REQUEST FOR PROPOSAL  
RFP #655914  

VETERINARY MEDICAL BUILDING A SUBSTATION REPLACEMENT

<table>
<thead>
<tr>
<th>RFP Timeline</th>
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<tbody>
<tr>
<td>RFP Issue Date:</td>
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<tr>
<td>Deadline for Respondent Questions to MSU:</td>
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<tr>
<td>RFP Response Due Date:</td>
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<tr>
<td>Estimated Contract Award</td>
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<td>Required Material Delivery Date</td>
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<th>RFP Contact</th>
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**DESCRIPTION:** Michigan State University (the "University" or "MSU") is soliciting proposals through this Request for Proposal ("RFP") for the purpose of replacing the existing 208V double-ended substation, and the double-ended 480V substation within the Veterinary Medical Building A (VetMed Bldg. A) building. The requested goods and services are more thoroughly described under the Scope of Services Section of this RFP. Firms intending to respond to this RFP are referred to herein as a "Bidder," "Respondent," or "Supplier."
PROPOSAL INSTRUCTIONS

1. PROPOSAL PREPARATION. The University recommends reading all RFP materials prior to preparing a proposal, particularly these Proposal Instructions. Respondents must follow these Proposal Instructions and provide a complete response to the items indicated in the table below. References and links to websites or external sources may not be used in lieu of providing the information requested in the RFP within the proposal. Include the Respondent’s company name in the header of all documents submitted with your proposal.

<table>
<thead>
<tr>
<th>Document</th>
<th>Description</th>
<th>Response Instructions</th>
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<tbody>
<tr>
<td>Cover Page</td>
<td>Provides RFP title and number, important dates, and contact information for MSU</td>
<td>Informational</td>
</tr>
<tr>
<td>Proposal Instructions</td>
<td>Provides RFP instructions to Respondents</td>
<td>Informational</td>
</tr>
<tr>
<td>Scope of Work</td>
<td>Describes the intended Scope of work for the RFP</td>
<td>Respondent must complete and submit by proposal deadline</td>
</tr>
<tr>
<td>Pricing</td>
<td>Pricing for goods and services sought by the University through this RFP</td>
<td>Respondent must complete and submit by proposal deadline</td>
</tr>
<tr>
<td>Master Service Agreement</td>
<td>Provides legal terms for a contract awarded through this RFP</td>
<td>Deemed accepted by Respondent unless information required in Section 8, Master Service Agreement is submitted by proposal deadline</td>
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2. EXPECTED RFP TIMELINE.

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3. CONTACT INFORMATION FOR THE UNIVERSITY. The sole point of contact for the University concerning this RFP is listed on the Cover Page. Contacting any other University personnel, agent, consultant, or representative about this RFP may result in Respondent disqualification.

4. QUESTIONS. Respondent questions about this RFP must be submitted electronically by email to the contact listed on the cover page of this RFP. In the interest of transparency, only written questions are accepted. Answers to all questions will be sent to Respondents via email. Submit questions by referencing the following: (i) Question Number, (ii) Document Name, (iii) Page Number, and (iv) Respondent Question. Please refer to Section 2 above for the deadline to submit questions.

Release Date: 11/01/2021
5. **MODIFICATIONS.** The University may modify this RFP at any time. Modifications will be sent via email. This is the only method by which the RFP may be modified.

6. **DELIVERY OF PROPOSAL.** The Respondent must submit its proposal, all attachments, and any modifications or withdrawals electronically via email to the contact listed on the cover page of this RFP. The price proposal should be saved separately from all other proposal documents. The Respondent should submit all documents in a modifiable (native) format (examples include, but are not limited to: Microsoft Word or Excel and Google Docs or Sheets). In addition to submitting documents in a modifiable format, the Respondent may also submit copies of documents in PDF. Respondent’s failure to submit a proposal as required may result in disqualification. The proposal and attachments must be fully uploaded and submitted prior to the proposal deadline. **Do not wait until the last minute to submit a proposal.** The University may not allow a proposal to be submitted after the proposal deadline identified in the Cover Page, even if a portion of the proposal was already submitted.

