipping substation.

1.8 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20, except as modified herein.

B. Provide an extended warranty of 5 years for rectifier-transformers.

PART 2 - PRODUCTS

2.1 TRANSFORMER-RECTIFIER UNIT - GENERAL REQUIREMENTS

A. Transformer-rectifier unit shall be manufactured in accordance with the referenced standards.

B. Transformer-rectifier unit consists of a separate rectifier-transformer and a rectifier, as shown on Contract Drawings.
   1. Provide each unit complete with auxiliaries, controls, wireways, interconnecting ac and dc buses, enclosures and necessary hardware, wiring and devices from the high voltage side of the transformer to the dc bus connections to the dc switchgear and negative enclosure.
   2. Except as otherwise specified, the transformer-rectifier shall conform to IEEE C57.12.01, C57.12.91, 519, and 1653.2, and NEMA SG 6 and TR 1.

C. Dc output of the transformer-rectifier unit shall feed the metal enclosed dc switchgear that controls and protects the power supply to the Overhead Contact System (OCS).

D. Enclosures for Transformer and Rectifier:
   1. Construct from sheet steel, 11 gage minimum, properly reinforced against distortion by suitable flanges and stiffening members.
   2. Doors:
      a. Minimum 11 gage sheet steel.
      b. Doors 36 inches or wider shall include vertical stiffeners, minimum 3 stiffeners for a 36-inch door, with one additional stiffener for each additional 12 inches of door width.
   3. Finish: Powder coat in accordance with 34 21 06, TES Common Work Results for Metals.
   4. Color: In accordance with Section 34 21 06, TES Common Work Results for Metals.

E. Design Loading Condition: Transformer-rectifier units shall meet the duty cycle specified in IEEE 1653.2 for heavy traction service.

F. Efficiency: Overall efficiency of each transformer-rectifier assembly shall be greater than 98 percent at its continuous rating.

G. Power Factor: Displacement power factor of each transformer-rectifier assembly shall be 0.95 or greater from 25 percent to full load at rated ac voltage.

H. Voltage Regulation:
   1. Minimum 4-1/2 percent between 1 percent and 200 percent load with the nominal ac voltage maintained at the transformer primary and the transformer set at the rated voltage tap.
   2. Engineer may allow minor variations in regulation based upon submitted design curve.

I. Dummy Load:
   1. Limit the no-load voltage to the value specified.
   2. Provide a bleeder resistance dummy load, if required, to prevent excessive voltage rise at no-load.

J. Provide protection against transient surge voltages on the dc side of the rectifier. If fuses are used in suppression networks, they shall be monitored by visual indicators and equipped with indication devices wired to local Annunciator.

K. Short Circuit Ratings:
   1. Design transformer, including terminal connections and buswork, to withstand a full short circuit with shorted low-voltage terminals and rated voltage on the high-voltage terminals, in accordance with IEEE C57.12.01. The duration of the short-circuit current shall be minimum 1 second.
   2. Design all parts of the rectifier unit, including the terminal connections and buswork, to withstand a maximum dc fault on the dc positive bus, without damage, for the period required for the back-up protection to operate and open the ac circuit breaker.

2.2 TRANSFORMER-RECTIFIER UNIT RATINGS AND CONFIGURATION

A. Mainline transformer-rectifier units:
   1. Rating: 750 Vdc, 500 kW measured at output terminals.
   2. Configuration: 12-pulse, double-way, in accordance with IEEE 1653.2, Circuit 31.
   3. Convert 13.2 kV, 60 Hz ac, three-phase, three-conductor primary power to 750 Vdc at 100 percent of full load.
   4. Ac power source: 13.2 kV switchgear; see Section 34 21 18, TES Medium-Voltage Ac Switchgear.

2.3 PROTECTIVE DEVICES AND RELAYS FOR TRANSFORMER-RECTIFIER UNIT

A. Coordinate protection to prevent false tripping or malfunction.

B. Supply an insulating dust cover for each internally-mounted device or the chamber that accommodates these devices.

C. Compartment: Mount control devices, relays and protective devices within the rectifier and transformer enclosure within a separate barriered compartment in compliance with IEEE C37.20.3.
   1. Devices shall be readily accessible without disassembling interior portions of the rectifier assembly.
   2. Control wiring shall be contained within the cubicle.
   3. Control wiring shall be barriered from and not intermixed with 750 Vdc power wiring.
   4. No 750 Vdc devices shall be mounted in control compartment.
   5. Locate devices such that heat from other equipment does not affect operation.

D. Control Power: Power supply for protective devices and relays shall use 125 Vdc auxiliary power system.

E. Transformer Temperature Monitor (TTM) Device 49:
   1. Shall be manufactured for the purpose and have a service proven history.
   2. Shall incorporate a hot-spot winding temperature indicator located where the highest temperature reading is obtained during Design testing.

3. Provide with two-step, electrically independent contacts that close on rising temperatures for alarm (first step) and tripping (second step).
    a. First stage, 49T1:
        1) Initiate an alarm on the TTM and SAS. Refer to Section 34 21 31 – TES Substation Automation System (SAS).
        2) Set initially at the temperature reached during the 2-hour heat run at 150 percent rated output, and annunciate when this temperature is reached.
    b. Second stage, 49T2: Initiate an alarm on the TTM and SAS, trip and lock out the main ac breaker, and open the main dc circuit breaker.
    c. Temperature set points, T1 and T2, shall be factory-preset when transformer is provided, as recommended by the manufacturer and approved by Engineer, and field adjustable
4. Display temperature continuously on a digital display mounted on the surface of transformer panel.
    a. Accuracy: Within 1.5 percent of the full-scale reading.
    b. Scale: Degrees Celsius.
    c. Peak Temperature:
        1) Peak temperature shall be displayed when requested by the activation of a front panel mounted pushbutton.
        2) Peak temperature shall be resettable via a separate front panel mounted pushbutton.
        3) TTM shall store the peak temperature reached by the rectifier-transformer.
5. Enclosure:
    a. NEMA 1 enclosure for low voltage terminals.
    b. Cover: Hinged- or screw-type.
6. Terminal strips: Provide covers and mount on back panel.
7. Barriers: Provide where necessary to separate conductors with different voltage insulation ratings, such as thermocouple wiring and 125 Vdc control wiring.
8. Mounting Securely mount enclosure to the transformer frame.
    a. Mount in a location readily accessible from the front as indicated, but not to restrict access to the transformer coils for maintenance.
    b. Do not mount the enclosure in removable panels.
9. Control Wiring:
    a. Control wiring shall be 600 V switchboard wire. See Section 34 22 10, TES Low-Voltage Conductors and Cable, for switchboard wire requirements.
    b. Size: Minimum 14 AWG, except for temperature sensor internal wiring.
10. Contacts: Electrically separate and suitable for operation at 125 Vdc.

F. Provide the following protective devices for the rectifier. Contacts on these devices shall be electrically separated:
1. Rectifier over-temperature (Device 26):
    a. Over temperature device shall be factory set, two stages (26R1 and 26R2).
    b. Shall detect first an abnormal rise in diode heat sink or diode temperature and initiate local and remote annunciation.
    c. Set-point for the alarm shall be set during the factory systems test to the level recorded during the two hour 150 percent heat run.
    d. An additional rise in heat sink temperature will trip and lock out the ac main breaker, open the main positive circuit breaker and shall alarm on the SAS. Refer to SECTION 34 21 31 – TES Substation Automation System (SAS).
    e. Devices shall be isolated from the bus voltage.
2. Frame fault protection for the rectifier: Provide high resistance frame fault protection for the rectifier cubicles.
3. Provide failed diode indications 98R1 and 98R2.
4. Refer to Contract Drawings for additional protective devices.

2.4 RECTIFIER

A. General:

1. Provide rectifier assembly as an integral part of the dc switchgear.
2. Rectifier assembly shall be constructed in accordance with IEEE C37.20.3, except as modified in this Section.
3. Rectifier shall include silicon diodes, internal buses, terminals for connection to external power and control wiring or buses, shunts, base or bleeder load resistors, protective devices, control wiring, terminal blocks, compartments, cubicles, and all other necessary accessories.

B. Rating and configuration:
1. IEEE 1653.2 heavy traction service.
2. Dc Insulation: 1200-Volt Class.
3. Mainline rectifiers:
   a. Rated 750 Vdc, 500 kW, with natural convection air cooling.
   b. Continuous current rating at 100 percent: 666 A.
   c. Twelve-phase, double-way, 12-pulse rectification.

C. Enclosure:
1. Mount rectifier assembly in a metal fully-enclosed switchgear section or compartment.
2. The switchgear section shall be indoor, self-ventilated, metal enclosed structure with barriers, compartments, hinged doors as required by IEEE C37.20.3, except as modified in this Section.
3. Assemble enclosure with a rigid self-supporting structural steel framework.
   a. Structural members shall be of sufficient strength to support the buswork under short circuit conditions.
   b. Principal structural members shall be electrically welded or bolted together.
   c. Provide lifting eyes for lifting the rectifier unit from the top.
   d. The completed package shall be capable of being skidded or rolled any direction.
   e. Provide jacking lugs at each base corner.
4. Doors:
   a. Provide convenient access doors on the front and rear of the section for normal maintenance and inspection.
   b. Latches: Equip each door with a heavy duty latch to hold the door fully and securely closed.
   c. Hinges: Stainless steel heavy-duty type.
   d. Door Stops:
      1) Provide heavy-duty door stops to hold the door in the open position.
      2) Not easily bent if an attempt is made to close door without releasing door stop.
   e. Window: Provide an ample sized, wired glass, gasketed observation window on each door to observe diode blown fuse indicators.
   f. Install front-mounted indicating and control devices without damaging the exposed finished surfaces.
5. Lights: Provide inside equipment enclosures, as specified in Section 34 21 18, TES Lighting.

D. Bus and Connections:
1. Rectifier buses shall be made of rigid, high conductivity, electrical grade copper.
2. Buses shall be suitably braced between each other and to the enclosure with high-strength, non-tracking porcelain or fiberglass insulators.
3. Buses shall be braced to safely withstand the available short-circuit current without damage to the bus or the rectifier.
4. Where aluminum heat sinks are bonded to a copper bus, coat connection with oxide inhibitor to prevent bimetallic corrosion.
5. Bus connections shall be bolted using a minimum of four bolts per joint.
   a. Wherever bolted together, the mating surfaces of copper buses shall be silver-plated.
   b. Bolted connections shall be made with Belleville washers.
6. Buses shall extend through the compartment walls to rear bus compartment and connected to the dc switchgear.

7. Rectifier section shall be designed as an integral part of the dc switchgear line up and shall be insulated from the ac and dc switchgear, substation grounds, or other enclosures.
8. Metal barriers, electrically bonded to the frame, shall be provided between dc positive and negative buses and terminal connections within the rectifier.

E. Dc surge arrester:
1. Rectifier unit shall be equipped with dc surge arresters.
2. The arresters shall limit the reverse voltage across rectifier silicon diodes to a value less than 75 percent of the peak-reverse-voltage rating of the diode by limiting the rise of the transient on the positive to negative bus.
3. Ensure that arresters will fail in a safe manner without damage to equipment and will self extinguish. Install in separate enclosure if necessary.

F. Silicon Diodes:
1. Silicon diodes shall be hermetically sealed and mounted on adequate heat sinks.
2. Diodes shall be rated and tested in accordance with IEEE 1653.2 for heavy traction service.
3. Rectifier shall be able to withstand a bolted fault on the dc switchgear bus without exceeding the safe diode junction temperature on the active diode for the time it takes the ac breaker to clear the fault.
4. Each diode shall be capable of withstanding, at its maximum operating temperature during blocking periods, repetitive voltages having a value 250 percent of its working peak reverse voltage without a permanent change in diode characteristics.
5. Each individual diode shall have a peak inverse voltage rating equal to at least 266 percent of the applied peak inverse voltage at no load.
6. Parallel stacks of diodes, when used, shall be electrically and geometrically similar and as symmetrical as practical to help balance the normal and surge electrical characteristics of each.
7. Design rectifier to maintain current balance between parallel-connected diodes, if used, in each phase.
   a. The current for each diode of a parallel-connected stack shall not differ from its proportionate share of the total current by more than plus or minus 10 percent, between 50 percent and 150 percent of the rated capacity.
   b. Current balancing shall not be achieved by use of selectively matched diodes.

G. Fuses:
1. Provide one current limiting fuse in series with each phase.
   a. Each fuse shall have adequate interrupting capacity
   b. Provide a visual fuse failure indication.
   c. Fuse failure indication shall be visible from outside rectifier through observation window.
2. Size fuses to the diode current rating. Diodes shall not open or fail on an external dc fault or rated overload condition.
   a. Only the fuse connected to a failed (shorted) diode shall open.
   b. No other rectifier diodes or fuses shall fail or be damaged when one diode fails.
3. Fuses: 750 V minimum, indicating type, affixed with micro switches for Device 98.

H. Diode Failure:
1. Diode failure 1 (98R1): If one diode fails, or if one entire leg fails, send alarm to SAS.
2. Diode failure 2 (98R2): If one leg has failed, and a second leg fails, trip the ac lockout relay (Device 86).

I. Special Tools: Provide special tools to remove or install the diodes and/or diode fuses and/or hardware with each substation rectifier.

J. Internal Wiring: 2 kV switchboard wire, per Section 34 22 10, TES Low-Voltage Conductors and Cable.

K. Heating and Cooling System:

1. Auxiliary heating will be by a thermostatically-controlled space heater within the substation. Heaters mounted within the rectifier enclosure are not necessary.
2. Rectifier shall be natural convection air-cooled.
    a. Circulation of ambient air shall do all necessary cooling at the IEEE 1653.2 heavy traction service loading specified.
    b. Cooling ducts shall not be used.
3. All rectifiers shall be equipped with fans and thermostats for future forced air cooling.

L. Maintenance: Heat transfer surfaces and characteristics shall be designed for easy cleaning and to minimize accumulations of dust and other contaminants expected in the operating environment.

M. In accordance with this Specification, voltages other than 125 Vdc control power are not permitted within the enclosure unless a specific requirement is stated in this Contract.

N. Nameplate:
1. Provided each rectifier with a corrosion resistant metal nameplate containing the following information at a minimum:
    a. Name of Manufacturer.
    b. Descriptive Name.
    c. Type Designation.
    d. Serial Number(s).
    e. Output Rated Power.
    f. Output Rated Voltage.
    g. Output Rated Current.
    h. Overload Currents - Magnitude and Duration.
    i. Weight.
    j. Schematic Diagram Number.

2.5 RECTIFIER-TRANSFORMER

A. Provide dry-type rectifier-transformer of VPI (Vacuum Pressure Impregnation).

B. Ratings and Configuration:
1. Ventilated, self-cooled Class AA/FA.
2. Transformer capacity shall be as required to achieve the specified transformer-rectifier unit rating.
3. IEEE 1653.2 heavy traction service duty cycle.
4. Transformer shall not suffer loss of life when operated at the specified duty cycle overload.
5. Insulation Class: 220 degrees C class.
6. Temperature Rise: Limit winding hottest-spot temperature rise and average winding temperature rise to the values given in IEEE C57.12.01 for the specified insulation class.
7. Cooling fans:
    a. Provide fans for forced air cooling, controlled by transformer temperature monitor.
    b. Fans shall increase the overall rating of rectifier-transformer by 33 percent of its rated output current without exceeding specified temperature rise.
8. Select the transformer impedance to provide the rectifier output voltage specified.

C. Windings:
1. Material: Copper.
2. Windings shall not absorb moisture and shall be suitable for both storage and operation in adverse environments, including prolonged storage in 100 percent humidity at temperature from minus 30 degrees C to 40 degrees C.
3. Primary windings mainline:
    a. Delta-connected.
    b. 95 kV BIL.
4. Secondary windings mainline:
    a. Connected for 12-pulse rectification.

b. 20 kV BIL

D. Taps:
1. Provide full capacity taps on primary voltage windings:
   a. Two above rated voltage in 1.25-percent steps;
   b. Two below rated voltage in 2.5 percent steps;
   c. One at rated voltage.
   d. Taps to the nearest turn are acceptable if the exact percentage cannot be achieved.
2. Tap changing shall be by movable silver plated copper bus links for de-energized tap changing.
3. Taps shall be brought out the side of the transformer, not the top.
4. Insulate jumpers from the transformer taps to the tap changer board and primary bus and keep as short as possible so as not to interfere with access to the coils for maintenance.
5. Tap connections shall be accessible through the front hinged enclosure doors.
6. Identify tap connections so that the tap selected is clearly visible through the observation window.
7. Securely bolt the tap-changing bus links in position.
8. Design of links and connectors shall make it impossible to short out sections of windings, or to select taps outside the prescribed range, by incorrectly connecting the links.

E. Connections:
1. Switchboard: Connect the high-voltage side using electrical grade copper bus with silver plated joints.
2. Rectifier: Connect the low voltage side using electrical grade copper bus with silver plated joints.

F. Bus supports:
1. Securely support bus from transformer frame using porcelain insulators.
2. Size bus supports for mechanical strength and ability to withstand a bolted fault without distortion.
3. Porcelain insulators: ASTM D116, rated for the line-to-line voltage application, free of imperfections. Insulators that have been re-touched with paint shall not be used.

G. Bus Bars:
1. Size:
   a. Minimum 1/4-inch by 2-inch, sized for mechanical strength and ability to withstand a bolted fault without distortion.
   b. Size bus for a current density of 750 A per square inch, or a maximum temperature of 90 degrees C at a 40 degree C ambient, whichever results in a larger size.
2. Bolted connections: Use a minimum of two silicon bronze bolted connections with Bellville washers on high and low voltage ac and dc buses.

H. Conductors within Transformer Enclosure:
1. Conductors not connected to transformer primary or secondary:
   a. Voltage rating: 600 V.
   b. Temperature rating: 105 degrees C.
   c. Protection:
      1) Enclose in GRS conduit securely strapped to the transformer frame or base, or to the enclosure if conduit does not obstruct removable panels or doors.
      2) If conduit must be secured to both frame or base and enclosure, insert a short section of liquid tight flexible metallic conduit for vibration isolation.
      3) Conductors may be unprotected for a maximum of 8 inches at the point of connection.
2. Cable jumpers from the secondary taps on the coil to the bus:
   a. Sized for maximum loading for IEEE 1653.2 heavy traction service.
   b. Temperature rating: 105 degrees C.
   c. Voltage rating: 2 kV.

d. Insulation level: 133 percent.

I. Maintainability:
1. Design transformer so that parts that require maintenance are readily accessible from the front and rear.
2. Ensure that bottom and top of coils are readily accessible for cleaning without removing buswork, panels, or obstructions of any kind.

J. Transformer Enclosure and Base:
1. Enclosure:
a. Enclose transformer in a rigid, self-supporting and self-contained, electrically welded or bolted, indoor, steel enclosure.
b. Enclosure shall not rely on transformer frame for support. Avoid attachments to transformer frame.
c. Vibration isolation: If enclosure is attached to transformer at any point, provide vibration isolation at attachment points.
2. Front door:
a. The entire front of the transformer shall open by padlockable hinged double doors secured by three-point latches.
b. Window: Provide an ample sized, wired glass, gasketed observation window in the front hinged doors; position such that the tap connections are readily visible.
3. Ventilation louvers: Design for maximum cooling from the bottom to top.
4. Rear panels:
a. The rear of the transformer shall be accessible by removable panels with stainless steel handles and lifting means.
b. Secure panels with 3/8-inch minimum stainless steel vandal-proof machine screws tapped into machined bosses.
5. Transformer base:
a. Construct from structural steel members suitable for rolling or skidding in any direction.
b. Make provisions for pulling along the centerlines perpendicular to each side.
c. Provide jacking facilities at each of the four corners of the base to permit insertion of rollers between floor and base.
d. Base construction shall firmly secure the core to prevent relative motion of the core during shipment, handling, or seismic shock.
6. Transformer frame:
a. Provide lifting hooks or eyes on the transformer frame with a safety factor of four to facilitate lifting the unit.
b. The structure shall be sufficiently rigid to withstand maximum transformer short circuit currents without deformation.
7. Transformer Mounting: Design to minimize vibration by using vibration isolation dampers.
8. Lights: Provide inside equipment enclosures, as specified in Section 34 21 14, TES Lighting.
9. Nameplate:
a. Provide rectifier-transformer with a corrosion-resistant metal nameplate marked in accordance with IEEE C57.12.01.
b. Securely fasten to the front of the enclosure.

K. Ac Surge Arrester:
1. Provide ac surge arresters on the rectifier-transformer primary side.
2. Provide a separate compartment for ac surge arresters within transformer enclosure.
3. Compartment shall be rigid steel, self-supporting and self-contained, electrically welded or bolted.

2.6 TRANSFORMER DESIGN OPTIMIZATION

A. Optimize the transformer design and select appropriate materials to provide transformers with the lowest possible life cycle cost.
   1. Definition of Life Cycle Cost: The sum of the cost of procurement and the cost of energy losses over the equipment's expected life.
   2. Calculate cost of energy losses over the transformer's expected life by:
      a. First, calculating annual cost of transformer energy losses (see Table 1, below);
      b. Second, using the calculated annual cost of transformer energy losses to calculate the present worth of transformer energy losses over the 30-year expected life (see Table 2, below).

table 1 – transformer energy loss schedule

Column 1	Column 2	Column 3	Column 4
Transformer Load (as percentage of rated power)	Transformer Energy Losses (at Column 1 Loads) (kW)	Estimated Annual Hours (of operation at given loads) (Hours)	Annual Transformer Energy Losses (kWh)
0 percent			
20 percent			
60 percent			
100 percent			
150 percent			
220 percent			
300 percent			
Total Transformer Annual Energy Losses E_L (kWh)			

B. Using Table 1 - Transformer Energy Loss Schedule:
   1. In Column 2, enter transformer energy losses in kW for each indicated transformer load in Column 1. Include energy losses in the transformer windings, steel core, and busbars, and demand requirements of auxiliary equipment such as cooling fans.
   2. In Column 4 calculate the Transformer Annual Energy Losses in kWh by multiplying the Transformer Energy Losses entered in Column 2 by the Estimated Annual Hours provided in Column 3.
   3. Total the numbers in Column 4 and enter in the box at the bottom of Table 1 for the Transformer Annual Energy Losses, E_L.
   4. Use this number to calculate the Present Worth of Transformer Energy Losses in Table 2.

TABLE 2 – PRESENT WORTH OF TRANSFORMER ENERGY LOSSES		
Equation:	$PW = N \cdot E_L \cdot e \cdot [1/(1+ i) + (1+k)/(1+ i)^2 + \ldots + (1+k)^{n-1}/(1+ 1)^n]$	
Symbol	Description	Value
PW	Present worth of transformer energy losses (Dollars)	$ _____
N	Number of transformer units	5 (mainline only)
E_L	Transformer annual energy losses (kWh)	from Table 1
E	Utility energy rate (Dollars/kWh)	0.09
I	Interest rate	0.04 (4 percent)
k	Average energy cost escalation factor	0.04
n	Transformer expected life (years)	30

C. Using Table 2 - Present Worth of Transformer Energy Losses:
   1. Calculate the Present Worth of Energy Losses, PW, in dollars over a 30-year period using the equation and values in Table 2.
   2. Insert the calculated Present Worth of Transformer Energy Losses into the Request for Proposal Bid List, where indicated.

D. Measured Present Worth of Transformer Energy Losses:
   1. After transformer is manufactured, measure the actual losses for the transformer at the load levels specified in Table 1.
   2. Update Table 1 with the measured values and recalculate Transformer Annual Energy Losses.
   3. Calculate the Present Worth of Transformer Energy Losses using Table 2, with the new value of Transformer Annual Energy Losses based on measured values.

E. Comparison of Calculated and Measured Present Worth of Transformer Energy Losses:
   1. Compare the Calculated Present Worth of Transformer Energy Losses (entered on the Price Page) with the Measured Present Worth of Transformer Energy Losses (calculated using measured values of a transformer manufactured for this project).
   2. If the Measured Present Worth of Transformer Energy Losses exceeds the Calculated Present Worth of Transformer Energy Losses, the Engineer will issue a unilateral deductive Change Order to deduct the dollar value of the difference between the two.
   3. If the Measured Present Worth of Transformer Energy Losses is equal to or less than the Calculated Present Worth of Transformer Energy Losses, no action will be taken.

2.7 INTERPHASE TRANSFORMER

A. Design interphase transformer in coordination with transformer-rectifier unit to meet the specified voltage regulation and maximize efficiency, under Kansas City service conditions.

B. Design, submit product data and shop drawings, and test in accordance with IEEE 1653.2.

2.8 FACTORY ASSEMBLY

A. Completely insulate rectifier from ground and from the rectifier-transformer and the ac switchgear.
   1. Insulate and isolate rectifier from the floor using an epoxy floor covering in accordance with Section 34 21 08, TES Dielectric Epoxy Flooring.
   2. Insulate and isolate rectifier from the transformer using electrical laminate in accordance with Section 34 21 17, TES Substation Design and Assembly.

2.9 SOURCE QUALITY CONTROL

A. Factory Design Tests:
   1. Transformer-Rectifier Unit Test:
      a. General Requirements:
         1) Existing test reports will not be accepted in lieu of this test.
         2) Transformer-rectifier unit shall be tested as a complete assembly including interconnecting bus and enclosures. AC switchgear is a required part of the assembly only for the short circuit test. DC switchgear is not required.
      b. Short circuit test:
         1) Conduct at a certified laboratory.
         2) Power supply shall be minimum 10 MVA.
         3) Transformer taps on high-voltage windings shall be connected at the center position of the five available taps.
         4) Set ac breaker for the IEEE 1653.2 short-time overload for heavy traction service.
         5) Perform in accordance with IEEE C57.12.91, to fully evaluate the capability of all windings.
            a) Apply fault on the rectifier secondary.
            b) Make recommended terminal measurements.
      c. Rated current test:
         1) Perform in accordance with IEEE 1653.2.
         2) Thermocouple locations shall be indicated in test procedure and approved by the Engineer.
         3) Transformer temperature rise determined by any of the thermocouples shall not exceed specified values.
         4) Verify efficiency, voltage regulation, and power factor at loads shown in IEEE 1653.2 for heavy traction service.
      d. Audible sound level test:
         1) Perform audible sound level tests in accordance with IEEE C57.12.91 using A-weighting, except apply 3-foot distance.
         2) Maximum sound level shall not exceed 60 dBA at 100 percent load measured 3 feet away from assembly.
         3) For 12-pulse Circuit 31 rectifier-transformers, include interphase transformer in transformer-rectifier assembly.
         4) Measure sound level with rectifier-transformer in its enclosure with all panels bolted closed.
   2. Rectifier:
      a. Dielectric tests: In accordance with IEEE 1653.2.
      b. Rated voltage test: Subject rectifier to 110 percent of ac rated voltage for 5 minutes with the dc circuit open.
      c. Current unbalance test:
         1) In accordance with IEEE 1653.2.
         2) Test may be performed during the design test for transformer-rectifier unit.
      d. Loss measurement test: Comply with IEEE 1653.2.
      e. Rated current test:
         1) At reduced voltage.
         2) After temperature stabilization at rated load.
         3) Include the overloads outlined in IEEE 1653.2.
         4) Perform with one diode removed from each phase arm. Engineer to select diodes to be removed for test.
         5) Shall demonstrate that the maximum safe junction temperature for each diode is not exceeded.
         6) Verify efficiency, voltage regulation, and power factor at loads shown in IEEE 1653.2 for heavy traction service.
   3. Rectifier-transformer:

a. Resistance measurements: Take in accordance with IEEE C57.12.91 except that they shall be taken for all tap settings.
b. Impedance and load loss: Perform tests in accordance with IEEE C57.18.10 except perform on all windings on all tap settings.
c. Commutating reactance: Calculate from load loss tests in accordance with IEEE C57.18.10.
d. Impulse test:
    1) Perform in accordance with IEEE C57.12.91.
    2) Perform after completion of short circuit tests.
e. Temperature rise tests: Perform in accordance with IEEE C57.12.91 for heavy traction service.
f. Partial discharge test: Perform after completion of all other tests.
g. Engineer shall be the sole judge of the serviceability of transformer after completion of design testing.

B. Factory Production Tests:
1. Rectifier:
    a. Dielectric tests: Perform in accordance with IEEE 1653.2.
    b. Continuity tests: Perform for all cables and buses.
    c. Rated voltage test: Perform in accordance with IEEE 1653.2.
2. Rectifier-transformer:
    a. Dielectric tests: Perform in accordance with IEEE C57.12.91.
    b. Applied-voltage test: Perform in accordance with IEEE C57.12.91.
    c. Induced-voltage tests: Perform in accordance with IEEE C57.12.91.
    d. Resistance measurements: Take for all windings on all taps.
    e. Ratio tests: Perform on the rated voltage connections and on all taps in accordance with IEEE C57.12.91.
    f. Polarity and phase relation tests: Perform in accordance with IEEE C57.12.91.
    g. No-load losses and excitation current: Determine in accordance with IEEE C57.12.91.
    h. Partial discharge test:
        1) Subject transformer to an induced voltage of 1.5 times the rated voltage at a frequency between 100 and 400 Hz.
        2) Partial discharge extinction level shall be reached at an induced voltage of not less than 1.2 times the rated line-to-line voltage.
        3) Partial discharge extinction level will be defined as the point when the reading at 1.9 MHz is less than 10 microvolts or 13 picocoulombs.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Insulate rectifier in built-in-place substation as required in Part 2, above, in the article titled "Factory Assembly."

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes.
1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 24P
TES DRY TYPE TRANSFORMERS
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes low voltage two-winding dry-type transformers.

B. Refer to SECTION 34 21 23 – TES Transformer-Rectifier Unit for rectifier transformer requirements.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 34 21 05 – Common Work Results for TES

E. SECTION 34 21 06 – TES Common Work Results for Metals

F. SECTION 34 21 14 – TES Medium-Voltage Ac Switchgear

G. SECTION 34 21 23 – TES Transformer-Rectifier Unit

H. SECTION 34 21 80 – TES Spare Parts and Special Tools

1.3 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. Institute of Electrical and Electronics Engineers (IEEE):
   1. IEEE C57.12.01, General Requirements for Dry-Type Distribution and Power Transformers Including Those with Solid-Cast and/or Resin Encapsulated Windings
   2. IEEE C57.12.91, Standard Test Code for Dry-Type Distribution and Power Transformers

C. National Electrical Manufacturer's Association (NEMA):
   1. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum)
   2. NEMA TP 1, Guide for Determining Energy Efficiency for Distribution Transformers

D. National Fire Protection Association (NFPA)
   1. NFPA 70, National Electrical Code (with amendments by the Authority Having Jurisdiction)

1.4 SUBMITTALS

A. Procedures: SECTION 01 33 00 – Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Product Data: Submit manufacturer's product data of manufactured materials and equipment including the following:
   1. Outline and support point dimensions of enclosures and accessories.
   2. Unit weights.
   3. Voltage, kVA and impedance ratings and characteristics.
   4. Loss data.
   5. Efficiency at 25, 50, 75 and 100 percent rated load.
   6. Sound level.

7. Tap configuration.
8. Insulation system type and rated temperature rise.

D. Spare Parts and Special Tools:
1. Submit a list of spare parts to be provided under this Section.
2. Submit at the same time as product data.
3. Provide part numbers for each part, including a detailed break down of each spare part assembly and set, as defined in SECTION 34 21 80 – TES Spare Parts and Special Tools.

E. Sizing Calculations: Submit calculations for sizing of the Station Service Transformer. Allow for 20 percent additional future load. At a minimum, the transformer shall be rated 25 kVA.

F. Operation and Maintenance Data:
1. Submit manufacturer's operating and maintenance instructions on products specified in this Section.
2. Submit immediately after approval of product data.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems, except as modified herein.

B. Obtain written permission from the Engineer before shipping substation.

1.6 SPARE PARTS

A. Submit spare parts in accordance with SECTION 34 21 80 – TES Spare Parts and Special Tools.

B. List below applies to items in this Specification Section:
1. Station service transformer: Provide 1 spare of each size.

1.7 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

PART 2 - PRODUCTS

2.1 DRY TYPE TWO-WINDING TRANSFORMERS

A. Dry Type Transformers: IEEE C57.12.01; factory-assembled, air cooled dry type transformers; ratings as shown on Contract Drawings.

B. Insulation system and average winding temperature rise for rated kVA as follows:
1. 1 to 15 kVA: Class 185 insulation, 80 degrees C rise.
2. 16 to 500 kVA: Class 220 insulation, 115 degrees C rise.

C. Load Ratings and Transformer Cooling: Load ratings, unless noted otherwise, are assumed to be AA (air convection cooling).

D. Windings: Copper primary and secondary.

E. Winding Taps:
1. Transformers Less than 15 kVA: Two 5 percent, full-capacity taps below rated voltage on primary winding.
2. Transformers larger than 15 kVA and smaller than 500 kVA: Two 2.5 percent full-capacity taps above rated voltage and four 2.5 percent full-capacity taps below rated voltage on primary windings.

F. Energy Efficiency: NEMA TP 1.

G. Sound Levels: Shall not exceed the following when tested according to IEEE C57.12.91.
1. 10 to 50 kVA: 45 dB.
2. 51 to 150 kVA: 50 dB.

3. 151-300 kVA: 55 dB.
4. 301 to 500 kVA: 60 dB.

H. Basic Impulse Level:
1. Low-Voltage Dry-Type Transformers:
a. Transformers less than 300 kVA: 10 kV.
b. Transformers 300 kVA and larger: 30 kV.
2. Medium-Voltage Dry-Type Transformers: 95 kV.

I. Ground core and coil assembly to enclosure by means of a visible, flexible copper grounding strap.

J. Mounting:
1. 75 kVA and less: Suitable for wall, floor, or trapeze mounting, or mounting internal to switchgear.
2. Larger than 75 kVA: Suitable for floor or trapeze mounting.

K. Coil Conductors: Continuous windings with terminations brazed or welded.

L. Enclosure:
1. Construction: Heavy gage sheet steel, ventilated.
2. Type:
a. Indoor: NEMA 250 Type 1.
b. Outdoor: NEMA 250 Type 3R.
3. Finish: Powder coat complying with Section 34 21 06, TES Common Work Results for Metals.
4. Standards compliance: NEMA 250, NFPA 70, IEEE C57.12.01.
5. Enclosure requirements do not apply to transformer located within ac switchgear cubicle, as indicated on Contract Drawings

M. Isolate core and coil from enclosure using vibration-absorbing mounts.

N. Nameplate: Include transformer connection data.

2.2 STATION SERVICE TRANSFORMER

A. Calculate size of the Station Service Transformer as follows:
1. Calculate load per NFPA 70 based on heating, cooling, lighting, and other loads.
2. Allow for 20 percent additional future load.
3. At a minimum, the transformer shall be rated 25 kVA.
4. Provide primary fused disconnect and secondary circuit breaker complying with NFPA 70.

2.3 FACTORY ASSEMBLY

A. Install transformers plumb and level.

B. Use copper bus for both primary and secondary connections.

C. Mount transformers inside substation on vibration isolating pads suitable for isolating the transformer noise from the structure.

D. Provide restraints for vertical and horizontal seismic motion in accordance with the seismic requirements in Section 34 21 05, Common Work Results for TES.

E. Station Service Transformer: Mount inside ac switchgear enclosure, as described in Section 34 21 14, TES Medium-Voltage Ac Switchgear.

PART 3 - EXECUTION

3.1 FIELD INSTALLATION

A. Requirements of Article titled "Factory Assembly" apply to field installation.

3.2 FIELD QUALITY CONTROL

A. Check for damage and tight connections before energizing transformer.

B. Measure primary and secondary voltages and make appropriate tap adjustments.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes.
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 25P
TES DC CONTROL POWER
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Battery charger/eliminator and batteries.
   2. Enclosed low-voltage switches and fuses.
   3. Dc distribution panelboard circuit breakers.
   4. Dc control circuit overcurrent protection.
   5. Low voltage dc power supply.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 34 21 12P – TES Low-Voltage Panelboards

E. SECTION 34 21 17P – TES Substation Design and Assembly

F. SECTION 34 21 31P – TES Substation Automation System (SAS)

G. SECTION 34 21 80P – TES Spare Parts and Special Tools

H. SECTION 34 21 90P – TES Testing

1.3 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. Institute of Electrical & Electronics Engineers (IEEE):
   1. IEEE 485, Recommended Practices for Sizing Lead Acid Batteries for Stationary Applications
   2. IEEE 1115, Recommended Practices for Sizing Nickel-Cadmium Batteries for Stationary Applications

C. National Electrical Manufacturers Association (NEMA):
   1. NEMA FU 1, Low Voltage Cartridge Fuses
   2. NEMA KS 1, Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
   3. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum)
   4. NEMA PE 5, Utility Battery Chargers

D. Underwriters Laboratories (UL):
   1. UL 489, Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures

1.4 SUBMITTALS

A. Procedures: SECTION 01 33 00 – Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Product Data: Manufacturer's product descriptions and catalog data for the following:

1. Submit manufacturers' product data for specified equipment and materials.

D. Spare Parts and Special Tools:
   1. Submit a list of spare parts to be provided under this Section.
   2. Submit at the same time as product data.
   3. Provide part numbers for each part, including a detailed break down of each spare part assembly and set, as defined in SECTION 34 21 80P – TES Spare Parts and Special Tools.
   4. Provide part numbers for each part, including a detailed break down of each spare part assembly and set, as defined in SECTION 34 21 80P – TES Spare Parts and Special Tools and required special tools are described below in Part 2.

E. Calculations:
   1. Battery capacity calculations, including load calculations.

F. Testing:
   1. Submit test procedures that meet the requirements of SECTION 34 21 90P - TES Testing for the following:
      a. Factory Design Tests.
   2. Submit test reports that meet the requirements of SECTION 34 21 90P - TES Testing for the following:
      a. Factory Design Tests.

G. Submit test procedures that comply with Section 34 21 90P, TES Testing.
   1. Design Tests.
   2. Production Tests.

H. Operations and Maintenance Data:
   1. Submit manufacturer's operating and maintenance instructions on products specified in this Section.
   2. Submit immediately after approval of product data.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Spare Parts:
   1. Deliver spare parts in accordance with SECTION 34 21 80P - TES Spare Parts and Special Tools.
   2. Furnish the following items specified in this Section:
      a. Battery cells: Provide 4 spares of each type.
      b. Battery charger/eliminator: Provide 1 spare.
      c. Mini circuit breakers: Provide 2 spare sets.
      d. Low voltage dc power supply: Provide 2 spares each type.

B. Special Tools and Accessories: Submit product data and provide the following accessories for normal operation and maintenance:
   1. Cell lifting sling complete with strap and spreader bar.
   2. Battery log book.
   3. Quart of terminal grease, if recommended.
   4. Set of special tools for maintenance.
   5. Micro ohmmeter for testing battery connection resistance.
   6. Set of cell identification numbers.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Ship batteries separate from substation.

1.7 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20, except as modified herein.

B. Batteries: Furnish warranty of one (1) year from the date the battery is placed in service and additional warranty of 9 years, pro rata, to deliver not less than 90% of its rated capacity.

PART 2 - PRODUCTS

2.1 GENERAL

A. Batteries and associated charger/eliminators shall operate in parallel, with the charger charging the battery while supplying the continuous connected loads.

B. Batteries shall supply peak short time current demands and, when the ac supply to the charger is interrupted, supply the entire connect load.

C. Batteries and charger/eliminators shall be rated for operation within the temperature range specified in SECTION 34 21 31P - TES Substation Automation System (SAS), and shall be capable of operation up to 100 degrees F.

D. After continuous 10 hours of battery charger outage, trip and lockout the high-voltage ac circuit breaker, via the 86H relay and trip and lockout the dc circuit breakers via the 186H relays.

2.2 BATTERY CHARGER/ELIMINATOR

A. Charger/eliminators: Solid-state, constant voltage, automatic, fully regulated, with output voltage temperature compensation, silicon controlled rectifier, convection cooled, complying with NEMA PE 5. Provide battery charger/eliminators to meet the following requirements:
   1. Rated for continuous operation, float-charging the battery, and for recharging the battery from a cell voltage of 1.1 V to 85 percent of battery capacity in a maximum of 8 hours, while simultaneously supplying the load demands.
   2. Input voltage Rating:
      a. Mainline: 240 Vac, 60 Hz, single phase.
      b. VMF: 208/120 Vac, 60 Hz, single phase.
   3. Output voltage and current: Matched to the requirements of the battery and the load.
   4. Output voltage regulation: Plus or minus 0.25 percent of output voltage over its complete load range with a plus or minus 10 percent variation of input ac voltage. Output ripple shall not exceed 30 mV rms.
   5. Output current limiting: Adjustable from 90 percent to 115 percent of output nominal current rating, and factory set at 110 percent.
   6. Filtered output to maintain ripple within the specified limits when the battery is disconnected.
   7. Adjustable 0 to 72 hour equalizing time charger, manually set for supplying an equalizing voltage per cell as recommended by battery manufacturer.
   8. Ac Input and Dc Output circuit breakers: Molded-case type complying with the requirements in UL 489.
   9. Enclosures: NEMA 250, Type 12 with hinged covers, lockable handles and two point (minimum) latches.

B. Provide the following additional features/options:
   1. Dc voltmeter with 0 V to 200 V range.
   2. Dc ammeter.
   3. Ac input pilot light marked "AC POWER ON."
   4. Two-position selector switch marked "FLOAT" and "EQUALIZE."
   5. Output ground fault pilot lights for positive and negative poles.
   6. Input line surge and transient-protective devices.
   7. Battery charger failed alarm.
   8. Battery undervoltage alarm.
   9. Battery overvoltage alarm.
   10. Ground fault alarm.

C. Send alarms to SAS, as specified in SECTION 34 21 31P – TES Substation Automation System (SAS).

2.3 BATTERIES

A. Batteries shall be designed specifically for float application and shall be sized for the specified duty cycle:
   1. Type: Heavy-duty, nickel-cadmium.
   2. Venting:
      a. Batteries shall not vent gas under normal operation.
      b. Provide one-way self-resealing, safety pressure-relief valves.
   3. Battery containers:
      a. Plastic, heat-resistant, flame retardant, impact resistant.
      b. Covers shall be cemented in place to provide a permanent leak-proof seal.
      c. Effectively seal at cell terminal posts with non-corrosive material
      d. Clearly and permanently mark polarity of cell terminal posts.
   4. Vendor may offer alternate battery technology for review and acceptance by the engineer. Documentation supporting the change shall be provided.

B. Ratings:
   1. Ampere-hour capacity: Select in accordance with IEEE 1115 taking into account the calculated loads from all devices, as indicated on the Contract Drawings, for a 10-hour discharge rate to a final cell voltage of 1.75 V for the specified duty cycle.
   2. Battery duty cycle:
      a. Duration: Period of 10 hours with the battery charger/eliminator out of service, assuming batteries are in a fully charged state at the beginning of the 10 hours.
      b. Load:
         1) Normal continuous demand of the substation auxiliary loads, including relays, indicating lamps, dc-connected lights, and alarm panel.
         2) Trip and reclose cycle of one dc feeder breaker every hour.
         3) Trip and reclose of the ac breaker after two hours and again after eight hours.

C. Lockout: Provide a timer such that after a continuous 10 hours of battery charger outage, timer shall trip and lockout the main ac circuit breaker via the 86 relay and trip and lockout the dc circuit breakers via the 186 relays

D. Connections:
   1. Provide inter-cell connector buses.
   2. Provide nickel plated solid copper terminal plates, connectors, plates, and lugs.

E. Battery Racks:
   1. Provide a four tier structural steel battery support racks sized to allow 1/2 inch between batteries.
   2. Include insulating plastic strips to cover all supports, hold downs, and restraining rails that are in contact with cells.
   3. Finish with a caustic-resistant paint coat.

F. Provide an insulating, electrolyte-resistant, plastic mat under each battery rack, extending a minimum of 12 inches outside the rack.

G. Battery Rack Top:
   1. Clear polycarbonate, minimum 1/4 inch thick, with sharp edges removed.
   2. Dimensions: Minimum overall 1 inch longer and wider than battery rack length and width.

H. Provide battery bank with a stainless steel nameplate. Nameplate shall be attached to the battery rack using stainless steel rivets and marked with the following information
   1. Manufacturer's name.
   2. Month and year of manufacture.
   3. Battery and cell type.

4. Ampere rating: 1 minute, 1 hour, and 5 hour.

2.4 FUSED DISCONNECT SWITCH

A. Provide NEMA 250 Type 12, 2-pole, fused disconnect switch for isolation of the battery with the following requirements:
   1. Rating: 250 Vdc, current rating to match batteries.
   2. NEMA KS 1: Quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position.
   3. Handle lockable in OFF position.

B. Fuse Clips: Suitable for Class R or J fuses with fuse rejection devices installed.

C. Fuses: NEMA FU 1 rated to provide short circuit protection for the battery and battery cables.

D. Coordinate fuse and switch ratings with the output circuit breaker in the battery charger.

E. Install disconnect switches where indicated on Contract Drawings or required by Codes with external handle centered 60 inches above finished floor or grade level.