7. **EVALUATION PROCESS.** The University will convene a team of individuals from various Departments within MSU to evaluate each proposal based on each Respondent’s ability to provide the required services, taking into consideration the overall cost to the University. The University may require an oral presentation of the Respondent's proposal; conduct interviews, research, reference checks, and background checks; and request additional price concessions at any point during the evaluation process. The following criteria will be used to evaluate each proposal:

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<td>Overall Cost to the University</td>
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<td>Ability of Vendor to Meet Required Delivery Dates</td>
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<tr>
<td>Acceptance of MSU Master Service Agreement</td>
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8. **MASTER SERVICE AGREEMENT.** The University strongly encourages strict adherence to the terms and conditions set forth in the Master Service Agreement. The University reserves the right to deem a proposal non-responsive for failure to accept the Master Service Agreement. Nevertheless, the Respondent may submit proposed changes to the Master Service Agreement in track changes (i.e., visible edits) with an explanation of the Respondent’s need for each proposed change. Failure to include track changes with an explanation of the Respondent’s need for the proposed change constitutes the Respondent’s acceptance of the Master Service Agreement. General statements, such as “the Respondent reserves the right to negotiate the terms and conditions,” may be considered non-responsive.

9. **CLARIFICATION REQUEST.** The University reserves the right to issue a Clarification Request to a Respondent to clarify its proposal if the University determines the proposal is not clear. Failure to respond to a Clarification Request timely may be cause for disqualification.

10. **RESERVATIONS.** The University reserves the right to:
    a. Disqualify a Respondent for failure to follow these instructions.
    b. Discontinue the RFP process at any time for any or no reason. The issuance of an RFP, your preparation and submission of a proposal, and the University’s subsequent receipt and evaluation of your proposal does not commit the University to award a contract to you or anyone, even if all the requirements in the RFP are met.
    c. Consider late proposals if: (i) no other proposals are received; (ii) no complete proposals are received; (iii) the University received complete proposals, but the proposals did not meet mandatory minimum requirements or technical criteria; or (iv) the award process fails to result in an award.
    d. Consider an otherwise disqualified proposal, if no other proposals are received.

Release Date: 11/01/2021
e. Disqualify a proposal based on: (i) information provided by the Respondent in response to this RFP; or (ii) if it is determined that a Respondent purposely or willfully submitted false or misleading information in response to the RFP.

f. Consider prior performance with the University in making its award decision.

g. Consider total-cost-of-ownership factors (e.g., transition and training costs) when evaluating proposal pricing and in the final award.

h. Refuse to award a contract to any Respondent that has outstanding debt with the University or has a legal dispute with the University.

i. Require all Respondents to participate in a Best and Final Offer round of the RFP.

j. Enter into negotiations with one or more Respondents on price, terms, technical requirements, or other deliverables.

k. Award multiple, optional-use contracts, or award by type of service or good.

l. Evaluate the proposal outside the scope identified in Section 7, Evaluation Process, if the University receives only one proposal.

11. AWARD RECOMMENDATION. The contract will be awarded to the responsive and responsible Respondent who offers the best value to the University, as determined by the University. Best value will be determined by the Respondent meeting the minimum requirements and offering the best combination of the factors in Section 7, Evaluation Process, and price, as demonstrated by the proposal. The University will email a Notice of Award to all Respondents. A Notice of Award does not constitute a contract, as the parties must reach final agreement on a signed contract before any services can be provided.

12. GENERAL CONDITIONS. The University will not be liable for any costs, expenses, or damages incurred by a Respondent participating in this solicitation. The Respondent agrees that its proposal will be considered an offer to do business with the University in accordance with its proposal, including the Master Service Agreement, and that its proposal will be irrevocable and binding for a period of 180 calendar days from date of submission. If a contract is awarded to the Respondent, the University may, at its option, incorporate any part of the Respondent’s proposal into the contract. This RFP is not an offer to enter into a contract. This RFP may not provide a complete statement of the University’s needs, or contain all matters upon which agreement must be reached. Proposals submitted via email are the University’s property.

13. FREEDOM OF INFORMATION ACT. Respondent acknowledges that any responses, materials, correspondence or documents provided to the University may be subject to the State of Michigan Freedom of Information Act (“FOIA”), Michigan Compiled Law 15.231 et seq., and may be released to third parties in compliance with FOIA or any other law.
SCOPE OF WORK

Please address each of the sections below in a written response, which can be completed on a separate sheet (using the same section headings).

1. Summary
   a. This project is part of the third phase of the substation replacement projects and encompasses the replacement of the existing 208V double-ended substation, and the double-ended 480V substation within the VetMed Bldg. A. Unlike other recent substation projects, the VetMed Bldg. A project as currently designed has sufficient space within the substation room to accommodate both substations without special design considerations.

2. General Requirements
   a. The delivery date for both the 208 volt, and 480 volt substations is May 27, 2022
   b. Unless agreed to by the University in writing, shipments will be considered FOB Jobsite
   c. During the bid period, bidders are encouraged to schedule a site walkthrough by contacting
      i. Ken Beach, beachken@msu.edu, (517) 355-6493
      ii. Dan Bell, belldani@msu.edu, (517) 432-0566
      iii. Site visits will follow MSU COVID19 procedures, more information can be found at: https://msu.edu/together-we-will/

3. Insurance Requirements
   a. The selected bidder shall procure and maintain in force General Liability coverage, including Products / Completed Operations coverage with a minimum limit of $1,000,000 each occurrence/$2,000,000 general aggregate.
      i. University may require a Certificate of Insurance prior to issuing the order or precedent to any payment per the contract resulting from this RFP.

4. Warranty
   a. The selected bidder shall provide a 24-month warranty for all equipment and materials
   b. In addition to any warranty provided by the selected supplier, the selected supplier shall extend to MSU any and all warranties offered by the manufacturer

5. Scope of Work
   a. Supplier shall be responsible for equipment and materials to replace the existing 208V double-ended substation, and the double-ended 480V substation within the VetMed Bldg. A as outlined in Attachment A.
      i. All materials, labor, equipment, and testing shall be per MSU Specification and Drawings including:
         1. Michigan State University Planning and Constructions Standards, more information can be found at: https://ipf.msu.edu/construction/construction-standards
         2. CP21046 Substation Project Specifications Attachment A
         3. CP21046 Vetmed 'A' Substation Bid Package Attachment B
         4. CS262713 ELECTRICITY METERING Attachment C
6. Terms of Payment
   a. Section 10 of the Master Services Agreement
   b. Progressive billings can be accommodated, and any request for progressive billings shall be outlined in the bidder’s response.

7. Attachments
   a. Bidder is required to acknowledge receipt of the following documents
      i. CP21046 Substation Project Specifications Attachment A
      ii. CP21046 Vetmed 'A' Substation Bid Package Attachment B
      iii. CS262713 ELECTRICITY METERING Attachment C
Please include a Pricing proposal as identified below.

Pricing shall include all equipment, labor, materials (unless indicated as owner provided), permits and other ancillary costs associated with providing the Goods and Services as described in MSU's RFP #655914

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<tr>
<th>Supplier Name</th>
<th>VetMed Bldg. A Substation Pricing</th>
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The signature below confirms the following:
1) Bidder acknowledges receipt of the following:
   a. CP21046 Substation Project Specifications Attachment A
   b. CP21046 Vetmed 'A' Substation Bid Package Attachment B
   c. CS262713 ELECTRICITY METERING Attachment C

2) All proposed materials conform to MSU Construction Standards, including Attachments above
3) Vendor acknowledged required delivery date of May 27, 2022.
4) This proposal is valid for 60 business days after the RFP due date

Supplier
Signature: __________________________
Name: ______________________________
Title: _______________________________
Company: ___________________________
Date: _______________________________
Please refer to Section 8 of the RFP Instructions when reviewing the Master Services Agreement terms and conditions.

This Master Service Agreement (this “Agreement”), entered into as of [Month, Day, Year] ("Effective Date"), is made by and between Michigan State University, with offices located at 426 Auditorium Rd, East Lansing, MI 48824 ("MSU" or "University") and [Name of Supplier], with offices at [Address, City, State, Zip] ("Supplier"). MSU and Supplier are sometimes referred to in this Agreement individually as a “party” and collectively as the “parties.”

1. **SALE OF GOODS.**

   Supplier shall sell to MSU and MSU shall purchase from Supplier the goods set forth on Schedule A (the "Goods") in the quantities and at the prices and upon the terms and conditions set forth in this Agreement.

2. **DELIVERY DATE.**

   Supplier shall deliver the Goods in the quantities and on the date(s) specified in Schedule A or as otherwise agreed in writing by the parties (the "Delivery Date"). Timely delivery of the Goods is of the essence. If Supplier fails to deliver the Goods in full on the Delivery Date, MSU may terminate this Agreement immediately by providing written notice to Supplier and Supplier shall indemnify MSU against any losses, claims, damages, and reasonable costs and expenses directly attributable to Supplier's failure to deliver the Goods on the Delivery Date.

3. **QUANTITY.**

   Supplier shall deliver the quantities of the Goods specified in Schedule A. If Supplier delivers more or less than the quantity of Goods specified in Schedule A, MSU may reject all or any excess Goods. Any such rejected Goods shall be returned to Supplier at Supplier’s risk and expense. If MSU does not reject the Goods and instead accepts the delivery of Goods at the increased or reduced quantity, the Price for the Goods shall be adjusted on a pro-rata basis.

4. **DELIVERY LOCATION.**

   All Goods shall be delivered to the address specified in Schedule A (the "Delivery Location") during MSU's normal business hours or as otherwise instructed by MSU.