F. Install fuse-rejection devices in fuse clips if required.

G. Install fuses in fusible disconnect switches.

2.5 DC DISTRIBUTION PANELBOARDS

A. Comply with requirements of SECTION 34 21 12P – TES Low-Voltage Panelboards.

B. Circuit breakers: 125 Vdc, 2-pole.

2.6 DC CONTROL CIRCUIT PROTECTION AND ALARMS

A. Within switchgear, dc control circuits shall be protected by mini circuit breakers. Fuses shall not be used.

B. Mini circuit breakers: 125 Vdc, 1-pole.

C. Provide an undervoltage alarm (Device 127) for each dc control circuit:
   1. If a circuit from the dc distribution panelboard feeds downstream mini circuit breakers, each of those circuits controlled by a mini circuit breaker is considered a control circuit for the purposes of this requirement.
   2. Provide alarm to SAS; see SECTION 34 21 31P – TES Substation Automation System (SAS).

2.7 LOW-VOLTAGE DC POWER SUPPLY

A. Voltage: 24 V or 48 V, but not both.

B. Power supply shall be powered from TES substation 125 Vdc power source. Power supply shall be redundant:
   1. Provide a main low-voltage power supply with automatic transfer to a backup low-voltage power supply or operate two low-voltage power supplies in parallel.
   2. Provide two circuits, each one fed from its own breaker in the 125 Vdc distribution panelboard, to power the two low-voltage power supplies

2.8 FACTORY ASSEMBLY

A. Install charger, battery rack, and other specified equipment within each substation enclosure secure, plumb and level and in true alignment with related adjoining work.

B. Install supporting members, fastenings, framing, hangers, bracing, brackets, straps, bolts, and angles as required to set and rigidly connect the Work.

C. Temporarily install batteries to conduct factory testing, then remove before shipping.

D. Anti-oxidants and other solvents that can cause cracking of cell jars shall not be used on batteries.

E. Verify that float and recharging rates are set to the values recommended by battery manufacturer.

2.9 SOURCE QUALITY CONTROL

A. Factory Design Tests:
   1. Battery Charger: Tests shall comply with design tests described in NEMA PE 5.

B. Factory Production Tests:
   1. Test the following:
      a. Cell voltages.
      b. Pressure-relief vent operation and reseal.
      c. Cell jar leakage.

PART 3 - EXECUTION

3.1 FIELD INSTALLATION

A. Requirements of Article titled "Factory Assembly" apply to field installation.

B. Following installation of each prefabricated substation at site, install battery cells on battery racks in accordance with manufacturer's recommendations. Verify that there is minimum 1/2 inch between each battery and adjacent batteries.

C. Install specified battery rack top after installing battery cells. Secure to top of rack posts.

D. After battery installation provide an equalizing charge as recommended by battery manufacturer.

E. Mount battery rack and batteries per seismic requirements.

3.2 FIELD QUALITY CONTROL

A. Test function of batteries and charging system and test terminal connection resistance after delivery of prefabricated substations and installation of built-in-place substation in conformance with SECTION 34 21 90P – TES Testing.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes.
   1. Description: Lump Sum.

4.2 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 31P
TES SUBSTATION AUTOMATION SYSTEM (SAS)
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes SAS in TES substations including the following:
   1. Programmable Automation Controller (PAC).
   2. Human Machine Interface (HMI) Display.
   3. Industrial Ethernet switch.
   4. HMI design and software applications.
   5. SAS/SCADA points list.
   6. Local Wide Area Network (LWAN) for transfer trip between substations.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 27 05 01 – SCADA and Control System Functions

E. SECTION 34 21 17P – TES Substation Design and Assembly

F. SECTION 34 22 15P – TES Fiber Optic Cable

G. SECTION 34 21 25P – TES DC Control Power

H. SECTION 34 21 8P0 – TES Spare Parts and Special Tools

I. SECTION 34 21 90P – TES Testing

J. SECTION 34 22 10P – TES Low Voltage Conductors and Cable

K. SECTION 34 22 15P – TES Fiber Optic Cable

1.3 ABBREVIATIONS

A. CPU Central Processing Unit

B. DNP3 Distributed Network Protocol

C. DVI Digital Visual Interface

D. GPS Global Positioning System

E. HDMI High Definition Multimedia Interface

F. HMI Human Machine Interface

G. IED Intelligent Electronic Device

H. I/O Input/Output

I. LAN Local Area Network

J. LWAN Local Wide Area Network

K. MAC Media Access Control

L. NTP Network Time Protocol

M. PAC Programmable Automation Controller

N. QoS Quality of Service

O. SAS Substation Automation System

P. SCADA Supervisory Control and Data Acquisition

Q. SFP Small Form-factor Pluggable

R. SNTP Simple Network Time Protocol

S. SSD Solid State Drive

T. TFT Thin Film Transistor

U. TCP/IP Transmission Control Protocol/Internet Protocol

V. TRAIM Time-Receiver Autonomous Integrity Monitoring

W. USB Universal Serial Bus

X. VGA Video Graphics Array

Y. VLAN Virtual Local Area Network

1.4 DEFINITIONS:

A. Intelligent Electronic Device (IED): See definition in SECTION 34 21 17P – TES Substation Design and Assembly.

B. SAS: A network of PACs and IEDs in the substation operating as a system for control and monitoring of substation equipment.

C. Supervisory Control and Data Acquisition (SCADA): An industrial control system consisting of SASs and other equipment controlled and monitored by a host workstation, or "Central Control".

D. Failure: When an SAS component does not operate as designed.

E. Repeated failure: Two or more failures of the same component; whether IED, communications interface hardware, related hardware, or software.

1.5 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents, or if standard is adopted by Kansas City, the latest revision adopted:

B. Code of Federal Regulations (CFR):
   1. CFR Title 47 Part 15, Radio Frequency Devices

C. Institute of Electrical and Electronics Engineers (IEEE):
   1. IEEE C37.90, Standard for Relays and Relay Systems Associated with Electric Power Apparatus
   2. IEEE C37.90.2, Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers
   3. IEEE 730, Standard for Software Quality Assurance Plans

D. International Electrotechnical Commission (IEC):
   1. IEC 60529, Degrees of protection provided by enclosures (IP Code)
   2. IEC 60255-21, Electrical Relays - Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment
   3. IEC 61000-4, Electromagnetic compatibility (EMC)
   4. IEC 61131-2, Programmable Controllers - Part 2: Equipment Requirements and Tests
   5. IEC 61131-3, Programmable Controllers - Part 3: Programming Languages

E. International Organization for Standardization (ISO):
   1. ISO 9001, Quality Management Systems - Requirements

F. National Fire Protection Association (NFPA):

1. NFPA 70, National Electrical Code

G. Underwriters Laboratories (UL):
   1. UL 60950-1, Information Technology Equipment – Safety – Part 1: General Requirements

1.6 SUBMITTALS

A. Procedures: SECTION 01 33 00 – Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Design Submittals:
   1. A written document describing the design, method of communication, and implementation of the selected communications protocol for the SAS and related components.
   2. Detailed design of the SAS and related components. Refer to Shop Drawings, below.
   3. Submit full-scale color screen shots of SAS applications displayed on the Human Machine Interface (HMI).
   4. Provide documentation demonstrating that specified requirements for service proven design have been met. Include contact information for transit agencies where units are in service.

D. Product Data: Include technical details and operating manuals of the system and subsystems including hardware, software, MTBF information, communications protocol specifications and show compliance with the specified requirements.
   1. PACs.
   2. HMI/Industrial Computer.
   3. Input/Output (I/O) modules
   4. Ethernet switches.
   5. Media converters.
   6. Network cables.
   7. HMI Development Software.
   8. Time server and GPS antenna.
   9. Laptop computer.

E. Spare Parts and Special Tools List:
   1. Submit a list of spare parts to be provided under this Section.
   2. Submit at the same time as product data.
   3. Furnish part numbers for each part, including a detailed break down of each spare part assembly and set, as defined in SECTION 34 21 80 – TES Spare Parts and Special Tools.
   4. Submit a list of special tools to be provided under this Section, as defined in SECTION 34 21 80 – TES Spare Parts and Special Tools.

F. Shop Drawings:
   1. Block diagrams
   2. Input/output maps
   3. Equipment layout drawings
   4. Ladder logic diagrams
   5. Wiring schematic
   6. Bill of Materials

G. Software:
   1. Provide development software for the SAS, including any software required to program, maintain, and download events/records for the PACs and HMI.
   2. Provide source code developed for the PACs and HMI in electronic format as directed by the Engineer.
   3. Furnish software licenses for application, interface, development software, and all other software, as described in Software Intellectual Property Rights Section below.

H. Testing:

1. Submit test procedures that meet the requirements of SECTION 34 21 90P – TES Testing, for the following:
   a. Factory Design Tests.
   b. Operational Tests.
2. Submit test reports that meet the requirements of SECTION 34 21 90P – TES Testing, for the following:
   a. Factory Design Tests.
   b. Operational Tests.

I. Submit a System Support Plan for support during commissioning and warranty period.

J. Operations and Maintenance Data:
1. Submit manufacturer's operating and maintenance instructions on products specified in this Section, including the following:
   a. Submittal information identified above.
   b. Manufacturer's operating and maintenance instructions, parts list, illustrations and diagram for components.
2. Submit immediately after approval of product data.

1.7 SPARE PARTS

A. Deliver spare parts in accordance with SECTION 34 21 80P – TES Spare Parts and Special Tools.

B. List below applies to items in this Specification Section:
1. PACs: Provide 1 spare of each type used.
2. HMI and Industrial Computer: Provide 1 spare.
3. Ethernet switch: Provide 1 spare of each type.
4. Media converters: Provide 1 spare of each type used.

1.8 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 Systems Quality Assurance.

B. SAS components must be UL labeled.

C. SAS components that are not UL certified may be furnished with a Field Evaluation label provided by a third party testing laboratory. The testing laboratory shall be approved by the Engineer.

D. Alarm panel component manufacturers shall be ISO 9001 certified.

E. A software quality assurance plan shall be used in accordance with IEEE 730. The plan shall describe a mechanism for orderly software development.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems.

1.10 SOFTWARE INTELLECTUAL PROPERTY RIGHTS

A. Furnish an irrevocable license to Owner for application software developed under this Contract, including source code.

B. Furnish an irrevocable license to Owner for interface software for SAS components.

C. Furnish an irrevocable license to Owner for development software for SAS components and HMI.

1.11 REQUIREMENTS FOR SERVICE PROVEN DESIGN

A. SAS components and software shall be of a proven design. Provide evidence of at least 15 identical units that have been in successful operation in rail transit projects for a minimum of 3 years.

1.12 RELIABILITY AND MAINTAINABILITY

A. SAS shall be fail-safe, such that a hardware or software failure condition shall not result in an unsafe equipment state.

B. Failure of an SAS component shall not damage other equipment or inhibit status indication of the equipment.

C. Investigate repeated failure in the SAS and provide a failure analysis report outlining the root cause of failure. Provide recommendations for correcting the failure and apply the corrective action at no cost to the Owner.

D. The following components shall have a minimum mean time between failure (MTBF):
   1. PAC: 100,000 hours
   2. HMI: 50,000 hours
   3. Ethernet Switch: 200,000 hours

E. SAS shall be capable of accommodating upgrades, bug-fixes, patches and modifications.
   1. Monitor the need for system modifications and supply such changes at no additional cost to the Owner for a period of 5 years.
   2. Fully document changes and submit documentation to the Engineer.

1.13 ENVIRONMENTAL REQUIREMENTS

A. SAS components shall be designed to operate in the environment in which they will be installed and shall comply with and fully function in the environmental conditions specified in Section 34 21 17P, TES Substation Design and Assembly.

B. Electrical interfaces shall meet the applicable ANSI and IEEE Standards for service, EMI immunity, and surge-withstand requirements.

C. The presence of transients on communication interfaces shall not cause disoperation or blocking of critical communications.

1.14 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20, except as modified herein.

B. Provide on-site and remote support for the specified SAS throughout the entire warranty period. Support shall include assistance with operation and maintenance of the system.

C. Develop a comprehensive System Support Plan and submit to Engineer.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide an SAS for monitoring and control of TES substation equipment at each substation capable of interfacing with other SASs and SCADA.

B. SAS shall consist of the following components:
   1. Programmable automation controllers (PAC) or industrial computers.
   2. HMI panel/Industrial Computer.
   3. Ethernet switch.
   4. Media converters.
   5. Network cables.

6. Power supplies.

C. Devices shall use commercial off-the-shelf products to minimize integration and future maintenance efforts.

D. Devices shall be of the same brand and model with similar modules and programming to achieve similarity between substations.

E. Provide terminal blocks, in accordance with SECTION 34 21 17P – TES Substation Design and Assembly, and wiring as required for alarms.

F. SAS components shall comply with the following requirements:
1. Mechanical shock and bump withstand level: IEC 60255-21-2, Response and Withstand Section, Class 1.
2. Vibration withstand level: IEC 60255-21-1, Response and Withstand Section, Class 2.
3. Seismic withstand level: IEC 60255-21-3, Class 2.
4. Electromagnetic field impulse withstand level: IEC 61000-4-3, 10 V/m.
5. Electromagnetic field radio frequency withstand level: ANSI C37.90.2, 35 V/m.
6. Storage Temperature: Minus 20 degrees to 60 degrees C.
7. Operating Temperature: Zero degrees to 40 degrees C.
8. Maximum humidity: 90 percent without condensation.
9. Provide product data verifying compliance.

G. SAS I/O Design:
1. Provide a list of all SAS component I/O and incorporate in the design for monitoring and indication to the HMI.
2. Provide 10 additional I/O points at each substation for indication or monitoring upon request at no additional cost to the Owner.

H. SAS component memory and removable storage shall be solid-state, non-volatile, and shall not utilize mechanically-driven (hard-drive based) components.

I. SAS shall be designed such that no supply-power fault will result in loss of data or require any manual re-work such as programming or reconfiguration.

2.2 POWER REQUIREMENTS

A. SAS and PAC shall be powered by 125 Vdc plus or minus 15 percent or 24 V or 48 V plus or minus 20 percent. See SECTION 34 21 25P – TES Dc Control Power, for requirements.

2.3 TIME SYNCHRONIZATION

A. Time Server:
1. Network Protocol: IEEE 1588 PTP C37.238
2. Time Accuracy:
a. Locked to GPS: Plus or minus 50 ns RMS, 150 ns peak to peak UTC, with minimum 4 satellites tracked.
b. Holdover/Aging: 18 milliseconds per day
3. GPS receiver: 12 channel parallel receiver with TRAIM
4. PTP Server: IEEE 1588-2008 (PTP version 2) Grandmaster
5. Mechanical/ Environmental:
a. Operating temperature: Minus 20 degrees C to 70 degrees C
b. Humidity: Up to 95 percent
6. Compliance:
a. UL 60950-1
b. CFR Title 47 Part 15, Class A

B. GPS Antenna:
1. Compatible with substation master clock.
2. Roof mountable.
3. Provide with lightning arrester.

C. Synchronize SAS components as follows:
   1. PAC and IEDs.
   2. SAS with other SASs.
   3. SAS with NTP server.

D. SAS must synchronize using PTP.

E. Acceptable Manufacturer/ Product: Symmetricom SyncServer SGC-1500 with L1 GPS antenna, or approved equal.

2.4 SAS NETWORK

A. Connect IEDs to the SAS via Ethernet over fiber.

B. Use VLANs for transfer trip between dc relay IEDs through the communications network.

C. Communications Protocol: Ethernet TCP/IP, Modbus TCP/IP, or approved equal.

2.5 PAC

A. Provide PACs at each substation for interfacing with other SAS components equipped with the following:
   1. Chassis or backplane.
   2. Redundant power supplies.
   3. Primary central processing unit (CPU).
   4. I/O modules.
   5. Ports: RJ45, RS232/RS485, USB.
   6. Removable flash memory with a minimum of 1 GB.
   7. Resident executable program and code.
   8. Communication Protocols: Modbus TCP/IP, DNP3, Profinet, Ethernet TCP/IP.

B. PAC shall provide the following functions:
   1. Monitor and control of substation equipment.
   2. Log substation alarms and events as a server. The use of a dedicated or separate event log server is acceptable.
   3. Communicate alarms and status to the HMI and SCADA.
   4. Operate independently of a failure of any other SAS component or their intercommunications.
   5. Retain programming, configuration and memory (including data logs) even with loss or degradation of supply power.

C. Repair and Replacement:
   1. PAC and associated modules shall be replaceable on site without requiring factory rewiring.
   2. PAC modules shall have free-standing terminals to allow changing modules without disturbing field wiring.

D. Programming facilities (logic, available functions and supported data types) shall be non-proprietary, shall be compliant with IEC 61131-3, and shall use the C or C++ standard programming language.

2.6 HUMAN MACHINE INTERFACE (HMI) HARDWARE

A. Provide an industrial touch screen monitor with industrial computer for the SAS HMI that is compatible with the PAC for controlling substation equipment and monitoring substation events and alarms.

B. HMI and ancillary devices shall be flush mounted in a door of the station control cabinet.
   1. Locate at a height appropriate for easy access by a person of average height.
   2. Locate such that a person standing in front of the HMI is not standing in front of a circuit breaker.

C. Screen:
   1. LED backlit LCD, active matrix TFT.

2. Touch screen: Resistive or capacitive.
3. Size: Minimum 22-inches diagonal.
4. Resolution: Minimum 1920 x 1080 pixels.
5. Brightness: Minimum 420 cd/m2.
6. Contrast Ratio: 1000:1.
7. Aspect Ratio: 16:9
8. Input: VGA, DVI, HDMI.

D. Industrial Computer
1. Provide an industrial computer for interfacing with the PAC through the substation LAN and run HMI touch screen applications for display on the HMI screen.
2. Interface with the substation LAN must use Ethernet.
3. Minimum Specifications:
a. Rack mountable, 2U minimum
b. Intel Core i7
c. 8GB RAM
d. DVI, HDMI ports for connectivity to HMI display
e. Ethernet, USB 3.0 ports
f. 256GB SSD Hard Drive
g. Windows 10 Professional 64-bit
h. Operating Temperature: Minus 40 to 74 degrees C
i. Alarm Output for Monitoring by PAC and SCADA
j. Dual Power supply

2.7 HMI DESIGN AND SOFTWARE APPLICATIONS

A. Provide HMI and software applications similar to the layouts shown on Contract Drawings.

B. Design:
1. Navigation bar:
a. Accessible from any application.
b. Contains buttons to navigate to other applications.
2. Buttons, text, and icons:
a. Sized appropriately for ease of use.
b. Designed with button responses to show button actions, e.g. selected, not selected.
c. Intuitively designed and representative of the equipment being monitored or controlled.
3. Input keyboards:
a. Alpha: QWERTY.
b. Numeric: 10-key.
c. Automatically display the appropriate keyboard when an input is required.
d. Provide a cancel button that closes the keyboard.

C. Provide the following HMI software applications:
1. Header Screen:
a. Displayed at all times and similar in design to what is shown on Contract Drawings.
b. Display the time, date, name of substation, system name, and SCADA control panel.
c. Time and Date:
1) Time shall be synchronized with time server.
2) Time format: 00:00:00.
3) Date format: December 10, 2013.
d. SCADA Control Panel: Contains local/remote buttons for enabling or disabling remote control by SCADA and indicating the current control status

D. Control Screen:
1. Displays equipment status and provides local control of substation equipment.
2. Status indications:
a. Display in real time and refresh at least every second.
b. Display local/remote status for each breaker.

c. Display test/disconnected status for each breaker.
d. Display energized/de-energized status for equipment.
e. Display opened/closed status of disconnect switches.
f. Display adjacent substation breaker energized/de-energized status.
g. Display line and load voltage and current for ac and dc breakers

3. Color Code:
   a. Energized Equipment: Red.
   b. De-energized Equipment: Green.
   c. Uncertain Equipment State: Grey.
   d. Color shall indicate the energized, de-energized, or uncertain state of each piece of equipment, including the busbar, feeder cables, transformer, and rectifier.
4. Control operation:
   a. Control operation sequence:
      1) Select object.
      2) Confirm object selection (confirm or cancel).
      3) Select operation (close, open, or cancel).
      4) Confirm operation (confirm or cancel).
   b. A combined message window shall not be used; each step shall have an individual window. Collapse previous windows after selection.
   c. Selection, confirmation, and execution information must be clear and displayed without abbreviations.
   d. Selection and confirmation of operation shall be automatically cancelled after 60 seconds if the operation is not executed.
   e. Provide a cancel button for each control step.
5. Bypass Load Measuring:
   a. Provide option for dc breaker close operation that allows selection of bypass mode, which bypasses the load measuring system.
   b. Upon confirmation of this operation, a warning shall flash on the screen stating "LOAD MEASURING BYPASSED."
6. Password Protection:
   a. Selection of an object shall be password protected.
   b. Selection of bypass load measuring shall require an additional level of password protection.
7. If a protection function is triggered, the related equipment alarm field shall flash until it is acknowledged.

E. Alarm Screen:
1. Display each alarm shown in Alarm Points List, at the end of this Section.
2. Layout: See Contract Drawings.
3. New Alarm: Flashing red.
4. Acknowledged alarm: Solid red.
5. New alarms resolved before acknowledgment: Flashing yellow.
6. Resolved Alarm: Grey.
7. Alarms shall be acknowledged by touching an Acknowledge button.
8. The Alarms button in the navigation bar must follow the same color logic as above.

F. Events Screen:
1. Layout and Format: See Contract Drawings.
2. Log each alarm and equipment event with time and date stamp.
3. Event log shall display a minimum of 1000 events. Implement page turn buttons to view alarms exceeding the length of one page.
4. Events must not be capable of being deleted.
5. Overwrite the oldest entry in the log with new events.
6. Display the most recent entry at the top of the screen.
7. Events shall be downloadable to a laptop and USB flash drive without deletion from the SAS.

8. File format: Compatible with Microsoft Excel.

G. Network Status Screen:
1. Layout: See Contract Drawings.
2. Application must indicate the communication/operational status of each SAS component.
3. Normal: Green.
4. Error: Red.
5. Unknown: Yellow.

H. Settings Screen:
1. Provide a settings screen application for adjusting time, editing user management/password settings, editing alarm screen windows, and viewing PAC I/O Status.
2. Time setting: Provide both manual adjustment options and automatic SNTP synchronization with an NTP server.
3. Viewing permissions: No password required.
4. Editing permissions: Password required.

I. Help Screen:
1. Provide a help screen containing operational instructions and descriptions for the SAS HMI applications described above.
2. Organize and display help topics in an outline format with individual topics that expand to display information when selected.
3. Provide a legend defining the symbols and abbreviations used in the HMI screens.

2.8 HMI DEVELOPMENT SOFTWARE

A. Provide a user-friendly PC/Windows based development environment suitable for application software updating and modification.

B. The environment shall be dedicated solely to creating control/monitoring software. It shall use familiar, standardized editors bundled into a single application.

C. The environment shall include a graphics editor and online help that simplify development of application software.

D. The environment shall comply with Microsoft Windows Graphical User Interface (GUI) and IEC 61131-2 and IEC 61131-3 standards for programmable logic controllers.

E. Provide de-bug, documentation and machine startup facilities in the environment.

F. Provide complete user training for the application of development environment in accordance with SECTION 34 21 97P, TES Demonstration and Training.

G. Provide complete user documentation for the environment complying with SECTION 34 21 95P, TES Operation and Maintenance Data.

H. Software must be compatible with Windows 10.

I. Approved Manufacturer: Wonderware, Vijeo Designer, WinCC, or approved equal. Manufacturer provided shall be consistent with previously provided software at existing substations.

2.9 ETHERNET SWITCH

A. Provide industrial managed Ethernet switches for connecting SAS components and SCADA.

B. Ports:
1. Copper: 10/100/1000 Base T RJ45.
2. SFP: 100/1000 base-X for fiber.
3. Spare: 20 percent.

C. Layer 2 Function:
1. VLAN: Up to 8 groups.
2. Port Configuration.

3. QoS.
4. Security: MAC filter, switch access.

D. Operating temperature: minus 40 to 70 degrees C

E. Redundant power supply.

2.10 ENGINEERING LAPTOP COMPUTER

A. Provide a laptop computer for use to interface with the SAS and other IEDs in the substation LAN.

B. Development and interface software for IEDs and SAS components must be preinstalled on the computer.

C. End user software and firmware developed for IEDs and SAS components must be loaded on the laptop computer with files descriptively labeled showing their intended purpose.

D. Specifications:
1. Intel Core i7
2. 8GB RAM
3. VGA, HDMI ports
4. Ethernet, USB 3.0 ports
5. 256GB SSD Hard Drive
6. Windows 10 Professional 64-bit
7. 14-inch HD display
8. LTE mobile broadband
9. MIL-STD-810G certified for shock, drop, vibration, temperature and humidity

E. Approved Manufacturer: Panasonic Toughbook 53 or approved equal.

2.11 INTERIOR BLUE LIGHT AND RESET SWITCH

A. Provide a blue light LED for substation alarm indication located above the HMI panel.

B. The blue light shall have a label "SUBSTATION TROUBLE ALARM."

C. The light shall operate as follows:
1. Light flashes when an SAS alarm/event occurs.
2. Light is solid when all alarms are acknowledged.
3. Light turns off when all alarms are resolved.

D. Alarm acknowledgement shall be provided by a button on the HMI.

E. Blue light shall be fail safe.

2.12 EXTERIOR BLUE LIGHT

A. Activate exterior blue light (see SECTION 34 21 17P – TES Substation Design and Assembly) for the following alarms:
1. Smoke alarm.
2. Intrusion Zone 1 alarm (entry doors).
3. Intrusion Zone 2 alarm (exterior equipment access doors).
4. Ac breaker trip.
5. Dc breaker trip without reclose.
6. Rectifier transformer over temperature (first stage).
7. Rectifier over temperature (first stage).
8. Substation high temperature.
9. Diode failure.
10. Frame fault.

B. For Intrusion Zone 1 alarm, provide a time delay, and an override in the HMI only, to allow authorized persons to enter the substation and override the alarm without activating the exterior blue light.

2.13 FACTORY ASSEMBLY

A. SAS hardware installation shall be identical and interchangeable between substations, including wire numbering, and marking.

B. Wiring: Interconnecting wiring shall be 14 AWG 600 V switchboard wire in accordance with SECTION 34 22 10P – TES Low Voltage Conductors and Cable.

C. Wire and Cable Identification:
   1. Wire and cables shall be identified whenever they enter or leave a housing or enclosure, and at all terminals.
   2. Provide labels in accordance with SECTION 34 22 10P – TES Low-Voltage Conductors and Cable.

D. Terminals: DIN rail mounted.

E. Spare Capacity:
   1. Design system with a minimum of 30 percent spare capacity. This shall include:
      a. Wiring terminals.
      b. Inputs and outputs of same kind per modular controller unit.
      c. Spaces for additional modules for each modular PAC unit.

F. Workmanship:
   1. Install equipment, enclosures, wire, cable, conduits and wireways in a neat and secure manner, level and plumb, and in true alignment with adjoining work.
   2. Equipment enclosures and installation shall comply with local and national codes including, but not limited to UL 508A and NFPA 70.

2.14 ALARMS POINTS LIST

A. Provide the following points for control and monitoring by the SAS and SCADA at each substation:

Device	Description	Device No.	Status	Control
Ac Circuit Breaker and Protective Relay	Breaker closed/open status	52	X	
	Breaker test/disconnected status		X	
	Remote Trip Command		X	X
	Remote Close Command		X	X
	Undervoltage	27	X	
	Overvoltage	59	X	
	Loss of Control power	27ac	X	
	Phase Sequence	47	X	
	Time Delay Overcurrent Phase	51	X	
	Instantaneous Overcurrent Phase	50	X	
	Time Delay Overcurrent Neutral	51N	X	
	Instantaneous Overcurrent Neutral	50N	X	

Device	Description	Device No.	Status	Control
	Local/Remote Indication	43	X	
	Rear Access Door	33A	X	
	Ac Breaker Trip Healthy Coil		X	
	Ac Lockout Relay Healthy Coil		X	
	Ac Protective Relay Status		X	
	Ac Lockout Relay	86	X	
	Breaker Connected Status		X	
Power Meter	V, A, kW, kVAr, kWh		X	
	Power Meter Status		X	
Dc Feeder Breaker and Protective Relay (for each feeder breaker)	Breaker closed/open status	172	X	
	Breaker test/disconnected status		X	
	Remote Trip Command		X	X
	Remote Close Command		X	X
	Local/Remote Indication	43	X	
	Incomplete Sequence	148	X	
	Overvoltage	159	X	
	Undervoltage	127	X	
	Rate of Rise di/dt	ROR	X	
	Timed Overcurrent	151	X	
	Imax	150	X	
	Loss of Control power	27dc	X	
	Dc Voltage		X	
	Dc Current		X	
	Transfer Trip	85	X	X
	Transfer Trip Lockout	85L	X	X
	Rear Access Door	33F	X	

Device	Description	Device No.	Status	Control
Positive Disconnect Switch	Open Indication	89P	X	
	Close Indication	89P	X	
	Access Door	33P	X	
Negative Disconnect Switch	Open Indication	89N	X	
	Close Indication	89N	X	
	Access Door	33N	X	
Rectifier Transformer	Over Temperature 1 Alarm	49T1	X	
	Over Temperature 2 Trip	49T2	X	
	Temperature Monitor Status		X	
	Access Door	33T	X	
Rectifier	Over Temperature 1 Alarm	26R1	X	
	Over Temperature 2 Trip	26R2	X	
	Temp Monitor Status		X	
	Diode Failure 1 Alarm	98R1	X	
	Diode Failure 2 Trip	98R2	X	
	Access Door	33R	X	
	Reverse Current	32	X	
Battery Charger	Undervoltage	27Batt	X	
	Overvoltage	59Batt	X	
	Charger Summary Alarm		X	
TES Substation General	Ac Control Power Undervoltage Alarm	127		
	Dc Control Power Undervoltage Alarm	127		
	ETS	5	X	
	High Temperature Alarm		X	
	Smoke alarm		X	
	Intrusion Zone 1 (access doors)		X	

Device	Description	Device No.	Status	Control
	Intrusion Zone 2 (exterior equipment access doors)		X	
	HVAC 1 Status Alarm		X	
	HVAC 2 Status Alarm		X	
Rail-to-Ground Monitor	Timed Overvoltage		X	
	Instantaneous Overvoltage		X	
	Timed Overcurrent		X	
	Instantaneous Overcurrent		X	
	R2G Status		X	
Ground Fault Detector	Grounded Structure Alarm	64GS	X	
	Hot Structure Trip	64HS	X	
Substation Dc Disconnect Switch (per switch)	Open Indication		X	
	Close Indication		X	
OCS Feeder Dc Disconnect Switch (per switch)	Open Indication		X	
	Close Indication		X	
SAS	PAC Status (each)		X	
	Network Switch Status (each)		X	
	IED Status (each)		X	
	HMI/Industrial Computer Status		X	
	Time Server Status		X	
	Communication Status to Adjacent substation (each)		X	

2.15 LWAN FOR TRANSFER TRIP

A. Configure mainline substations as a local wide area network (LWAN) for transfer trip as indicated on Contract Drawings.

B. Configure for fiber from adjacent substations to the Ethernet Switch/ Gateway in each substation.

C. See SECTION 34 22 15P – TES Fiber Optic Cable, for fiber installation requirements.

D. See SECTION 34 21 19P – TES DC Switchgear, for transfer trip functional requirements.

2.16 SOURCE QUALITY CONTROL

A. Factory Design Tests:
   1. Perform with all accessories attached in accordance with design tests in IEEE C37.90.
   2. Demonstrate electrical operation and accuracy of all components.
   3. Test from alarm panel to initiating devices for proper operation.

B. Factory Production Tests:
   1. Test all components for proper operation and function.
   2. Test control wiring continuity by actual electrical operation of control devices.
   3. Test inputs and outputs for proper operation and short circuits.
   4. Communications: Verify communications and SCADA information is retrievable from the SCADA interface point.
   5. HMI: Verify that display, screens, and user interface operate in accordance with Specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

3.2 INTEGRATION WITH SCADA NETWORK – BY INSTALLATION CONTRACTOR

A. Program and configure SAS switches and SAS components to establish communication between substations and to a host SCADA workstation over the SCADA network. Coordination with SECTION 27 05 01 – SCADA and Control System Functions is required.

B. Configure dc multifunction IEDs and SAS components to communicate transfer trip signals over the Ethernet based communications network using VLAN.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes.
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 33P
RAIL-VOLTAGE MONITORING AND GROUNDING SYSTEM
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Requirements for the Rail Voltage Monitoring and Grounding System for each mainline TES substation.
   2. Rail Voltage Monitoring and Grounding System includes a bi-directional switching device and an integrated Device 64V protective relay function for voltage and current monitoring and tripping of dc feeder circuit breakers.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 26 05 00.13 – Systemwide Electrical General Requirements for Systems

D. SECTION 01 60 01 – Buy America Requirements

E. SECTION 34 21 17P – TES Substation Design and Assembly

F. SECTION 34 21 25P – TES DC Control Power

G. SECTION 34 21 31P – TES Substation Automation System (SAS)

H. SECTION 34 21 80P – TES Spare Parts and Special Tools

I. SECTION 34 21 90P – TES Testing

J. SECTION 34 22 10P – TES Low-Voltage Conductors and Cable

1.3 ABBREVIATIONS AND ACRONYMS

A. Rail-to-Ground System: Rail-Voltage Monitoring and Grounding System.

B. R2G: Rail Voltage Monitoring and Grounding System.

C. SAS: Substation Automation System

1.4 DEFINITIONS

A. Controller: A programmable logic controller (PLC) and human machine interface (HMI) device.

B. Rail voltage:
   1. Zero potential: Equal to earth potential.
   2. Positive voltage: Ground positive with respect to rail.
   3. Negative voltage: Ground negative with respect to rail.

C. Current:
   1. Positive current is current that flows from ground to rail.
   2. Negative current is current that flows from rail to ground.

1.5 SUBMITTALS

A. Procedures: SECTION 01 33 00 – Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Product Data:
   1. Product descriptions and catalog data for system components.
   2. Information concerning design and application ratings.
   3. Information concerning service, performance and reliability and locations where units are currently in service.
   4. Measures used to prevent failure of switch.

D. Spare Parts and Special Tools:
   1. Submit a list of spare parts to be provided under this Section.
   2. Submit at the same time as product data.
   3. Provide part numbers for each part, including a detailed breakdown of each spare part assembly and set, as defined in SECTION 34 21 80P – TES Spare Parts and Special Tools.
   4. Submit a list of special tools to be provided under this Section, as defined in Section 34 21 80P, TES Spare Parts and Special Tools.

E. Shop drawings:
   1. Manufacturer's arrangement and outline dimensions for each device.
   2. Logic diagram.
   3. Wiring schematics.
   4. Connection diagrams.
   5. HMI screen shots.

F. Submit test procedures that comply with SECTION 34 21 90P – TES Testing.
   1. Design Test.
   2. Production Tests: Provide production test reports for each component.

G. Submit test reports that comply with SECTION 34 21 90P – TES Testing.
   1. Design Test.
   2. Production Tests: Provide production test reports for each component.

H. Operation and Maintenance Data:
   1. Submit manufacturer's operating and maintenance instructions on products specified in this Section, including the following:
      a. Submittal information identified above.
      b. Parts list, illustrations and diagram for components for products specified in this Section.
      c. Wiring diagram.
   2. Submit immediately after approval of product data.

1.6 SPARE PARTS

A. Provide spare parts in accordance with SECTION 34 21 80P – TES Spare Parts and Special Tools.

B. List below applies to items in this Specification Section.
   1. Rail-to-Ground System complete assembly, including PLC, HMI, and switch: Provide 1 assembly.
   2. Rail-to-Ground PLC; Provide 1 spares.
   3. Rail-to-Ground HMI; Provide 1 spare.
   4. Enclosure door key: Provide 2 spare keys for each substation.

1.7 QUALITY ASSURANCE

1. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 Systems Quality Assurance.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems, except as modified herein.

1.9 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

PART 2 - PRODUCTS

2.1 RAIL-TO-GROUND SYSTEM (R2G)

A. General Requirements:
   1. Provide an R2G at each TES substation for monitoring and protecting against rail-to-ground overvoltages and overcurrents.
   2. R2G shall be of proven design with minimum 3-years successful operation in a rail application.
   3. R2G shall be a self-contained unit with a bi-directional switching element, voltage transducer, current transducer, and PLC/HMI controller suitable for use in a 750 Vdc traction power system.

B. Controller:
   1. Dedicated PLC.
   2. Form C contacts for overvoltage, overcurrent, and summary alarm signals.
   3. Sufficient memory to store 500 events

C. HMI Display:
   1. Type: Industrial LCD touch screen monitor with resistive touch.
   2. Size: 12-inch active matrix, minimum.
   3. Color: 18-bit color.
   4. Resolution: 1600 x 1200.
   5. Contrast Ratio: 600:1.

D. Bi-Directional Switch:
   1. Composed of phase-controlled stud-type thyristors.
   2. Continuous Current Rating: Minimum 800 A.
   3. Current Withstand: 30 kA for 100 ms and 50 kA for peak value half sine wave.

E. Enclosure: Steel, with a latching access door that is lockable; all enclosures keyed alike.

F. LED indications:
   1. Provide LED indicators mounted on the enclosure
      a. Red LED: Switch is closed and conducting
      b. Yellow LED: Event has occurred. LED will remain flashing until acknowledged.

G. Acknowledge Button:
   1. Provide a momentary push button on the outside of the enclosure for the local acknowledgement of the yellow LED event alarm

H. Control power: Refer to Section 34 21 25P TES Dc Control Power

I. Communications:
   1. Protocol: Modbus TCP/IP, Ethernet TCP/IP, or approved equal.
   2. Device shall be capable of being remotely monitored by the SAS, as specified in Section 34 21 31P, TES Substation Automation System (SAS), and SCADA.
   3. R2G shall communicate alarms and switch status to the SAS.

2.2 HMI APPLICATION DESIGN

A. General Design Requirements:
   1. Provide HMI applications for displaying event notifications, rail voltage and current data, and device configuration information.
   2. HMI must provide a means of field programming time and date, voltage and current triggers, and communications settings.

3. HMI must have password protection for functions related to changing the configuration of the device.
4. Current date and time must be displayed at all times.
5. R2G must synchronize time and date with the SAS.

B. Event Log:
1. Record events and retain for seven days minimum in non-volatile memory.
2. Create events for the following:
   a. Overvoltage, with voltage at the time of event;
   b. Overcurrent, with current at the time of event;
   c. Switch trigger;
   d. Thyristor fail;
   e. Breaker trip;
   f. Breaker lockout;
   g. R2G fault.
3. Events must be date and time stamped.
4. Events shall be downloadable onto a laptop computer and USB thumb drive.
5. Event log must be viewable using Microsoft Excel.
6. See Section 34 21 17P, TES Substation Design and Assembly, for requirement to supply software.

C. Waveform Capture:
1. Log and capture voltage and current data upon voltage and current triggers.
2. Waveform information shall be downloadable onto a laptop computer and USB thumb drive.
3. Waveform information must display the voltage and current before and after the trigger event.
4. Log must be viewable using Microsoft Excel.

D. Overvoltage Protection:
1. Long-Time Overvoltage:
   a. Voltage setting range: 0 to 200 V, positive or negative, in 1 V increments.
   b. Time delay setting range: 0 to 20 seconds in 0.1-second increments.
   c. Default setting: Plus/minus 50 V and 10-second delay.
2. Short-Time Overvoltage:
   a. Voltage setting range: 0 to 200 V, positive or negative, in 1 V increments.
   b. Time-delay setting range: 0 to 10 seconds in 0.1-second increments.
   c. Default setting: Plus/minus 95 V and 1-second delay.
3. Each voltage trigger shall close the R2G switch.

E. Switch Operation:
1. Time duration of closure shall be dependent on the current flowing through switch and the natural characteristics of the thyristor.
2. Provide an option for disabling conduction of the switch in each direction. This option must be field adjustable using the HMI.

F. Overcurrent Protection:
1. When switch is conducting, the R2G shall monitor current through the switch and provide two overcurrent-protection triggers.
2. Long-time overcurrent:
   a. Current setting range: 0 to 100 A, positive or negative, in 1 A increments.
   b. Time-delay setting range: 0 to 60 seconds in 0.1-second increments.
   c. Default setting: Plus/minus 5 A and 50-second delay.
3. Instantaneous overcurrent:
   a. Current setting range: 0 to 100 A, positive or negative, in 1 A increments.
   b. Time-delay setting range: 0 to 60 seconds in 0.1-second increments.
   c. Default setting: Plus/minus 20 A and 0.5-second delay.

4. Each overcurrent stage shall trigger any one of three user-selectable responses:
    a. Trip and reclose dc breakers with breakers reclosing one-by-one.
    b. Trip and lockout dc breakers.
    c. Trip and lockout dc breakers and transfer trip adjacent substations.
5. The R2G shall trip and lockout the breaker on a repeat overcurrent trigger if it occurs within a user-adjustable time. The user-adjustable settings are as follows:
    a. Repeat Trigger Function: Enabled, Disabled.
    b. Time-Window Setting range: 2 to 60 seconds in 1-second increments. The setting shall not be less than the instantaneous-overcurrent time delay.
    c. Default setting: 60 seconds.

G. If the current or voltage value measured by the R2G is lower than its setting, the grounding device counters shall be reset.

H. R2G shall be fail-safe as described in the following two scenarios, at minimum:
1. A malfunction of the control component shall cause grounding switch to close until control component is restored.
2. An alarm signal shall be sent to SAS if a thyristor or control component fails.

2.3 CONNECTIONS

A. Ground R2G enclosure and internal ground reference busbar to the structure earth using 4/0 copper, 2 kV insulated cable, as specified in Section 34 22 10P, TES Low-Voltage Conductors and Cable.

B. Connect the R2G negative reference to the negative return using 4/0 copper 2 kV insulated cable.

2.4 SOURCE QUALITY CONTROL

A. Factory Design Tests:
1. Perform on the first unit before it is installed in a substation. Comply with requirements for factory design tests in Section 34 21 90P, TES Testing. This test must be conducted and will not be waived on the basis of existing test reports.
2. Perform a heat run test to verify 800A continuous current rating.
3. Perform functional tests to verify the requirements in this Section.

PART 3 - EXECUTION - NONE

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes.
1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 50P
DC SURGE ARRESTERS
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Product and installation requirements for dc surge arresters in TES substations.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 34 21 80P – TES Spare Parts and Special Tools

E. SECTION 34 21 90P – TES Testing

F. SECTION 34 22 10P – TES Low-Voltage Conductors and Cable

G. SECTION 34 22 26P – TES Grounding and Bonding

1.3 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. American Society for Testing and Materials (ASTM)
   1. ASTM B3, Soft or Annealed Copper Wire
   2. ASTM B172, Rope-Lay Stranded Conductors having Bunch Stranded Members

C. American National Standards Institute (ANSI)
   1. ANSI C62.11, Standard for Metal-Oxide Surge Arresters for Ac Power Circuits (> 1 kV)

D. National Electrical Manufacturer's Association (NEMA)
   1. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum)

1.4 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Product Data:
   1. Descriptive data on the surge arresters to be provided.
   2. Shop (installation) drawings to scale showing the surge arrester installation.

D. Spare Parts and Special Tools:
   1. Submit a list of spare parts to be provided under this Section.
   2. Submit at the same time as product data.
   3. Provide part numbers for each part, including a detailed break down of each spare part assembly and set, as defined in Section 34 21 80P, TES Spare Parts and Special Tools.
   4. Submit a list of special tools to be provided under this Section, as defined in Section 34 21 80P, TES Spare Parts and Special Tools.

E. Submit factory test reports within 30 days after conducting tests:
   1. Design test reports.

2. Production test reports.

1.5 SPARE PARTS

A. Provide spare parts in accordance with Section 34 21 80P, TES Spare Parts and Special Tools.

B. List below applies to items in this Specification Section.
   1. Dc surge arrester, complete with mounting bracket and minimum 3-foot extra-flexible grounding conductor: Provide 2 spares.

1.6 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 Systems Quality Assurance, except as modified herein.

B. Surge Arresters shall be UL labeled or shall be furnished with a Field Evaluation label in accordance with Section 34 21 17P, TES Substation Design and Assembly.

C. Manufacturer's Qualifications:
   1. Manufacturer shall have minimum 5 years of successful use of its surge arrester at light rail or streetcar facilities.
   2. Excessive failures of the proposed surge arrester at one or more transit facilities disqualifies the product for use on this project.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems, except as modified herein.

1.8 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

PART 2 - PRODUCTS

2.1 DC SURGE ARRESTERS

A. Dc surge arresters shall be outdoor style, intermediate class and shall be designed, constructed, and tested in accordance with the general requirements of ANSI C62.11.

B. Surge arresters shall be of the metal oxide varistor (MOV) type.

C. MOV elements shall be fully encapsulated in epoxy.

D. Minimum conduction voltage: 1000 V.

E. Energy discharge capability: 2.6 kJ for currents 500 A or less.

F. Reverse voltage across rectifier silicon diodes: Arresters shall limit to a value less than 75 percent of the peak-reverse-voltage rating of the diode by limiting the rise of the transient on the positive to negative bus.

G. Acceptable Manufacturer/Supplier: Reuel/Balfour Beatty Rail, Inc., IMP-1, or approved equal.

2.2 GROUNDING CONDUCTOR

A. Extra-flexible bare cable: Copper, 4/0 AWG, Class I stranding, ASTM B3, ASTM B172.

B. Insulated cable: Copper, 4/0 AWG, 2 kV rated insulation. Refer to Section 34 22 10, TES Low-Voltage Conductors and Cable, for requirements.

C. Splice: C-type compression connector, Burndy Hyground or approved equal.

2.3 SOURCE QUALITY CONTROL

A. Design Testing:

1. Test to Failure:
    a. Perform test on one surge arrester.
    b. Install surge arrester in proposed enclosure, or in approved alternate mounting arrangement, complete with cables connected.
    c. Test to failure at two times energy rating and verify that arc clears and that enclosure does not fail catastrophically.
    d. If enclosure does not contain the surge arrester failure, submit a new surge arrester, new enclosure, or both, and retest.

B. Production Testing:
1. Energy Test:
    a. Test each surge arrester and provide test report.
    b. Test at 80 percent of rated energy.
2. Voltage Test (minimum requirement; additional tests may be performed):
    a. Test each surge arrester after completion of the energy test and provide test report.
    b. Test using a calibrated ac dielectric test set capable of reading leakage values.
    c. Apply 1000 Vac for 30 seconds. Maximum allowable leakage current 15 mA.
    d. Increase voltage to 1100 Vac for 5 seconds. Maximum allowable leakage current 30 mA.

2.4 TES SUBSTATION ASSEMBLY

A. Negative: Provide surge arresters connected between the negative bus and the ground mat.

B. Positive: Provide surge arresters between the load side of each dc feeder breaker and substation ground as indicated on Contract Drawings.
1. Wall mount surge arresters on insulated brackets on exterior of substation.
2. Mounting Height: Minimum 8 feet to bottom of surge arrester.

C. Install in accordance with surge arrester manufacturer's instructions and as indicated on Contract Drawings.

D. Install conductors with a minimum number of bends. Bends shall be no less than 8-inch radius.

E. Connection of cable to surge arrester on ungrounded side shall be taped and covered with a heat-shrink insulating sleeve to provide an insulation level of 1000 V.

F. Ground side of surge arrester: Provide extra flexible grounding conductor, minimum length 3 feet.

PART 3 - EXECUTION

3.1 TES SUBSTATION SURGE ARRESTERS

A. Connect extra-flexible copper ground to ground-mat pigtail.

B. If ground-mat pigtail is too short, provide cable and splices to connect ground-mat pigtail to substation surge arrester extra-flexible copper ground.

3.2 NOT USED

3.3 TESTING SURGE ARRESTER GROUNDS - BY INSTALLATION CONTRACTOR

A. Test surge arrester grounds in accordance with Section 34 21 90P, TES Testing.

B. See required maximum values for grounds in Section 34 22 26P, TES Grounding and Bonding. –

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes.
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 75P
TES ASSURANCE
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes developing and implementing a Systems Assurance Program for this Contract, encompassing system safety and reliability engineering to accomplish the following:
   1. Avoid, eliminate or reduce potential identified hazards at the early stage of the project life.
   2. Control and minimize hazards to passengers, personnel, and public.
   3. Incorporate fail-safe design principle if possible.
   4. Use high reliability and predictable failure modes components.
   5. Support for the Owner's Safety Certification Program.

1.1 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

1.2 REFERENCED STANDARDS

A. This Section incorporates by reference the latest revisions of the following documents:

B. U.S. Department of Transportation, Federal Transit Administration
   1. DOT-FTA-MA-26-5005-00-01, Hazard Analysis Guidelines for Transit Projects http://www.fta.dot.gov/documents/HAGuidelines.pdf
   2. DOT-FTA-MA-90-5006-02-01, Handbook for Transit Safety and Security Certification http://transit-safety.volpe.dot.gov/publications/safety/SafetyCertification/pdf/SSC.pdf

1.3 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Qualifications:
   1. Resume for each proposed person preparing required submittals.
   2. Samples of similar documents prepared by each proposed person for previous projects.

D. Proposed Software: Product data, list of projects where used, sample output.

E. System Safety Program Plan (SSPP):
   1. Submit the following hazard analyses included in the SSPP in compliance with DOT-FTA-MA-26-5005-00-01:
      a. Preliminary Hazard Analysis (PHA).
      b. Fault Tree Analysis (FTA).
      c. Failure Mode Effect and Criticality Analysis (FMECA).
      d. Operating Hazard Analysis (OHA).
   2. For each hazard analysis, include either separate sections or submit separate submittals for each Systems subsystem:
      a. TES substations

1.4 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 Systems Quality Assurance, except as modified herein.

B. Qualifications:
   1. Documents required in this Section shall be prepared by persons with a minimum of 5-years experience preparing comparable documents for the transit industry.
   2. Persons preparing documents for each Systems subsystem shall be experienced in that subsystem.
   3. Provide samples of documents from previous projects that demonstrate familiarity with the process and subject matter.

C. Software:
   1. Prepare required documents using recognized industry analysis software.

PART 2 - PRODUCTS

2.1 SYSTEM SAFETY PROGRAM PLAN (SSPP)

A. The SSPP is designed to eliminate and/or control identified hazards. Include the following hazard analyses prepared in accordance with the guidelines in DOT-FTA-MA-26-5005-00-01:

B. The SSPP is designed to identify and eliminate hazards where possible, and where not possible, to control identified hazards.

C. Prepare the following safety analyses in accordance with the guidelines in DOT-FTA-MA-26-5005-00-01. Conform to the schedule in DOT-FTA-MA-26-5005-00-01.
   1. Preliminary Hazard Analysis (PHA): Perform during the concept-planning phase.
   2. Failure Mode Effect and Criticality Analysis (FMECA): Perform during preliminary design so that identified changes can be incorporated into the final design. Update during the commissioning and integrated testing phase if additional hazards are identified.
   3. Fault Tree Analysis (FTA): Perform at the beginning of final design.
   4. Operating Hazard Analysis (OHA): Perform during the latter portion of final design. Update during the commissioning and integrated testing phase if additional hazards are identified.

PART 3 - EXECUTION

3.1 IMPLEMENTATION OF SYSTEM SAFETY

A. After completion of required safety submittals, implement changes required to eliminate or mitigate hazards, at no cost to the Owner:
   1. Change design if necessary to eliminate identified hazards.
   2. Where hazards cannot be eliminated, include safety devices and warning devices in design to mitigate hazards.
   3. If an identified hazard can be mitigated only by procedures and training, identify specifically where the hazard has been addressed in training program and Operation and Maintenance Manuals.

3.2 SAFETY CERTIFICATION PROGRAM

A. The Owner may comply with FTA guidelines to implement a Safety Certification Program (reference DOT-FTA-MA-90-5006-02-01).

B. Support the Owner's implementation of the program as directed by Engineer.

C. Participation includes activities such as assisting the Owner with development of checklists and documentation, identifying submittals that satisfy requirements of the Certifiable Item List, providing standards to which components are designed and tested, and identifying safety-related instructions in training and maintenance documents.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes.
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 80P
TES SPARE PARTS AND SPECIAL TOOLS
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Requirements for providing spare parts indicated in Related Sections.
   2. Requirements for providing maintenance equipment.

B. Related Section
   1. SECTION 01 33 00 – Submittal Procedures
   2. SECTION 01 43 00 – Systems Quality Assurance
   3. 01 60 01 – Buy America Requirements
   4. 34 21 08P - TES Dielectric Epoxy Flooring
   5. 34 21 10P - TES Self-Contained Eyewash Equipment
   6. 34 21 12P - Low-Voltage Panelboards
   7. 34 21 14P - TES Medium-Voltage AC Circuit-Breaker Switchgear
   8. 34 21 16P - TES Substation Enclosures
   9. 34 21 17P – TES Substation Design and Assembly
   10. 34 21 18P - TES Lighting
   11. 34 21 19P - TES DC Switchgear
   12. 34 21 23P - TES Transformer-Rectifier Unit
   13. 34 21 24P - TES Dry Type Transformers
   14. 34 21 25P - TES DC Control Power
   15. 34 21 31P - TES Substation Automation System (SAS)
   16. 34 21 33P – Rail-Voltage Monitoring and Grounding System
   17. 34 21 50P - DC Surge Arresters
   18. 34 22 10P - TES Low-Voltage Conductors and Cable
   19. 34 22 15P - TES Fiber Optic Cable

1.2 DEFINITIONS

A. Assembly: A unit consisting of components or parts that have been fitted together to form a self-contained device or fixture.

B. Set: The quantity of the stated part that is provided as part of one substation. For example, if the part is "LEDs for Dc Switchgear," and 1 substation has 2 red LEDs, 2 green LEDs, and 1 white LED for Dc Switchgear, then 4 sets consists of 8 red LEDs, 8 green LEDs, and 4 white LEDs.

1.3 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Submit all items described below with delivery of the substation:
   1. Comprehensive list of mandatory spare parts. Include spare parts listed in each section of these Specifications that contains a spare parts requirement. List by Specification section.
   2. Comprehensive list of mandatory special tools for each TES substation.
   3. List of additional recommended spare parts, special tools, and test and maintenance equipment. List separately the recommended special tools, test, and maintenance equipment that can be shared by substations.
   4. Provide part numbers for each part, including a detailed break-down of each spare part assembly and set.

5. Provide a price for each part that can be purchased separately, effective for 1 year after delivery.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems.

B. Schedule: Delivery of spare parts shall be complete at time of delivery of the substation.

C. Notice and Shipping List: Provide Engineer notice of delivery and a complete shipping list a minimum of 10 days before delivery. Shipping list shall include the following:
   1. Quantity of each part.
   2. Manufacturer's part number.
   3. Serial number, if applicable.
   4. Description.
   5. Spaces for inserting date of delivery, signature of Vendor, and signature of Engineer.

D. Authorization: Spare parts shall not be shipped until authorized by Engineer.

E. Location: Deliver spare parts to a location in greater Kansas City, Missouri metropolitan area designated by the Engineer.

F. Packaging: Package and label spare parts in moisture-proof containers suitable for shipment and storage. Attach copies of shipping list in the package and to the exterior of the package.

G. Unloading: Unload spare parts in a manner that will prevent damage to the packages and the contents.

H. Inspection:
   1. Engineer will open the packages and inspect spare parts for damage. Damaged parts will be returned to Vendor and shall be replaced with undamaged parts and materials at no additional expense to the Owner.
   2. Assist Engineer in verifying quantity of parts.
   3. Sign shipping list with quantities verified, obtain Engineer's signature, and date. Engineer will retain the signed shipping list.

1.5 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

PART 2 - PRODUCTS

2.1 REPLACEMENT PARTS

A. Mandatory Spare Parts:
   1. Provide quantity and type of spares specified in each Specification Section. Supply of a spare from one Section does not satisfy the requirement for an identical spare specified in a different Section.
   2. Spare parts shall be identical to those submitted for approval and provided in substations.
   3. Unit price: Include on the submitted mandatory and recommended spare parts lists a price for each item that can be purchased separately, effective for 1 year after notice to proceed.

B. Spare Parts for Warranty Repairs:
   1. The capital spare parts or the spare parts ordered by the Owner for support of operations are not to be used by the Vendor for warranty repairs and warranty parts replacements. Engineer will not be responsible for receiving or storing any parts for warranty support.
   2. At the end of the warranty period, the Owner may consider a negotiated price for purchase of parts stocked by the Vendor for warranty support.

C. Availability of Replacement Parts:
   1. Guarantee parts availability for a period of 10 years from Contract award.

2. Provide detailed manufacturing drawings to the Owner at the end of the 10-year period or when the availability of parts ceases after that date.

2.2 MANDATORY SPECIAL TOOLS

A. Special tools include but are not limited to fixtures, equipment, gages, hand tools, power tools, motors, or other tools and equipment necessary to troubleshoot, maintain, repair, overhaul, assemble, disassemble, and adjust the TES substation and other elements of the traction electrification system that are not commonly available from commercial tool suppliers.

B. Provide one set of special tools for each substation and one set for the traction electrification system.

2.3 RECOMMENDED SPARE PARTS AND SPECIAL TOOLS

A. Provide list of recommended spare parts including description, break down, part number, recommended quantity, and unit price.

B. Provide list of recommended special tools, test, and maintenance equipment. The Owner may or may not exercise purchase of the recommended items.

PART 3 - EXECUTION - NONE

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes.
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 90P
TRACTION ELECTRIFICATION SYSTEM (TES) TESTING
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. General testing requirements.
   2. Factory Acceptance Testing TES substation and its components.
   3. Other test requirements appear in other Sections.

B. The requirements of this Section apply to all Division 34 21 xxP and 34 22 xxP Sections.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 34 21 05P – Common Work Results for TES

E. SECTION 34 21 15P – TES Lighting

F. SECTION 34 21 19P – TES Dc Switchgear.

G. SECTION 34 21 25P – TES Dc Control Power

H. SECTION 34 21 31P – TES Substation Automation System (SAS)

I. SECTION 34 21 33P – TES Rail Voltage Monitoring and Grounding System

J. SECTION 34 22 26P – TES Grounding and Bonding

1.3 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents.

B. Institute of Electrical and Electronics Engineers (IEEE):
   1. IEEE 80, IEEE Guide for Safety in Ac Substation Grounding
   2. IEEE 81, Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
   3. IEEE 400, Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems
   4. IEEE 1187, Recommended Practice for Installation Design and Installation of Valve-Regulated Lead-Acid Batteries for Stationary Applications
   5. IEEE 1188 Recommended Practice for Maintenance, Testing, and Replacement of Valve-Regulated Lead-Acid (VRLA) Batteries for Stationary Applications
   6. IEEE C37.20.1, Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
   7. IEEE C37.20.2, Standard for Metal-Clad Switchgear
   8. IEEE C37.41, Standard Design Tests for High-Voltage (> 1000 V) Fuses, Fuse and Disconnecting Cutouts, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories Used with These Devices

C. International Electrical Testing Association (NETA):
   1. NETA ATS, Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems

D. National Electrical Manufacturers Association (NEMA):
   1. NEMA PE 5, Utility-Type Battery Chargers

1.4 FAILURE OF TEST

A. If any test fails, make corrections and retest at no additional cost to the Owner.

B. If off-site test is witnessed by Engineer or his representatives and fails, Vendor shall pay for return trip to facility or test site(s) including air fare and lodging.

C. In the event equipment is not ready for testing by Vendor upon agreed testing date and Engineer or his representatives arrive at test site, Vendor shall pay for return air fare and lodging of Engineer or his representatives.

1.5 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Test program plan: Submit within 120 Days after NTP and provide monthly updates.

D. Test procedures:
   1. Submit a minimum of 60 Days before test is scheduled to be performed.
   2. Tests shall not be performed and test reports will not be considered valid until procedures are approved by Engineer.

E. Test reports:
   1. Submit within 30 calendar days after completion of each test unless otherwise indicated.
   2. Factory Design Test Reports:
      a. Submit existing test reports 90 calendar days before shipping equipment.
      b. Equipment shall not be shipped until the report is approved by the Engineer.
   3. Factory Production Test Reports: For each test specified in this Section.
   4. Submit Electrically Insulated Floor and Wall Test Report for each substation before installing substation equipment:
   5. TES Substation Factory Acceptance Test Report.
   6.
   7. Pretest TES Substation Factory Acceptance Test Report.

1.6 REQUIREMENTS FOR TEST PROGRAM PLAN, TEST PROCEDURES, AND TEST REPORTS

A. Test Program Plan:
   1. Identify each test by reference to the Section, Article, and Paragraph number of the appropriate Technical Section of these Specifications.
   2. Provide a detailed schedule showing the time and place of each test to be performed.
   3. Tests to be included:
      a. Each test described in this Section and in other Contract Specification Sections, including a test for each substation equipment type or assembly.
      b. Supplier and SubVendor tests to be completed at the suppliers' or SubVendors' plants.
      c. Vendor's tests to be completed at its plant or approved independent testing lab prior to delivery.
      d. Other tests conducted by Vendor in connection with its own Quality Assurance program.

B. Test Procedures: Develop detailed test procedures for each test containing the following:
   1. Title of test.
   2. Contract Specifications Section, Article, and Paragraph number.
   3. Test location.

4. Name of the agency performing each test (Vendor, its supplier, or an independent testing company).
5. Test objective.
6. Equipment and instrumentation requirements including manufacturer's name, model number, and serial number.
7. Personnel requirements.
8. Attached copies of applicable portions of ANSI, IEEE, or NEMA standards. Obtain permission of copyright holder to reproduce the necessary portions of standards and pay copyright holder if required.
9. Test methodology including test setup, with circuit diagrams and test sequence.
10. A step-by-step procedure for performing the test, including all steps required for each device tested, even if devices are identical. For example, if there are four circuit breakers to test, provide a separate step-by-step procedure for each breaker.
11. Forms for recording test data:
    a. May be incorporated into step-by-step procedure.
    b. Include space for test equipment calibration data.
    c. Include a step-by-step format for data reduction and formulas used in deriving the format.
    d. Include criteria for acceptability and justification for the criteria set forth, including procedures for evaluating data.
    e. Include space for signatures of test witnesses.
12. Expected test results.
13. Test evaluation procedures.
14. Proposed test report form.

C. Test Reports:
1. Each test report shall have attached the related and approved test procedure.
2. Each report shall document the test results obtained and shall include the following information:
    a. Title of test.
    b. Contract Specifications Section and Article number.
    c. Test objectives.
    d. Summary and conclusions including Pass/Fail or N/A.
    e. Test location, date, and time.
    f. List of test equipment used, including the following for each piece of test equipment:
        1) Manufacturer's name.
        2) Model number.
        3) Serial number.
        4) Calibration certificate showing that equipment was calibrated by an independent agency within the previous 12 months.
    g. Conditions of test, including temperature and humidity.
    h. Raw test data from the approved test procedure forms.
    i. Summarized test data including tables, curves, photographs and any additional test data required to support the test results.
    j. Test results in a form that can easily be compared to these Specifications requirements.
    k. Descriptions of equipment and material failures, and reasons for the failure.
    l. Descriptions of all modifications to equipment or wiring performed during testing, reasons for modifications, and names of individuals approving such modifications.
    m. Abbreviations and references.
    n. Signatures of tester and test witnesses.

1.7 WITNESSING OF TESTS

A. Engineer will, at his/her option, witness all tests.

B. Testing Notification: At least 30 calendar days before each test, upon the approval of test procedure, notify Engineer in writing of the date, time, and location the test will be performed.

C. Verify that test equipment bears a current calibration sticker before scheduling testing.

D. If Engineer elects not to witness a test or tests, test reports shall nevertheless be submitted to Engineer for review and approval.

E. Witnessing of test by Engineer shall not waive requirements in Specifications or relieve Vendor from its responsibility to produce test report in accordance with Specifications.

1.8 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 Systems Quality Assurance.

B. Calibration of Testing Equipment:
   1. Testing equipment must be calibrated by an independent agency minimum every 12 months, or more frequently if recommended by the manufacturer.
   2. Calibration sticker shall be affixed to test equipment indicating last calibration date.

C. Quality of Test Data:
   1. Take a sufficient number of test readings to assure that random factors due to human error in reading the instruments and transient disturbances in electrical network have negligible influence on final results.
   2. Establish adequacy of the data as follows:
      a. Examine data to verify that removal of either the highest or lowest value will not alter the arithmetic average of the group by more than 5 percent.
      b. If the average would be altered by more than 5 percent, take one more set of data and combine results with the first set.
   3. If the average of the combined data would still be altered by more than 5 percent if the highest or lowest value were removed, advise Engineer that an unstable condition might exist.

PART 2 - PRODUCTS

2.1 TESTING EQUIPMENT

A. Electrical Megohmmeter for Insulation Testing:
   1. 1000 Vdc output voltage suitable for resistance measurement from 500 kilohm to 500,000 megohms. Use a megohmmeter with an internal bleeder resistor for discharge.
   2. Approved Manufacturer: Hipotronics or approved equal.

B. High-Potential Test Set:
   1. Portable high-potential dc test set, 0 to 130 kVdc, 10 mA with regulated output.
   2. Internal shorting solenoid and discharge resistor.
   3. Full-scale accuracy: 2 percent.
   4. Capable of measuring cable insulation resistance up to 5,000,000 megohms.
   5. Approved Manufacturer: Hipotronics or approved equal.

2.2 FACTORY DESIGN TESTS

A. General Requirements:
   1. Tests shall be conducted by or under supervision of the equipment manufacturer.
   2. Demonstrate compliance with specified design requirements.
   3. Perform on production components, assemblies, subsystems and substations on the highest level of assembly that will allow demonstration of design compliance.
   4. Perform on the first production unit and perform in accordance with these Specifications.

B. Perform Factory Design Tests as specified in each 34 21 xxP and 34 22 xxP section, under the Part 2 article titled "Source Quality Control."

C. Existing Test Reports:

1. Unless otherwise specified, if design tests have already been performed by the manufacturer of equipment, existing test reports may be submitted to Engineer, who will determine whether the new design test may be waived.
2. Existing test reports need not meet the format requirements specified in this Section, but content of reports shall include all relevant information.

2.3 FACTORY PRODUCTION TESTS

A. General Requirements:
   1. Tests shall be conducted by or under the supervision of the equipment manufacturer.
   2. Demonstrate that each unit to be delivered operates within specified limits and is in compliance with design requirements and industry standards.
   3. Test requirements may vary from an inspection and functional demonstration for a simple component to a full system functional demonstration of an assembly.

B. Perform Factory Production Tests as specified in each 34 21 xxP and 34 22 xxP section, under the Part 2 article titled "Source Quality Control."

C. Tests in this Section are in addition to those specified in other 34 21 xxP and 34 22 xxP sections.

D. Electrically Insulated Floor and Wall Tests:
   1. Perform hi-potential dielectric tests on the epoxy floor and wall insulation installed in each TES substation enclosure prior to the installation of substation equipment.
   2. Provide a hi-potential tester with a voltage range of 0-15,000 Vdc and a current range of 0-2000 microamperes dc to perform the tests.
   3. Floor: Perform a wet mop test as follows:
      a. Provide a sponge mop with a non-metallic handle. Provide a copper plate behind the sponge with a wire terminal to attach the test lead.
      b. Connect one lead from the tester to the copper disk and the other lead to the station ac ground bus.
      c. Apply 2500 Vdc from the hi-potential tester, using precautions such as insulated boots and hot gloves to protect the test technician.
      d. Saturate the mop with saline solution of 1/3 salt and 2/3 water (by volume).
      e. Mop the entire insulated floor with the room darkened. Re-saturate the mop as necessary.
      f. Visible arcing indicates inadequate dielectric strength of the epoxy coatings; apply additional layers of epoxy until the leakage current is lower than 50 microamperes.
   4. Walls: Perform a copper disk test as follows:
      a. Provide a copper disc 4 inches in diameter and 1/4-inch thick. The disk shall have a non-conductive handle and wire terminal to attach the test lead.
      b. Connect one lead from the tester to the copper disk and the other lead to the station ground bus.
      c. Place the copper disc on the wall insulation at a minimum of 10 locations selected by Engineer where the laminate is fastened to the wall with mechanical fasteners.
      d. Apply 2500 Vdc for 60 seconds and record the leakage current.
      e. If leakage current is greater than 50 microamperes, epoxy insulation shall be applied to the fastener to increase the insulation and the fastener retested.

2.4 TES SUBSTATION FACTORY ACCEPTANCE TESTS

A. General Requirements:
   1. Perform test for each completely assembled substation at substation manufacturer's facility before shipping substation to site.
   2. Perform at ambient conditions unless a specific environmental or operating limit is necessary to demonstrate acceptable operation.
   3. Tests shall demonstrate that each substation is complete and ready for shipping to the site, both functionally and cosmetically.

B. Pretest: Perform for each substation using an approved test procedure and submit a test report prior to performing the factory acceptance test for witnessing.

C. Wire and Cable Testing:
   1. Perform tests after factory wiring and terminations have been installed.
   2. Inspect wire and cable for physical damage and proper connections.
   3. Protect semiconductor devices against the test voltage by means of shorting jumpers or other methods accepted by Engineer, if they are not inherently protected by the circuit in which they are used.
   4. Continuity Tests: Check continuity from point to point and check for shorts to ground with an ohmmeter.
   5. Insulation Resistance Tests:
      a. Measure insulation resistance with a 1000 Vdc megohmmeter.
      b. Measure insulation resistance between conductor and ground.
      c. Test cables after terminations are complete. Do not connect equipment to the cable system during tests.
      d. Acceptance Criteria for 600 V wire and cable: 10 Megohms for 1,000 feet when measured at 25 C.
      e. Test Failure: If insulation resistance values are unacceptable, correct deficiency and retest. If the test fails again, replace the entire wire or cable segment.
   6. High Potential Tests: In accordance with IEEE 400.
      a. Passing Criteria: No insulation breakdown or excessive leakage current.
      b. Failures: Locate and determine the trouble, replace defective wires, cables or components, make necessary corrections to installation, and retest without additional cost to the Owner.
   7. Control circuit wiring: Test for continuity and insulation after termination.
   8. Power and equipment branch circuits: Perform continuity test on conductors.
   9. Three-phase loads: Verify circuit phasing.

D. Low-Voltage Panelboards and Enclosed Circuit Breakers:
   1. Test circuits for connections in accordance with the wiring diagram.
   2. Test that insulation resistance to ground of nongrounded conductors is a minimum of 10 megohms.
   3. Test panelboard and load center enclosures for continuity to the grounding system.
   4. Test operation of circuits and controls. When testing, operate each control a minimum of 10 times and each circuit continuously for a minimum of 1/2 hour.
   5. Test that each panel has a balanced load.

E. Ancillary Systems:
   1. Perform operational and functional tests on auxiliary and ancillary systems including the following:
      a. Auxiliary panelboards;
      b. Auxiliary contacts;
      c. Door interlocks;
      d. Receptacles;
      e. Interior, exterior, emergency, and cubicle lighting. Measure lighting levels and confirm that minimum lighting levels are met as required by Section 34 21 15P, TES Lighting;
      f. HVAC;
      g. All systems provided in this Contract that are not specifically called out in this Section.

F. General Substation Operation:
   1. Perform a functional test of substation operation.
   2. Check the interlocks on the enclosure and panels for proper functioning alarm and operation of shutdown circuitry.
   3. Use strip chart recorders or oscillographs as required to provide a permanent record of the protective functions.

4. Perform other tests as required by substation equipment manufacturer and Engineer to determine the acceptability of the installation and equipment.

G. Medium-Voltage Ac Switchgear:
   1. Perform on ac switchgear in accordance with IEEE C37.20.2:
      a. Dielectric tests.
      b. Mechanical operation tests.
      c. Electrical operation and control wiring tests, except that the control wiring continuity shall be verified by actual electrical operation of control devices.
      d. Grounding of instrument transformer cases.

H. Dc Circuit Breaker: Perform on each dc circuit breaker after mounting in switchgear:
   1. Operation test.
   2. Position test: Disconnected, test, and connected positions.
   3. Alignment test of primary and secondary contacts.
   4. Interlocking test for all positions.

I. Dc Switchgear: Perform Production Tests as specified in IEEE C37.20.1:
   1. Dielectric tests.
   2. Mechanical operation tests.
   3. Grounding of instrument transformer case test.
   4. Electrical operation and control wiring tests: Verify by actual electrical operation of the component control devices.

J. Positive and Negative Disconnect Switches: Perform Production Tests as specified in IEEE C37.41.
   1. Perform standard production tests on all switches to check the quality and uniformity of workmanship and materials used, including the following:
   2. Check for gaps, using a feeler gage (or other approved method) at each contact and assembly point. Gaps are grounds for rejection.
   3. Test operation of all components.
   4. Perform power frequency dielectric withstand test.
   5. Test electric resistance of current path.

K. Dc Relays:
   1. Verify proper operation and setting of all relays including rate of rise, frame fault relay and rail-to-earth relay.
   2. Where applicable, settings to be in accordance with approved relay coordination curves.

L. Rectifier Transformer:
   1. Perform insulation tests between windings and between windings to ground and between the core to ground using a 2500 Vdc megohmmeter for 1 minute.
   2. Perform functional tests of temperature protective devices.

M. Rectifiers:
   1. Perform insulation tests between the diode strings and rectifier enclosure using a 2500 Vdc megohmmeter for one minute.
   2. Perform insulation tests between the enclosure and ground using a 2500 Vdc ohmmeter for 1 minute.
   3. Perform a functional test of all temperature, protective, monitoring and alarm devices.

N. Emergency trip stations (ETS): Perform functional test.

O. Substation Automation System (SAS):
   1. Simulate alarm and analog functions at each device on Alarm Points List in Section 34 21 31P, TES Substation Automation System (SAS).
      a. Simulation shall replicate actual field activation of functions to the extent possible.
      b. Include method of simulation of functions in test procedure for approval by the Engineer.

2. Demonstrate downloading of event log to flash drive or laptop.

P. SCADA: Simulate alarm functions at each device on Alarm Points List in Section 34 21 31P, TES Substation Automation System (SAS).

Q. Transfer Trip: Simulate transfer trip and verify correct outputs at PLC for transfer trip.

R. Frame Fault (Device 64HS & GS) Tests:
1. Connection: As shown in the one-line diagram.
2. Test: Simulate a 750 Vdc to frame fault by passing low dc current levels through the relays.
3. Criteria: Maximum total clearing time including operation of the 64HS & GS relay, the substation lock-out relay, and the tripping of the main ac and dc feeder breakers shall not exceed 300 ms.
4. At the time of testing, provide graphical outputs, including time characteristics, onsite for review and approval.

S. Rail Voltage Monitoring and Grounding Devices Tests:
1. Test: Demonstrate proper function of the rail-to-earth relay and rail-to-earth grounding device.
   a. Simulate rail-to-earth voltages and currents.
   b. Show that the substation will alarm, trip, and short circuit rail to earth when the voltage and currents exceed the alarm, trip, and short circuit points specified in Section 34 21 33, TES Rail Voltage Monitoring and Grounding System.

PART 3 - EXECUTION

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes.
1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 95P
TES OPERATION AND MAINTENANCE DATA
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes Operation and Maintenance (O&M) Manual requirements for all TES Work in Sections 34 21 xxP and 34 22 xxP.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 34 21 97P – TES Demonstration and Training

1.3 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Quality Assurance:
   1. Submit names, qualifications, and a sample of similar work for each person who will be involved in producing the O&M Manual, within 90 days after NTP.
   2. Submit O&M Manual outline minimum 30 days before starting work on O&M Manual.
   3. Submit specified Quality Control checklist at the same time as the O&M Manual signed by the quality checker.

D. O&M Manual:
   1. Submit minimum of 120 days before scheduled energization of first substation. Ensure that O&M Manual is approved prior to starting training of Owner's maintenance and operations personnel as required by Section 34 21 97P, TES Demonstration and Training.
   2. Submit an electronic version in PDF format for review.
      a. Include a page and PDF bookmark for each tab that will be inserted in the hard copy final version.
      b. If the initial submittal does not include the required Quality Control Checklist and the specified O&M Manual formatting, organization, and content it will not be reviewed in detail.
   3. After final approval of submitted O&M Manual submit 10 hard copy sets and 5 electronic copies on a flash drive.

E. Renewal Parts Catalog:
   1. Submit sample within 120 days of NTP.
   2. Submit minimum of 120 days before scheduled energization of first substation.
   3. Submit an electronic version in pdf format for review.
   4. After final approval of submitted Renewal Parts Catalog submit 10 hard copy sets and 5 electronic copies on a flash drive..

1.4 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 – Systems Quality Assurance, except as modified herein.

B. Qualifications:

1. The O&M Manual must be laid out and assembled by a person with the following competence:
    a. Skilled in organization with experience producing manuals or other large documents of this kind.
    b. Competent at using the word processing program used, including the ability to create a template for headings to be used throughout the document and produce an automatic table of contents.
    c. Competent at using Adobe Acrobat and producing hierarchical bookmarks
2. Each written portion of the O&M Manual must be produced or edited by a person or persons with the following competence:
    a. Skilled in writing in English with proper paragraph construction, sentence construction, grammar, spelling, and punctuation.
    b. An ability to write clearly and concisely.
    c. An ability to organize the written material in such a way that it is easy to navigate.
    d. Familiar with operation, troubleshooting, and maintenance of the equipment included in the manual.
3. Submit the names and qualifications of the persons who will be involved in production of the manual, describe the role of each person, and provide a sample of comparable work produced by each person.

C. Quality Control:
1. Prepare an O&M Manual outline including headings and two levels of subheadings for submittal. Verify that the approved outline is used to assemble the O&M Manual.
2. Prepare an O&M Manual Quality Checklist including the following and verify that each item has been included before submittal:
    a. Each requirement listed in the paragraph below titled “Format.”
    b. Each piece of equipment that will be included in the O&M Manual.
    c. Each type of content required by the Specifications.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE MANUAL

A. Format:
1. If the Manual has multiple volumes, include the following in each volume, specific to that volume of the manual:
    a. Frontispiece: Preceding and facing the title page, showing a recognizable illustration of the equipment described.
    b. Title Page: Include the name and function of the equipment, manufacturer's identification number(s), and the Contract Specifications number(s) and title(s).
    c. Table of Contents: List the sections and subsection titles with the page on which each starts and a list of included drawings for each section or subsection.
2. Consecutively number each page, restarting the numbering for each volume, with the volume number included in the page number. For example, Page 2-36 would be the page number of the 36th page in Volume 2.
3. Present content in a logical hierarchy with headings and subheadings in a consistent format that make it easy to navigate the manual.
4. PDF Format:
    a. Create a hierarchy of bookmarks, with each major section as a top-level bookmark, and subsections as bookmark subheadings.
    b. The bookmarks must match the structure of the table of contents and include the headings and subheadings in the same hierarchical structure.
5. Hard Copy Format:
    a. Dividers: Insert dividers with identifying tabs to separate sections of the manual.
    b. Pages: 8-1/2 inches by 11 inches in size or folded to that size.
    c. Binders: Heavy duty, D-ring, locking, three-ring binders not filled to more than 2/3 of their capacity.

d. Paper: 47 pound bond.

B. General Requirements for Content:
1. Information shall cover the exact equipment provided and shall not consist of marked up general catalog data.
2. Delete information on material or equipment not used.
3. Include drawings and diagrams for major assemblies and subassemblies.
4. Include descriptive brochures providing physical and functional description of the equipment.
   a. Brochures shall be original, printed materials or high quality color prints from electronic media.
   b. Brochures shall not be photocopies.
5. Do not include as-built drawings in the O&M Manual. Submit separately in accordance with Section 34 21 96, TES Project Record Documents.

C. Organization of Content:
1. Provide major headings and subheadings corresponding to major topics and subtopics that present the information in a logical, easy to access format.
2. Include only major headings and subheadings in the Table of Contents.
3. Provide a tab for each major heading and subheading.
4. Within the manual, at the beginning of each subtopic include a detailed list of the individual items included in that subtopic, with page numbers.
5. Manufacturer's publications must be organized in one of two ways:
   a. Placed in the same section as Vendor-written content by system, such as "Dc switchgear," or
   b. Separate from Vendor-written content, but organized by system using the same structure used to organize the Vendor-written content. Vendor written content must include references to manufacturer's publications including the following:
      1) Subsection name and number.
      2) O&M Manual sequential page number.
      3) Manufacturer name and model number.
      4) Title of publication.
6. Titles of headings and subheadings must be generic, such as "HVAC System," not names of manufacturers or part numbers.

D. Content: Provide maintenance and operating instructions for all equipment and systems installed, including the following:
1. Installation:
   a. Pre-installation inspection.
   b. Installation verification checklist.
   c. Torque: Include manufacturer's recommended torque information for each type of bolted connection used.
   d. Calibration.
   e. Preparation for operation for initial installation.
2. Operation:
   a. Performance specifications.
   b. Operating limitations.
   c. Include step-by-step procedures for:
      1) Starting: Provide start-up checklist.
      2) Restarting.
      3) Operating.
      4) Shutdown.
      5) Emergency requirements.
3. Preventative Maintenance:
   a. Include step-by-step procedures for
      1) Inspection.
      2) Operation checks.

3) Cleaning.
4) Lubrication.
5) Adjustments.
b. Indicate required tools
c. Indicate annual maintenance schedule
4. Corrective Maintenance:
a. Include step-by-step procedures for:
1) Repair.
2) Disassembly.
3) Reassembly of the equipment for proper operation.
b. Indicate required tools
5. Overhaul:
a. Parameters that indicate an overhaul is required.
b. Disassembly.
c. Parts to replace.
d. Adjustment, cleaning, etc. for parts not replaced.
e. Reassembly of the equipment for proper operation.
f. Preparation for operation after overhaul.

E. Appendices: Include the following in a separate volume, each in its own tabbed appendix. Do not include this information in the body of the manual:
1. Glossary, abbreviations, symbols.
2. Bill of Materials:
a. Organize by system and subsystem.
b. Provide complete with all necessary information, including part numbers and catalog item numbers if applicable, for identifying parts.
c. Identify parts or assemblies obtained from another manufacturer by the name of that manufacturer and the manufacturer’s identifying part number.
d. Supply the size, capacity, or other characteristics of the part if required for identification.
3. Torque table for all types of bolts used in bolted connections.
4. Spare Parts and Special Tools:
a. Provide a list of contractual and recommended spare parts
b. Provide a list of special tools required for maintenance.
5. Safety: Safety precautions.
6. Testing: Copies of Field Acceptance Testing procedures.
7. Warranty information.
8. Other appendices as needed.

2.2 RENEWAL PARTS CATALOG

A. Organize by system and subsystem.

B. Enumerate and describe every component with its related parts, including supplier's number, Vendor's number, Drawings Apparatus Reference number, and provision for entry of the Owner's part number.

C. Use cut-away and exploded drawings to aid identification of parts not readily identified by description.

D. Parts common to different components, such as bolts and nuts, shall bear the same Vendor's number with a reference to other components in which they are found.

E. For each part or component, list all the assemblies of which it is a component.

F. Standard parts:
1. Identify commercially available items such as common standard fastenings, fuses, lamps, galvanized pipe, nuts and bolts, etc., by standard hardware nomenclature besides Vendor's number.

2. Furnish a separate list of these items in the catalog with adequate information to order these items through commercial channels.

G. Furnish a complete itemization of servicing materials (oils, paints, special compounds, greases, etc.) required and component requiring its use.

H. Furnish ordering and procurement information required for components and subassemblies to the lowest level replaceable component. Ensure that the Owner will not need to request information from Vendor at a future date.

I. Submit lists in the form of reproducible Bills of Materials suitable for loose-leaf binding adequately cross-referenced to related drawings and Bills of Material.

PART 3 - EXECUTION

3.1 REVISIONS

A. If subsequent modifications to the equipment require revised operation and maintenance procedures:
   1. Revise the O&M Manuals to show the equipment as installed.
   2. Revise by issue of replacement pages to the final O&M Manuals, or by reissue of the O&M Manuals, at the Engineer's option.
   3. Submit the revisions to the O&M Manuals not later than 30 Days following revision of the equipment.

3.2 SPECIAL SUBMITTAL PROCEDURES

A. Work with Engineer to review O&M Manuals together in a meeting environment, if requested

B. Revise manuals in accordance with directions and comments from meeting inputs and formal mark-ups (by reviewers)

C. Resubmit as required in accordance with Section 01 33 00, Submittal Procedures

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes.
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer’s option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 96P
TES PROJECT RECORD DOCUMENTS
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for TES as-built drawings in Sections 34 21 xxP and 34 22 xxP.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 34 21 95P – TES Operation and Maintenance Data

1.3 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Incremental Submission of As-Built Drawings
   1. Upon request from the Engineer, make available copies of selected as-built drawings in color.
   2. Incremental as-built drawings requested by the Engineer shall be stamped "As-Built", signed, and dated by Vendor.

C. Final Submission of As-Built Drawings:
   1. At completion of Factory Testing.
   2. Installation Vendor may require additional updates based on field as-built changes after installation and testing. Vendor shall support updating original drawings.
   3. Submit five hard copies and three electronic copies on Flash Drives (USB 3.0 or Type C) in AutoCAD (latest version) and in PDF formats.
   4. Submit as-built drawings and include the following information:
      a. Date of submission.
      b. Project title and number.
      c. Vendor's name and address.
      d. Certification that as-built drawings as submitted are complete and accurate.
      e. Signature of Vendor or its authorized representative.

1.4 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 – Systems Quality Assurance.

PART 2 - PRODUCTS - NONE

PART 3 - EXECUTION

3.1 MAINTENANCE OF AS-BUILT DRAWINGS

A. During factory wiring and testing of a TPSS, or other equipment, immediately update drawings or documents affected by a change in the circuits or equipment.

B. Protect drawings from damage.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes.
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 21 97P
TES DEMONSTRATION AND TRAINING
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Requirements for instruction and training of Operations and Maintenance personnel in the management, operation, and maintenance of provided equipment and systems.
   2. Requirements for training materials.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 34 21 96P – TES Project Record Documents

D. SECTION 34 21 95P – TES Operation and Maintenance Data

1.3 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Submit the names and qualifications of the persons who will be involved in production of the manuals, describe the role of each person, and provide a sample of comparable work produced by each person.

C. Submit resumes of proposed instructors.

D. Submit an electronic version of the Instructor Guide three months before the start of training in PDF format for review.

E. Submit an electronic version of the Training Manual 90 days before the start of training in PDF format for review.

F. After final approval of submitted Instructor Guide submit 3 hard copies.

G. After final approval of submitted Training Manual submit 10 hard copies.

H. Training shall not commence until the Training Program Plan and Instructor Guides are approved by the Engineer.

I. Submit videos before the start of training if videos are used in training. Submit on DVD and flash drives in MPEG-4 format.

J. Submit Training Reports not later than 1 week after completion of course.

1.4 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 – Systems Quality Assurance.

B. Qualifications:
   1. The Instructor Guide and Training Manual must be laid out and assembled by a person with the following competence:
      a. Skilled in organization with experience producing manuals of this kind.
      b. Competent at using the word processing program used, including the ability to create a template for headings to be used throughout the document and produce an automatic table of contents.

c. Competent at using Adobe Acrobat and producing hierarchical bookmarks

2. Each written portion of the Instructor Guide and Training Manual must be produced or edited by a person or persons with the following competence:
   a. Skilled in writing in English with proper paragraph construction, sentence construction, grammar, spelling, and punctuation.
   b. An ability to write clearly and concisely.
   c. An ability to organize a training program in a logical way so that each lesson builds on the previous lessons and trainees are able to achieve the specified goals.
   d. Familiar with operation, troubleshooting, and maintenance of the equipment included in the manual.
3. Submit the names and qualifications of the persons who will be involved in production of these manuals, describe the role of each person, and provide a sample of comparable work produced by each person.
4. Qualifications of Instructors:
   a. Must be fluent in English.
   b. Must be experienced in the system for which they are conducting training.
   c. Must have minimum two years experience conducting training.

PART 2 - PRODUCTS

2.1 TRAINING PROGRAM

A. Design program to train the Owner's maintenance and operations personnel in details of furnished equipment and systems and enable them to operate, service, and maintain systems such that systems will perform and continue to perform in accordance with requirements of this Contract.

B. Provide a logically related sequence of separate training sessions covering System Operation, Overall System Maintenance, and Equipment Operation and Maintenance.

C. Ensure operations and maintenance personnel are fully trained prior to start of passenger service.

D. Operations and Maintenance Personnel Qualifications:
   1. Assume personnel to be trained have only basic skills pertinent to their craft.
   2. Assume Operations and Maintenance personnel to be trained have no knowledge of features of specific equipment or systems to be taught.

2.2 TRAINING COURSE

A. Course requirements:
   1. Include classroom, hands-on, and/or field instruction, as appropriate, and models, mockups, documentation, and aids to carry out the program. It’s anticipated that 50 percent of the training will be in the field, and 50 percent in the office/training room. Scheduling of the training class shall be co-incident with Contractor Installation. Installation Contractor to coordinate scheduling of the training classes.
   2. Class Sizes: Unless otherwise specified elsewhere in these Specifications, the Owner will be able to send up to 10 participants to the training course specified.
   3. Duration: Maximum 8 hours per day. Vendor to propose number of classes and schedule.
   4. Training Location and Classrooms: Conduct training sessions in facilities provided by the Owner. The facilities will be equipped with tables, chairs, and one cabinet with lock hasp.
   5. Provide video players and projectors as required.
   6. Provide literature and equipment necessary to train personnel.
   7. Training on actual system equipment and spare equipment will be permitted; however, such use shall not interfere with pre-revenue tests and system demonstrations.

B. Equipment Operations and Maintenance Training:
   1. Provide training in the operation and maintenance of equipment systems provided.
   2. Provide hardware training including, but not limited to:

a. Equipment operation.
b. Troubleshooting procedures, including field diagnostics and test equipment.
c. Interface with other equipment.
d. Preventative maintenance procedures.