5. **SHIPPING TERMS.**

   Unless otherwise specified in Schedule A, delivery shall be made F.O.B. Delivery Location. Supplier shall give written notice of shipment to MSU when the Goods are delivered to a carrier for transportation.
Supplier shall provide MSU all shipping documents, including the commercial invoice, packing list, and any other documents necessary to release the Goods to MSU after Supplier delivers the Goods. MSU’s purchase order number must appear on all shipping documents, shipping labels, invoices, correspondence and any other documents pertaining to the order.

6. **TITLE AND RISK OF LOSS.**

Title passes to MSU upon delivery of the Goods to the Delivery Location. Supplier bears all risk of loss or damage to the Goods until delivery of the Goods to the Delivery Location.

7. **PACKAGING.**

Supplier shall properly pack, mark and ship Goods as instructed by MSU and otherwise in accordance with applicable law and industry standards and shall provide MSU with shipment documentation showing the purchase order number, the quantity of pieces in shipment, the number of cartons or containers in shipment, Supplier’s name, the bill of lading number, and the country of origin.

8. **INSPECTION AND REJECTION OF NONCONFORMING GOODS.**

MSU has the right to inspect the Goods on or after the Delivery Date. MSU, at its sole option, may inspect all or a sample of the Goods, and may reject all or any portion of the Goods if it determines the Goods are nonconforming or defective. If MSU rejects any portion of the Goods, MSU has the right, effective upon written notice to Supplier, to: (a) rescind this Agreement in its entirety; or (b) reject the Goods and require replacement of the rejected Goods. If MSU requires replacement of the Goods, Supplier shall, at its expense, promptly replace the nonconforming Goods and pay for all related expenses, including, but not limited to, transportation charges for the return of the defective goods and the delivery of replacement Goods. Any inspection or other action by MSU under this Section shall not reduce or otherwise affect Supplier’s obligations under this Agreement, and MSU shall have the right to conduct further inspections after Supplier has carried out its remedial actions.

9. **PRICE.**

MSU shall purchase the Goods from Supplier at the prices set forth in Schedule A (the "Fees"). The Fees include all packaging, transportation costs to the Delivery Location, insurance, customs duties. No increase in the Fees is effective, whether due to increased material, labor, or transportation costs or otherwise, without the prior written consent of MSU.

10. **PAYMENT**

10.1 MSU will pay the Fees in accordance with this Section 10 and any payment milestones set forth in Schedule A.
10.2 All undisputed amounts are payable 2.75% 10 Net 30 of MSU’s receipt of a valid invoice. Invoices must include an itemized statement of all charges. MSU is exempt from state sales tax for direct purchases and may be exempt from federal excise tax, if Goods are purchased under this Agreement are for MSU’s exclusive use.

10.3 MSU has the right to withhold payment of any disputed amounts until the parties agree as to the validity of the disputed amount. MSU will notify Supplier of any dispute within a reasonable time. Payment by MSU will not constitute a waiver of any rights as to Supplier’s continuing obligations, including claims for deficiencies or substandard Goods.

10.4 Without prejudice to any other right or remedy it may have, MSU reserves the right to set off at any time any amount then due and owing to it by Supplier against any amount payable by MSU to Supplier.

11. INTELLECTUAL PROPERTY

MSU is and shall be, the sole and exclusive owner of all right, title and interest throughout the world in and to all designs, drawings, reports, or other materials created specifically for MSU under this Agreement, including all patents, copyrights, trademarks, trade secrets and other intellectual property rights therein.

12. RELATIONSHIP OF THE PARTIES

12.1 Supplier is an independent contractor of MSU, and this Agreement shall not be construed to create any association, partnership, joint venture, employee or agency relationship between Supplier and MSU for any purpose. Supplier has no authority (and shall not hold itself out as having authority) to bind MSU and Supplier shall not make any agreements or representations on MSU’s behalf without MSU’s prior written consent.

12.2 Without limiting paragraph 12.1, Supplier will not be eligible under this Agreement to participate in any vacation, group medical or life insurance, disability, profit sharing or retirement benefits or any other fringe benefits or benefit plans offered by MSU to its employees, and MSU will not be responsible for withholding or paying any income, payroll, Social Security or other federal, state or local taxes, making any insurance contributions, including unemployment or disability, or obtaining worker’s compensation insurance on Supplier’s behalf. Supplier shall be responsible for, and shall indemnify MSU against, all such taxes or contributions, including penalties and interest. Any persons employed by Supplier in connection with the performance of the services shall be Supplier’s employees and Supplier shall be fully responsible for them.