3. Provide Operations and Maintenance personnel with a thorough knowledge of the equipment and its operation, its interface with other equipment, and the capabilities and use of test equipment.
4. Provide participants with theoretical background and hands-on experience in troubleshooting, repair procedures, and preventive maintenance procedures.
5. Enable Operations and Maintenance personnel to develop a self sufficient hardware maintenance team for the equipment.
6. Include a page by page review and explanation of approved O&M Manuals.

C. Supplemental Training:
1. Provide extended, duplicate, or additional training for the systems provided, as deemed necessary by the Engineer, due to modification of systems and equipment configuration made after completion of the scheduled training course.

D. Training Materials:
1. Use approved O&M Manuals and as-built drawings as part of training materials, but do not duplicate this information or incorporate it into the training materials specified in this Section.
2. Provide each course participant with a copy of the Training Manual and other pertinent material, including O&M Manual and As-Built Drawings, prior to commencement of course.
3. Upon completion of the course, instructor's manuals, training manuals, and training aids become the property of the Owner unless such items are specifically exempted by the Engineer.
4. The Owner reserves the right to copy training materials and aids for use in Owner-conducted training courses.
5. Provide special tools, equipment, training aids, and other materials required to train course participants. Provide sufficient quantity of special tools and other training equipment for the number of participants attending the course.
6. Use actual hardware and photographs taken during the manufacturing process wherever possible. Actual hardware used for training must pass re-inspection and acceptance testing prior to being placed in service.
7. Videos:
a. Do not use videos as a replacement for a classroom instructor, or as the primary training vehicle.
b. Use prerecorded lectures only as supplementary training material.
c. The Owner shall have the right to take video recordings of training courses presented by the Vendor. The Owner shall also have the right to use these videos to train personnel in the future.

2.3 INSTRUCTOR GUIDE

A. Provide Owner-specific materials prepared specifically for training Owner’s personnel.

B. The Instructor Guide may not be combined with the Training Manual, and must include the following:
1. A one-page training program summary including a list of each training session with a brief description and the estimated time required for the session.
2. A table of contents.
3. An introduction explaining the overall format for training.
4. A separate section for each training session.
5. A disk containing a separate Microsoft PowerPoint file for each training session. Name each file with its respective training session number.

6. Other materials used in support of the lesson.
7. One complete student handout package.
8. One copy of material referenced in the lesson.

C. Electronic Format for Review:
1. Create a bookmark for the one page summary, the table of contents, the introduction, and one for each training session.
2. Include a PDF version of the PowerPoint slides for each training session.
3. Other materials used in the lesson. Materials that have already been submitted separately, such as O&M Manuals, do not need to be submitted with the Instructor Guide.

D. Final Hard Copy Format:
1. Pages: 8-1/2 inches by 11 inches in size or folded to that size.
2. Binders: Heavy duty, D-ring, locking, three-ring binders not filled to more than 2/3 of their capacity.
3. Paper: 47 pound bond.
4. Include a flash drive with the Power Point Instructor Guide in the three-ring binder.

E. Each section of the Instructor Guide, representing one training session, must include the following information in the order listed below:
1. A short summary section including the following:
a. Training session number.
b. Lesson name: Concise but descriptive of what is included.
c. Estimated time to teach: This is an approximate period that may vary due to student number and knowledge level. It should correspond to the time listed in the training program summary at the beginning of the Instructor Guide.
d. Objectives: One or more performance-based objectives each of which specifies a measurable minimum level of performance considered acceptable.
e. Training session location, such as classroom, substation, or Shop facility.
f. Instructor materials needed for the training section, such as the following:
1) Laptop and video projector
2) PowerPoint Presentation
3) Equipment, such as tools parts for disassembly
g. Trainee reference materials needed for that particular training session, in addition to the Training Manual, such as the following:
1) O&M Manual
2) As-Built Drawings
3) Test equipment
2. A presentation section, including the following:
a. A short paragraph introducing the subject covered by the session.
b. A brief description of the lesson objectives.
c. A descriptive outline of all the topics to be included in the session, including the point at which to show each PowerPoint slide (reference slide number), certain sections of the O&M Manual (reference section and page number), certain drawings from the as-built drawings (reference drawing number), or other training materials.
3. A closing section including any evaluations, tests, or quizzes given in conjunction with this lesson

F. The Instructor Guide must be detailed enough to accomplish the following:
1. Serve as a written record of the specific facts and information.
2. Allow another instructor with knowledge of the area to teach the class.
3. Ensure that the subject delivery is consistent each time the lesson is given.
4. Allow replication of all evaluations, tests, and quizzes given in conjunction with this lesson.

2.4 TRAINING MANUAL FOR TRAINEE'S USE

A. The Training Manual will be furnished to each trainee, and must include the following:
1. The one-page training program summary from the Instructor's Manual.

2. A table of contents.
3. The introduction explaining the overall format for training from the Instructor's Manual.
4. A separate section for each training session, similar to the Instructor's Manual but with the differences noted:
    a. The summary section of the Instructor's Manual without the list of Instructor Materials.
    b. The presentation section of the Instructor's Manual, but with full page power point slides added for each section at the end of the section.

B. Electronic Format for Review:
1. Create a bookmark for the one page summary, the table of contents, the introduction, and one for each training session.
2. Include a PDF version of the PowerPoint slides for each training session.
3. Other materials used in the lesson. Materials that have already been submitted separately, such as O&M Manuals, do not need to be submitted with the Instructor Guide.

C. Final Hard Copy Format:
1. Pages: 8-1/2 inches by 11 inches in size or folded to that size.
2. Binders: Heavy duty, D-ring, locking, three-ring binders not filled to more than 2/3 of their capacity.
3. Paper: 47 pound bond

PART 3 - EXECUTION

3.1 TRAINING REPORTS

A. Grading system: Establish to report progress of each trainee during the course and identify requirements for further training for each participant.

B. Training Reports:
1. Include graded tests (without names) with raw scores.
2. Include a summary of the results of monitoring and evaluating.
3. Include records of student attendance and performance.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes.
1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 22 05P
TES COMMON WORK RESULTS FOR CONDUCTORS AND CABLE SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Products used with TES conductors and cable.
   2. Wire and cable type requirements.
   3. Requirements for circuit separation.
   4. Requirements for installation of TES conductors and cable for electrical power and traction power.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 34 21 05P – Common Work Results for TES

E. SECTION 34 21 90P – TES Testing

F. SECTION 34 21 96P – TES Project Record Documents

G. SECTION 34 22 29P – TES Raceway and Equipment Hangers and Supports

1.3 DEFINITIONS

A. Low-voltage cable: A single or multi-conductor insulated cable rated 2000 V or less.

1.4 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. Institute of Electrical and Electronics Engineers (IEEE):
   1. IEEE 1210, Standard Tests for Determining Compatibility of Cable-Pulling Lubricants With Wire and Cable

C. National Electrical Contractors Association (NECA):
   1. NECA 1, Standard Practice of Good Workmanship in Electrical Contracting

D. National Fire Protection Association (NFPA):
   1. NFPA 70, National Electrical Code

E. Underwriters Laboratories (UL):
   1. UL 224, Extruded Insulating Tubing

1.5 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. As-built Drawings:
   1. Submit as specified in Section 34 21 96, TES Project Record Documents.

1.6 NOT USED

1.7 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 – Systems Quality Assurance.

1.8 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems, except as modified herein.

B. Ship each unit securely wrapped, packaged, and labeled for safe handling in shipment and to avoid damage.

C. Deliver wires and cables to the site in unbroken standard coils or reels with attached tag bearing manufacturer's name, wire trade name, and listing information.

D. Store wire and cable in secure and dry storage facility, in accordance with NECA 1.

PART 2 - PRODUCTS

2.1 CABLE RACKS

A. UL listed, heavy duty, glass-reinforced nylon, suitable for the support of low voltage insulated cables without additional insulators, with sufficient load capacity to support the installed and future cables.

B. Size: Racks shall be of adequate length to support the number of cables indicated without stacking, with space for 25 percent additional cables.

2.2 CABLE PROTECTORS

A. Nylon, flanged, split tube to insert in duct end to protect cable from damage.

B. Approved Manufacturers/Products:
   1. Greenlee 488-2 or 488-3;
   2. Condux 08042301 or 08042300; or approved equal.

2.3 INSULATED CABLE CLAMPS

A. Thermoplastic elastomer, high-dielectric split-sleeve cable bushing and two-piece, galvanized or stainless-steel clamp assembly for installation on hot-dip galvanized framing channel.

B. See Section 34 22 29, TES Raceway and Equipment Hangers and Supports, for framing channel requirements.

C. Approved Manufacturer/Product: B-Line, Insulclamp, or approved equal.

2.4 CABLE SUPPORTS

A. Designed to support cable in vertical conduit and provide a watertight seal.

B. Malleable or ductile iron with hot-dip galvanized finish, threaded for rigid conduit.

C. Approved Manufacturer/Product: OZ Gedney Cable Support, Type C Compound, or approved equal.

2.5 CABLE TIES (TIE WRAPS)

A. Self-extinguishing nylon with a temperature range of minus 40 degrees F to 185 degrees F.

B. Cable ties shall have a locking hub or head with a stainless steel locking barb on one end and a taper on the other end.

C. Width:
   1. Dc feeder cables: Minimum 1/2 inch.
   2. Other applications: Adequate to prevent damage to wire or cable insulation.

D. Strength: Minimum 250 pounds for dc feeder cables.

E. Outdoor use: Ultraviolet-resistant material.

2.6 SPLICE AND TERMINAL CONNECTORS

A. Fittings shall be tool-applied, compression, compatible with conductors on which they are used, and listed for use with provided cable.

B. No. 10 AWG and smaller conductors:
   1. Wire terminations: Heavy duty, ring type, nylon insulated.
   2. Splices: Self-insulating or provided with an insulating cap or heat-shrink insulating sleeve.

C. No. 8 AWG to No. 4 AWG: Provide double-bolted NEMA two-hole terminals where rotation of a single-bolted terminal would result in contact or unacceptable clearance with other conductors or the enclosure.

D. No. 2 AWG to No. 3/0 AWG: Provide terminals with two NEMA-standard bolt holes in tongue unless otherwise indicated.

E. No. 4/0 AWG and larger conductors: Provide long-barrel, double-compression type, with two NEMA standard bolt holes in tongue unless otherwise indicated.

F. Compression Tools:
   1. Shall apply a hexagonal compression using mechanical, electrical, or hydraulic power mechanism that ensures a complete compression cycle.
   2. Shall permanently imprint die information on the completed connection.

2.7 INSULATING MATERIAL FOR SPLICES AND TERMINATIONS

A. Provide insulating material for terminations of type accepted by Engineer for the particular use, location, and voltage. Mark each tape package to indicate shelf-life expiration date.

B. Electrical insulating tape for general use: Vinyl plastic with rubber based pressure sensitive adhesive, pliable from temperatures of minus 18 degrees C to 105 degrees C. Verify tape has the following minimum properties when tested in accordance with ASTM D3005:
   1. Thickness: 7 mils.
   2. Breaking Strength: 15 pounds per inch.
   3. Elongation: 200 percent.
   4. Dielectric Strength: 10 kV/mil.
   5. Insulation Resistance (Direct method of electrolytic corrosion): 10 megohms.

C. Rubber electrical insulating tape for protective overwrapping: Silicone rubber with a silicone pressure-sensitive adhesive. Verify tape has the following minimum properties when tested in accordance with ASTM D1000:
   1. Elongation: 525 percent.
   2. Dielectric Strength: 13 kV.
   3. Insulation Resistance (Indirect Method of Electrolytic Corrosion): 10 megohms.

D. Heat shrink tubing: Product meeting the electrical and environmental requirements of the application.

2.8 FIREPROOFING TAPE

A. Fire and arc proof tape, self extinguishing, and compatible with conductor insulation and jacket.

B. Tape shall not deteriorate when subjected to water, salt water, gases or sewage.

C. Approved Manufacturer/Product: 3M, Type 77, or approved equal.

2.9 IDENTIFICATION

A. Wire Sleeves: Non-fading, heat-shrink polyolefin, machine-printed sleeve labels.
   1. Approved Manufacturer/Product: Brady PermaSleeve.
   2. Material: Polyolefin heat shrinkable tubing.
   3. Standards: UL 224.
   4. Color: White with black printing, unless specified or indicated otherwise.

B. Cable Tags: Non-fading, polyethylene, slide in, printed cable tags with holes for attachment to cable with plastic cable ties.
   1. Numbers shall be 1-inch high.
   2. Approved Manufacturer/Product: Almetek Industries, Inc., E-Z Tags, or approved equal

PART 3 - EXECUTION

3.1 WIRE AND CABLE TYPE REQUIREMENTS

A. Substation power circuits, ac and dc: 600 V single conductor cable.

B. Within switchgear, where not exposed to medium voltage: 600 V switchboard wire.

C. Within ac switchgear: 600 V switchboard wire.

D. Within dc switchgear and rectifier: 2 kV switchboard wire.

E. Dc feeders: 2 kV single-conductor dc feeder cable.

F. Conductors installed in the same raceway or vault as 2 kV feeder cables (e.g. blue light conductors): 2 kV control wire.

G. Control wiring to dc disconnect switches: 2 kV control wire.

H. Cable sizes up to 4/0 AWG in cable tray: Multi-conductor cable.

I. Surge arresters: Extra-flexible cable.

J. Use bare conductor for ground wire only.

3.2 CIRCUIT SEPARATION

A. Physically separate conductors and cables on circuits of different voltages or systems to reduce the possibility of unsafe conditions, interference, or equipment damage.

B. The following major circuit groups shall not be harnessed or bundled together, shall not run in the same conduit and shall be physically separated and secured in vaults, enclosures, and cable trays.
   1. Low-voltage ac circuits.
   2. Low-voltage dc circuits: 600 V rated.
   3. Low-voltage dc circuits: 2 kV rated.
   4. Dc control circuits.
   5. Dc traction power positive feeders.
   6. Dc traction power negative feeders.

C. Where these circuit groups share vaults, enclosures, or cable trays, physically separate and secure such that there is a minimum separation of 6 inches.

D. Where dc traction power positive and negative feeders share the same vault, rack them on opposite sides of the vault.

3.3 MANDRELLING RACEWAYS

A. Mandrel and brush raceways before installing cable.

3.4 INSTALLING CABLE IN RACEWAY

A. General Requirements:
   1. Inspect wire and cable for damage before installation. Damaged cable shall not be installed.
   2. Cable shall not exceed fill limits of NFPA 70.
   3. Install all cables to be placed in one duct simultaneously.
   4. Install conductors and cables in accordance with NECA 1 and as recommended by the manufacturer.
   5. Use extreme care in installing cables so as to avoid twisting, kinking, or injuring cable or its sheath.
   6. Apply generous amounts of approved cable pulling lubricant.
   7. Use an approved wire cable grip extending not less than 18 inches back from the end of the cable.
   8. Do not bend cables during installation, either permanently or temporarily, to radii less than 12 times the outer diameters, except where conditions make the specified radius impractical and shorter radii are permitted by the manufacturer.
   9. grounding as required to provide a properly arranged and supported installation.

B. Bundle cable and conductors neatly and securely with nylon cable ties in branch circuit panelboards, cabinets and control boards. Bundle power cables separately from control cables.

3.5 INSTALLING SPLICES AND TERMINATIONS

A. Use continuous lengths of wire and cable between power source and equipment. Splices are subject to approval by Engineer.

B. Install splices and terminations in accordance with the cable and terminator manufacturers' instructions.

C. Where splices are required and approved by Engineer, make them only in approved outlet, junction or pull boxes, or in equipment cabinets.

D. Splice multi-conductor cables in accordance with the cable and splice-kit manufacturers' recommendations.

E. Tools:
   1. Use compression splice and terminator installation tools and installation techniques recommended by the manufacturer and as specified above.
   2. Conductor sizes through No. 6 AWG: Mechanical hand tools may be used, with dies for each conductor size as recommended by the manufacturer.
   3. Conductor sizes larger than No. 6 AWG: Use hydraulic tools with hexagonal or circumferential dies as recommended by the manufacturer.
   4. Insulate splices to a level equal to that of the cable.
   5. Fixture Wire: Make splices in lighting circuits with insulated crimp-type connectors.
   6. Control and Switchboard Wires: Terminate each wire held with screw-type terminals using an insulated sleeve (nylon), ring-tongue-type or locking spade-type, crimp-on lugs.

F. Torque bolted connections with a calibrated torque wrench to values specified in Section 34 21 05, Common Work Results for TES.

3.6 IDENTIFICATION

A. Identify conductors cables at all terminal points and duct entrances at junction boxes, switches, circuit breakers, and pullboxes with tags as specified.

B. Engineer will furnish cable numbering system.

C. Wire sleeves: Print cable destination and number of conductors in cable as described in Contract Drawings.

D. Wire and Cable tags: Attach with plastic tie wraps.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes.
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 22 10P
TES LOW-VOLTAGE CONDUCTORS AND CABLE
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Low-voltage wire and cable
   2. Dc traction power cable
   3. Extra-flexible cable, bare and insulated
   4. Wiring connections, splices, and terminations

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 34 21 90P – TES Testing

E. SECTION 34 21 96P – TES Project Record Documents

F. SECTION 34 22 05P – TES Common Work Results for Conductors and Cable

1.3 DEFINITIONS

A. Low-voltage cable: A single or multi-conductor insulated cable rated 2000 V or less.

1.4 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. ASTM International (ASTM):
   1. ASTM B3, Specification for Soft or Annealed Copper Wire
   2. ASTM B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
   3. ASTM B33, Standard Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes
   4. ASTM B172, Standard Specification for Rope-Lay-Stranded Copper Conductors Having Bunch-Stranded Members, for Electrical Conductors
   5. ASTM B496, Standard Specification for Compact Round Concentric-Lay-Stranded Copper Conductors
   6. ASTM D747, Standard Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam
   7. ASTM D1000, Test Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications
   8. ASTM D3005, Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape

C. Insulated Cable Engineering Association (ICEA):
   1. ICEA S-73-532/NEMA WC57, Standard for Control, Thermocouple Extension, and Instrumentation Cables
   2. ICEA S-95-658/NEMA WC 70, Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy

D. Institute of Electrical and Electronics Engineers (IEEE):

1. IEEE 1202, Standard for Flame-Propagation Testing of Wire and Cable

E. InterNational Electrical Testing Association, (NETA):
   1. ANSI/NETA ATS, Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems

F. International Organization for Standardization (ISO):
   1. ISO 9001, Quality Management Systems - Requirements

G. National Electrical Contractors Association:
   1. NECA 1, Standard Practices for Good Workmanship in Electrical Contracting

H. National Fire Protection Association:
   1. NFPA 70, National Electrical Code

I. Underwriter's Laboratories (UL):
   1. UL 44, Thermoset-Insulated Wires and Cables
   2. UL 1277, Electrical Power and Control Tray Cables with Optional Optical-Fiber Member
   3. UL 1581, Reference Standard for Electrical Wires, Cables, and Flexible Cords

1.5 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Submit Product Data on the following items:
   1. Wire and cable of each type.
   2. Splicing and terminating materials.

D. Product information for each type and size of wire and cable shall include the following:
   1. Manufacturer of wire and cable, and certificate of compliance.
   2. Number and size of strands composing each conductor.
   3. Conductor insulation composition and thickness.
   4. Average overall diameter of finished wire and cable.
   5. Storage instructions.
   6. Minimum training radius, in inches.
   7. Minimum insulation resistance in megohms per 1000 feet at 30 degrees C ambient.
   8. Jacket composition and thickness in mils.
   9. Total number of conductors per cable.
   10. Shield material (if any) and thickness.
   11. Conductor resistance and reactance in ohms per 1000 feet at 25 degrees C ambient.
   12. Conductor ampacity at 30 degrees C ambient for 600 V wire and cable.

E. Submit Test Procedures and Test Reports:
   1. Certified test reports for Design Tests, Production Tests, and Flame Tests.
   2. Test procedures, including details of proposed test equipment.
   3. Field Test Report, including the following:
      a. Continuity test.
      b. Phase test for three-phase circuits.
      c. Insulation resistance test.

F. As-built Drawings:
   1. Submit as specified in Section 34 21 96, TES Project Record Documents.
   2. Show splices in low-voltage cable, where permitted by Engineer, on as-built drawings.

1.6 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 – Systems Quality Assurance.

B. Qualifications: Cable manufacturer shall have a minimum of five years experience successfully manufacturing the type of cable to be supplied by that manufacturer.

1.7 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

1.8 DELIVERY, STORAGE, AND HANDLING

A. See Section 34 22 05P, TES Common Work Results for Conductors and Cable.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Wire and Cable Marking: Verify that wire and cable markings comply with applicable NEMA and NFPA 70 requirements.

2.2 600 V SINGLE CONDUCTOR WIRE AND CABLE

A. Conductor Material: ICEA stranded or solid copper meeting requirements of ASTM B3, soft drawn.

B. Conductor Type:
1. Size 12 AWG and Smaller: Solid conductor.
2. Size 10 AWG and Larger: Class B stranded.

C. Insulation:
1. Size No. 14 to 1/0 AWG: Type XHHW-2, cross-linked polyethylene insulated in accordance with ICEA S-95-658/NEMA WC 70.
2. Size 2/0 AWG and Larger: Type XHHW-2, cross-linked polyethylene insulated in accordance with ICEA S-95-658/NEMA WC 70 or type RHH/RHW, ethylene-propylene-rubber-insulated in accordance with ICEA S-95-658/NEMA WC 70.
3. Voltage Rating: 600 V.
4. Temperature Rating: Insulation temperature rating not less than 90 degrees C in wet or dry locations.

2.3 600 V SWITCHBOARD WIRE

A. Conductor: Stranded, tinned, annealed copper per ASTM B33.

B. Insulation: Thermoset, chemically cross-linked polyethylene, UL Type SIS, 90 degrees C. Flame rated per UL 1581, Vertical Flame (VW-1).

2.4 2 KV SWITCHBOARD WIRE

A. Conductor: Annealed, tinned copper per ASTM B33, flexible-stranded per ASTM B172.

B. Insulation: Flame-retardant, crosslinked polyolefin, rated 2000 V, 110 C, 45 mil minimum thickness.

C. Acceptable Manufacturer/Product: Rockbestos Exane-1068A, or approved equal.

2.5 2 KV CONTROL WIRE

A. Conductor: Stranded, tinned, annealed copper per ASTM B33.

B. Insulation: Thermoset, cross-linked polyethylene or ethylene propylene meeting the requirements of ICEA S-73-532/NEMA WC57, rated 2000 V, 90 degrees C wet or dry, single- or multi-conductor, suitable for installation in raceway.

2.6 2 KV SINGLE-CONDUCTOR DC FEEDER CABLE

A. General:
1. Type RHW-2, 90 degrees C, unshielded, size as indicated.

2. Insulation and jacket system shall be rated for application up to 2 kV.
3. Cable shall be suitable for use on service and feeders, indoors or outdoors, in wet or dry locations, or in raceway/duct. Cable shall be sunlight resistant and suitable for installation at 0 degrees C and in cable tray.
4. Cables shall meet or exceed the requirements of ICEA S-95-658/NEMA WC 70, UL 44, and UL 1581.
5. Cable shall be manufactured and tested under the control of a Quality Assurance program that meets the requirements of ISO 9001.

B. Conductors: Annealed, uncoated copper, round or compact, concentric-lay stranded per ASTM B496.

C. Insulation: Ethylene-propylene rubber (EPR) meeting electrical and physical requirements of ICEA S-95-658/NEMA WC 70.
1. No polyethylene shall be allowed as a component of the insulation and EPR insulation shall be compounded by the cable manufacturer.
2. For flexibility, the insulation compound shall have an Apparent Bending Modulus of 2600 psi or less in accordance with Standard Test Method ASTM D747.

D. Overall Sheath Jacket: Thermosetting chlorinated polyethylene unless noted otherwise.

E. Approved Manufacturer/Product: The Okonite Company, Okoguard-Okolon TS-CPE, or approved equal.

2.7 EXTRA-FLEXIBLE CABLE

A. Conductor: Copper; Class I stranding, or as indicated; ASTM B3, ASTM B172; bare or insulated.

B. Insulation:
1. Type RHW-2, 90 degrees C, unshielded, rated 2 kV, size as indicated.
2. Ethylene-propylene rubber (EPR) as specified above under 2 kV single-conductor cable.

2.8 MULTI-CONDUCTOR, LOW-VOLTAGE CABLE

A. Provide multi-conductor cable conforming to ICEA S-95-658/NEMA WC 70, approved for use in cable tray, with the following additional requirements:
1. Conductors: Bare, soft annealed copper per ASTM B33, Class B stranded in accordance with ASTM B8. Quantity of conductors as indicated.
2. Insulation: As specified above for single conductor cable.
3. Overall Covering: Cable shall be provided with sunlight-resistant jacket over the insulation meeting the flame-spread requirements of UL 1277.
4. Multiple conductors for control wire shall be minimum of 14 AWG stranded copper.
5. Insulation Rating: 600 V.

B. Multi-conductor cable shall be made by assembling individual or twisted pairs of insulated conductors into a tight cylindrical form using fillers that are compatible with other materials in the cable. The jacket used shall fit tightly to form a firm assembly.

2.9 FIXTURE WIRE

A. Provide fixture wire conforming to the following requirements:
1. Type: SF-2 silicone rubber insulated.
2. Conductor: Stranded copper conductor 16 AWG or larger as indicated.

2.10 BARE CONDUCTOR

A. ASTM B3, Class B stranded, annealed soft-drawn copper conductor unless otherwise indicated. Size as indicated.

2.11 COLOR CODING OF CONDUCTORS (600 V)

A. Identify individual conductors of multi-conductor cables by means of solid colors, stripes, or printing, unless otherwise approved by Engineer.

B. Jacket Printing: Mark conductors in compliance with NFPA 70, and with the following additional information:
   1. Number of conductors (for multi-conductor cables).
   2. Date of manufacture.

C. Footage Marker: Provide the following cable types with footage printing on the jacket or a footage marker tape under the jacket.
   1. Multi-conductor cables.

D. Ac Power Cables: Conform to the following color coding for power cables:

Conductor	480Y/277 V	208Y/120 V
Phase A	Brown	Black
Phase B	Orange	Red
Phase C	Yellow	Blue
Neutral	White	White
Ground	Green	Green

E. Use solid color insulation or solid color coating for branch circuit phase conductors No. 10 AWG and smaller and neutral and equipment ground conductors.

F. Use a background color other than white or green for phase conductors with colored tracers.

2.12 FACTORY ASSEMBLY

A. Wire and cable type requirements: See Section 34 22 05P, TES Common Work Results for Conductors and Cable.

B. Circuit Separation: See Section 34 22 05P, TES Common Work Results for Conductors and Cable.

C. Install wires and cables in accordance with manufacturer's recommendations and restrictions.

D. Do not bend cables during installation, either permanently or temporarily, to radii less than 12 times the outer diameters, except where conditions make the specified radius impractical and shorter radii are permitted by the manufacturer.

E. Bundle cable and conductors neatly and securely with cable ties in branch circuit panelboards, cabinets and control boards. Bundle power cables separately from control cables.

F. Install wire and cable in conduit as indicated and in accordance with NECA 1.

G. Terminations:
   1. Use continuous lengths of wire and cable between power source and equipment. Splices are not permitted.
   2. Tools:
      a. Use terminator installation tools and installation techniques recommended by the manufacturer.
      b. Conductor sizes through No. 6 AWG: Mechanical hand tools may be used, with dies for each conductor size as recommended by the manufacturer.
      c. Conductor sizes larger than No. 6 AWG: Use hydraulic tools with hexagonal or circumferential dies as recommended by the manufacturer.
      d. Use compression tools that permanently imprint die information on the completed connection.

3. Control and Switchboard Wires: Terminate each wire held with screw-type terminals using an insulated sleeve (nylon), ring-tongue-type or locking spade-type, crimp-on lugs.

H. Wiring Within Enclosures:
1. Requirements below apply to all electrical equipment enclosures, including junction boxes.
2. General:
   a. Install wire as continuous lengths inside substations, without splices between terminations.
   b. Wiring entering a removable enclosure shall be harnessed and secured to facilitate removal.
   c. Wires from different wire runs shall not be harnessed together or with internal wiring.
3. Wire support:
   a. Attach wiring within enclosures to conductor supports rigidly fastened to the enclosure structure.
   b. Wiring supports shall be free from edges, bolt heads, or similar areas and shall not interfere with nor contact enclosure covers.
   c. Secure wiring such that there is no strain on wire terminals, multi-pin connector pins, or other wire termination hardware.
   d. Use of adhesive wire supports is not permitted.
4. Wire dress:
   a. Allow sufficient slack at terminals to accommodate vibration, equipment shifting, cover removal, and component replacement.
   b. Provide additional wire length for re-termination of wires without excess tension or splicing as follows:
      1) No. 10 and smaller: Three re-terminations.
      2) No. 8 and larger: Two re-terminations.
5. Terminal blocks: Provide with insulated covers.
6. Cubicle doors: Protect wires at hinges.

2.13 SOURCE QUALITY CONTROL

A. Design Tests:
1. 2 kV Single-Conductor Dc Feeder Cable:
   a. Cable shall meet the requirements of the following flame test procedures:
      1) UL 44 vertical tray flame test.
      2) IEEE 1202 for 1/0 AWG & larger.
2. Multi-Conductor 600 V Type TC Control Cable:
   a. Flame Test: Completed cable shall pass the UL 1581 vertical tray flame test for cable assemblies.

B. Production Tests:
1. 2 kV single-conductor dc feeder cable: Perform on each reel of 2 kV single conductor dc feeder cable.
   a. High voltage ac withstand test: Perform at the potential indicated in the table below after six hours immersion in water and while still submerged. Hold voltage for 5 minutes.

Conductor Size (AWG/kcmil)	Wall Thickness (min average)		Withstand Voltage (kVac)
	EPR	TS-CPE	
8-2	55	30	7.0
1-4/0	65	45	8.0
250-500	75	65	9.5
550-1000	90	65	11.5

b. Insulation Resistance Test: The insulation resistance constant shall not be less than 15,000 megohms per1000 feet at 15.6 degrees C.

2. Submit certified test reports documenting production testing.

PART 3 - EXECUTION

3.1 WIRE AND CABLE TYPE REQUIREMENTS

A. See Section 34 22 05P, TES Common Work Results for Conductors and Cable.

3.2 FIELD INSTALLATION

A. See Section 34 22 05P, TES Common Work Results for Conductors and Cable.

3.3 FIELD QUALITY CONTROL

A. See Section 34 21 90P, TES Testing, for field testing for wire and cable.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes.
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 22 15P
TES FIBER OPTIC CABLE
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Patch panel for fiber optic cable.
   2. TES fiber optic cable

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 26 05 43 – Systemwide Electrical Underground Ductbanks and Raceways for Systems

E. SECTION 34 21 06P – TES Common Work Results for Metals

F. SECTION 34 21 31P – TES Substation Automation System

G. SECTION 34 21 90P – TES Testing

H. SECTION 34 22 05P – TES Common Work Results for Conductors and Cable

I. SECTION 34 22 33P – TES Raceway and Boxes

1.3 DEFINITIONS

A. See RUS Bulletin 1753F-601a.

1.4 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. ASTM International (ASTM)
   1. ASTM D1248, Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable

C. U.S. Department of Agriculture, Rural Utilities Service (RUS)
   1. RUS Bulletin 1753F-601a (PE-90a), Minimum Performance Specification for Fiber Optic Cables

D. National Fire Protection Association (NFPA)
   1. NFPA 70, National Electrical Code (NEC)

E. National Electrical Vendors Association (NECA)
   1. NECA 301, Installing and Testing Fiber Optics

F. International Organization of Standardization (ISO)
   1. ISO 9001 Standard Quality Management Systems

G. Telecordia
   1. GR-326, Generic Requirements for Single-Mode Optical Connectors and Jumper Assemblies

H. Telecommunications Industry Association (TIA)
   1. TIA-598, Optical Fiber Cabling Coding

1.5 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Product Data:
   1. Fiber optic cable.
   2. Connectors.
   3. Splice kits.

D. Certificates of compliance with specified standards.

E. Cable identification schedule.

F. Qualifications:
   1. Manufacturer.

G. Installation:
   1. Installation plan.
   2. Manufacturer's cable installation requirements, including maximum pulling tension, minimum bend radius under tension, minimum final bend radius, and recommended installation methods.
   3. Manufacturer's installation instructions:
      a. Connectors.
      b. Splice kits.

H. Testing:
   1. Test procedure complying with Section 34 21 90P, TES Testing.
   2. Test report complying with Section 34 21 90P, TES Testing, for each segment tested.

1.6 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 – Systems Quality Assurance.

B. Qualifications:
   1. Manufacturer:
      a. Minimum 5 years of demonstrated experience manufacturing fiber optic cable and minimum 2,000,000 feet of fiber optic cable supplied and successfully installed.
      b. Quality Assurance Program in place conforming to requirements of ISO 9001.
      c. .

1.7 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems, except as modified herein.

PART 2 - PRODUCTS

2.1 FIBER PATCH PANEL

A. Type: Rack mounted, unloaded.

B. Configuration: Minimum 12 ports with connector bulkhead, space for storing 6 meters of each fiber optic cable, tie point for securing fiber cable central member, and effective management of fiber terminations.

C. Identification: Labeling provisions that correspond to each fiber port location. Labeling shall be viewable from front of panel.

D. Cable entrance: Provide grommet and cable clamp strain relief.

2.2 FIBER PATCH CORDS

A. Patch Cord Cable Construction:
   1. Factory-fabricated, flexible fiber optic cable assembly with SC compatible connectors, from manufacturer's standard products lines.
   2. Shall contain a dielectric strength member and a protective outer jacket and allow for small bend radius for installation in space-constrained areas.
   3. Type: Single-Mode Duplex Zip cord.
   4. Acceptable Manufacturer: ADC Krone or approved equal.

B. Jacket Color: Yellow for single mode.

C. Connectors:
   1. SC UPC (blue) for patch panel ports.
   2. Connector ends for field equipment shall match equipment optical port configuration.

D. Fiber: Meet the same characteristic requirements of the patch-panel-terminated cable to which it mates.

PART 3 - EXECUTION

3.1 WITHIN SUBSTATION

A. Install patch panel in substation communications rack.

B. Terminate outside plant fiber optic cable in patch panel.

C. Provide fiber patch cords as required for the following applications:
   1. From port to port within same patch panel, for fiber cross-connection patching.
   2. From patch panel to SAS switch (see Section 34 21 31, TES Substation Automation System).

D. Patch cords installed within ladder tray and at conduit to equipment transitions shall be installed in flexible corrugated innerduct for protection.

3.2 CABLE MANAGEMENT

A. Provide horizontal and vertical cable management hardware for cables in manholes, racks, cable trays, and in switchgear.

B. Perform the following using cable management:
   1. Organize cable, arranging it neatly and securely.
   2. Arrange cable such that it does not interfere with the future use of or access to unused conduit.
   3. Segregate different classes of cable, such as ac power, dc power, ground, and data.
   4. Make ports and designation strips visible.
   5. Provide permanent circuit identification for cables supported or terminated.

3.3 SPLICING AND TERMINATION

A. Fiber splicing shall be performed by the fusion splicing method only and placed only in communication equipment enclosures in the substation.

B. Fiber optic cable shall not be spliced in manholes or handholes unless specifically authorized.

C. Splices and terminations shall be connectorized and supported in a cabinet or splice enclosure.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes.
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 22 26P
TES GROUNDING AND BONDING
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. TES substation power system grounding, electrical equipment grounding, and raceway grounding.
   2. TES substation interior ground bus.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 34 21 16P – TES Substation Enclosures

E. SECTION 34 21 90P – TES Testing

F. SECTION 34 22 29P – TES Raceway and Equipment Hangers and Supports

1.3 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. ASTM International (ASTM):
   1. ASTM B3, Specification for Soft or Annealed Copper Wire
   2. ASTM B187, Specification for Copper Bar, Bus Bar, Rod and Shapes

C. Institute of Electrical and Electronics Engineers (IEEE):
   1. IEEE 837, Standard for Qualifying Permanent Connections Used in Substation Grounding

D. National Fire Protection Association (NFPA):
   1. NFPA 70, National Electrical Code

1.4 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Product Data: Specified materials.

D. Substation interior perimeter ground bus drawings:
   1. Provide plan view showing perimeter ground bus, equipment, and ground connections.
   2. Provide elevations of each wall showing height of perimeter ground bus and connections to equipment.

1.5 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 Systems Quality Assurance.

B. Regulatory Requirements:
   1. Unless otherwise specified, electrical equipment and material shall be listed and labeled for the purpose for which it is used, by the Underwriters Laboratories, Inc. (UL).

2. Installations shall be in accordance with NFPA 70.

C. Qualifications: Persons installing exothermic welds shall be trained in their installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems.

B. Ship each item of equipment and materials securely wrapped, packaged, and labeled for safe handling in shipment and to avoid damage.
   1. Store equipment and materials in secure and dry storage facility.

1.7 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS

A. Substation Ground bus:
   1. ASTM B187, 98 percent conductivity copper, silver plated.
   2. Size: 1/4-inch thick. Width depends on specific application (see Part 3, below).

B. Stranded Bare Conductors: ASTM B3, Class B stranded, annealed copper conductor, unless otherwise indicated; size as indicated.

C. Insulated Conductors: ASTM B3, Class B stranded, annealed copper conductor, type XHHW-2 unless otherwise indicated, green colored, size as stated or indicated.

D. Terminal Lugs: Exothermically-welded or compression-type approved for the application.

E. Jumpers: Tin-plated copper, braided, flexible jumper.

F. Compression Connections: Connectors and compression tools of a single manufacturer. Connectors shall have an inspection port for use in checking proper conductor insertion.

G. Bolted connectors: Burndy, or approved equal.

H. Bolts for attachment of lug to equipment: Bronze.

2.2 FACTORY ASSEMBLY

A. Raceway Ground:
   1. Assemble metallic conduits to provide a continuous ground path.
      a. Bond metallic conduits using insulated grounding bushings.
      b. Connect grounding bushings to the grounding system using conductors sized to comply with NFPA 70.
   2. Equipment Ground: In metallic and nonmetallic conduits where conductors are installed, provide a separate equipment grounding conductor, sized to comply with NFPA 70, Article 250, and installed in accordance with these Specifications.

B. Equipment and Enclosure Grounds:
   1. Connect electrical and distribution equipment to the grounding system. Size cables or bus as specified.
   2. Connect non-electrical equipment with metallic enclosures to the grounding system.
   3. Bond boxes to the raceway or conduit system with a copper jumper solidly bolted to the box, sized to comply with NFPA 70.

C. Equipment Grounding Requirements:
   1. Install a copper equipment grounding conductor in each raceway and bond to metallic raceways and boxes at access and pull points.

2. Size equipment grounding conductors in accordance with NFPA 70 to provide adequate conduction path for ground faults. Increase size as required to allow for circuit voltage drop.
3. Ground metallic raceways, boxes, cabinets, exposed expansion joints, lighting fixtures, motors, transformers and receptacles. Provide grounding bushings or compression connectors attached with machine screws for bonding.

D. Substation Interior Perimeter Ground Bus:
1. Provide 2-inch wide ground bus around entire perimeter of substation interior.
   a. Mount on steel framing channel. See Section 34 22 29P, TES Raceway and Equipment Hangers and Supports, for framing channel requirements.
   b. Install at 18 inches above finished floor where there are no obstructions, and up to 8 feet above finished floor to avoid equipment or doorways.
2. Provide 1-inch wide ground bus from ac switchgear, ac surge arresters, panelboards, and other electrical equipment to perimeter ground bus.
3. Connect interior perimeter ground bus to four substation enclosure exterior grounding pads specified in Section 34 21 16P, TES Substation Enclosures.

PART 3 - EXECUTION

3.1 RACEWAY GROUND

A. Metallic and nonmetallic conduit: Provide a separate ground wire sized in accordance with NFPA 70, 250.122, Size of Equipment Grounding Conductors.

B. Equipment grounds shall not be installed in a raceway with dc positive feeders or dc negative returns.

3.2 TES SUBSTATION INTERIOR PERIMETER GROUND BUS

A. Provide substation interior ground bus as specified above in Part 2 Article titled “Factory Assembly.”

3.3 FIELD TESTING – BY INSTALLATION CONTRACTOR

A. Test grounds in accordance with Section 34 21 90, Traction Electrification System Testing.

B. Grounds shall not exceed the following maximum resistance:
1. TES substation enclosure or building ground: 5 ohms.
2. Surge arrester grounds: 5 ohms.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes.
1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 22 29P
TES RACEWAY AND EQUIPMENT HANGERS AND SUPPORTS
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes supports for raceway and equipment.

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 34 21 06P – TES Common Work Results for Metals

E. SECTION 34 22 33P – TES Raceways and Boxes

1.3 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. ASTM International (ASTM)
   1. ASTM A123/A123M, Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
   2. ASTM F2329, Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners

1.4 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. Product Data:
   1. Submit for each type of specified material proposed for use.
   2. Indicate the name of manufacturer, brand name, and catalog number for each type of material.

1.5 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 Systems Quality Assurance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems.

1.7 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

PART 2 - PRODUCTS

2.1 RACEWAY SUPPORTS

A. Conduit clamps for individual conduit supports: One-hole, galvanized, heavy-gage steel, or galvanized malleable iron with clamp back.

B. Channels, fittings and conduit racks: As specified in this Section.

C. Straps and clamps: Listed for the task.

2.2 METALLIC FRAMING CHANNEL AND FITTINGS

A. Framing channel and channel fittings, clamps and accessories shall be hot-dip galvanized, or electro-galvanized and zinc chromate coated steel.

B. Framing channel: 14-gage minimum, 13/16 inch or 1-5/8 inch-deep by minimum 1-5/8 inch-wide.

C. Where heavy-duty racks are called out, framing channel shall be 12-gage, single or double 1-5/8 inch deep by 1-5/8 inch wide.

D. Hanger rods: Galvanized steel or electro-galvanized and zinc chromate coated steel, 3/8-inch minimum.

E. Prohibited: Aluminum, or light gage or strength metals or materials shall not be used.

F. Acceptable Manufacturers:
   1. Unistrut;
   2. Powerstrut;
   3. Beeline; or approved equal.

2.3 NON-METALLIC FRAMING CHANNEL AND FITTINGS

A. Framing channel and channel fittings: Heavy-duty vinyl ester fiberglass.

B. Clamps, accessories, and hardware: Heavy-duty vinyl ester fiberglass or stainless steel.

C. Acceptable Manufacturers:
   1. Unistrut;
   2. Powerstrut;
   3. Beeline; or approved equal.

2.4 ANCHORS

A. Anchor Rating: Sufficient strength to support four times the load.

B. For metal, use machine screws, bolts, or welded studs with nuts and lockwashers.

C. Prohibited: Powder driven anchors or studs shall not be used.

2.5 FASTENERS AND HARDWARE

A. Fasteners and hardware shall be suitable for the use and environment intended.
   1. Fasteners shall be corrosion resistant.
   2. Plated steel fasteners: Use only indoors, in dry locations.
   3. Prohibited: Unplated steel shall not be used.

B. Stainless steel fasteners shall be used in splice boxes where exposed to weather, or in damp or wet locations.

C. Bolted connections shall be made using lock washers.

2.6 CORROSION CONTROL

A. Material and equipment shall be designed to ensure satisfactory operation and life in the environmental conditions that exist where the material or equipment is installed.

B. Wherever "galvanized" or "hot-dip galvanized" is called out in this Section of the Specification, the material shall be coated in accordance with ASTM A123/A123M.

C. For sheet steel, galvanneal finish complying with Section 34 21 06, TES Common Work Results for Metals is an acceptable alternative to hot-dip galvanizing if cut edges are protected from corrosion.

D. Galvanized Steel Field Coating: Organic cold galvanizing coating as specified in Section 34 21 06P, TES Common Work Results for Metals.

2.7 FACTORY ASSEMBLY

A. Conduit Supports and Racks:
   1. Load Rating: Conduit supports shall be capable of supporting a load equal to the sum of the weights of the conduit, wire, and the hanger itself, plus 200 pounds.
   2. Spare capacity: Minimum 25 percent.
   3. Multiple runs of exposed conduit: Group and support on conduit racks constructed from steel channels, conduit clamps and fittings.
   4. Vertical conduit racks: Provide supplementary bolted stop-blocks below each conduit clamp in a vertical strut to assure that clamps cannot slide down the channel.
   5. Multiple Conduits 2-inch or Larger: Support with heavy-duty channel, clamps and accessories.
   6. Individual Horizontal Conduits 2-inch or Larger: Support with individual hangers.
   7. Conduits 1-1/2 inch or smaller: Support with one-hole conduit straps with back spacers or individual conduit racks.
   8. Insulated: When conduit is within 18 inches above rectifier and dc switchgear, support with insulated materials.
   9. Make fittings up tight to prohibit movement, unless longitudinal movement is required due to conduit expansion.

B. Cable Tray Supports:
   1. Support in accordance with Section 34 22 33P, TES Raceways and Boxes, using steel channels, threaded rods and hardware.
   2. Insulate cable tray supports where cable tray runs over rectifiers and dc switchgear and supports are within 18 inches of rectifier or dc switchgear.

C. Fasteners and Hardware:
   1. The material, coating and finish of fasteners and hardware shall be suitable for the environment and use intended.
   2. If fasteners or hardware exhibit corrosion, replace with a suitable type as directed by Engineer at no additional cost to the Owner.

D. Damage Touch Up:
   1. Apply to galvanized surfaces where required due to cutting of hanger rods or channel, or construction damage.
   2. Brush on a thick coat of cold galvanizing coating to cut ends. Coating may be sprayed on if at least three coats are applied.

PART 3 - EXECUTION

3.1 INSTALLATION

1. Requirements of Article titled "Factory Assembly" apply to field installation.

PART 4 - MEASUREMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes.
   1. Description: Lump Sum.

PART 5 - PAYMENT

5.1 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

SECTION 34 22 33P
TES RACEWAY AND BOXES
SUBSTATION PROCUREMENT ONLY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Electrical conduit and ducts
   2. Cable tray
   3. Outlet, junction, and pull boxes
   4. Electrical distribution cabinets

1.2 RELATED SECTIONS

A. SECTION 01 33 00 – Submittal Procedures

B. SECTION 01 43 00 – Systems Quality Assurance

C. SECTION 01 60 01 – Buy America Requirements

D. SECTION 34 21 05P – Common Work Results for TES

E. SECTION 34 21 06P – TES Common Work Results for Metals

F. SECTION 34 22 26P – TES Grounding and Bonding

G. SECTION 34 22 29P – TES Raceway and Equipment Hangers and Supports

1.3 DEFINITIONS

A. Raceway: As defined in NFPA 70, and products specified in this Section.

1.4 REFERENCED STANDARDS

A. Section incorporates by reference the latest revisions of the following documents:

B. American National Standards Institute (ANSI)
   1. ANSI C80.1, Standard for Electrical Rigid Steel Conduit (ERSC)

C. National Electrical Contractor's Association (NECA)
   1. NECA 1, Standard Practice of Good Workmanship in Electrical Contracting

D. National Electrical Manufacturers Association (NEMA)
   1. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum)
   2. NEMA FG 1, Fiberglass Cable Tray Systems
   3. NEMA ICS 2, Industrial Control and Systems Controller, Contactors, and Overload Relays 600 V
   4. NEMA RN 1, Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
   5. NEMA TC 2, Electrical Polyvinyl Chloride (PVC) Conduit
   6. NEMA TC 3, Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing
   7. NEMA TC 14, Reinforced Thermosetting Resin Conduit (RTRC) and Fittings

E. National Fire Protection Association (NFPA)
   1. NFPA 70, National Electrical Code
   2. NFPA 130, Fixed Guideway Transit and Passenger Rail Systems

F. Underwriters Laboratories (UL)

1. UL 2024, Signaling, Optical Fiber and Communications Raceways and Cable Routing Assemblies

1.5 SUBMITTALS

A. Procedures: Section 01 33 00, Submittal Procedures.

B. Certification that products submitted meet Buy America requirements of 49 U.S.C. Section 5323(j) and 49 CFR Part 661, as per SECTION 01 60 01 – Buy America Requirements.

C. List of Materials:
1. Submit a list of materials proposed for use.
2. Give name of manufacturer, brand name, product data, and catalog number of each item.
3. Submit list complete at one time, with items arranged and identified in numerical sequence by Specification Section and Article number.

D. Compliance with Applicable Standards:
1. Where equipment or materials are specified to conform to standards of organizations such as ANSI, ASTM, and NEMA, submit evidence of conformance. The label or listing of specified agency will be acceptable evidence.
2. Instead of the label or listing, Vendor may submit a written certificate from an approved, nationally recognized testing organization, stating that items have been tested and units conform to specified standard.

E. Shop Drawings:
1. Submit shop drawings showing exact location and arrangement of conduits, cabinets, and pullboxes installed under this Contract.
2. Submit drawings with ample time to prevent delays in Work.

1.6 QUALITY ASSURANCE

A. Quality Assurance/Quality Control shall be carried out in accordance with the requirements of SECTION 01 43 00 Systems Quality Assurance.

B. Qualifications: Raceway installers shall be electricians licensed by the State.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be carried out in accordance with the requirements of 26 05 00-13, Systemwide Electrical General Requirements for Systems, except as modified herein.

B. Obtain written permission from the Engineer before shipping substation.

1.8 WARRANTY

A. Comply with warranty requirements in accordance with the General Conditions, Article 6.20.

PART 2 - PRODUCTS

2.1 CONDUIT AND FITTINGS

A. Galvanized Rigid Steel (GRS) Conduit and Accessories: ANSI C80.1; hot-dip galvanized inside and out after threading; ensure each length bears UL label.

B. GRS Fittings and Accessories:
1. Bushings: Nylon-insulated, metallic.
2. Grounding bushings: Nylon-insulated, metallic, with lay-in lugs.
3. Sealing Bushings:
   a. Galvanized malleable or ductile iron bushings with Bakelite sealing and pressure discs and individual neoprene cable rings.
   b. Bushings shall seal ends of GRS conduit against the entrance of water, air or dust around emerging cables.

c. Approved Manufacturer/Product: O-Z/Gedney, type KR, or approved equal.
4. Conduit straps, clamps, and clamp backs: Galvanized malleable iron.
5. Vertical-Conduit Cable Supports:
a. Malleable or ductile iron body with hot-dip galvanized finish.
b. Non-metallic tapered wedging plug that supports cable without damaging insulation.
c. Weatherproof, ventilating type.
d. Acceptable Manufacturer/Product: O-Z/Gedney, type CMT, R-style, or approved equal.

C. PVC-Coated GRS Conduit (PVC/GRS or PGRS): NEMA RN 1, with corrosion resistant internal coating.

D. Reinforced Thermosetting Resin Conduit (RTRC): NEMA TC 14; standard or heavy-wall, UL listed.
1. Conduit joints and fittings: Tapered or untapered; all of one type.

E. PVC Electrical Conduit and Fittings:
1. Conduit: NEMA TC 2, EPC-40-PVC or EPC-80-PVC; heavy wall, high impact strength, rigid PVC.
2. Fittings: NEMA TC 3, EPC-40-PVC.

F. Liquidtight Flexible Metallic Conduit and Fittings.
1. Core: Flexible galvanized steel with a continuous copper bonding conductor spiral wound between the convolutions.
2. Jacket: Extruded liquid-tight plastic or neoprene; moisture- and oil-proof, capable of conforming to the minimum radius bends of flexible conduit without cracking; self-extinguishing with low halogen containing material.
3. Fittings: Zinc-coated.

2.2 OXIDE INHIBITING JOINT COMPOUNDS

A. Petroleum-based compound with evenly suspended zinc particles.

B. Approved Manufacturer/Product: Burndy, Penetrox A, or approved equal.

2.3 CABLE TRAY

A. Type: Fiberglass, ladder or solid-bottom type with solid covers and other accessories, NEMA FG 1.

B. Minimum Dimensions:
1. Width: Minimum 6 inches.
2. Loading depth: Minimum 3 inches.
3. Inside nominal depth: Minimum 5 inches.
4. Radius of curved fittings: Minimum 24 inches unless otherwise approved by Engineer.

C. Performance Requirements:
1. 30 inch width or less: Capable of supporting a total cable load of 55 pounds per linear foot on a maximum span of 8 feet, including a 200-pound static load as specified below.
2. Over 30-inch width: Capable of supporting a total cable load of 88 pounds per linear foot on a maximum span of 8 feet including a 200-pound static load as specified below.
3. Requirements shall be independent of type of splice plates or type of span, when tested in accordance with load test procedure specified in NEMA standards.
4. Safety factor: 2, based on destructive load.
5. 200 pound static load: Straight sections and fittings shall not permanently deform under a 200 pound static concentrated load applied vertically along a 4-inch length for both of the following conditions:
a. Load applied to center of one tray section having specified cable load and support spacing.
b. Load shall be applied at midpoint between supports over a splice connection.

c. Load applied to one rung of empty tray section having specified support spacing. Load shall be located at midpoint between side rails and supports.

2.4 CONDUIT HANGERS AND SUPPORTS

A. Refer to Section 34 22 29, TES Raceway and Equipment Hangers and Supports.

2.5 OUTLET, JUNCTION, AND PULL BOXES

A. Sheet metal outlet boxes: Steel, galvanized.

B. Sheet metal junction and pull boxes: Galvanized or stainless steel, hinged or screw-cover with stainless steel screws.

C. Cast metal boxes: Hot-dip galvanized inside and out.
   1. Blank covers: Same thickness as boxes and secured with No. 10-24 stainless steel machine screws.
   2. Device covers: See Section 34 21 17P, TES Substation Design and Installation.
   3. Neoprene gaskets: 1/8-inch thick.

D. Nonmetallic boxes: Heavy duty, phenolic, surface-mounted, with threaded nonmetallic conduit hubs, type FD, single- or double-gang as required. Provide non-metallic device covers.
   1. Acceptable Manufacturer/Product: Thomas & Betts, Carlon FSC-34, or approved equal.

2.6 ELECTRICAL CABINETS

A. NEMA 1, 12, 4X, or as indicated.

B. Galvanized or stainless steel, size as noted on Contract Drawings.
   1. Fronts: Steel.
   2. Mounting: Surface or recessed type as required for the application.
   3. Hinges: Continuous, stainless steel.
   4. Locks: Provide flush locks from a single manufacturer with standard key blank; field-keyable.
   5. Finish: Powder coat, as specified in Section 34 21 06, TES Common Work Results for Metals.
   6. Cabinet back panel: white, galvanized steel interior mounting panel suitable for mounting terminal blocks and relays.

C. Fiberglass composite:
   1. Covers: Fiberglass.
   2. Hinges: Continuous, stainless steel.
   3. Surface: Smooth, no color variations, swirls, color pockets, or voids.

2.7 FACTORY ASSEMBLY

A. See Part 3, below, for type requirements.

B. Conduit:
   1. General:
      a. Install electrical raceway, boxes and accessories in locations as indicated, in accordance with NFPA 70, NECA 1, local codes and ordinances, and as indicated to provide a complete and operable system.
      b. Where a conduit type indicated on Contract Drawings is in conflict with this Section, refer discrepancy to Engineer.
   2. Conduit threading:
      a. Clean threads with a solvent recommended by coating manufacturer to remove oil.
      b. Coat threads with organic cold galvanizing coating, in accordance with manufacturer's instructions.
      c. If spray application is used, provide at least three coats.
   3. Metal-to-metal threaded joints:

a. Coat threads with oxide inhibiting compound.
b. Take care that compound is not present on interior of conduit after installation.

4. Conduit caps:
   a. Provide threaded cap or similar closure designed for the purpose on conduits that are not terminated immediately.
   b. Prohibited: Tape is not acceptable for temporary cap.
5. Conduit sealing:
   a. Conduit exposed to different temperatures: Seal conduit to prevent condensation and passage of air from one area to the other.
   b. Where waterproofing is required, seal conduits with watertight duct sealing system.
6. Liquid tight flexible metal conduit:
   a. Install so that liquids tend to run off surface and do not drain toward fittings.
   b. Provide sufficient slack to reduce the effects of vibration.

C. Conduit Grounding and Bonding:
1. Install metallic conduits to be electrically and mechanically continuous and connected to ground by bonding to the grounding system.
2. See Section 34 22 26P, TES Grounding and Bonding, for additional requirements.

D. Conduit terminations:
1. Dry areas:
   a. Provide two locknuts, one inside and one outside of box or enclosure, for rigid conduit terminating at steel box, panelboard, cabinet, or similar enclosure.
   b. Provide insulating bushing or grounding bushing on conduit end.
2. Exposed, damp and wet locations: Provide threaded, water-tight hubs with sealing o-rings for cabinet connections or threaded connections to tapered threaded hubs for cast boxes and fittings.
3. Terminate the conduit in appropriate boxes at motors, switches, outlets, and junction points.

E. Cable Tray:
1. General:
   a. Install cable trays using approved fittings and adequately support the complete system. See Section 34 22 29P, TES Raceway and Equipment Hangers and Supports.
   b. Install cable trays parallel to each other and the building and plumb and level.
   c. Support cable trays with wall brackets or ceiling-mounted supports from the prefabricated building structure, with anti-sway brackets or braces where necessary.
   d. Trays shall be located no closer than 2-1/2 inches from the nearest wall, unless otherwise approved.
2. Supports:
   a. Finish: Hot-dip galvanized after fabrication.
   b. Ceiling supports: See Section 34 22 29P, TES Raceway and Equipment Hangers and Supports.
   c. End supports: Support terminating sections of cable tray not more than 12 inches from end of tray.
   d. Wall supports: Capable of sustaining an end-load of 1,600 pounds.
   e. Spacing:
      1) Supports: Space at maximum distance of 5 feet to provide rigidity and adequate strength to support weight of trays and cables.
      2) Splices: Each tray splice shall have a support between 6 inches and 24 inches from the splice.
3. Seismic bracing: Provide bracing for cable tray system complying with sealed seismic calculations required in Section 34 21 05P, Common Work Results for TES.
4. Fasteners:
   a. Solidly bolt trays to supporting channels using countersunk machine screws, 1/4 inch by 20 threads per inch, minimum.
   b. After installation of fasteners, tray shall be free from burrs or sharp edges.

5. Separators: Provide separators to isolate cables of different voltages.

F. Boxes:
   1. General:
      a. Provide electrical boxes and cabinets of the material, finish, type, and size indicated and as required for the location, kind of service, number of wires, and function.
      b. Ensure boxes and support fittings are of suitable and compatible materials that will not corrode when subjected to moisture or standing water.
      c. Provide brackets, supports, hangers, fittings, bonding jumpers, and other installation accessories as required. Refer to Section 34 22 29P, TES Raceway and Equipment Hangers and Supports.
      d. Securely attach outlet, junction, and pull boxes to the structure. Do not use conduits entering the box as supports for the box.
   2. Covers:
      a. Provide boxes complete with accessible covers designed for quick removal and suitable for the purpose for which they will be used.
      b. Provide flat or raised blank covers for boxes without devices or fixtures.
      c. Provide neoprene gaskets for boxes subjected to weather.
   3. Installation:
      a. Mount outlet, junction, and pull boxes so as to prevent moisture from entering or accumulating within the boxes.
      b. Junction and Pull Boxes: Install so that covers are readily accessible after completion of the installation.
   4. Grounding: Ground/bond each box and cabinet as specified in Section 34 22 26P, TES Grounding and Bonding.
   5. Dc equipment: For areas within 6 feet of dc rectifier and dc circuit breaker enclosures provide nonmetallic pull-boxes, junction boxes, device boxes, and covers.

PART 3 - EXECUTION

3.1 RACEWAY TYPE REQUIREMENTS

A. Permitted Conduit Types:
   1. Conduits in TES substations:
      a. GRS or RTRC.
      b. Within 6 feet of dc rectifier or distribution breaker enclosures: RTRC.
   2. Liquid-tight flexible metal conduit:
      a. Permitted only where required for flexibility such as connections to vibrating equipment and across joints subject to differential movement.
      b. Not acceptable as a substitute for other conduit types in areas with complicated bending requirements.
   3. Conduit or raceway types not specifically called out in these Specifications or Contract Drawings shall not be used.

B. Permitted Cable Tray Type: Fiberglass with insulating support hardware.

C. Prohibited Raceway Types:
   1. Wiring gutters or wireways.
   2. Electrical Metallic Tubing (EMT).
   3. Intermediate Metal Conduit (IMC).
   4. Flexible metal conduit.
   5. Conduit running thread.

3.2 RACEWAY MINIMUM SIZES:

A. GRS: 3/4-inch.

B. RTRC: 3/4-inch.

C. Liquid-tight Flexible Metallic Conduit: 1/2-inch.

3.3 RACEWAY BENDS

A. Minimum Bend Radius (above grade): In accordance with NFPA 70 Chapter 9 Table 2, "Other Bends" column.

B. Refer to Section 26 05 43, Systemwide Electrical Underground Ductbanks and Raceways for Systems, for bending requirements for underground ducts.

3.4 BOX AND CABINET TYPE REQUIREMENTS

A. Dry locations:
   1. Outlet boxes: Sheet metal outlet boxes.
   2. Junction or pull boxes with volume less than 100 inches: Sheet metal junction or pull box.
   3. Cabinets: Galvanized steel, NEMA 250 Type 1.

B. Damp locations:
   1. Outlet, junction, and pull boxes: Cast metal boxes.
   2. Cabinets: NEMA 250 Type 4X stainless steel unless otherwise approved.

C. Within 6 feet of dc switchgear:
   1. Cabinets: Fiberglass composite.

3.5 INSTALLATION

A. Requirements of Article titled "Factory Assembly" apply to field installation.

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT

A. The quantities of accepted work will be measured in the following units. All measurements will be plan measure except for authorized changes.
   1. Description: Lump Sum

4.2 PAYMENT

A. Payment will be made at the respective unit or lump-sum price listed in the proposal and shall be full compensation for all labor, materials, and equipment necessary to complete the respective unit in place. There will be no separate measurement or payment for any item of work not specifically identified and listed in the proposal, and all such work shall be considered a subsidiary item with all costs pertaining thereto included in the prices for other items listed in the proposal. At the Engineer's option, partial payment may be made for any lump sum item listed in the proposal, providing that the Vendor is diligently and satisfactorily pursuing full completion of such partially complete item in accordance with the approved job progress schedule.

END OF SECTION

TRACTION POWER SYMBOLS

NO — DISCONNECT SWITCH IS NORMALLY CLOSED (NC), UNLESS DESIGNATED WITH (NO) NORMALLY OPEN

FUSED DISCONNECT SWITCH

LOW VOLTAGE CIRCUIT BREAKER

POTENTIAL TRANSFORMER

OR — CURRENT TRANSFORMER

RECTIFIER TRANSFORMER, 12 PULSE

RECTIFIER TRANSFORMER, 6 PULSE OR POWER TRANSFORMER

INTERPHASE TRANSFORMER

WYE, TRANSFORMER CONNECTION

DELTA, TRANSFORMER CONNECTION

SURGE ARRESTER

TRACTION RECTIFIER

FUSE

DRAWOUT FUSE

SHUNT OR TPSS BUS CONNECTION

172 / 76 — WITHDRAWABLE DC CIRCUIT BREAKER WITH SERIES TRIP UNIT

DIRECTION OF CONTROL OR RELAY INFLUENCE LINE

DIODE

CONTACTOR

52 — WITHDRAWABLE MEDIUM VOLTAGE AC BREAKER

A — ANNUNCIATOR / HMI / SAS PLC

AM — AMMETER

VM — VOLTMETER

KWHR — KILOWATT HOUR METER

KVAR — KILOVAR HOUR METER

AS — AMMETER SWITCH

KW — KILOWATT METER

SC — SCADA

ETS — EMERGENCY TRIP STATION

AT — CURRENT TRANSDUCER

VT — VOLTAGE TRANSDUCER

K — K — MECHANICAL KEY INTERLOCK

UTILITY GROUND CONNECTION

1 — INTERLOCK

SD — SMOKE DETECTOR

GFI RECEPTACLE

MH/HH/VAULT

LIGHT FIXTURE

INSULATED OVERLAP (IOL)

OCS SECTION INSULATOR (SI)

EXTERIOR LIGHT

GROUND

CHASSIS GROUND

EXIT SIGN WITH EMERGENCY LIGHT

EMERGENCY LIGHT

CABLE POTHEAD/CABLE CONNECTOR

S_3 — THREE-WAY LIGHT SWITCH

ø — ELECTRICAL PHASE

FE — FIRE EXTINGUISHER

PHOTOCELL

MULTI-MODE FIBER OPTIC

DEVICE / FUNCTION REFERENCES

52	RELAY OPERATING COIL. INSIDE NUMBER DESIGNATES DEVICE FUNCTION. OUTSIDE NUMBER DESIGNATES QUANTITY OF DEVICES
5	EMERGENCY STOP PUSHBUTTON
26R1	RECTIFIER OVERTEMP ALARM (1ST. STAGE)
26R2	RECTIFIER OVERTEMP TRIP (2ND. STAGE)
27	UNDERVOLTAGE RELAY
30	INTERPOSING RELAY
32	REVERSE CURRENT RELAY
33A	AC CIRCUIT BREAKER REAR DOOR SWITCH
33F	FEEDER BREAKER REAR DOOR SWITCH
33N	NEGATIVE SWITCH DOOR OPEN
33P	POSITIVE SWITCH DOOR OPEN
33R	RECTIFIER DOOR SWITCH
33T	TRANSFORMER DOOR SWITCH
43	MANUAL TRANSFER OR SELECTOR DEVICE
47	PHASE SEQUENCE
49T1	TRANSFORMER OVERTEMP ALARM (1ST STAGE)
49T2	TRANSFORMER OVERTEMP TRIP (2ND STAGE)
50/51	PHASE FAULT TIME OVERCURRENT RELAY (INST. AND TIME DELAY)
50N/51N	GROUND FAULT TIME OVERCURRENT RELAY (INST. AND TIME DELAY)
52	AC CIRCUIT BREAKER
59	AC OVERVOLTAGE
59B	BANK PHASE OVERVOLTAGE
64GS	GROUNDED STRUCTURE
64HS	HOT STRUCTURE
64V	NEGATIVE-TO-EARTH VOLTAGE RELAY
76	DC DIRECT ACTING OVERCURRENT TRIP DEVICE
86	AC LOCKOUT RELAY
89P	DC POSITIVE DISCONNECT SWITCH
89N	DC NEGATIVE DISCONNECT SWITCH
98R1	R1 RECTIFIER DIODE FAILURE ALARM
98R2	R2 RECTIFIER DIODE FAILURE TRIP
148	DC INCOMPLETE SEQ. RELAY
150	DC INSTANTANEOUS OVERCURRENT RELAY
151	DC TIME OVERCURRENT RELAY
172	DC CIRCUIT BREAKER
182	DC LOAD MEASURING RELAY
183	DC RECLOSING RELAY
185	TRANSFER TRIP RELAY
186	DC LOCKOUT RELAY
R2G	RAIL-TO-GROUND SYSTEM
ROR	DC RATE OF RISE RELAY

REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:15:24 PM

DESIGNED BY JDW
CHECKED BY PGL
DRAWN BY JDW
CHECKED BY PGL
APPROVED BY NKS
DATE 06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 — DATE: **09-09-2022**

HDR Engineering, Inc.
10450 Holmes Road
Suite 600
Kansas City, MO 64131-3471
816-360-2700
Certificate of Authority: 000856

HNTB
The HNTB COMPANIES
INFRASTRUCTURE SOLUTIONS
300 Apollo Drive
Chelmsford, MA 01824
Phone: 978-905-4000
Certificate of Authority: 001270

NOT FOR CONSTRUCTION

KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER
TRACTION POWER SYMBOLS

SCALE FOR 22"x34": NOT TO SCALE
FILENAME: G036.DWG
CONTRACT NO.: CONTRACT NO. ###
VOLUME: 1
DRAWING NO.: G036
SHEET NO.:

302794

TRACTION POWER ABBREVIATIONS

A

A	AMPERE
AM	AMMETER
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APPROX	APPROXIMATELY
A	ANNUNCIATOR / SAS ALARM
AC	ALTERNATING CURRENT / AC BREAKER
AS	AMMETER SWITCH
AT	CURRENT TRANSDUCER
AUX	AUXILARY

B

BAL.	BALANCE
BKR	BREAKER
BLVD	BOULEVARD

C

C	CONDUIT
CB	CIRCUIT BREAKER
CKT	CIRCUIT
COMP	COMPARATOR
CONN	CONNECTION
CT	CURRENT TRANSFORMER
CUB	CUBICLE

D

DC	DIRECT CURRENT
DR	DUCTBANK/RACEWAY
DS	DISCONNECT SWITCH

E

ELT	EXTERIOR LIGHTS
ETS	EMERGENCY TRIP STATION

F

F	DC FEEDER BREAKER
FACP	FIRE ALARM CONTROL PANEL
FX	FAST ETHERNET

G

GFI	GROUND FAULT INTERRUPTER
GL	GREEN LIGHT
GND	GROUND

H

HH	HAND HOLE
HMI	HUMAN MACHINE INTERFACE
HR	HOUR
HTS	HEAVY TRACTION SERVICE
HS	HOT STRUCTURE
HVAC	HEATING VENTING AND AIR CONDITIONING
HW	HARDWIRE

I

ILT	INTERIOR LIGHTS
INST.	INSTANTANEOUS
I/O	INPUT/OUTPUT
IOS	INSULATED OVERLAP

K

K	MECHANICAL KEY INTERLOCK
KCMIL	THOUSANDS CIRCULAR MILS
KV	KILOVOLT
KVA	KILOVOLT AMPERE
KVAC	KILOVOLT ALTERNATING CURRENT
KW	KILOWATT

L

LMR	LOAD MEASURING RESISTOR

M

MCB	MAIN CIRCUIT BREAKER
MFPR	MULTI-FUNCTION PROTECTION RELAY
MH	MANHOLE
MOC	MECHANISM OPERATED CONTACT

N

N	NEGATIVE
NC	NORMALLY CLOSED
NEG	NEGATIVE
NO	NORMALLY OPEN
NR	NEGATIVE FEEDER

O

OCS	OVERHEAD CONTACT SYSTEM

P

P, POS	POSITIVE
PAC	PROGRAMMABLE AUTOMATION CONTROLLER
PC	PERSONAL COMPUTER
PF	POSITIVE FEEDER
PSC	PHOTOCELL SHORTING CAP
PSI	POUNDS PER SQUARE INCH
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE

R

R	RECTIFIER
R2G	RAIL-TO-GROUND SYSTEM
RL	RED LIGHT
RT	RECTIFIER TRANSFORMER
REV.	REVERSE
ROR	DC RATE OF RISE RELAY
RTU	REMOTE TERMINAL UNIT

S

SAS	SUBSTATION AUTOMATION SYSTEM
SC	SIGNAL/COMMUNICATIONS
SCC	STATION CONTROL CABINET
SCADA	SUPERVISORY CONTROL AND DATA ACQUISITION
SD	SMOKE DETECTOR
SFP	SMALL FORM-FACTOR PLUGABLE
SEQ.	SEQUENCE
SI	SECTION INSULATOR
SPD	SURGE PROTECTIVE DEVICE
STA.	STATIONING
SUMM	SUMMARY ALARM (COMMON ALARM)

T

TB	TERMINAL BLOCK
TBD	TO BE DETERMINED
TD	TIME DELAY
TE	TRACTION ELECTRIFICATION
TOC	TRUCK OPERATED CONTACT
TPD	TRACTION POWER DUCTBANK
TPSS	TRACTION POWER SUBSTATION
TRFY	TRAFFICWAY
TT	TRANSFER TRIP
TYP.	TYPICAL

V

V	VOLT
VM	VOLTMETER
VAC	VOLT ALTERNATING CURRENT
VDC	VOLT DIRECT CURRENT
VT	VOLTAGE TRANSDUCER
VT	VAULT

W

W	WATT
WL	WHITE LIGHT
WT	WEIGHT

NOTES:

1. SEE CITY OF KANSAS CITY STANDARD PLANS FOR ADDITIONAL ABBREVIATIONS.

REV	DATE	DESCRIPTION

PLOT DATE: 9/7/2022 3:17:17 PM

DESIGNED BY	JDW
CHECKED BY	PGL
DRAWN BY	JDW
CHECKED BY	PGL
APPROVED BY	NKS
DATE	06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

HDR Engineering, Inc.
10450 Holmes Road
Suite 600
Kansas City, MO 64131-3471
816-360-2700
Certificate of Authority: 000856

HNTB
The HNTB COMPANIES
INFRASTRUCTURE SOLUTIONS
300 Apollo Drive
Chelmsford, MA 01824
Phone: 978-905-4000
Certificate of Authority: 001270

NOT FOR CONSTRUCTION

KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER
ABBREVIATIONS

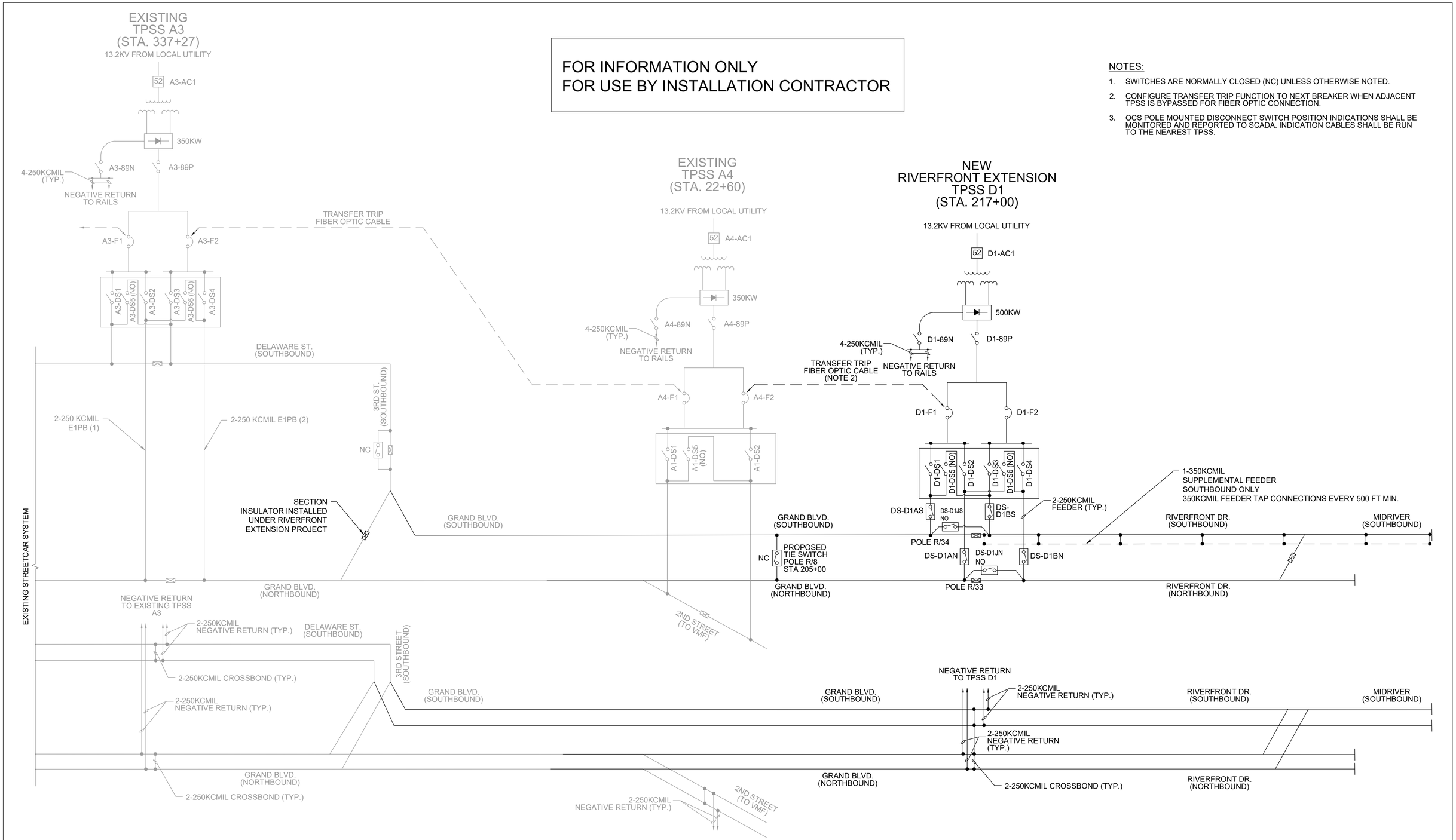
SCALE FOR 22"x34":	NOT TO SCALE
FILENAME:	G037.DWG
CONTRACT NO.:	CONTRACT NO. ###
VOLUME:	1
DRAWING NO.:	G037
SHEET NO.:	

302795

FOR INFORMATION ONLY
FOR USE BY INSTALLATION CONTRACTOR

NOTES:

1. SWITCHES ARE NORMALLY CLOSED (NC) UNLESS OTHERWISE NOTED.
2. CONFIGURE TRANSFER TRIP FUNCTION TO NEXT BREAKER WHEN ADJACENT TPSS IS BYPASSED FOR FIBER OPTIC CONNECTION.
3. OCS POLE MOUNTED DISCONNECT SWITCH POSITION INDICATIONS SHALL BE MONITORED AND REPORTED TO SCADA. INDICATION CABLES SHALL BE RUN TO THE NEAREST TPSS.



REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:53:29 PM

DESIGNED BY JDW
CHECKED BY PGL
DRAWN BY JDW
CHECKED BY PGL
APPROVED BY NKS
DATE 05/04/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

HDR Engineering, Inc.
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816-360-2700
Certificate of Authority: 000856

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The HNTB COMPANIES
INFRASTRUCTURE SOLUTIONS
300 Apollo Drive
Chelmsford, MA 01824
Phone: 978-905-4000
Certificate of Authority: 001270

NOT FOR CONSTRUCTION

KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER SYSTEM MASTER SINGLE LINE DIAGRAM RIVERFRONT EXTENSION

SCALE FOR 22"x34": NOT TO SCALE
FILENAME: J101.DWG
CONTRACT NO.:
CONTRACT NO. ###
VOLUME: 1
DRAWING NO.: J101
SHEET NO.:

AC LOCKOUT (86) IS ACTIVATED BY THE FOLLOWING DEVICES:

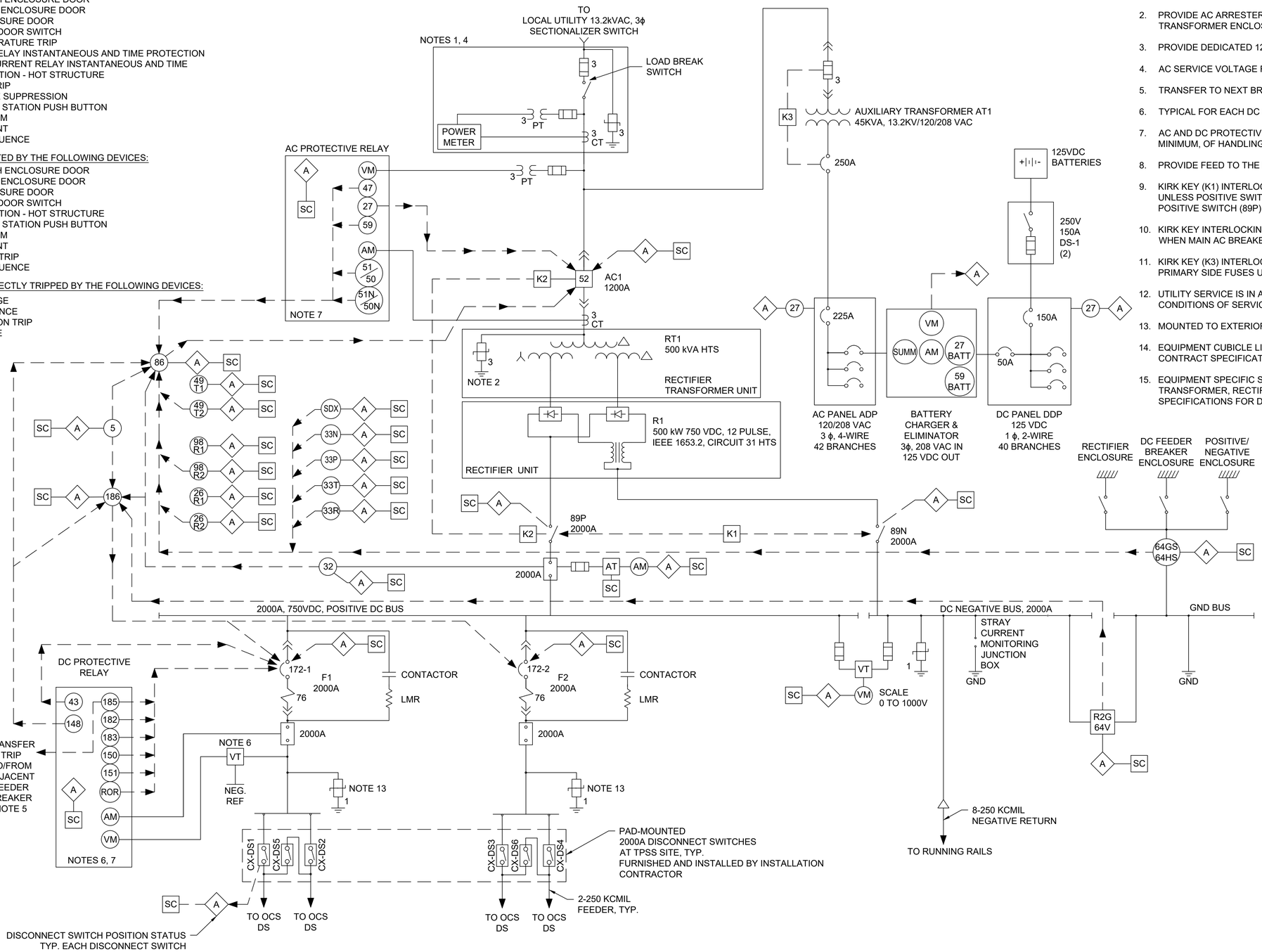
26-R2	RECTIFIER DIODE OVER TEMP TRIP
33A-X	MAIN AC BREAKER CUBICLE REAR DOOR
33F-X	DC FEEDER BREAKER CUBICLE REAR DOOR
33N-X	NEGATIVE SWITCH ENCLOSURE DOOR
33P-X	POSITIVE SWITCH ENCLOSURE DOOR
33R-X	RECTIFIER ENCLOSURE DOOR
33T-X	TPT ENCLOSURE DOOR SWITCH
49-WT2	TPT OVER TEMPERATURE TRIP
50/51	OVERCURRENT RELAY INSTANTANEOUS AND TIME PROTECTION
50N/51N	NEUTRAL OVERCURRENT RELAY INSTANTANEOUS AND TIME
64HS	GROUND PROTECTION - HOT STRUCTURE
98R2	DIODE FAILURE TRIP
99T	RECTIFIER SURGE SUPPRESSION
5	EMERGENCY TRIP STATION PUSH BUTTON
SDX	FIRE/SMOKE ALARM
32	REVERSE CURRENT
148	INCOMPLETE SEQUENCE

DC LOCKOUT (186) IS ACTIVATED BY THE FOLLOWING DEVICES:

33N-X	NEGATIVE SWITCH ENCLOSURE DOOR
33P-X	POSITIVE SWITCH ENCLOSURE DOOR
33R-X	RECTIFIER ENCLOSURE DOOR
33T-X	TPT ENCLOSURE DOOR SWITCH
64HS	GROUND PROTECTION - HOT STRUCTURE
5	EMERGENCY TRIP STATION PUSH BUTTON
SDX	FIRE/SMOKE ALARM
32	REVERSE CURRENT
R2G	RAIL TO GROUND TRIP
148	INCOMPLETE SEQUENCE

AC MAIN BREAKER (52) IS DIRECTLY TRIPPED BY THE FOLLOWING DEVICES:

27	AC UNDERVOLTAGE
47	AC PHASE SEQUENCE
50/51	RELAY PROTECTION TRIP
59	AC OVERVOLTAGE



NOTES:

1. UTILITY METERING INSTRUMENT TRANSFORMERS AND METER PROVIDED BY LOCAL UTILITY.
2. PROVIDE AC ARRESTER IN A SEPARATE ENCLOSURE WITH BARRIER WITHIN TRANSFORMER ENCLOSURE.
3. PROVIDE DEDICATED 120V AC CIRCUIT FOR TPSS BUILDING EXTERIOR RECEPTACLES.
4. AC SERVICE VOLTAGE FOR ALL SUBSTATIONS IS 13.2KV, 3-PHASE.
5. TRANSFER TO NEXT BREAKER WHEN ADJACENT TPSS IS IN BYPASS.
6. TYPICAL FOR EACH DC FEEDER BREAKER
7. AC AND DC PROTECTIVE RELAYS SHALL BE MULTIFUNCTION AND CAPABLE, AT A MINIMUM, OF HANDLING ALL FUNCTIONS SHOWN.
8. PROVIDE FEED TO THE BATTERY CHARGER AND OTHER BUILDING AUXILIARY LOADS.
9. KIRK KEY (K1) INTERLOCK WILL PREVENT OPENING OF 89N NEGATIVE DISCONNECT UNLESS POSITIVE SWITCH (89P) IS DISCONNECTED AND SHALL PREVENT CLOSE OF THE POSITIVE SWITCH (89P) UNLESS THE 89N NEGATIVE DISCONNECT IS CLOSED.
10. KIRK KEY INTERLOCKING (K2) WILL PREVENT OPENING OF THE POSITIVE SWITCH (89P) WHEN MAIN AC BREAKER IS CLOSED AND RACKED IN.
11. KIRK KEY (K3) INTERLOCK WILL PREVENT REMOVAL OF AUXILIARY TRANSFORMER AT1 PRIMARY SIDE FUSES UNLESS SECONDARY (250A) CB IS OPEN.
12. UTILITY SERVICE IS IN ACCORDANCE WITH LOCAL UTILITY REQUIREMENTS AND CONDITIONS OF SERVICE.
13. MOUNTED TO EXTERIOR OF TPSS.
14. EQUIPMENT CUBICLE LIGHTING AND HEATING TO BE PROPOSED BY VENDOR. SEE CONTRACT SPECIFICATIONS FOR DETAILED REQUIREMENTS.
15. EQUIPMENT SPECIFIC SCHEMATICS (AC SWITCHGEAR, DC SWITCHGEAR, RECTIFIER TRANSFORMER, RECTIFIER, ETC.) SHALL BE PROPOSED BY VENDOR. SEE CONTRACT SPECIFICATIONS FOR DETAILED REQUIREMENTS.

REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:56:01 PM

DESIGNED BY	JDW
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CHECKED BY	PGL
APPROVED BY	NKS
DATE	06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

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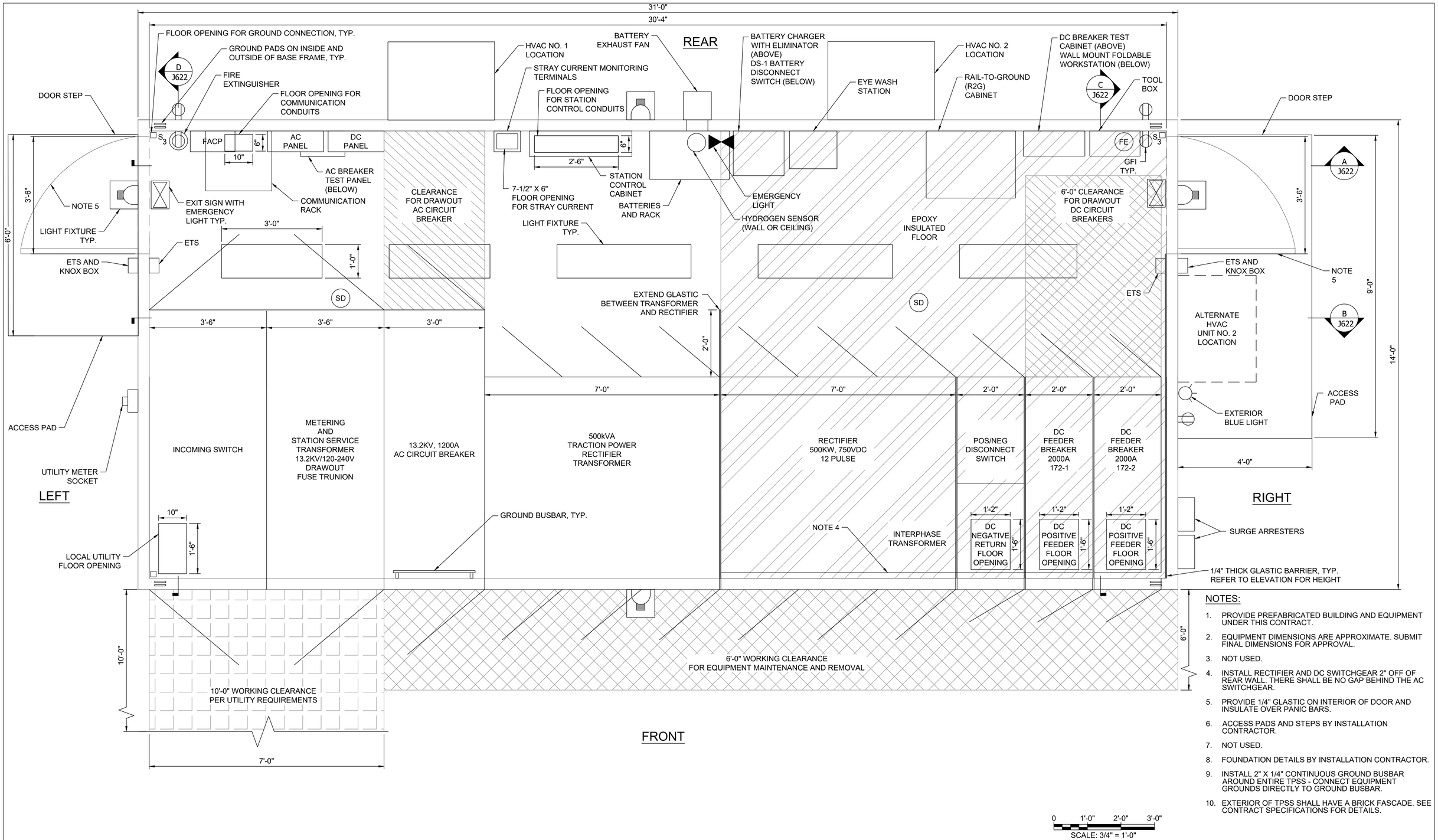
NOT FOR CONSTRUCTION

KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER
TYPICAL MAINLINE TPSS SINGLE LINE
SINGLE LINE DIAGRAM

SCALE FOR 22"x34":	NOT TO SCALE
FILENAME:	J610.DWG
CONTRACT NO.:	CONTRACT NO. ###
VOLUME:	1
DRAWING NO.:	J610
SHEET NO.:	

302797



NOTES:

1. PROVIDE PREFABRICATED BUILDING AND EQUIPMENT UNDER THIS CONTRACT.
2. EQUIPMENT DIMENSIONS ARE APPROXIMATE. SUBMIT FINAL DIMENSIONS FOR APPROVAL.
3. NOT USED.
4. INSTALL RECTIFIER AND DC SWITCHGEAR 2" OFF OF REAR WALL. THERE SHALL BE NO GAP BEHIND THE AC SWITCHGEAR.
5. PROVIDE 1/4" GLASTIC ON INTERIOR OF DOOR AND INSULATE OVER PANIC BARS.
6. ACCESS PADS AND STEPS BY INSTALLATION CONTRACTOR.
7. NOT USED.
8. FOUNDATION DETAILS BY INSTALLATION CONTRACTOR.
9. INSTALL 2" X 1/4" CONTINUOUS GROUND BUSBAR AROUND ENTIRE TPSS - CONNECT EQUIPMENT GROUNDS DIRECTLY TO GROUND BUSBAR.
10. EXTERIOR OF TPSS SHALL HAVE A BRICK FASCADE. SEE CONTRACT SPECIFICATIONS FOR DETAILS.