13. CONFIDENTIALITY

13.1 Meaning of Confidential Information. The term “Confidential Information” means all information and documentation of a party that: (a) has been marked “confidential” or with words of similar meaning, at the time of disclosure by such party; (b) if disclosed orally or not marked “confidential” or with words of similar meaning, was subsequently summarized in writing by the disclosing party and marked “confidential” or with words of similar meaning; or, (c) should reasonably be recognized as confidential information of the
disclosing party. The term “Confidential Information” does not include any information or documentation that was or is: (a) in the possession of MSU and subject to disclosure under the Michigan Freedom of Information Act (FOIA); (b) already in the possession of the receiving party without an obligation of confidentiality; (c) developed independently by the receiving party, as demonstrated by the receiving party, without violating the disclosing party’s proprietary rights; (d) obtained from a source other than the disclosing party without an obligation of confidentiality; or, (e) publicly available when received, or thereafter became publicly available (other than through any unauthorized disclosure by, through, or on behalf of, the receiving party). Notwithstanding the above, in all cases and for all matters, MSU Data is deemed to be Confidential Information.

13.2 **Obligation of Confidentiality.** The parties agree to hold all Confidential Information in strict confidence and not to copy, reproduce, sell, transfer, or otherwise dispose of, give or disclose such Confidential Information to third parties other than employees, agents, or subcontractors of a party who have a need to know in connection with this Agreement or to use such Confidential Information for any purposes whatsoever other than the performance of this Agreement. The parties agree to advise and require their respective employees, agents, and subcontractors of their obligations to keep all Confidential Information confidential. Disclosure to the Supplier’s subcontractor is permissible where (a) the disclosure is necessary or otherwise naturally occurs in connection with work that is within the subcontractor’s responsibilities; and (b) Supplier obligates the subcontractor in a written contract to maintain MSU’s Confidential Information in confidence. At MSU’s request, any of the Supplier’s representatives may be required to execute a separate agreement to be bound by the provisions of this Section 13.2.

13.3 **Cooperation to Prevent Disclosure of Confidential Information.** Each party must use its best efforts to assist the other party in identifying and preventing any unauthorized use or disclosure of any Confidential Information. Without limiting the foregoing, each party must advise the other party immediately in the event either party learns or has reason to believe that any person who has had access to Confidential Information has violated or intends to violate the terms of this Agreement. Each party will cooperate with the other party in seeking injunctive or other equitable relief against any such person.

13.4 **Remedies for Breach of Obligation of Confidentiality.** Each party acknowledges that breach of its obligation of confidentiality may give rise to irreparable injury to the other party, which damage may be inadequately compensable in the form of monetary damages. Accordingly, a party may seek and obtain injunctive relief against the breach or threatened breach of the foregoing undertakings, in addition to any other legal remedies which may be available, to include, in the case of MSU, at the sole election of MSU, the immediate termination, without liability to MSU, of this Agreement.

13.5 **Surrender of Confidential Information upon Termination.** Upon termination or expiration of this Agreement, each party must, within five (5) Business Days from the date of termination, return to the other party any and all Confidential Information received from the other party, or created or received by a party on behalf of the other party, which are in such party’s possession, custody, or control. If Supplier or MSU determine that the return of any Confidential Information is not feasible, such party must destroy the Confidential Information and certify the same in writing within five (5) Business Days from the date of termination to the other party.
14. **Audit and Retention of Books and Records**

University shall have access to and the right to examine and copy any directly pertinent books, documents, papers, and records of Supplier involving transactions related to this Agreement until the expiration of three (3) years after final payment hereunder. Supplier further agrees to promptly furnish, when requested by University, such books, documents, and records of Supplier as are necessary to verify the accuracy of the amounts invoiced to University against any past or current goods and services provided by Supplier. If any audit discloses an overpayment by University or a discrepancy in the amount invoiced by Supplier against the goods and services actually provided by Supplier, Supplier will promptly reimburse University within thirty (30) days of University’s notification to Supplier of any such overpayment, rectify such discrepancy, or both, and further pay University a fee equal to 25% of the amount of any overpayment.

15. **Representations and Warranties**

15.1 Supplier represents and warrants to MSU that all Goods will, for a period of twenty-four (24) months from delivery: (a) be free from any defects in workmanship, material, and design; (b) conform to applicable specifications, drawings, designs, samples, and other requirements specified by MSU; (c) be fit for their intended purpose and operate as intended; (d) be free and clear of all liens, security interests, or other encumbrances; and (e) not infringe or misappropriate any third party's patent or other intellectual property rights. These warranties survive any delivery, inspection, acceptance, or payment of or for the Goods by MSU. These warranties are cumulative and in addition to any other warranty provided by law or equity. Any applicable statute of limitations runs from the date of MSU's discovery of the noncompliance of the Goods with the foregoing warranties. If MSU gives Supplier notice of noncompliance with this Section, Supplier shall, at its own cost and expense, promptly replace or repair the defective or nonconforming Goods and pay for all related expenses, including, but not limited to, transportation charges for the return of the defective or nonconforming goods to Supplier and the delivery of repaired or replacement Goods to MSU.