0 1'-0" 2'-0" 3'-0"
SCALE: 3/4" = 1'-0"

REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:53:55 PM

DESIGNED BY	JDW
CHECKED BY	PGL
DRAWN BY	JDW
CHECKED BY	PGL
APPROVED BY	NKS
DATE	06/24/2022

RideKC STREETCAR

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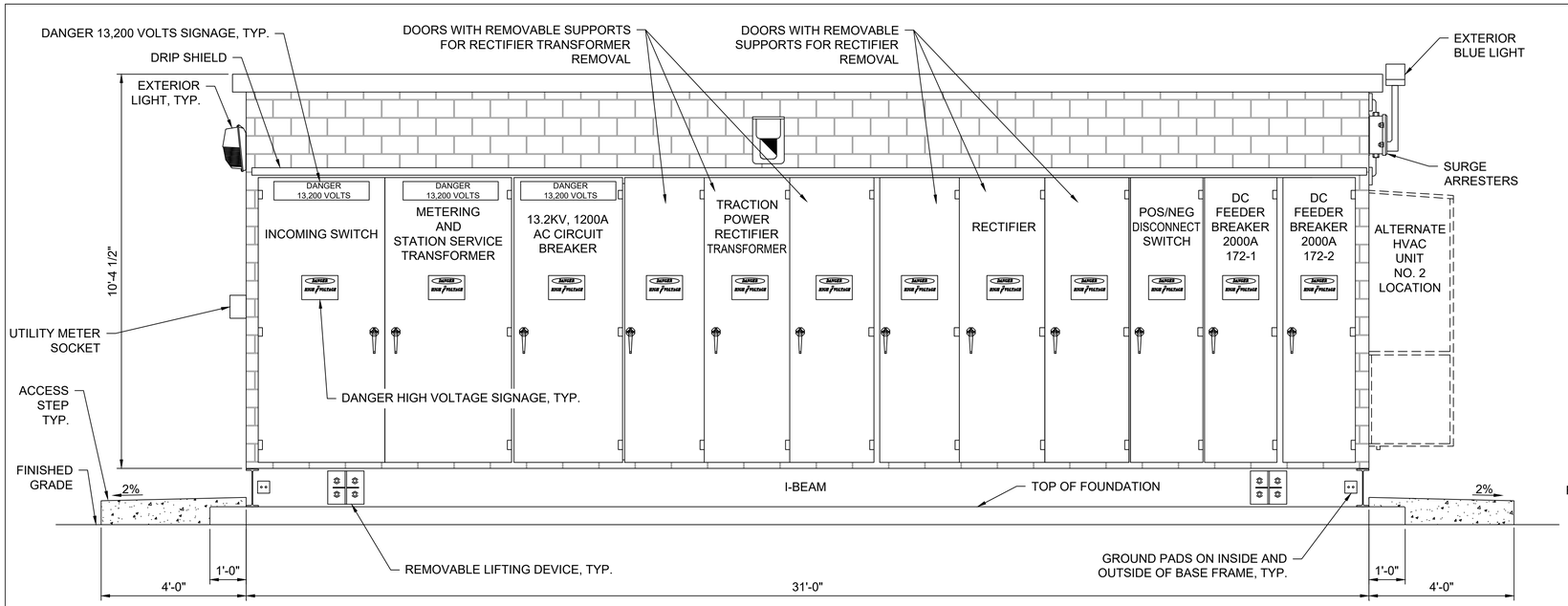
KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER
TYPICAL PREFABRICATED TPSS PLAN
EQUIPMENT LAYOUT PLAN

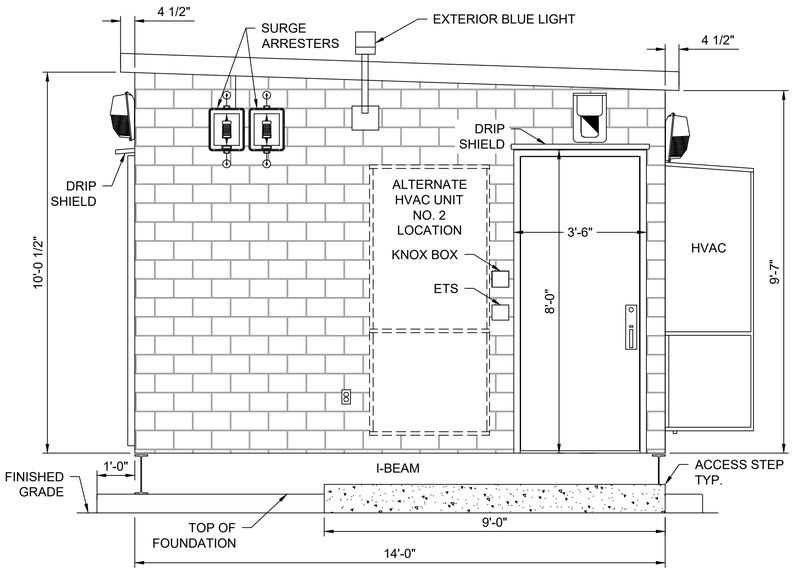
SCALE FOR 22"x34":	3/4"=1'-0"
FILENAME:	J620-J623.DWG
CONTRACT NO.:	
CONTRACT NO.	###
VOLUME:	1
DRAWING NO.:	J620
SHEET NO.:	

302798



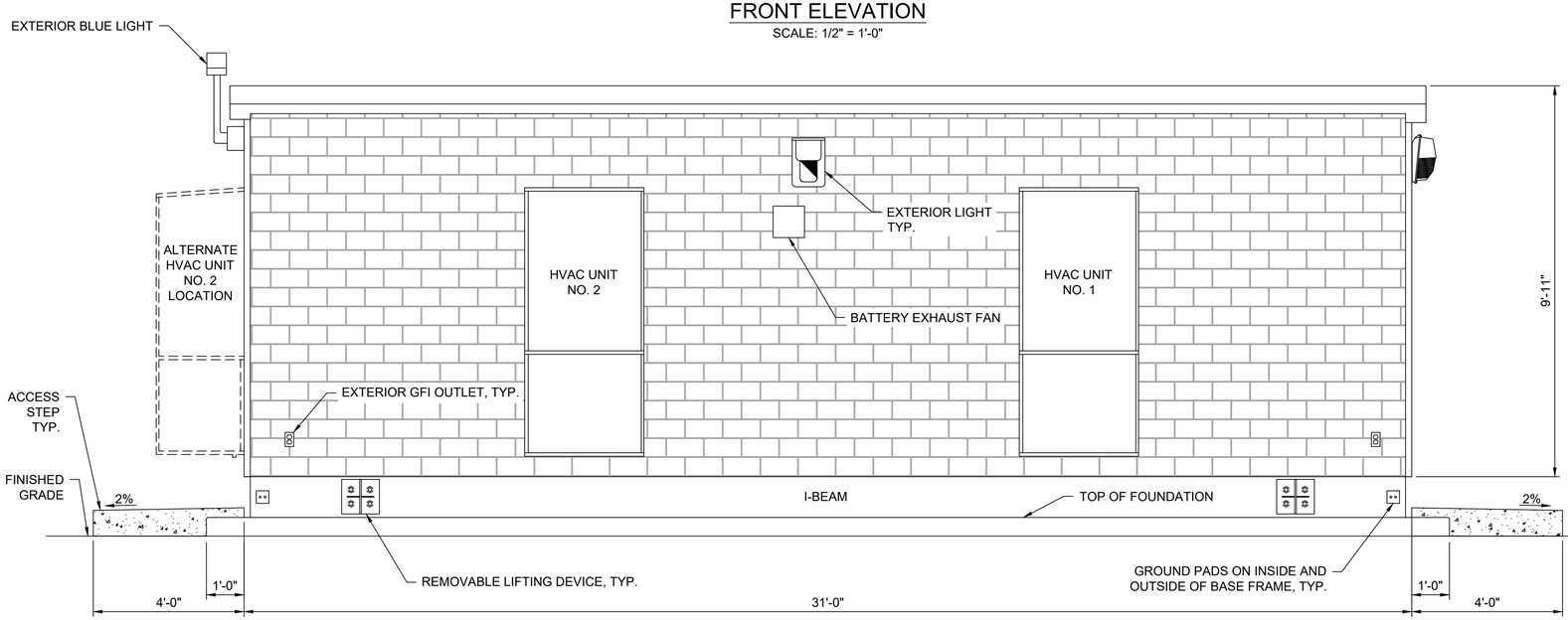
FRONT ELEVATION

SCALE: 1/2" = 1'-0"



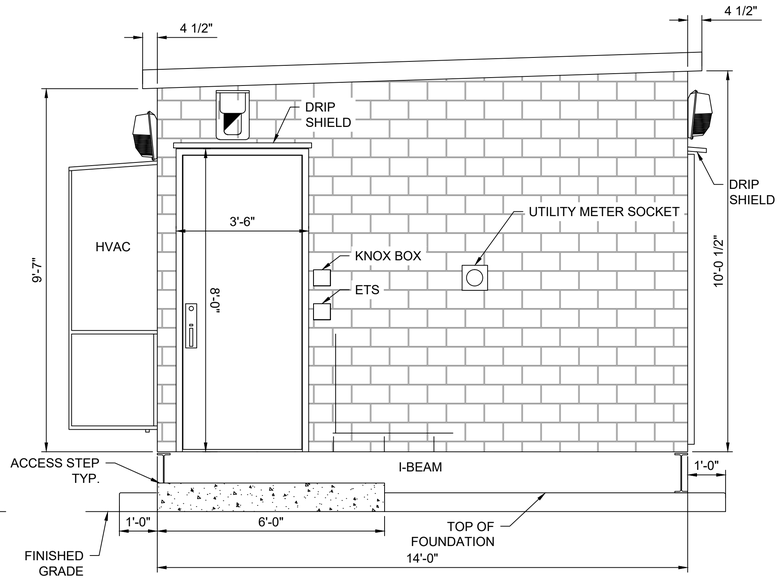
RIGHT ELEVATION

SCALE: 1/2" = 1'-0"



REAR ELEVATION

SCALE: 1/2" = 1'-0"



LEFT ELEVATION

SCALE: 1/2" = 1'-0"

0 2'-0" 4'-0" 6'-0"

SCALE: 1/2" = 1'-0"

NOTES:

1. EQUIPMENT DIMENSIONS ARE APPROXIMATE. SUBMIT FINAL DIMENSIONS FOR APPROVAL.
2. NOT USED.
3. FOUNDATION DETAILS BY INSTALLATION CONTRACTOR.
4. METERING EQUIPMENT AND SOCKET DETAILS SUBJECT TO APPROVAL OF UTILITY.
5. VENDOR SHALL SIZE EXTERIOR EQUIPMENT DOORS AND SUPPORTS FOR RECTIFIER AND TRANSFORMER TO ALLOW FOR REMOVAL FROM OUTSIDE THE TPSS.
6. EXTERIOR OF TPSS SHALL HAVE A BRICK FASCADE. SEE CONTRACT SPECIFICATIONS FOR DETAILS.

REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:53:55 PM

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DATE 06/24/2022

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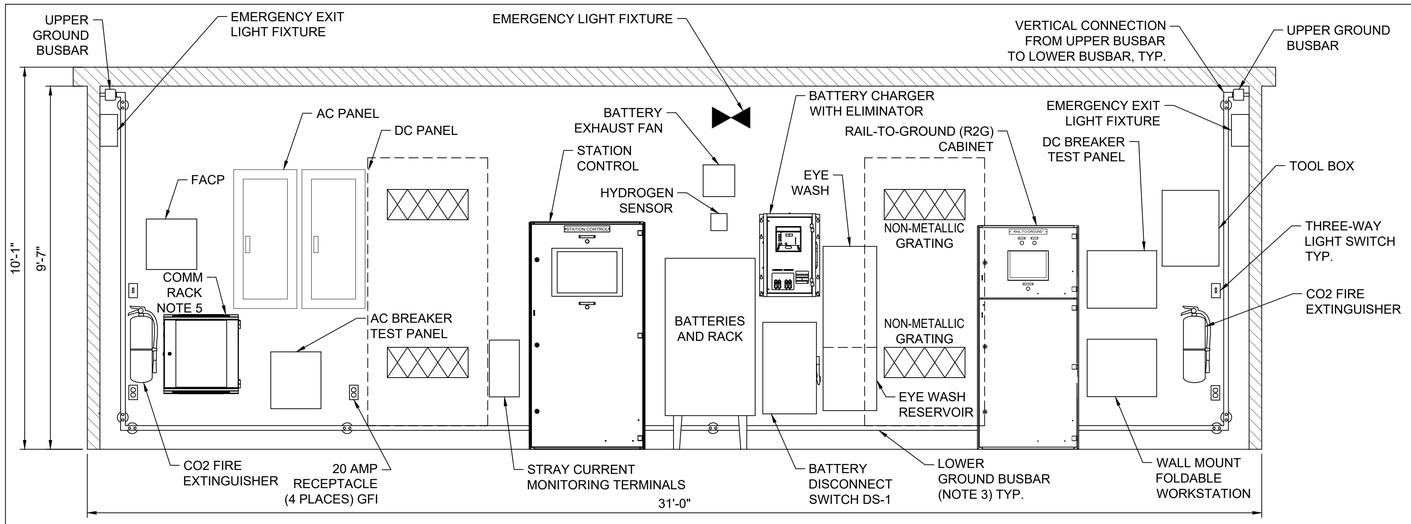
KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

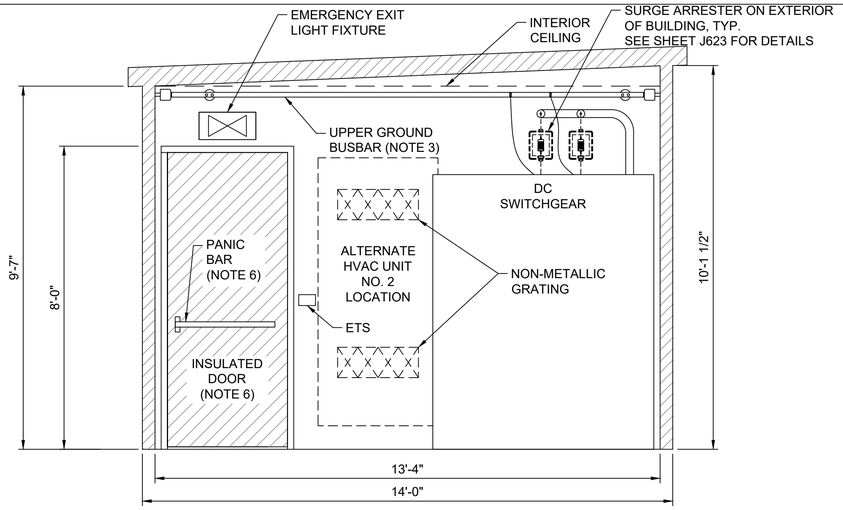
TRACTION POWER
TYPICAL PREFABRICATED TPSS - EXTERIOR ELEVATIONS
ELEVATION VIEW

SCALE FOR 22"x34":	1/2"=1'-0"
FILENAME:	J620-J623.DWG
CONTRACT NO.:	CONTRACT NO. ###
VOLUME:	1
DRAWING NO.:	J621
SHEET NO.:	

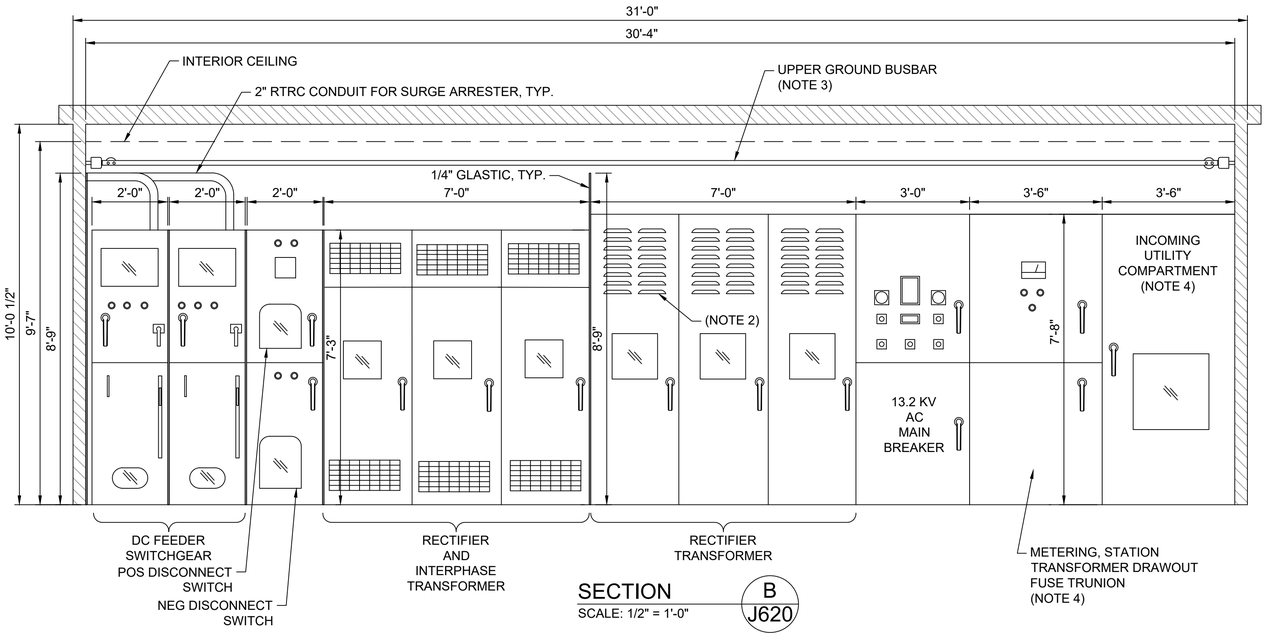
302799



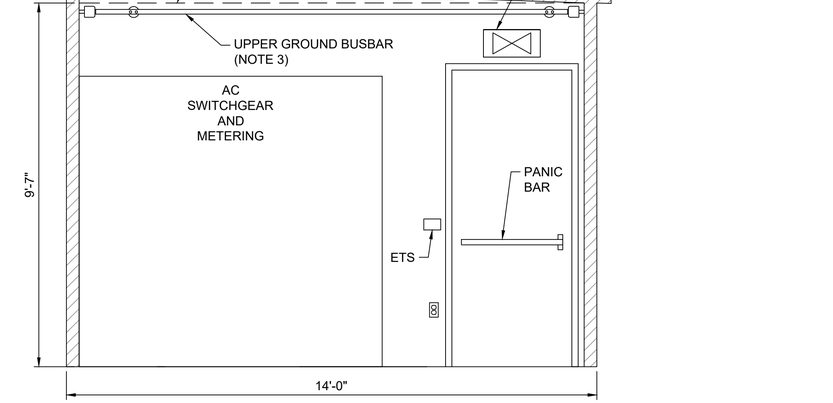
SECTION A
SCALE: 1/2" = 1'-0"
J620



SECTION C
SCALE: 1/2" = 1'-0"
J620



SECTION B
SCALE: 1/2" = 1'-0"
J620



SECTION D
SCALE: 1/2" = 1'-0"
J620

0 2'-0" 4'-0" 6'-0"
SCALE: 1/2" = 1'-0"

NOTES:

1. ALL DIMENSIONS ARE APPROXIMATE. SUBMIT FINAL DIMENSIONS FOR APPROVAL.
2. CONTRACTOR TO DETERMINE SIZE AND LOCATION OF TRANSFORMER AND RECTIFIER VENTILATION.
3. INSTALL 2" x 1/4" CONTINUOUS GROUND BUSBAR AROUND ENTIRE TPSS - CONNECT EQUIPMENT GROUNDS DIRECTLY TO GROUND BUSBAR.
4. INCOMING SWITCH, METERING EQUIPMENT, AND SOCKET DETAILS SUBJECT TO APPROVAL OF UTILITY.
5. REFER TO SPECIFICATIONS FOR COMMUNICATIONS RACK REQUIREMENTS.
6. PROVIDE 1/4" GLASTIC ON INTERIOR OF DOOR AND INSULATE OVER PANIC BARS.
7. INSTALL RECTIFIER AND DC SWITCHGEAR 2" OFF OF REAR WALL. THERE SHALL BE NO GAP BEHIND THE AC SWITCHGEAR.

REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:53:55 PM

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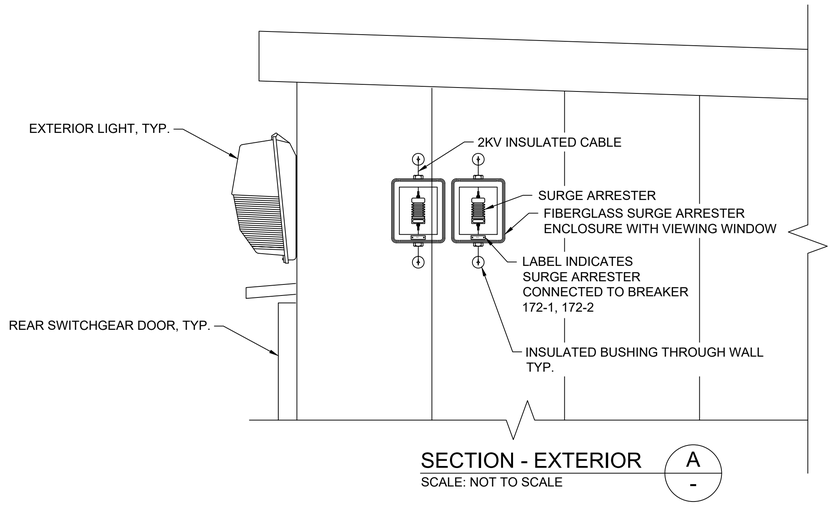
KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER
TYPICAL PREFABRICATED TPSS INTERIOR ELEVATIONS
INTERIOR ELEVATIONS

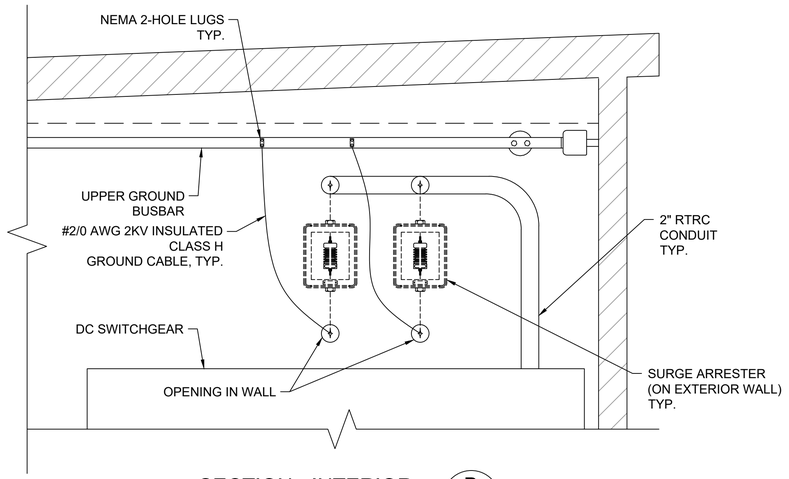
SCALE FOR 22"x34": 1/2"=1'-0"	
FILENAME: J620-J623.DWG	
CONTRACT NO.: CONTRACT NO. ###	
VOLUME: 1	
DRAWING NO.: J622	SHEET NO.:

302600



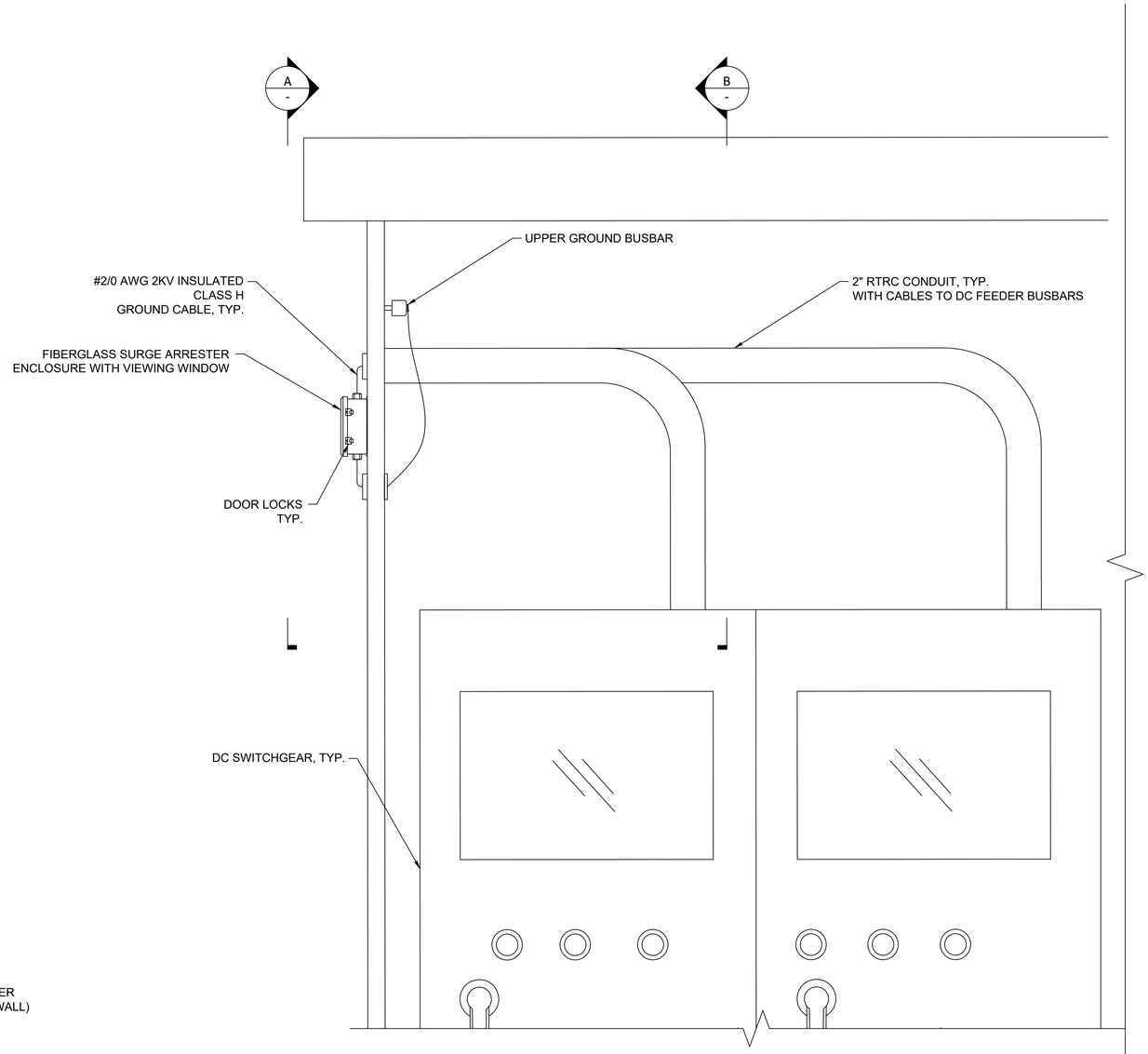
SECTION - EXTERIOR (A / -)

SCALE: NOT TO SCALE



SECTION - INTERIOR (B / -)

SCALE: NOT TO SCALE



SIDE VIEW

SCALE: NOT TO SCALE

NOTES:

1. SECURE CABLES ALONG THE BRACKET.
2. PROVIDE ENOUGH SLACK IN CABLE FOR SURGE ARRESTER TO FALL AWAY FROM BRACKET.
3. PROVIDE FIBERGLASS ENCLOSURE WITH VIEWING WINDOW AND DOOR LOCKS.
4. SURGE ARRESTERS SHALL BE MOUNTED AT A MINIMUM OF 9'-6" ABOVE FINISHED GRADE.

REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:53:55 PM

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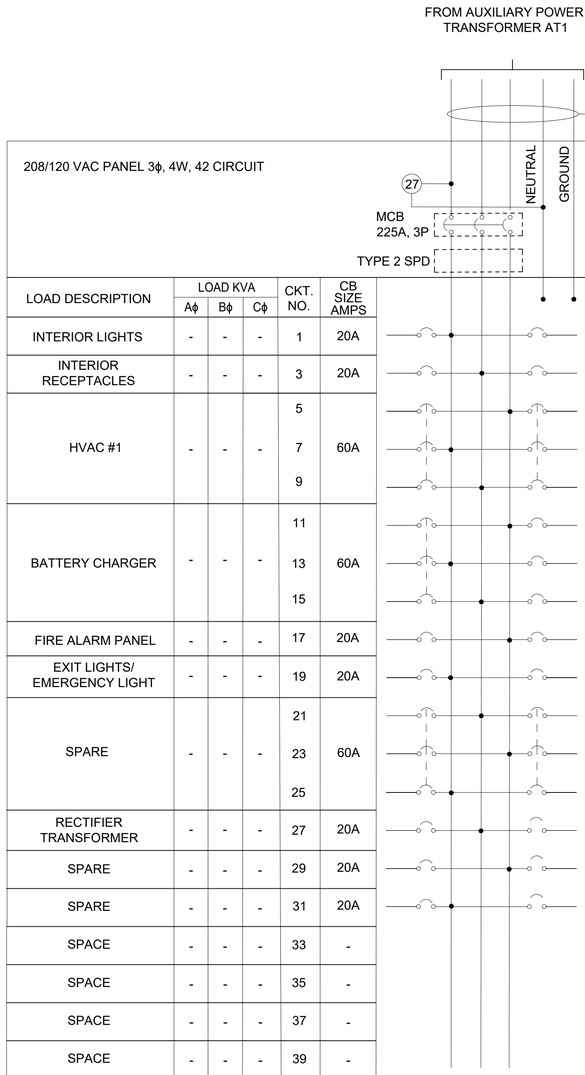
KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER
TYPICAL SURGER ARRESTER
INTERIOR ELEVATIONS

SCALE FOR 22"x34": NOT TO SCALE
FILENAME: J620-J623.DWG
CONTRACT NO.: CONTRACT NO. ###
VOLUME: 1
DRAWING NO.: J623
SHEET NO.:

302601



LOAD DESCRIPTION	LOAD KVA Aϕ	LOAD KVA Bϕ	LOAD KVA Cϕ	CKT. NO.	CB SIZE AMPS	CB SIZE AMPS	CKT. NO.	LOAD KVA Cϕ	LOAD KVA Bϕ	LOAD KVA Aϕ	LOAD DESCRIPTION
INTERIOR LIGHTS	-	-	-	1	20A	20A	2	-	-	-	EXTERIOR LIGHTS
INTERIOR RECEPTACLES	-	-	-	3	20A	20A	4	-	-	-	EXTERIOR RECEPTACLES
HVAC #1	-	-	-	5 7 9	60A	60A	6 8 10	-	-	-	HVAC #2
BATTERY CHARGER	-	-	-	11 13 15	60A	20A 20A 20A	12 14 16	- - -	- - -	- - -	AC SWITCHGEAR HEATER STRIPS EXHAUST FAN SMOKE DETECTOR
FIRE ALARM PANEL	-	-	-	17	20A	20A	18	-	-	-	DC SWITCHGEAR HEATER STRIPS
EXIT LIGHTS/ EMERGENCY LIGHT	-	-	-	19	20A	20A	20	-	-	-	SWITCHGEAR LIGHTS
SPARE	-	-	-	21 23 25	60A	60A	22 24 26	-	-	-	SPARE
RECTIFIER TRANSFORMER	-	-	-	27	20A	20A	28	-	-	-	RECTIFIER HEATERS
SPARE	-	-	-	29	20A	20A	30	-	-	-	RECTIFIER LIGHTS
SPARE	-	-	-	31	20A	20A	32	-	-	-	SPARE
SPACE	-	-	-	33	-	-	34	-	-	-	SPACE
SPACE	-	-	-	35	-	-	36	-	-	-	SPACE
SPACE	-	-	-	37	-	-	38	-	-	-	SPACE
SPACE	-	-	-	39	-	-	40	-	-	-	SPACE
SPACE	-	-	-	41	-	-	42	-	-	-	SPACE

AC PANEL ADP - PANEL SCHEDULE

SCALE: NOT TO SCALE

NOTES:

1. NOT FOR CONSTRUCTION: FOR INFORMATIONAL PURPOSES ONLY. REFER TO VENDOR'S AC PANELBOARD DRAWING FOR AC PANEL LAYOUT
2. ALL INTERNAL BUILDING WIRING AND FINAL BREAKER SIZES TO BE DETERMINED BY VENDOR.

REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:18:33 PM

DESIGNED BY JDW
CHECKED BY PGL
DRAWN BY JDW
CHECKED BY PGL
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DATE 06/24/2022

RideKC STREETCAR

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KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

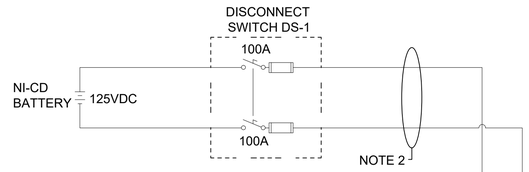
TRACTION POWER
120/208V AC PANEL ADP
PANEL SCHEDULE

SCALE FOR 22"x34": NOT TO SCALE
FILENAME: J642.DWG
CONTRACT NO.: CONTRACT NO. ###
VOLUME: 1
DRAWING NO.: J642
SHEET NO.:

302602

NOTES:

1. NOT FOR CONSTRUCTION: FOR INFORMATIONAL PURPOSES ONLY. REFER TO VENDOR'S DC PANELBOARD DRAWING FOR DC PANEL LAYOUT
2. ALL INTERNAL BUILDING WIRING AND FINAL BREAKER SIZES TO BE DETERMINED BY VENDOR.
3. FOR THE DC DISTRIBUTION PANEL: AUXILIARY CONTACTS OF THE MAIN AND EACH BRANCH CIRCUIT BREAKER SHALL BE FACTORY WIRED TO A TERMINAL STRIP FOR CONNECTION TO THE ANNUNCIATOR AND SUPERVISORY CIRCUITS. TRIPPED OR OPEN CIRCUIT BREAKERS SHALL BE ANNUNCIATED.



125 VDC PANEL, 2W, 40 CIRCUIT

DC PANEL
DDP

27

MCB
150A
2P

LOAD DESCRIPTION	LOAD WATTS	CB CKT. NO.	SIZE AMPS	SIZE AMPS	CB CKT. NO.	LOAD WATTS	LOAD DESCRIPTION
BATTERY CHARGER INPUT	-	1	50A	20A	2	-	AC SWITCHGEAR
		3			4		
DC BREAKER TEST CABINET	-	5	20A	20A	6	-	SWITCH POSITION LIGHTS
		7			8		
SPARE	-	9	20A	30A	10	-	DC SWITCHGEAR POSITIVE 89P CUBICLE
		11			12		
ADC BREAKER TEST CABINET	-	13	20A	20A	14	-	DC SWITCHGEAR NEGATIVE 89N CUBICLE
		15			16		
STATION CONTROL CABINET	-	17	20A	20A	18	-	DC FEEDER 1
		19			20		
SPARE	-	21	20A	20A	22	-	DC FEEDER 2
		23			24		
SPARE	-	25	20A	20A	26	-	RECTIFIER TRANSFORMER
		27			28		
SPARE	-	29	20A	20A	30	-	SPARE
		31			32		
SPARE	-	33	20A	20A	34	-	SPARE
		35			36		
SPARE	-	37	20A	20A	38	-	SPARE
		39			40		

DC PANEL DDP - PANEL SCHEDULE

SCALE: NOT TO SCALE

REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:18:58 PM

DESIGNED BY JDW
CHECKED BY PGL
DRAWN BY JDW
CHECKED BY PGL
APPROVED BY NKS
DATE 06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

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Phone: 978-905-4000
Certificate of Authority: 001270

NOT FOR CONSTRUCTION

KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER
125V DC PANEL DDP
PANEL SCHEDULE

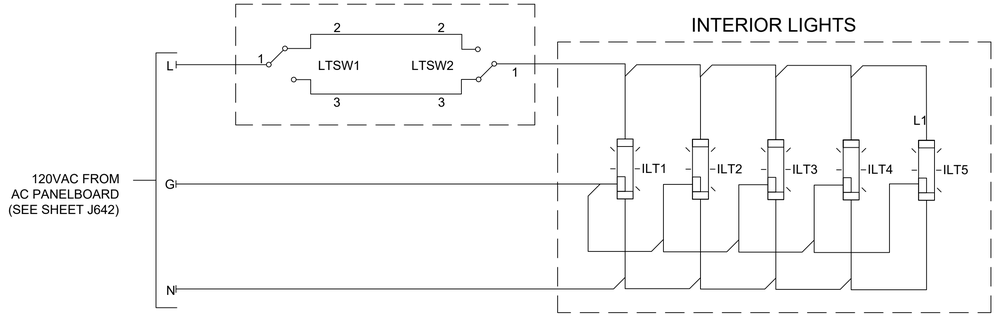
SCALE FOR 22"x34": NOT TO SCALE
FILENAME: J643.DWG
CONTRACT NO.:
CONTRACT NO. ###
VOLUME: 1
DRAWING NO.: J643
SHEET NO.:

302803

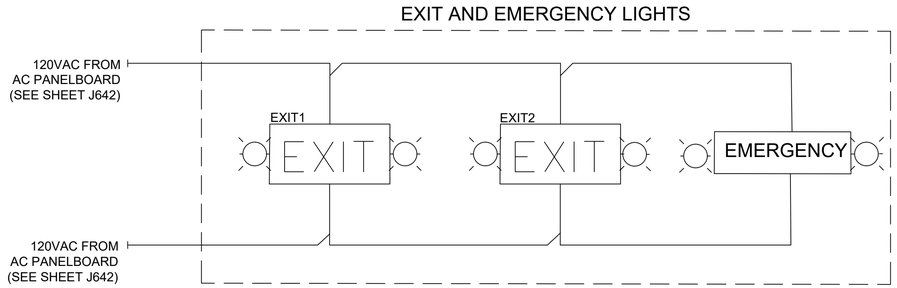
NOTES:

1. FINAL SCHEMATICS, LOGIC, AND FUNCTIONAL REQUIREMENTS SHALL BE DEVELOPED BY THE VENDOR.
2. EQUIPMENT CUBICLE LIGHTING AND HEATING TO BE PROPOSED BY VENDOR. SEE CONTRACT SPECIFICATIONS FOR DETAILED REQUIREMENTS.
3. EQUIPMENT SPECIFIC SCHEMATICS (AC SWITCHGEAR, DC SWITCHGEAR, RECTIFIER TRANSFORMER, RECTIFIER, ETC.) SHALL BE PROPOSED BY VENDOR. SEE CONTRACT SPECIFICATIONS FOR DETAILED REQUIREMENTS.

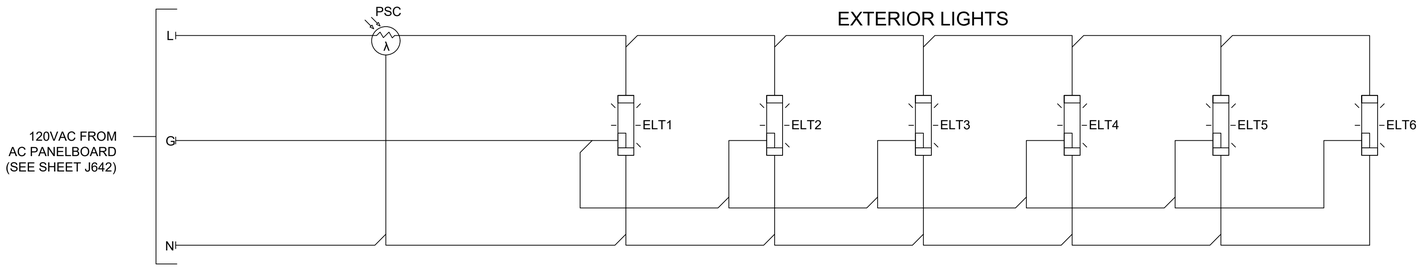
INTERIOR LIGHTS



EXIT AND EMERGENCY LIGHTS



EXTERIOR LIGHTS



REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:31:17 PM

DESIGNED BY	JDW
CHECKED BY	PGL
DRAWN BY	JDW
CHECKED BY	PGL
APPROVED BY	NKS
DATE	06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

HDR Engineering, Inc.
10450 Holmes Road
Suite 600
Kansas City, MO 64131-3471
816-360-2700
Certificate of Authority: 000856

HNTB
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Chelmsford, MA 01824
Phone: 978-905-4000
Certificate of Authority: 001270

NOT FOR CONSTRUCTION

KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER
TYPICAL TPSS LIGHTING SCHEMATIC

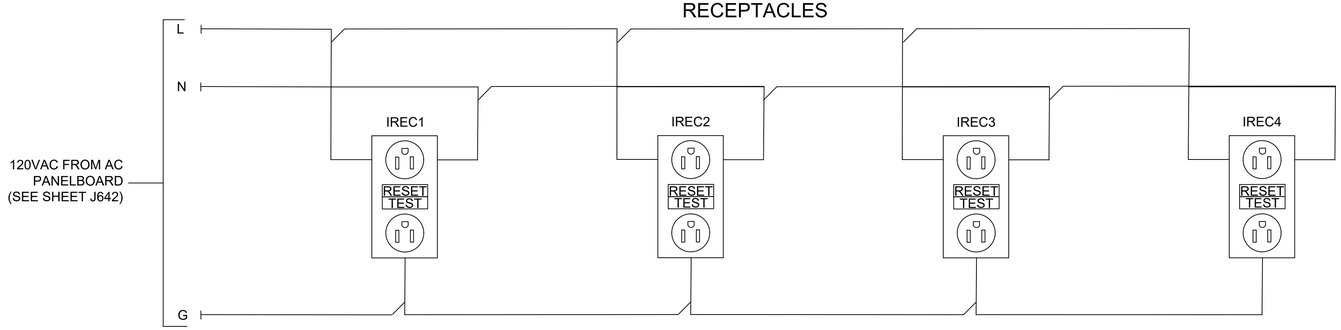
SCALE FOR 22"x34":	NOT TO SCALE
FILENAME:	J644.DWG
CONTRACT NO.:	
CONTRACT NO. ###	
VOLUME:	1
DRAWING NO.:	J644
SHEET NO.:	

302804

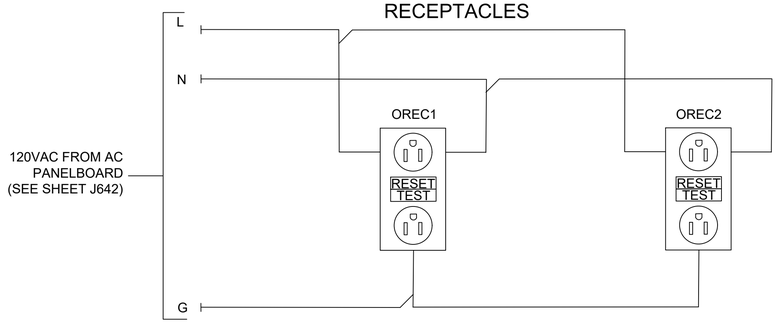
NOTES:

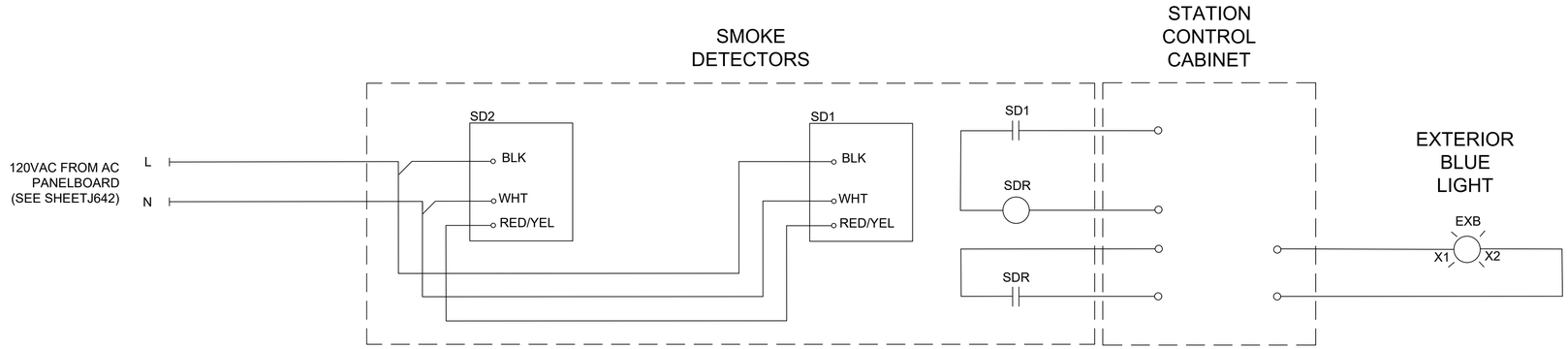
1. FINAL SCHEMATICS, LOGIC, AND FUNCTIONAL REQUIREMENTS SHALL BE DEVELOPED BY THE VENDOR.
2. EQUIPMENT CUBICLE LIGHTING AND HEATING TO BE PROPOSED BY VENDOR. SEE CONTRACT SPECIFICATIONS FOR DETAILED REQUIREMENTS.
3. EQUIPMENT SPECIFIC SCHEMATICS (AC SWITCHGEAR, DC SWITCHGEAR, RECTIFIER TRANSFORMER, RECTIFIER, ETC.) SHALL BE PROPOSED BY VENDOR. SEE CONTRACT SPECIFICATIONS FOR DETAILED REQUIREMENTS.