15.2 In addition to the warranty provided by Supplier above, Supplier shall extend to MSU the rights and benefits, to the extent that the same are not extinguished by the passage of time, of any warranties, service life policies and patent indemnities of any third-party manufacturer and any maintenance and overhaul agencies of and for the Goods which Supplier may have to the extent that the same are assignable and transferable. Supplier also hereby grants to MSU rights of subrogation relating to any claim which Supplier may have under such warranties (if any) concerning the Goods.

16. **Indemnification**

16.1 Supplier shall defend, indemnify and hold harmless MSU and its affiliates and their trustees, officers, directors, employees, agents, successors and permitted assigns from and against all losses, damages, liabilities, deficiencies, actions, judgments, interest, awards, penalties, fines, costs or expenses of whatever kind (including reasonable attorneys’ fees) arising out of or resulting from:
(a) bodily injury, death of any person or damage to real or tangible, personal property arising out of or occurring in connection with the Goods purchased from Supplier;

(b) Supplier’s breach of any representation, warranty or obligation under this Agreement; and

(c) any claim that the Goods infringe any other person’s or entities’ intellectual property rights.

16.2 MSU may satisfy such indemnity (in whole or in part) by way of deduction from any payment due to Supplier.

17. INSURANCE

17.1 While performing services under this Agreement, Supplier shall purchase and maintain the following insurance:

(a) Workers Compensation insurance, Coverage A, with limits statutorily required by any applicable Federal or state law and Employers Liability insurance, Coverage B, with minimum limit of $500,000 per accident.

(b) Commercial General Liability insurance with a minimum limit of $1,000,000 each occurrence/$2,000,000 general aggregate. Coverage shall include bodily injury and property damage liability, personal and advertising injury liability, products/completed operations, and liability assumed under an insured contract.

(c) Professional liability/errors and omissions insurance with limits no less than $1 million

17.2 Insurance policies shall be issued by companies licensed or approved to do business within the State of Michigan. Insurers shall possess a minimum A.M. Best rating of A. The insurance policies, where allowable, shall be endorsed to name Michigan State University as “Additional Insureds.” In the event any insurance policies required by this Agreement are written on a “claims made” basis, coverage shall extend for three years past completion and acceptance of Supplier’s services and must be evidenced by annual certificates of insurance. All policies of insurance must be on a primary basis, non-contributory with any other insurance and/or self-insurance carried by MSU. Supplier shall provide a minimum 30 days written notice to MSU via certified mail of cancellation or non-renewal of policies required under this Agreement and a renewal certificate at least 15 days prior to expiration.

18. TERMINATION

18.1 MSU may terminate this Agreement without cause upon thirty (30) days’ written notice to Supplier. In the event of termination pursuant to this paragraph 18.1, MSU shall pay Supplier any Fees due and payable for any Goods delivered and accepted up to and including the date of such termination.

18.2 MSU may terminate this Agreement, effective upon written notice to Supplier, in the event that Supplier materially breaches this Agreement, and such breach is incapable of cure, or with respect to a material breach capable of cure, Supplier does not cure such breach within fifteen (15) days after receipt of written notice of such breach. MSU shall pay Supplier any Fees due and payable for any Goods delivered and
accepted up to and including the date of such termination, subject to MSU’s right of offset for reasonable costs incurred by MSU as a result terminating the Agreement.

18.3 Upon expiration or termination of this Agreement for any reason, or at any other time upon MSU’s written request, Supplier shall within fifteen (15) days after such expiration or termination:

(a) deliver to MSU all paid-for Goods
(b) deliver to MSU any tools, equipment or other materials provided for Supplier’s use by MSU;
(c) deliver to MSU all tangible documents and materials (and any copies) containing, reflecting, incorporating or based on the Confidential Information;
(d) prepare an accurate accounting from which MSU and Supplier may reconcile all outstanding accounts;
(e) permanently erase all of the Confidential Information from Supplier’s computer systems; and
(f) certify in writing to MSU that Supplier has complied with the requirements of this paragraph.

19. ASSIGNMENT
Supplier shall not assign any rights, or delegate or subcontract any obligations, under this Agreement without MSU’s prior written consent. Any assignment in violation of the foregoing shall be deemed null and void. MSU may freely assign its rights and obligations under this Agreement at any time. Subject to the limits on assignment stated above, this Agreement will inure to the benefit of, be binding upon, and be enforceable against, each of the parties hereto and their respective successors and assigns.