INTERIOR RECEPTACLES



EXTERIOR RECEPTACLES





REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:32:18 PM

DESIGNED BY	JDW
CHECKED BY	PGL
DRAWN BY	WAC
CHECKED BY	PGL
APPROVED BY	NKS
DATE	06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

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KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

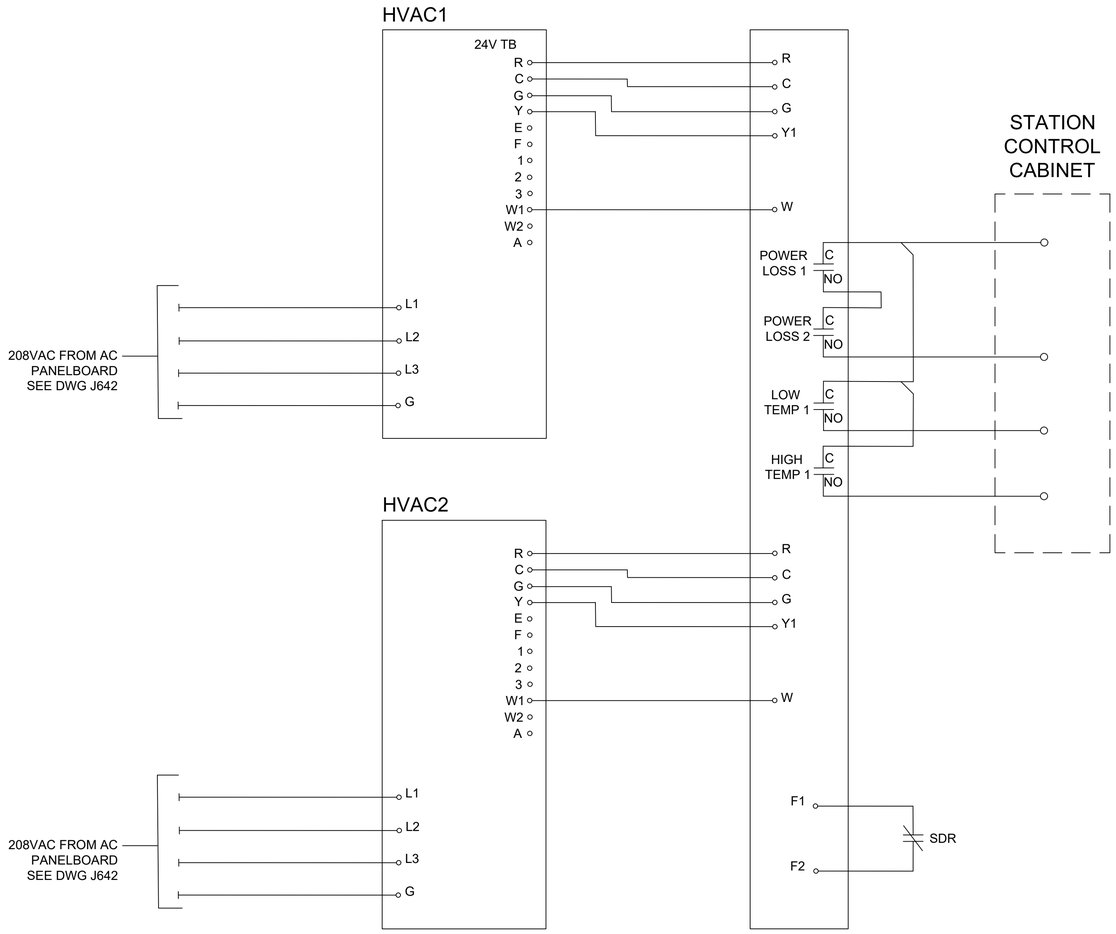
TRACTION POWER
TYPICAL TPSS RECEPTACLES AND SMOKE DETECTOR SCHEMATIC

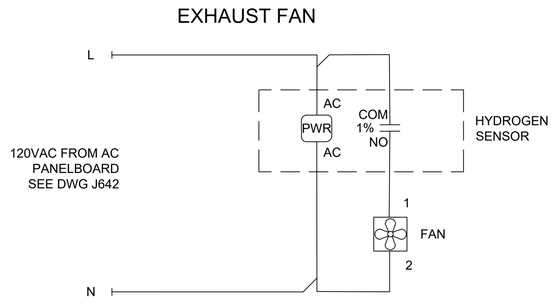
SCALE FOR 22"x34":	NOT TO SCALE
FILENAME:	J645.DWG
CONTRACT NO.:	CONTRACT NO. ###
VOLUME:	1
DRAWING NO.:	J645
SHEET NO.:	

302805

NOTES:

1. FINAL SCHEMATICS, LOGIC, AND FUNCTIONAL REQUIREMENTS SHALL BE DEVELOPED BY THE VENDOR.
2. EQUIPMENT CUBICLE LIGHTING AND HEATING TO BE PROPOSED BY VENDOR. SEE CONTRACT SPECIFICATIONS FOR DETAILED REQUIREMENTS.
3. EQUIPMENT SPECIFIC SCHEMATICS (AC SWITCHGEAR, DC SWITCHGEAR, RECTIFIER TRANSFORMER, RECTIFIER, ETC.) SHALL BE PROPOSED BY VENDOR. SEE CONTRACT SPECIFICATIONS FOR DETAILED REQUIREMENTS.





REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:32:36 PM

DESIGNED BY	JDW
CHECKED BY	PGL
DRAWN BY	WAC
CHECKED BY	PGL
APPROVED BY	NKS
DATE	06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

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NOT FOR CONSTRUCTION

KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

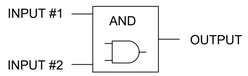
TRACTION POWER
TYPICAL TPSS HVAC AND VENTILATION SCHEMATIC

SCALE FOR 22"x34":	NOT TO SCALE
FILENAME:	J646.DWG
CONTRACT NO.:	CONTRACT NO. ###
VOLUME:	1
DRAWING NO.:	J646
SHEET NO.:	

NOTES:

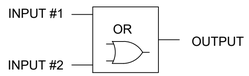
1. FINAL SCHEMATICS, LOGIC, AND FUNCTIONAL REQUIREMENTS SHALL BE DEVELOPED BY THE VENDOR.

AND GATE



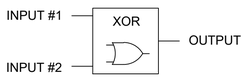
INPUT #1	INPUT #2	OUTPUT
0	0	0
0	1	0
1	0	0
1	1	1

OR GATE



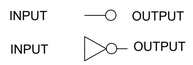
INPUT #1	INPUT #2	OUTPUT
0	0	0
0	1	1
1	0	1
1	1	1

EXCLUSIVE OR GATE



INPUT #1	INPUT #2	OUTPUT
0	0	0
0	1	1
1	0	1
1	1	0

SIGNAL INVERSION



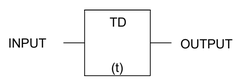
INPUT	OUTPUT
0	1
1	0

SET OVER RESET OPERATOR

INPUT #1	INPUT #2	OUTPUT (LATCHED)
0	0	PREVIOUS STATE
0	1	0
1	0	1
1	1	PREVIOUS STATE

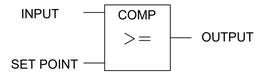
OUTPUT CHANGES STATE ONLY UPON RISING EDGE OF INPUT SIGNAL

TIME DELAY



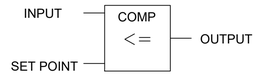
A RISING EDGE ON THE INPUT STARTS THE TIMER(t). THE TIMER COUNTS AS LONG AS THE INPUT IS HIGH. IF THE TIMER EXPIRES WHILE THE INPUT IS HIGH THE OUTPUT BECOMES ACTIVE. A FALLING INPUT EDGE RESETS THE TIMER.

GREATER THAN COMPARATOR



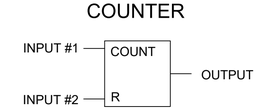
IF THE INPUT VALUE IS GREATER THAN OR EQUAL TO THE SET POINT, THE OUTPUT BECOMES ACTIVE.

LESS THAN COMPARATOR



IF THE INPUT VALUE IS LESS THAN OR EQUAL TO THE SET POINT, THE OUTPUT BECOMES ACTIVE.

COUNTER



EACH TIME INPUT #1 IS PULSED HIGH THE COUNTER INCREMENTS AND THE OUTPUT REFLECTS THE COUNT VALUE. WHEN INPUT #2 IS PULSED HIGH THE COUNT VALUE IS RESET.

REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:33:08 PM

DESIGNED BY JDW
CHECKED BY PGL
DRAWN BY WAC
CHECKED BY PGL
APPROVED BY NKS
DATE 06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

HDR Engineering, Inc.
10450 Holmes Road
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816-360-2700
Certificate of Authority: 000856

HNTB
The HNTB COMPANIES
INFRASTRUCTURE SOLUTIONS
300 Apollo Drive
Chelmsford, MA 01824
Phone: 978-905-4000
Certificate of Authority: 001270

NOT FOR CONSTRUCTION

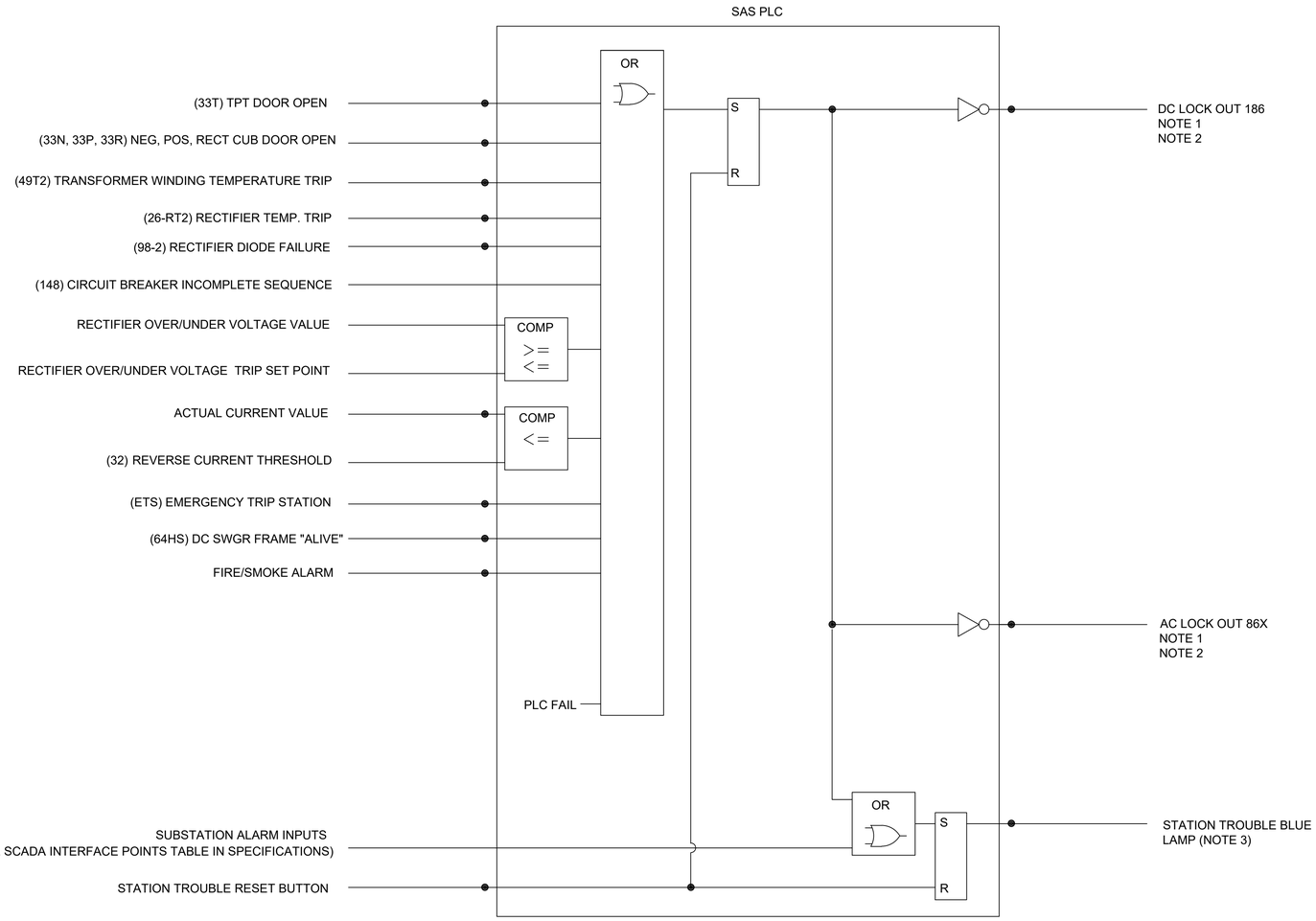
KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER
LOGIC DIAGRAMS
SYMBOLS AND LEGEND

SCALE FOR 22"x34": NOT TO SCALE
FILENAME: J648.DWG
CONTRACT NO.: CONTRACT NO. ###
VOLUME: 1
DRAWING NO.: J648
SHEET NO.:

302807

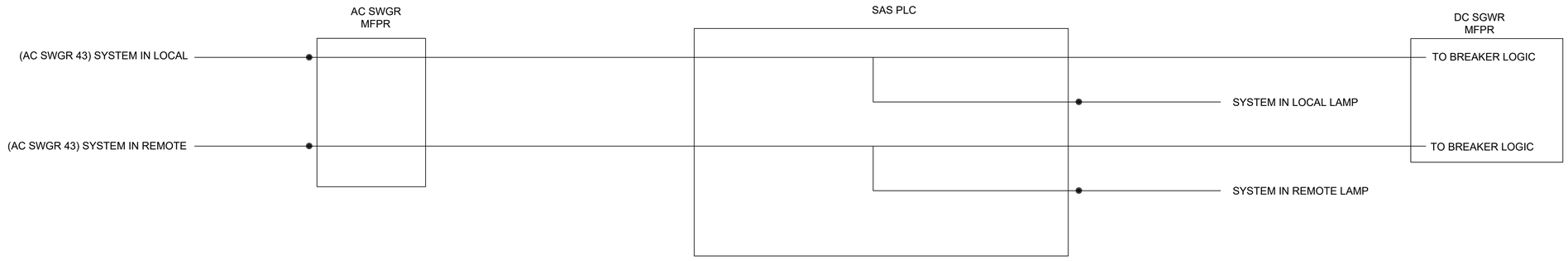
SUBSTATION LOCKOUT AND ALARM LOGIC



NOTES:

1. PLC OUTPUT ACTIVATES LOCKOUT RELAY 186 & 86X.
2. THIS SIGNAL IS ACTIVE LOW.
3. FLASHING BLUE LIGHT (NEW UNACKNOWLEDGED ALARM)
   SOLID BLUE LIGHT (ACTIVE ACKNOWLEDGED ALARMS)
   BLUE LIGHT OFF (NO ACTIVE ALARMS).
4. FINAL SCHEMATICS, LOGIC, AND FUNCTIONAL REQUIREMENTS SHALL BE DEVELOPED BY THE VENDOR.

LOCAL / REMOTE LOGIC



REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:33:18 PM

DESIGNED BY	JDW
CHECKED BY	PGL
DRAWN BY	WAC
CHECKED BY	PGL
APPROVED BY	NKS
DATE	06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

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KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER
SUBSTATION LOCKOUT AND ALARM LOGIC DIAGRAM

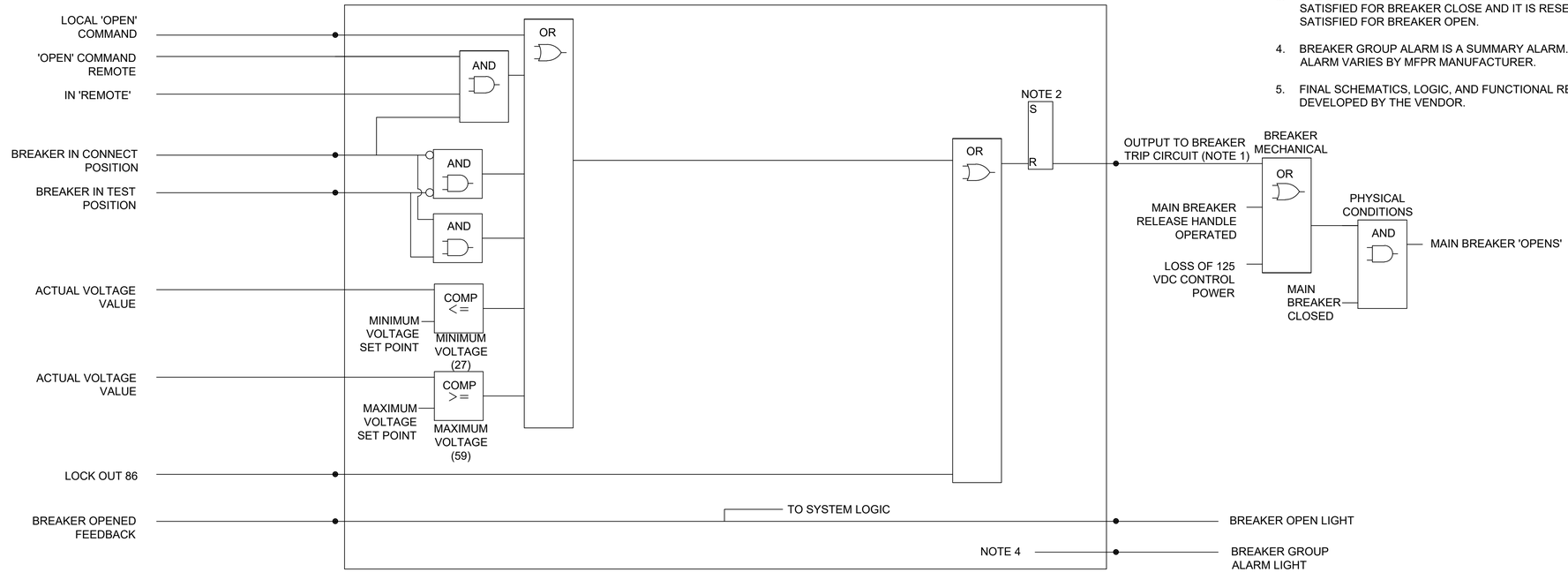
SCALE FOR 22"x34":	NOT TO SCALE
FILENAME:	J649.DWG
CONTRACT NO.:	CONTRACT NO. ###
VOLUME:	1
DRAWING NO.:	J649
SHEET NO.:	

302808

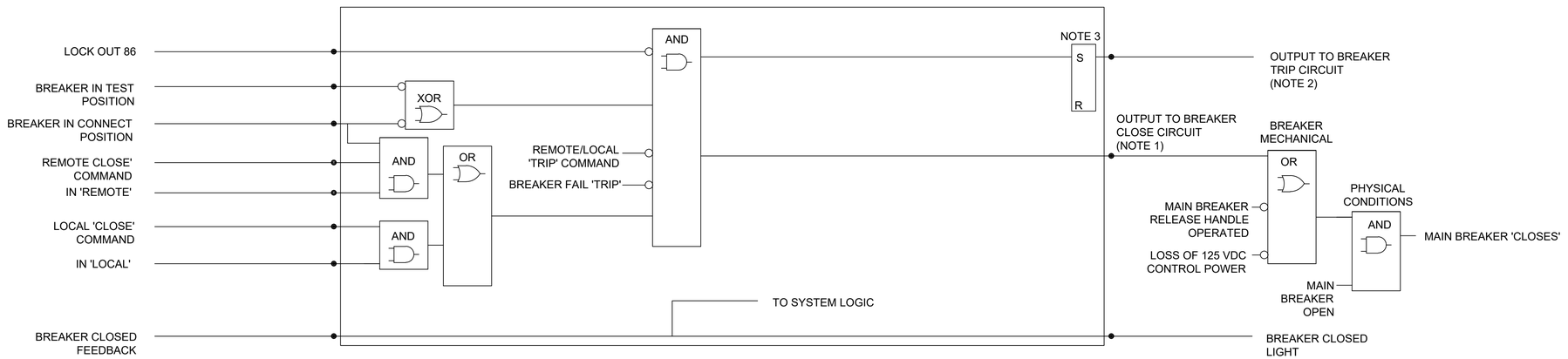
NOTES:

1. WHEN CONDITIONS ARE MET OUTPUT IS PULSED ONCE.
2. WHEN THE BREAKER IS CLOSED THIS OUTPUT IS SET HIGH.
3. THE BREAKER OPEN OUTPUT LATCH IS SET WHEN ALL CONDITIONS ARE SATISFIED FOR BREAKER CLOSE AND IT IS RESET WHEN CONDITIONS ARE SATISFIED FOR BREAKER OPEN.
4. BREAKER GROUP ALARM IS A SUMMARY ALARM. AVAILABILITY OF THIS ALARM VARIES BY MFPR MANUFACTURER.
5. FINAL SCHEMATICS, LOGIC, AND FUNCTIONAL REQUIREMENTS SHALL BE DEVELOPED BY THE VENDOR.

AC MAIN BREAKER TO TRANSFORMER TRIPPING LOGIC



AC MAIN BREAKER TO TRANSFORMER CLOSE LOGIC



REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:33:31 PM

DESIGNED BY	JDW
CHECKED BY	PGL
DRAWN BY	JDW
CHECKED BY	PGL
APPROVED BY	NKS
DATE	06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

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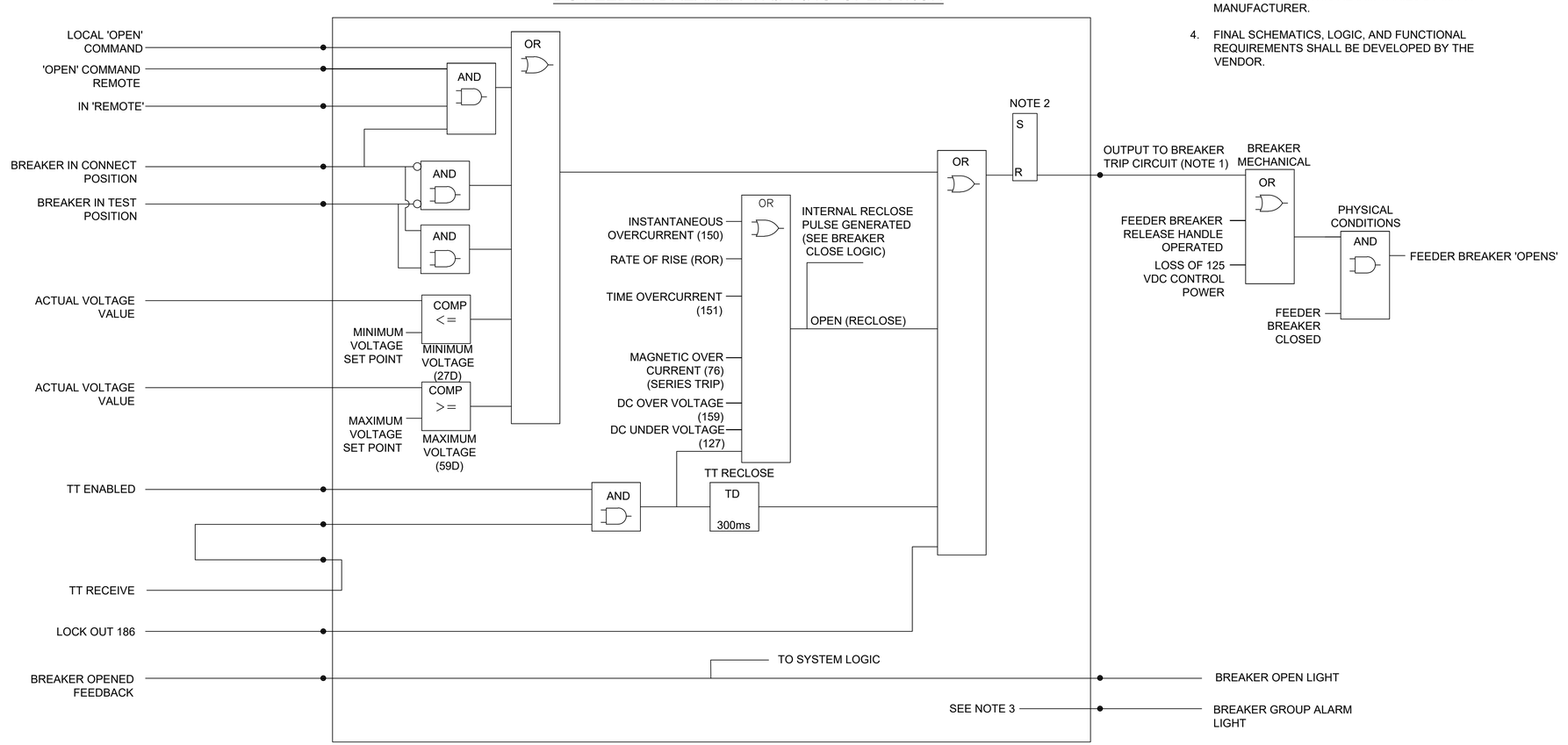
KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER
AC SWITCHGEAR
INCOMING CUBICLE LOGIC DIAGRAM

SCALE FOR 22"x34":	NOT TO SCALE
FILENAME:	J650.DWG
CONTRACT NO.:	CONTRACT NO. ###
VOLUME:	1
DRAWING NO.:	J650
SHEET NO.:	

302809

DC FEEDER BREAKER 'TRIPPING' OPERATION



NOTES:

1. WHEN THE BREAKER IS CLOSED THIS OUTPUT IS SET HIGH.
2. THE BREAKER OPEN OUTPUT LATCH IS SET WHEN ALL CONDITIONS ARE SATISFIED FOR BREAKER CLOSE AND IT IS RESET WHEN CONDITIONS ARE SATISFIED FOR BREAKER OPEN.
3. BREAKER GROUP ALARM IS A SUMMARY ALARM. AVAILABILITY OF THIS ALARM VARIES BY MFPR MANUFACTURER.
4. FINAL SCHEMATICS, LOGIC, AND FUNCTIONAL REQUIREMENTS SHALL BE DEVELOPED BY THE VENDOR.

REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:33:38 PM

DESIGNED BY JDW
CHECKED BY PGL
DRAWN BY JDW
CHECKED BY PGL
APPROVED BY NKS
DATE 06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

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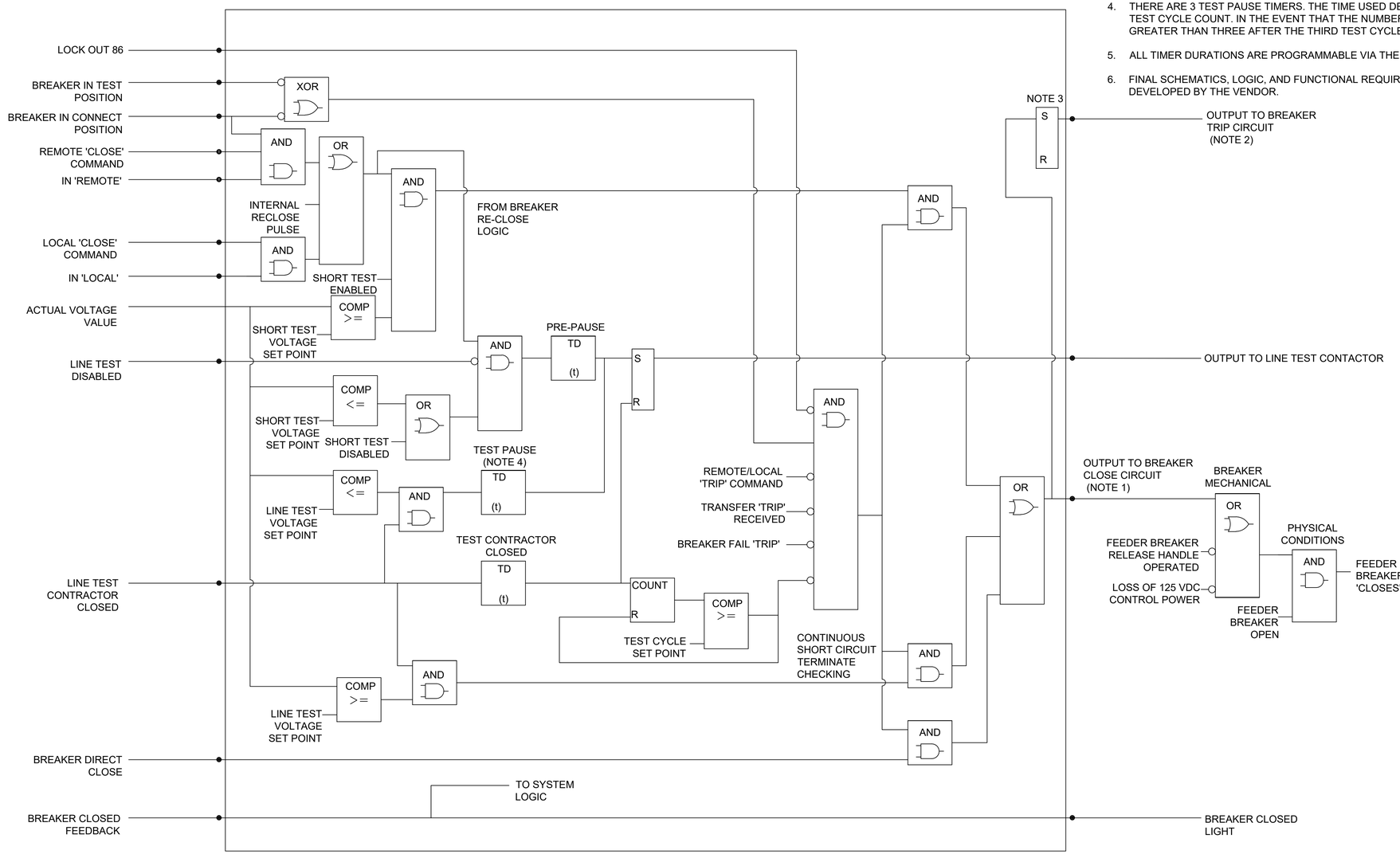
KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER
TYPICAL DC FEEDER CUBICLE
LOGIC DIAGRAM SHEET 1 OF 2

SCALE FOR 22"x34": NOT TO SCALE
FILENAME: J652.DWG
CONTRACT NO.: CONTRACT NO. ###
VOLUME: 1
DRAWING NO.: J652
SHEET NO.:

302610

DC FEEDER BREAKER 'CLOSING' OPERATION



NOTES:

1. WHEN CONDITIONS ARE MET OUTPUT IS PULSED ONCE.
2. WHEN THE BREAKER IS CLOSED THIS OUTPUT IS SET HIGH.
3. THE BREAKER OPEN OUTPUT LATCH IS SET WHEN ALL CONDITIONS ARE SATISFIED FOR BREAKER CLOSE AND IT IS RESET WHEN CONDITIONS ARE SATISFIED FOR BREAKER OPEN.
4. THERE ARE 3 TEST PAUSE TIMERS. THE TIME USED DEPENDS ON THE CURRENT TEST CYCLE COUNT. IN THE EVENT THAT THE NUMBER OF TEST CYCLES IS SET GREATER THAN THREE AFTER THE THIRD TEST CYCLE THE SAME TIME IS USED.
5. ALL TIMER DURATIONS ARE PROGRAMMABLE VIA THE FRONT DISPLAY.
6. FINAL SCHEMATICS, LOGIC, AND FUNCTIONAL REQUIREMENTS SHALL BE DEVELOPED BY THE VENDOR.

REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:33:50 PM

DESIGNED BY	JDW
CHECKED BY	PGL
DRAWN BY	JDW
CHECKED BY	PGL
APPROVED BY	NKS
DATE	06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

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KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER
TYPICAL DC FEEDER CUBICLE
LOGIC DIAGRAM SHEET 2 OF 2

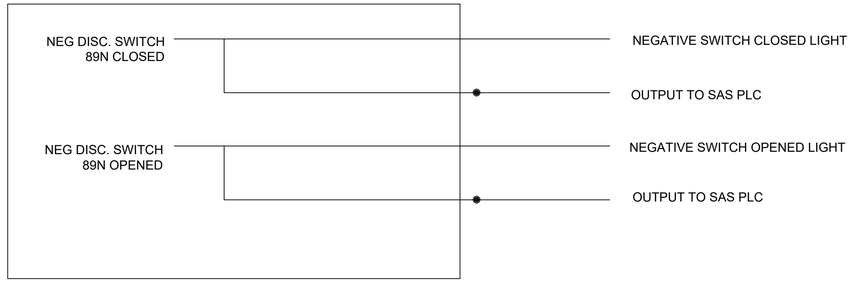
SCALE FOR 22"x34":	NOT TO SCALE
FILENAME:	J653.DWG
CONTRACT NO.:	CONTRACT NO. ###
VOLUME:	1
DRAWING NO.:	J653
SHEET NO.:	

302811

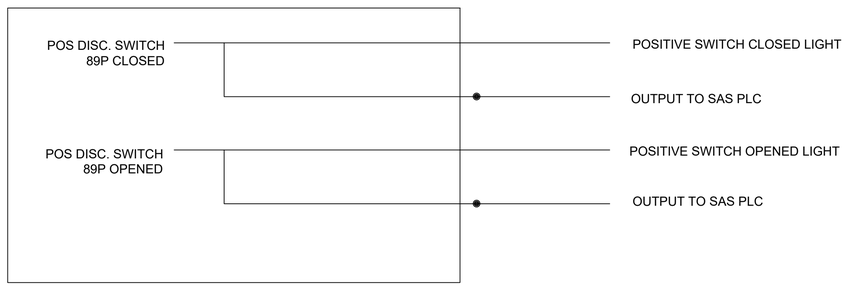
NOTES:

1. FINAL SCHEMATICS, LOGIC, AND FUNCTIONAL REQUIREMENTS SHALL BE DEVELOPED BY THE VENDOR.

NEGATIVE DISCONNECT SWITCH LOGIC



POSITIVE DISCONNECT SWITCH LOGIC



REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:33:57 PM

DESIGNED BY	JDW
CHECKED BY	PGL
DRAWN BY	WAC
CHECKED BY	PGL
APPROVED BY	NKS
DATE	06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

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Phone: 978-905-4000
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NOT FOR CONSTRUCTION

KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

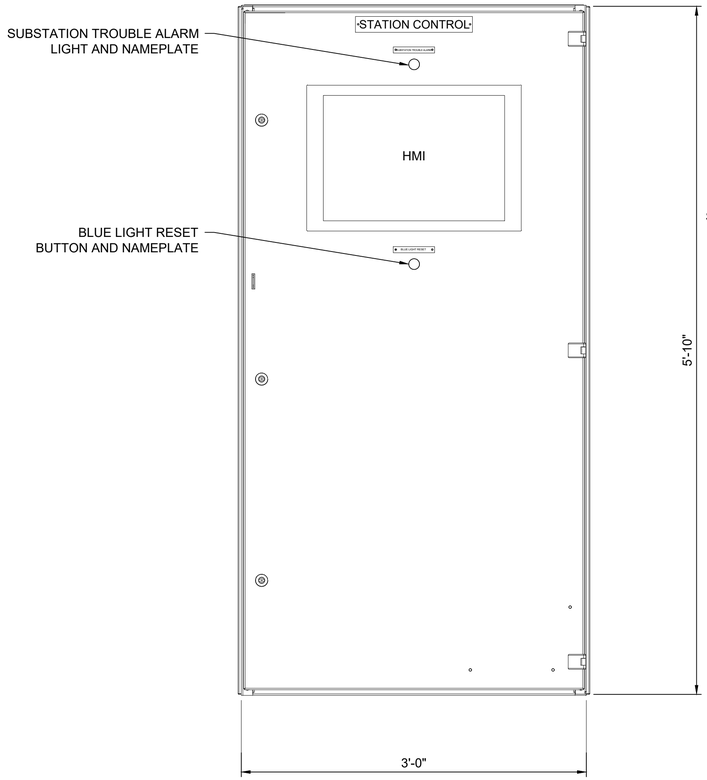
TRACTION POWER
NEGATIVE AND POSITIVE DISCONNECT SWITCH
LOGIC DIAGRAM

SCALE FOR 22"x34":	NOT TO SCALE
FILENAME:	J654.DWG
CONTRACT NO.:	CONTRACT NO. ###
VOLUME:	1
DRAWING NO.:	J654
SHEET NO.:	

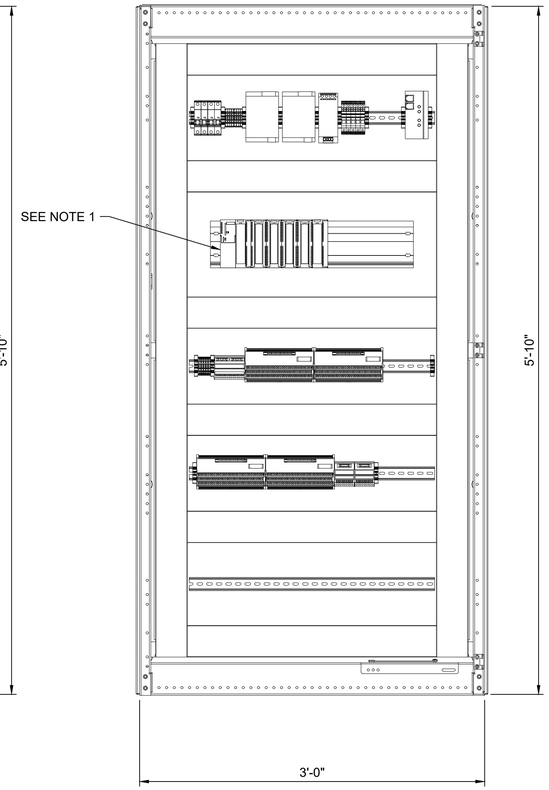
302812

NOTES:

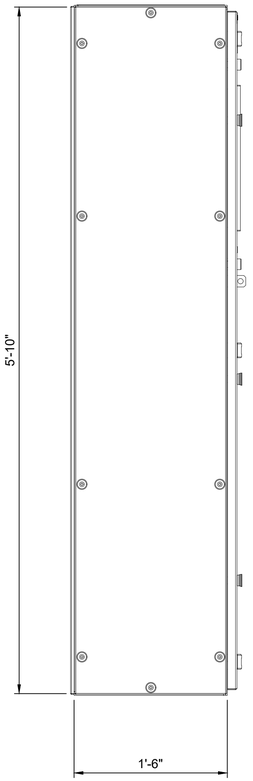
1. SEE CONTRACT SPECIFICATIONS FOR DETAILED REQUIREMENTS.
2. FINAL DIMENSIONS SHALL BE DETERMINED BY VENDOR.



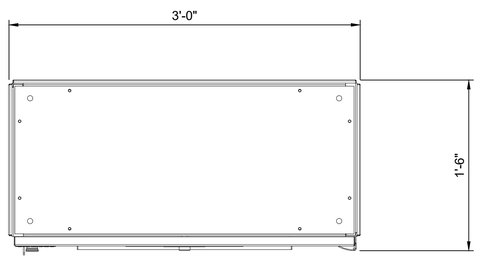
FRONT VIEW
SCALE: NOT TO SCALE



FRONT VIEW
(WITHOUT DOORS AND TRUCK)
SCALE: NOT TO SCALE



SIDE VIEW
SCALE: NOT TO SCALE



TOP VIEW
SCALE: NOT TO SCALE

REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:34:07 PM

DESIGNED BY JDW
CHECKED BY PGL
DRAWN BY JDW
CHECKED BY PGL
APPROVED BY NKS
DATE 06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

HDR Engineering, Inc.
10450 Holmes Road
Suite 600
Kansas City, MO 64131-3471
816-360-2700
Certificate of Authority: 000856

HNTB
The HNTB COMPANIES
INFRASTRUCTURE SOLUTIONS
300 Apollo Drive
Chelmsford, MA 01824
Phone: 978-905-4000
Certificate of Authority: 001270

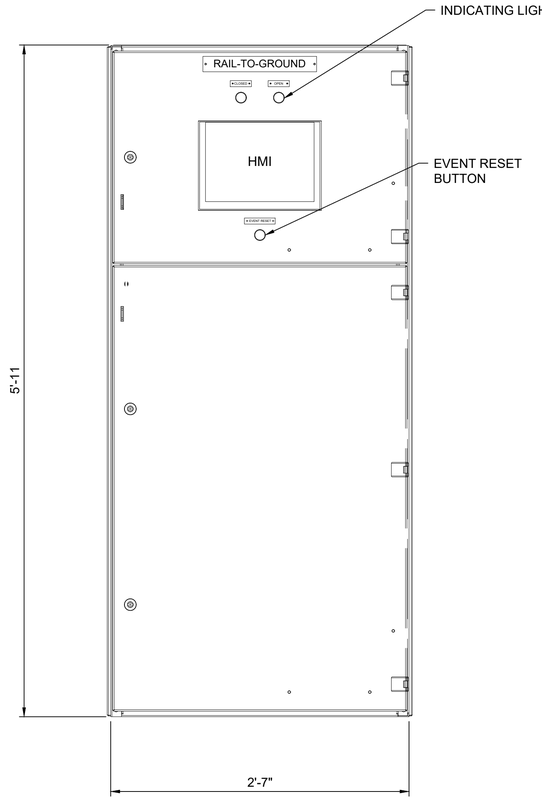
NOT FOR CONSTRUCTION

KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

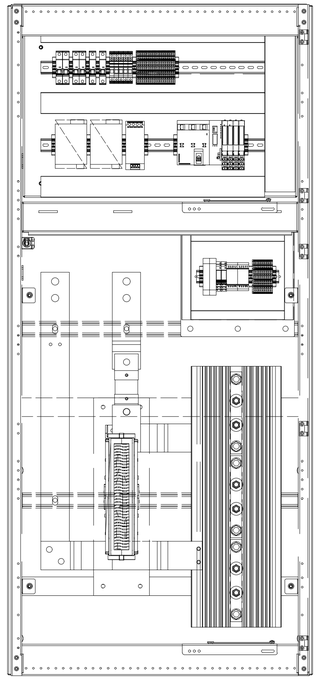
TRACTION POWER
STATION CONTROL CABINET
TYPICAL LAYOUT

SCALE FOR 22"x34": NOT TO SCALE
FILENAME: J660.DWG
CONTRACT NO.:
CONTRACT NO. ###
VOLUME: 1
DRAWING NO.: J660
SHEET NO.:

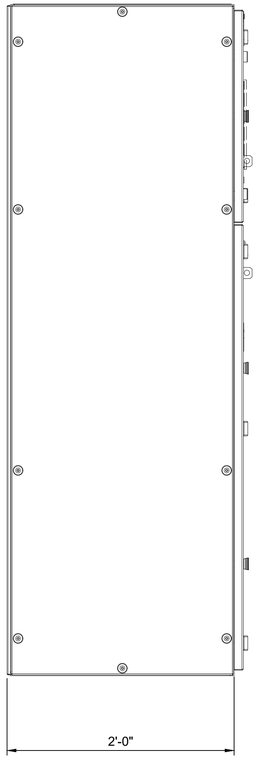
302613



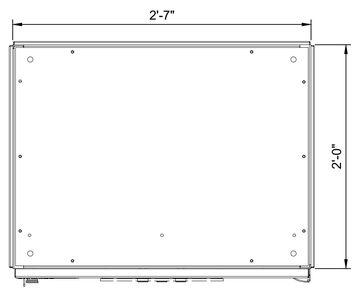
FRONT VIEW
SCALE: NOT TO SCALE



FRONT VIEW
(WITHOUT DOORS AND TRUCK)
SCALE: NOT TO SCALE



SIDE VIEW
SCALE: NOT TO SCALE



TOP VIEW
SCALE: NOT TO SCALE

NOTES:

1. SEE CONTRACT SPECIFICATIONS FOR DETAILED REQUIREMENTS.
2. FINAL DIMENSIONS AND CABINET CONFIGURATION SHALL BE DETERMINED BY VENDOR.

REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:34:18 PM

DESIGNED BY JDW
CHECKED BY PGL
DRAWN BY JDW
CHECKED BY PGL
APPROVED BY NKS
DATE 06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

HDR Engineering, Inc.
10450 Holmes Road
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816-360-2700
Certificate of Authority: 000856

HNTB
The HNTB COMPANIES
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300 Apollo Drive
Chelmsford, MA 01824
Phone: 978-905-4000
Certificate of Authority: 001270

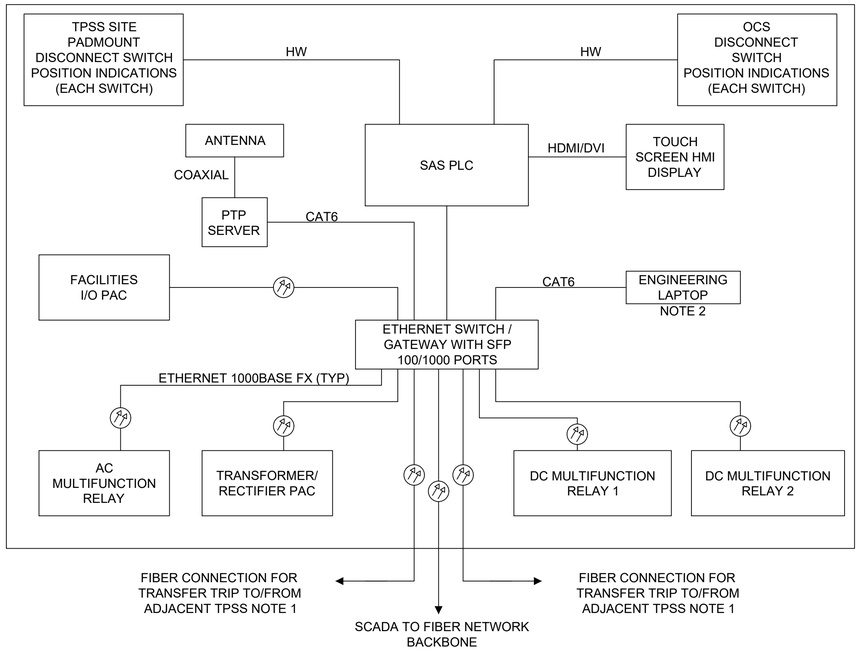
NOT FOR CONSTRUCTION

KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER
RAIL-TO-GROUND (R2G) CABINET
TYPICAL LAYOUT

SCALE FOR 22"x34": NOT TO SCALE
FILENAME: J661.DWG
CONTRACT NO.: CONTRACT NO. ###
VOLUME: 1
DRAWING NO.: J661
SHEET NO.:

302814



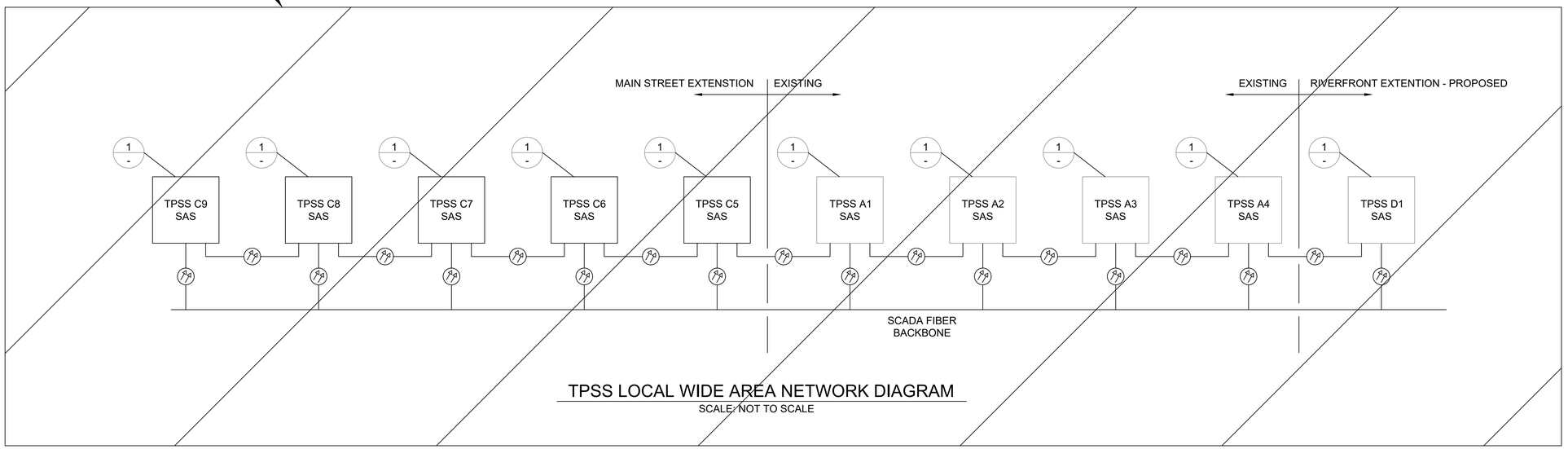
TYPICAL TPSS SAS LOCAL AREA NETWORK DIAGRAM (1 / -)

SCALE: NOT TO SCALE

NOTES:

1. CONFIGURE TRANSFER TRIP FUNCTION BETWEEN ADJACENT TPSS DC MULTIFUNCTION RELAYS USING THE COMMUNICATIONS SYSTEM FOR FIBER OPTIC CONNECTION. SEE SPECIFICATIONS FOR ADDITIONAL DETAILS.
2. PROVIDE ONE ENGINEERING LAPTOP PER THE SPECIFICATIONS.

FOR INFORMATION ONLY
FOR USE BY INSTALLATION CONTRACTOR



TPSS LOCAL WIDE AREA NETWORK DIAGRAM

SCALE: NOT TO SCALE

REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:55:48 PM

DESIGNED BY JDW
CHECKED BY PGL
DRAWN BY JDW
CHECKED BY PGL
APPROVED BY NKS
DATE 06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3

DATE: **09-09-2022**

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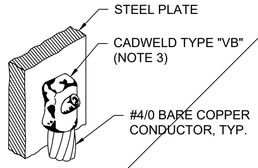
KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

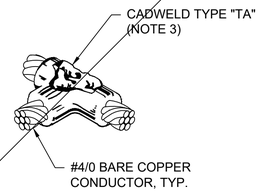
TRACTION POWER
TPSS COMMUNICATIONS BLOCK DIAGRAM

SCALE FOR 22"x34": NOT TO SCALE
FILENAME: J665.DWG
CONTRACT NO.: CONTRACT NO. ###
VOLUME: 1
DRAWING NO.: J665
SHEET NO.:

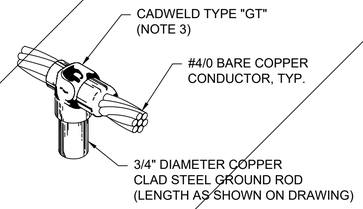
302815



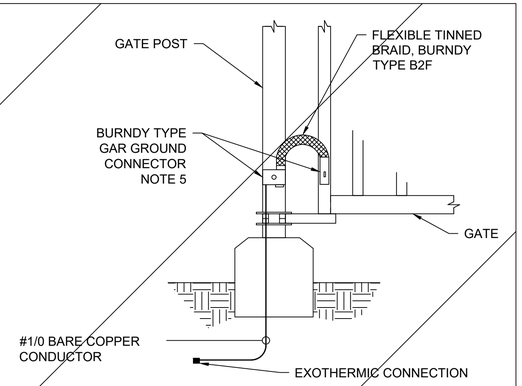
STEEL PLATE CONNECTION 1 -
SCALE: NOT TO SCALE



GROUND CONDUCTOR TEE CONNECTION 2 -
SCALE: NOT TO SCALE



GROUND ROD CONNECTION 3 -
SCALE: NOT TO SCALE

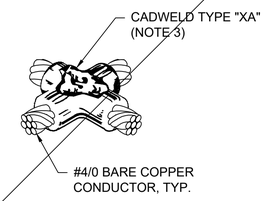


GATE GROUNDING CONNECTION 11 -
SCALE: NOT TO SCALE

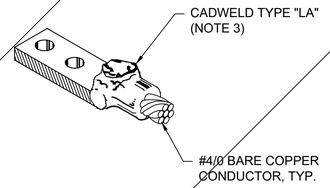
NOTES:

1. NOT USED.
2. NOT USED.
3. CADWELD TYPE CONNECTIONS LISTED FOR REFERENCE ONLY AND DOES NOT PRECLUDE ANY OTHER MANUFACTURER.
4. DRILL AND TAP FOR 2-HOLE NEMA LUGS.
5. COMPRESSION TYPE GROUND CONNECTIONS ARE ACCEPTABLE WHERE NOT IN CONTACT WITH GROUND/EARTH. BURNDY OR APPROVED EQUAL.
6. PRE-DRILL COPPER BUSBAR FOR NEMA 2 HOLE LUGS.

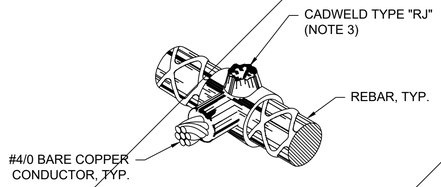
FOR INFORMATION ONLY
FOR USE BY INSTALLATION CONTRACTOR



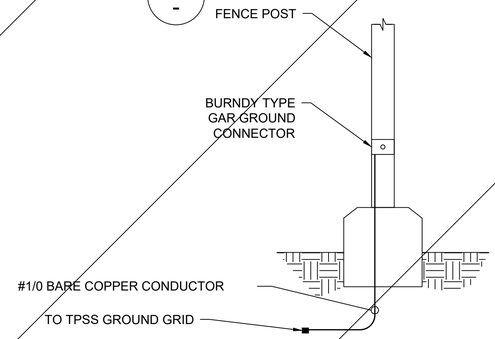
GROUND CONDUCTOR CROSS CONNECTION 4 -
SCALE: NOT TO SCALE



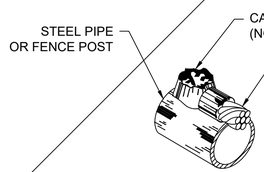
GROUND CONDUCTOR TO 2-HOLE TERMINAL CONNECTION 5 -
SCALE: NOT TO SCALE



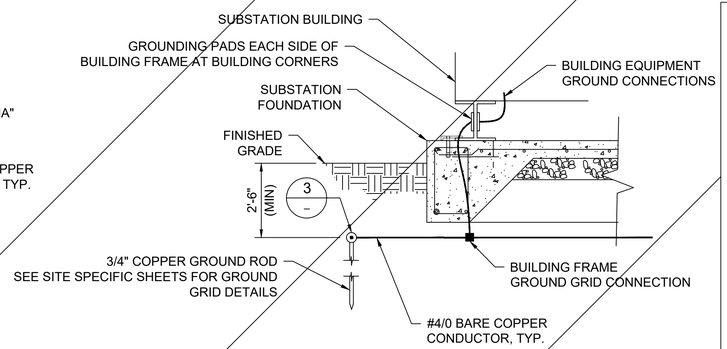
GROUND CONDUCTOR TO REBAR CONNECTION 6 -
SCALE: NOT TO SCALE



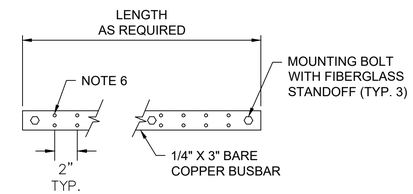
FENCE POST GROUNDING CONNECTION 12 -
SCALE: NOT TO SCALE



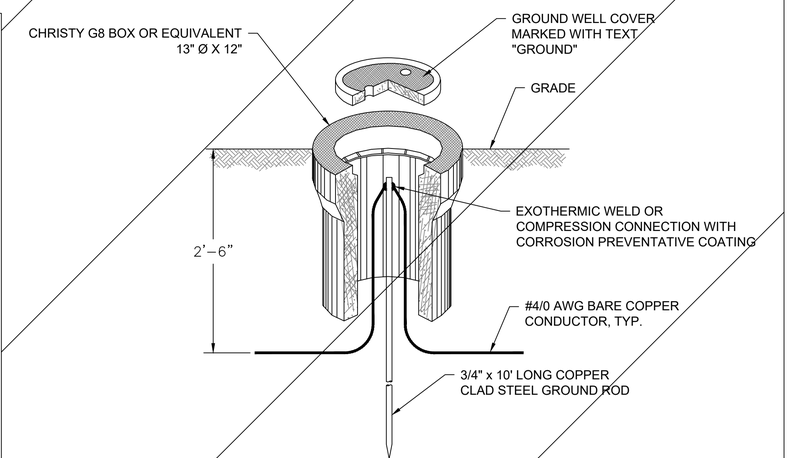
GROUND CONDUCTOR TP STEEL PIPE CONNECTION 7 -
SCALE: NOT TO SCALE



GROUNDING MAT DETAIL 8 -
SCALE: NOT TO SCALE



TYPICAL GROUND BUSBAR 9 -
SCALE: NOT TO SCALE



GROUND WELL DETAIL 10 -
SCALE: NOT TO SCALE

REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:55:17 PM

DESIGNED BY	JDW
CHECKED BY	PGL
DRAWN BY	JDW
CHECKED BY	PGL
APPROVED BY	NKS
DATE	06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

HDR Engineering, Inc.
10450 Holmes Road
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816-360-2700
Certificate of Authority: 000856

HNTB
The HNTB COMPANIES
INFRASTRUCTURE SOLUTIONS
300 Apollo Drive
Chelmsford, MA 01824
Phone: 978-905-4000
Certificate of Authority: 001270

NOT FOR CONSTRUCTION

KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER
TYPICAL GROUNDING DETAILS

SCALE FOR 22"x34":	NOT TO SCALE
FILENAME:	J673.DWG
CONTRACT NO.:	
CONTRACT NO.	###
VOLUME:	1
DRAWING NO.:	J673
SHEET NO.:	

302816

FOR INFORMATION ONLY
FOR USE BY INSTALLATION CONTRACTOR

NOTES:

1. SEE SHEET J630 FOR TPSS D1 SITE RACEWAY LAYOUT.

TPSS D1 - CONDUCTOR SCHEDULE

FEEDER NUMBER	FROM	TO	VIA DUCTBANK/CONDUIT	DUCTBANK SECTION	CABLE DESCRIPTION					DRAWING NUMBER	COMMENTS
					QUANTITY	SIZE	TYPE	VOLTAGE RATING	TEMPERATURE RATING		
D1-PF1	D1-F1	D1-DS1	TPD-D1P1	2A / C404	2	250 KCMIL	EPR	2000 V	90° C	J630	POSITIVE FEEDER
	D1-DS1	TE-MH-D101	TPD-D1P5	2A / C404 10A / C404	2	250 KCMIL	EPR	2000 V	90° C	J630	
	TE-MH-D101	OCS FEEDER POLE R/34 (SB) DS-D1AS			2	250 KCMIL	EPR	2000 V	90° C		SEE SYSTEMWIDE ELECTRICAL PLAN
D1-PF2	D1-F1	D1-DS2	TPD-D1P2	2A / C404	2	250 KCMIL	EPR	2000 V	90° C	J630	POSITIVE FEEDER
	D1-DS2	TE-MH-D101	TPD-D1P6	2A / C404 10A / C404	2	250 KCMIL	EPR	2000 V	90° C	J630	
	TE-MH-D101	OCS FEEDER POLE R/33 (NB) DS-D1AN			2	250 KCMIL	EPR	2000 V	90° C		SEE SYSTEMWIDE ELECTRICAL PLAN
D1-PF3	D1-F2	D1-DS3	TPD-D1P3	2A / C404	2	250 KCMIL	EPR	2000 V	90° C	J630	POSITIVE FEEDER
	D1-DS3	TE-MH-D101	TPD-D1P7	2A / C404 10A / C404	2	250 KCMIL	EPR	2000 V	90° C	J630	
	TE-MH-D101	OCS FEEDER POLE R/34 (SB) DS-D1BS			2	250 KCMIL	EPR	2000 V	90° C		SEE SYSTEMWIDE ELECTRICAL PLAN
D1-PF4	D1-F2	D1-DS4	TPD-D1P4	2A / C404	2	250 KCMIL	EPR	2000 V	90° C	J630	POSITIVE FEEDER
	D1-DS4	TE-MH-D101	TPD-D1P8	2A / C404 10A / C404	2	250 KCMIL	EPR	2000 V	90° C	J630	
	TE-MH-D101	OCS FEEDER POLE R/33 (NB) DS-D1BN			2	250 KCMIL	EPR	2000 V	90° C		SEE SYSTEMWIDE ELECTRICAL PLAN
D1-NR1	DC NEGATIVE BUS	TE-MH-D102	TPD-D1N1	4A / C404	4	250 KCMIL	EPR	2000 V	90° C	J630	NEGATIVE RETURN
	TE-MH-D102	TRACK BLOCKOUT (SB)			4	250 KCMIL	EPR	2000 V	90° C		SEE SYSTEMWIDE ELECTRICAL PLAN
D1-NR2	DC NEGATIVE BUS	TE-MH-D102	TPD-D1N1	4A / C404	4	250 KCMIL	EPR	2000 V	90° C	J630	NEGATIVE RETURN
	TE-MH-D102	TRACK BLOCKOUT (NB)			4	250 KCMIL	EPR	2000 V	90° C		SEE SYSTEMWIDE ELECTRICAL PLAN
D1-HV1	FUSED LOAD BREAK FUSED /METERING CABINET	LOCAL UTILITY SECTIONALIZER SWITCHGEAR	TPD-D1U1	2A / C404	BY LOCAL UTILITY	BY LOCAL UTILITY	BY LOCAL UTILITY	BY LOCAL UTILITY	BY LOCAL UTILITY	J630	COORDINATE CABLE AND DUCTBANK REQUIREMENTS WITH LOCAL UTILITY
D1-HV2	LOCAL UTILITY SECTIONALIZER SWITCHGEAR	LOCAL UTILITY MANHOLE / SPLICE	TPD-D1U2	2A / C404	BY LOCAL UTILITY	BY LOCAL UTILITY	BY LOCAL UTILITY	BY LOCAL UTILITY	BY LOCAL UTILITY	J630	COORDINATE CABLE AND DUCTBANK REQUIREMENTS WITH LOCAL UTILITY
D1-SS1	HMI PAC I/O MODULE	D1-DS1, D1-DS2, D1-DS3, D1-DS4, D1-DS5, D1-DS6 OPEN/CLOSE AUX CONTACTS	TPD-D1S1	2B / C404	2	12/C - #12 AWG	XLPE	600 V	90° C	J630	SWITCH STATUS INDICATIONS
D1-SS2	HMI PAC I/O MODULE	DS-D1AS, DS-D1JS, DS-D1BS, DS-D1AN, DS-D1JN, DS-D1BN OPEN/CLOSE AUX CONTACTS SC-PB-D101	TPD-D1S2	2A / C404 11 / C404	6	7/C - #12 AWG	XLPE	600 V	90° C	J630	OCS DISCONNECT SWITCH STATUS INDICATIONS
	SC-PB-D101	TE-MH-D101	TPD-D1S3	2A / C404	6	7/C - #12 AWG	XLPE	600 V	90° C	J630	OCS DISCONNECT SWITCH STATUS INDICATIONS
FIBER	COMMUNICATIONS RACK	FIBER BACKBONE SEE COMMUNICATIONS PLANS	TPD-D1C1	2B / C404 4C / C404	SEE COMMUNICATIONS PLANS	SEE COMMUNICATIONS PLANS	SEE COMMUNICATIONS PLANS	SEE COMMUNICATIONS PLANS	SEE COMMUNICATIONS PLANS	SEE COMMUNICATIONS PLANS	SEE COMMUNICATIONS PLANS

REV	DATE	DESCRIPTION

PLOT DATE: 9/12/2022 5:51:48 PM

DESIGNED BY JDW
CHECKED BY PGL
DRAWN BY JDW
CHECKED BY PGL
APPROVED BY NKS
DATE 06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

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NOT FOR CONSTRUCTION

KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

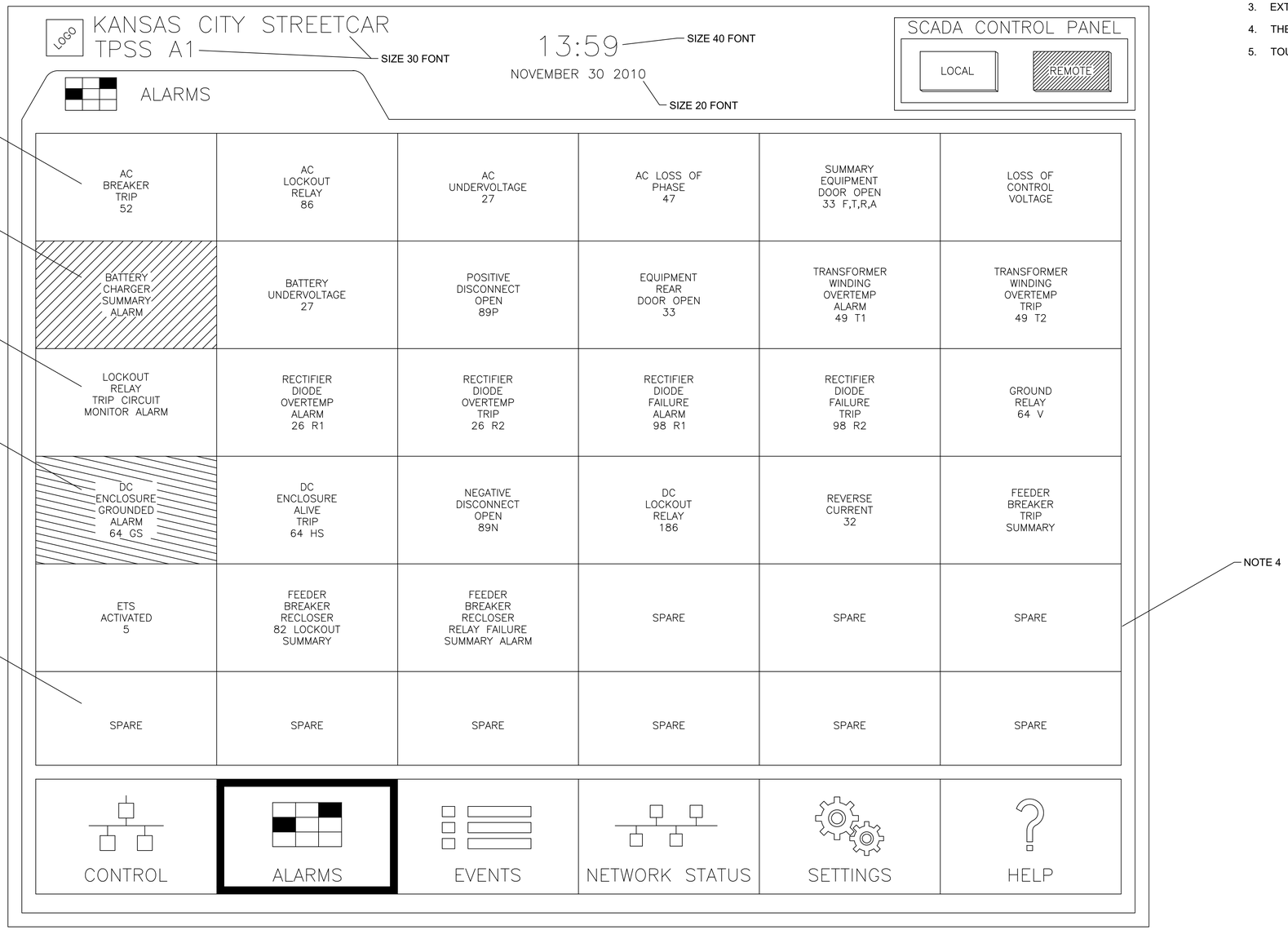
TRACTION POWER
D1 CONDUCTOR SCHEDULE

SCALE FOR 22"x34": NOT TO SCALE
FILENAME: J680.DWG
CONTRACT NO.: CONTRACT NO. ###
VOLUME: 1
DRAWING NO.: J680
SHEET NO.:

302817

NOTES:

1. SEE CONTRACT SPECIFICATIONS FOR DETAILED REQUIREMENTS.
2. HEADER INFORMATION SHALL BE VIEWABLE AT ALL TIMES.
3. EXTEND GUI TO FULL DIMENSIONS OF HMI SCREEN.
4. THERE SHALL BE A MINIMUM OF 36 WINDOWS.
5. TOUCH WINDOW TO ACKNOWLEDGE ALARMS.



REV	DATE	DESCRIPTION

PLOT DATE: 6/19/2022 2:09:02 PM

DESIGNED BY	JDW
CHECKED BY	PGL
DRAWN BY	JDW
CHECKED BY	PGL
APPROVED BY	NKS
DATE	06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

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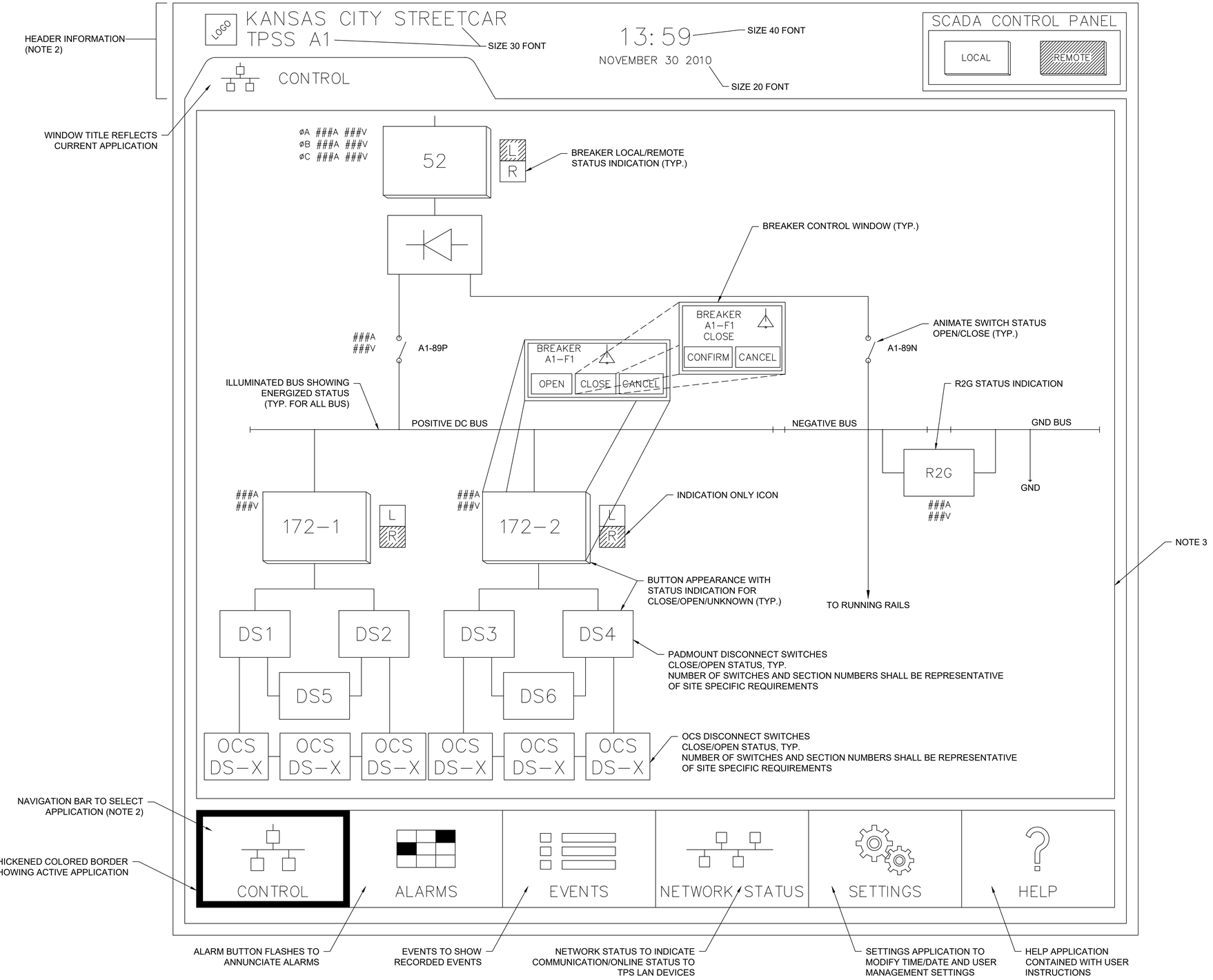
KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER
TYPICAL TPSS HMI ALARM
SCREEN LAYOUT

SCALE FOR 22"x34":	NOT TO SCALE
FILENAME:	J690-J693.DWG
CONTRACT NO.:	CONTRACT NO. ###
VOLUME:	1
DRAWING NO.:	J690
SHEET NO.:	



NOTES:

1. SEE CONTRACT SPECIFICATIONS FOR DETAILED REQUIREMENTS.
2. HEADER INFORMATION SHALL BE VIEWABLE AT ALL TIMES.
3. EXTEND GUI TO FULL DIMENSIONS OF HMI SCREEN.

REV	DATE	DESCRIPTION

PLOT DATE: 6/19/2022 2:09:02 PM

DESIGNED BY	JDW
CHECKED BY	PGL
DRAWN BY	JDW
CHECKED BY	PGL
APPROVED BY	NKS
DATE	06/24/2022

RideKC STREETCAR

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KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

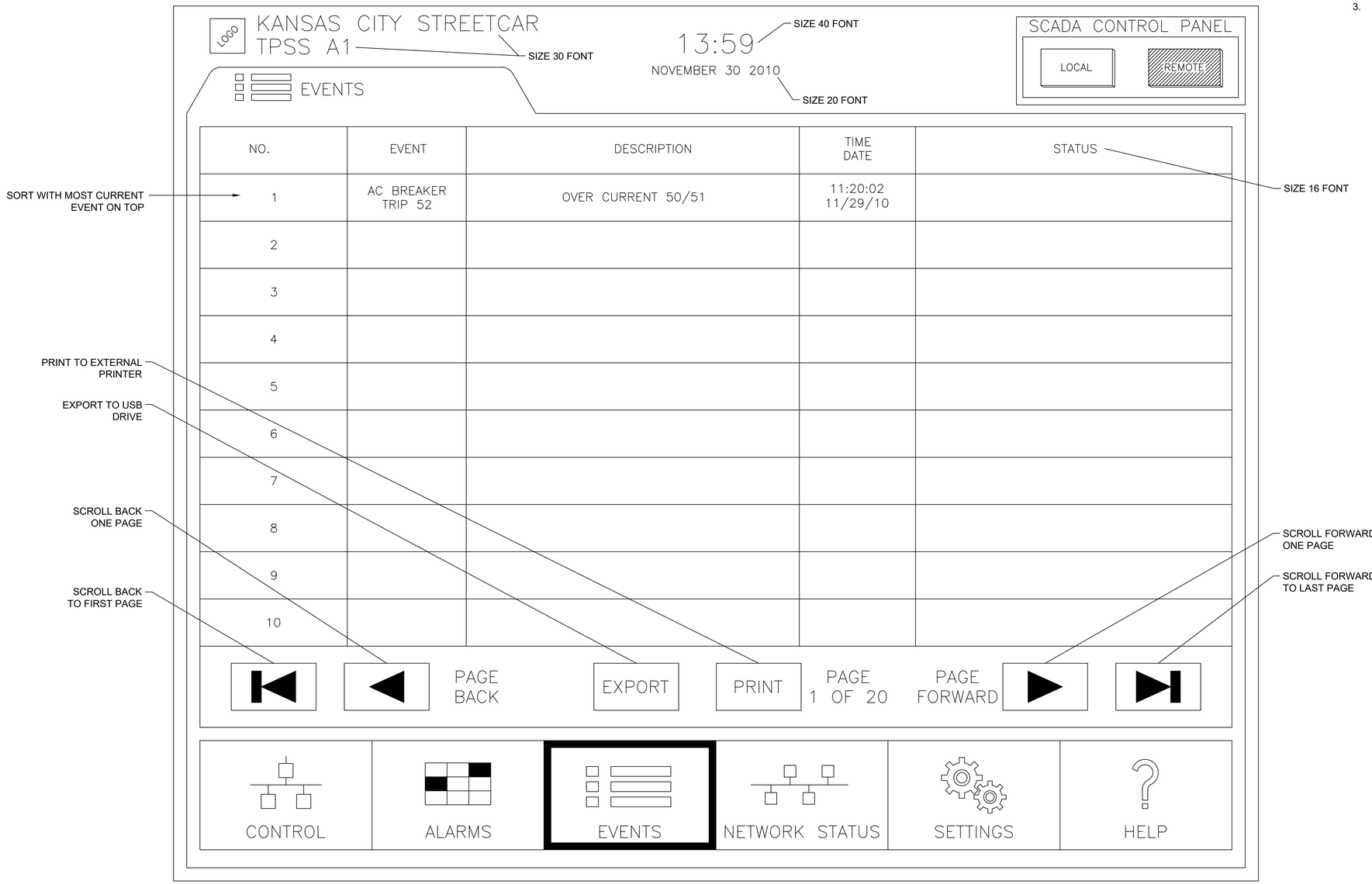
TRACTION POWER
TYPICAL TPSS HMI CONTROL
SCREEN LAYOUT

SCALE FOR 22"x34":	NOT TO SCALE
FILENAME:	J690–J693.DWG
CONTRACT NO.:	CONTRACT NO. ###
VOLUME:	1
DRAWING NO.:	J691
SHEET NO.:	

302819

NOTES:

1. SEE CONTRACT SPECIFICATIONS FOR DETAILED REQUIREMENTS.
2. HEADER INFORMATION SHALL BE VIEWABLE AT ALL TIMES.
3. EXTEND GUI TO FULL DIMENSIONS OF HMI SCREEN.



REV	DATE	DESCRIPTION

PLOT DATE: 6/19/2022 2:09:02 PM

DESIGNED BY	JDW
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DRAWN BY	JDW
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DATE	06/24/2022

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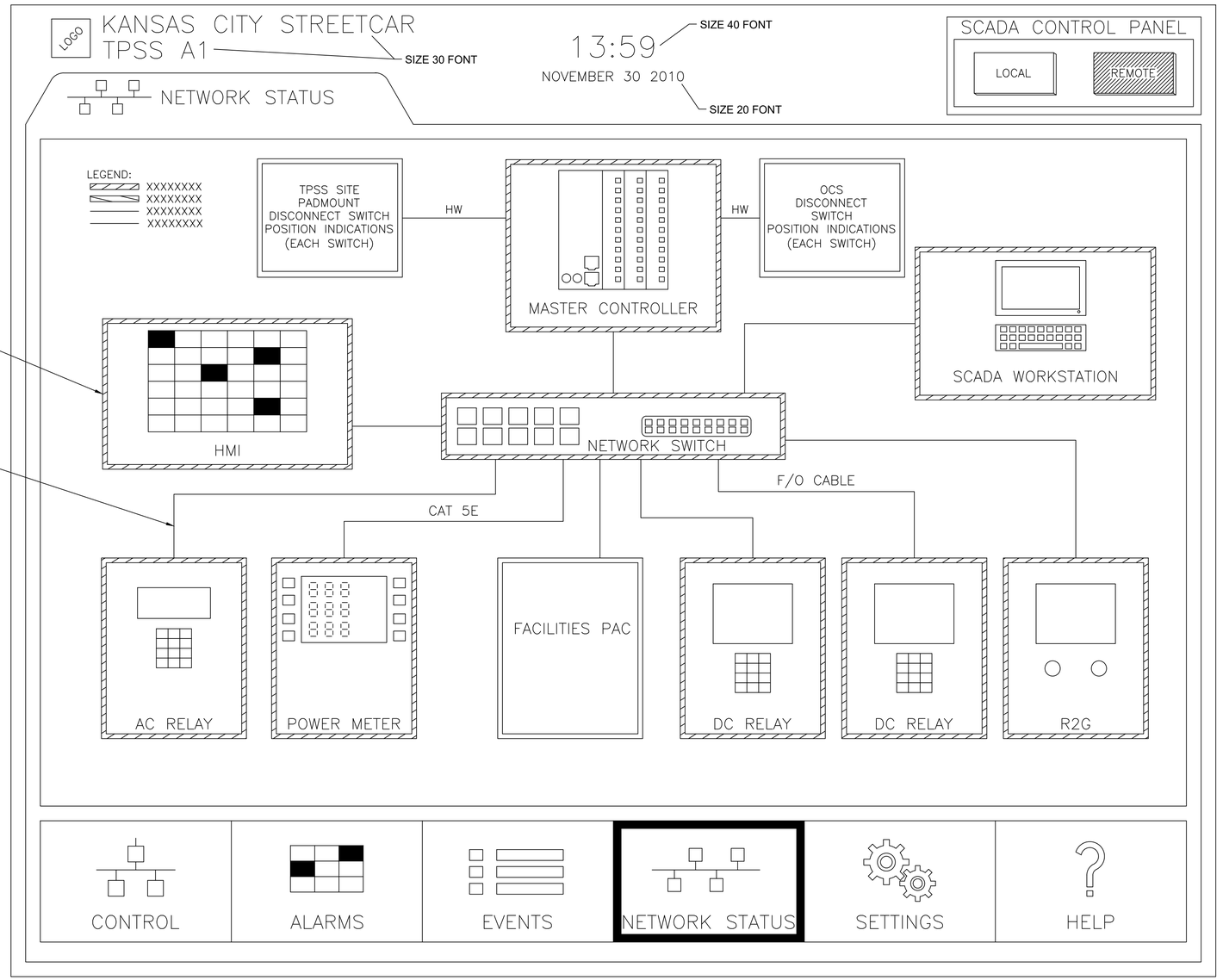
NOT FOR CONSTRUCTION

KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER
TYPICAL TPSS HMI EVENT LOG SCREEN LAYOUT

SCALE FOR 22"x34":	NOT TO SCALE
FILENAME:	J690-J693.DWG
CONTRACT NO.:	CONTRACT NO. ###
VOLUME:	1
DRAWING NO.:	J692
SHEET NO.:	

302820



NOTES:

1. SEE CONTRACT SPECIFICATIONS FOR DETAILED REQUIREMENTS.
2. HEADER INFORMATION SHALL BE VIEWABLE AT ALL TIMES.
3. EXTEND GUI TO FULL DIMENSIONS OF HMI SCREEN.

REV	DATE	DESCRIPTION

PLOT DATE: 6/19/2022 2:09:02 PM

DESIGNED BY JDW
CHECKED BY PGL
DRAWN BY JDW
CHECKED BY PGL
APPROVED BY NKS
DATE 06/24/2022

RideKC STREETCAR

EARLY PROCUREMENT PACKAGE 3 DATE: **09-09-2022**

HDR Engineering, Inc.
10450 Holmes Road
Suite 600
Kansas City, MO 64131-3471
816-360-2700
Certificate of Authority: 000856

HNTB
The HNTB COMPANIES
INFRASTRUCTURE SOLUTIONS
300 Apollo Drive
Chelmsford, MA 01824
Phone: 978-905-4000
Certificate of Authority: 001270

NOT FOR CONSTRUCTION

KANSAS CITY STREETCAR - RIVERFRONT EXTENSION

TRACTION POWER
TYPICAL TPSS HMI NETWORK STATUS
SCREEN LAYOUT

SCALE FOR 22"x34": NOT TO SCALE
FILENAME: J690-J693.DWG
CONTRACT NO.: CONTRACT NO. ###
VOLUME: 1
DRAWING NO.: J693
SHEET NO.:

302821

TPSS Responsibility Matrix

		RESPONSIBILITY P = primary responsibility S = secondary responsibility				Contractor - Construction Contractor Supplier - TPSS Vendor, Fabricator, and Supplier.
	Work Item	**Contractor**	**Independent Test Company (ITC)**	**TPSS Supplier**	**KCATA / EOR**	**Notes**
1.	**New Pre-fabricated TPSS:**					New TPSS to be procured separately by KCATA (Owner) via specifications and drawings supplied as refernce to the Contractor. Shop drawing will be supplied by Supplier and shared with Contractor when available. Note: shop drawing review shall maintain all site and physical interfaces as designed to avoid any changes
	Manufacture and Factory testing per shop drawings			P	Witness, Review and Accept	KCATA or representative shall witness testing and review shop drawings and accept test results prior to shipment.
	Mobilization				Accept for payment	Payment to supplier up to 10% of Bid Item 1
	Prepared Shop Drawings				Accept for payment	Payment to supplier up to 20% of Bid Item 1
	Assembly				Accept for payment	Payment to supplier up to 25% of Bid Item 1
	Testing				Accept for payment	Payment to supplier up to 20% of Bid Item 1
	Store TPSS until required			P		Contract documents to advise expected need by date. Optional costs for up to 180 of storage past the stated date.
	Deliver TPSS	S		P		Supplier shall coordinate the time and date of delivery directly to site with the Contractor and with the Owner
	Inspect TPSS interior and exterior for damage before accepting delivery	P		S	Accept for payment	Payment to supplier up to 5% of Bid Item 1
2.	**Site Preparation**					
	Shop drawing verification with foundation dimensions and all openings	P		S		Contractor to confirm openings under Prepared Shop Drawings Task.
	TPSS foundation	P				
	TPSS lift plan	P		S	Review and Accept	Contractor shall provide cranage needed to off load and place. Contractor shall coordinate delivery with Supplier and Owner for a specific window to off load directly onto foundation
	Off load TPSS & install TPSS on foundation	P		S		
3.	**TPSS Installation**					
	Fasten TPSS to foundation per TPSS supplier recommendations	P		S		
	Connect all building mounted equipment disconnected or shipped separately e.g. photocells, HVAC units, batteries, etc. per supplier recommendations	P		S		Supplier shall provide all necessary installation details to Contractor
	Test and Connect all external cables	P			Accept for payment	Payment to supplier up to 10% of Bid Item 1

4.	**TPSS Field Testing**					
a	Test procedures	P				Field test procedures shall utilize factory test procedures as reference to confirm correct functionality is demonstrated on site.
b	Relay protection settings and parameters & associated studies	P		S		TPSS Supplier (through Contractor) to provide and supply.
c	Installation checks - visual, ground grid, etc.	S	P		Witness	Independent test company shall test to approved test procedures, specifications and per NETA standards. The ITC is responsible for the reporting and verification, the Contractor is responsible for steps to meet ITC requirements. The Contractor shall review these criteria with the Supplier during Offloading.
d	Mechanical Tests - doors, locks, keys, dimensions, breaker racking, etc.	S	P	S	Witness	The Supplier shall be engaged by the Contractor to support field testing of the TPSS. This engagement is in the Suppliers scope of work
e	Equipment insulation, megger tests, resistance tests, etc.	S	P	S	Witness	The Supplier shall be engaged by the Contractor to support field testing of the TPSS. This engagement is in the Suppliers scope of work
f	Equipment Functional Tests - rectifiers, transformers, circuit breakers, relays, etc.	S	P	S	Witness	The Supplier shall be engaged by the Contractor to support field testing of the TPSS. This engagement is in the Suppliers scope of work
g	Equipment integration tests - SCADA integration of TPSS PLC with comms and SCADA Master.	S	P	S	Witness	The Supplier shall be engaged by the Contractor to support field testing of the TPSS. This engagement is in the Suppliers scope of work
h	Test reports and results	P	S		Review and accept for payment	Payment to supplier up to 10% of Bid Item 1
i	Energization - TPSS	P			Witness	Contractor shall coordinate energization with utility after all prior test are completed satisfactorily and punchlist items cleared.
j	Cutover / commissioning - energization of OCS	P			Witness	
k	Cutover / commissioning - Short Circuit Tests	P		S	Witness	It is expected that the TPSS supplier shall be engaged by the Contractor to support field testing of the TPSS.
l	System Testing - train tests (load tests, instrumentated pantograph etc.) operations, pre-revenue service, etc.	P			S	Test program to prove the line, tracks, signals, OCS shall be submitted by Contractor. Vehicles for testing shall be provided by KCATA and operated under their direction in accordnace with the submitted procedures. Supplier shall be available to address potential issue that may require investigation of its supplied material. This work shall be incidental to the project
m	Handover to Agency for further train tests - driver trainin, pre-revenue, etc.	S			P	Test program to prove the line, tracks, signals, OCS shall be submitted by Contractor. Vehicles for testing shall be provided by KCATA and operated under their direction in accordnace with the submitted procedures.
n	Finish final items and cleanup	P				