20. PUBLICITY
Supplier may not, without the prior written consent of MSU, issue any press release or announcement, advertise or publish the fact that the parties have entered into this Agreement, or disclose any information relating to this Agreement. Further, Supplier will not use the name, logo, or any other marks (including, but not limited to, colors and music) owned by or associated with MSU, or the name of any representative of MSU without the prior written permission of MSU in each instance.

21. LIMITATION OF LIABILITY
NEITHER PARTY WILL BE LIABLE, REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT, TORT, NEGLIGENCE, STRICT LIABILITY OR BY STATUTE OR OTHERWISE, FOR ANY CLAIM RELATED TO OR ARISING UNDER THIS CONTRACT FOR CONSEQUENTIAL, INCIDENTAL, INDIRECT, OR SPECIAL DAMAGES, INCLUDING WITHOUT LIMITATION LOST PROFITS AND LOST BUSINESS OPPORTUNITIES. OTHER THAN ITS PAYMENT OBLIGATIONS, IN NO EVENT WILL MSU’S AGGREGATE LIABILITY TO SUPPLIER UNDER THIS AGREEMENT, REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT, TORT, NEGLIGENCE, STRICT LIABILITY OR BY STATUTE OR OTHERWISE, FOR ANY CLAIM RELATED TO OR ARISING UNDER THIS AGREEMENT, EXCEED THE TOTAL AMOUNT OF PAYMENTS PAID BY MSU TO SUPPLIER DURING THE TWELVE (12) MONTHS PRECEDING THE APPLICABLE CLAIM.
22. **NON-DISCRIMINATION UNDER MICHIGAN LAW**

Pursuant to Section 209 of the Michigan Elliot-Larsen Civil Rights Act and Section 209 of the Michigan Persons with Disabilities Civil Rights Act, in providing services, the Supplier and its contractor(s) agree not to discriminate against any employee or applicant for employment with respect to hire, tenure, terms, conditions, or privileges of employment, or any matter directly or indirectly related to employment, because of age, color, familial status, height, marital status, national origin, race, religion, sex, weight, or a disability that is unrelated to the individual’s ability to perform the duties of a particular job or position.

23. **FEDERAL CONTRACT COMPLIANCE.**

University is an equal opportunity employer and a federal contractor or subcontractor. Consequently, the parties agree that, as applicable, they will abide by the requirements of 41 CFR 60-1.4(a), 41 CFR 60-300.5(a) and 41 CFR 60-741.5(a) and that these laws are incorporated herein by reference. These regulations prohibit discrimination against qualified individuals based on their status as protected veterans or individuals with disabilities, and prohibit discrimination against all individuals based on their race, color, religion, sex, sexual orientation, gender identity or national origin. These regulations require that covered prime contractors and subcontractors take affirmative action to employ and advance in employment individuals without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, protected veteran status or disability. The parties also agree that, as applicable, they will abide by the requirements of Executive Order 13496 (29 CFR Part 471, Appendix A to Subpart A), relating to the notice of employee rights under federal labor laws.

24. **CRIMINAL BACKGROUND CHECKS**

Supplier may be required to perform criminal background checks of its personnel pursuant to the MSU Contractor Criminal Background Check Requirements Policy (“CBC Policy”), available at https://usd.msu.edu/common/documents/criminal-back-ground-check.pdf. If Supplier is subject to the CBC Policy, Supplier must sign and deliver the Contractor Certification for Criminal Background Checks to University prior to the provision of any services or delivery of any goods. University reserves the right to audit compliance with the CBC Policy requirements and may require further documentation of compliance from Supplier. Non-compliance with the Policy is considered a material breach of this Agreement, which may result in a termination for cause.

25. **CONFLICT OF INTEREST.**

Supplier warrants that to the best of Supplier’s knowledge, there exists no actual or potential conflict between Supplier and the University, and its services under this Agreement, and in the event of change in either Supplier’s private interests or services under this Agreement, Supplier will inform the University regarding possible conflict of interest which may arise as a result of the change. Supplier also affirms that,
to the best of Supplier’s knowledge, there exists no actual or potential conflict between a University employee and Supplier.

26. MISCELLANEOUS

26.1 All notices, requests, consents, claims, demands, waivers and other communications hereunder (each, a “Notice”) shall be in writing and addressed to the parties at the addresses set forth on the first page of this Agreement (or to such other address that may be designated by the receiving party from time to time in accordance with this section). All Notices shall be delivered by personal delivery, nationally recognized overnight courier (with all fees pre-paid), facsimile or e-mail (with confirmation of transmission) or certified or registered mail (in each case, return receipt requested, postage prepaid). Except as otherwise provided in this Agreement, a Notice is effective only if (a) the receiving party has received the Notice and (b) the party giving the Notice has complied with the requirements of this Section.

26.2 Neither Supplier nor MSU shall be liable for failure to perform its respective obligations under the Agreement when failure is caused by fire, explosion, flood, act of God, epidemics or pandemics, civil disorder or disturbances, strikes, vandalism, war, riot, sabotage, weather and energy related closings, or like causes beyond the reasonable control of the party (“Force Majeure Event”). In the event that either party ceases to perform its obligations under this Agreement due to the occurrence of a Force Majeure Event, the party shall: (a) as soon as practicable notify the other party in writing of the Force Majeure Event and its expected duration; (b) take all reasonable steps to recommence performance of its obligations under this Agreement as soon as possible, including, as applicable, abiding by the disaster plan in place for MSU. In the event that any Force Majeure Event delays a party’s performance for more than thirty (30) calendar days following notice by the delaying party pursuant to this Agreement, the other party may terminate this Agreement immediately upon written notice.

26.3 This Agreement, together with any other documents incorporated herein by reference and related Exhibits and Schedules, constitutes the sole and entire agreement of the parties to this Agreement with respect to the subject matter contained herein, and supersedes all prior and contemporaneous understandings, agreements, representations and warranties, both written and oral, with respect to such subject matter. NO TERMS ON SUPPLIER’S INVOICES, WEBSITE, BROWSE-WRAP, SHRINK-WRAP, CLICK-WRAP OR OTHER NON-NEGOTIATED TERMS AND CONDITIONS PROVIDED WITH ANY OF THE SERVICES HEREUNDER WILL CONSTITUTE A PART OR AMENDMENT OF THIS AGREEMENT OR IS BINDING ON MSU FOR ANY PURPOSE. ALL SUCH OTHER TERMS AND CONDITIONS HAVE NO FORCE AND EFFECT AND ARE DEEMED REJECTED BY MSU, EVEN IF ACCESS TO OR USE OF SUCH SERVICES REQUIRES AFFIRMATIVE ACCEPTANCE OF SUCH TERMS AND CONDITIONS.

26.4 This Agreement may only be amended, modified or supplemented by an agreement in writing signed by each party hereto, and any of the terms thereof may be waived, only by a written document signed by each party to this Agreement or, in the case of waiver, by the party or parties waiving compliance.

26.5 This Agreement shall be governed by and construed in accordance with the internal laws of the State of Michigan without giving effect to any choice or conflict of law provision or rule. Each party irrevocably
submits to the exclusive jurisdiction and venue of the federal and state courts located in Ingham County in the State of Michigan in any legal suit, action or proceeding arising out of or based upon this Agreement or the services provided hereunder.

26.6 If any term or provision of this Agreement is invalid, illegal or unenforceable in any jurisdiction, such invalidity, illegality or unenforceability shall not affect any other term or provision of this Agreement or invalidate or render unenforceable such term or provision in any other jurisdiction.

26.7 This Agreement may be executed in multiple counterparts and by facsimile signature, each of which shall be deemed an original and all of which together shall constitute one instrument.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the Effective Date.

MICHIGAN STATE UNIVERSITY  [Name of Supplier]
Signature: ___________________________  Signature: ___________________________
Print Name: ___________________________  Print Name: ___________________________
Title: ___________________________  Title: ___________________________
Date: ___________________________  Date: ___________________________
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings: Electrical construction documents intended for the replacement of the 208 volt and 480 volt double-ended substations in the Veterinary Medical Center (Vet Med) Building – ‘A’. Drawing set includes revised One-Line diagram, main electrical room plan, and the substation elevation details; including general provisions of the bid.

1.2 SUMMARY

A. This project is part of the fourth phase of the substation replacement projects and encompasses the replacement of the existing 208V and 480V double-ended substations within the Vet Med ‘A’ building. Similar to other recent substation projects, the Vet Med ‘A’ project has space constraints within the substation room to accommodate both substations without special design considerations. Given the constraints noted, the maximum depth of the Low Voltage switchgear sections must not be any greater than 66”. Noting such, each switchgear breaker distribution section must be capable of accommodating a minimum of (9) 4” outbound conduits, however there are also moderate constraints as to length of the switchgear assembly. Bidders are encouraged to conduct a site visit during the bidding phase of the project to field verify the physical conditions and MSU can support vendor visits when requested. Presently, the “On Campus” COVID-19 restrictions only require that masks be worn while indoors.

B. The delivery date for both the 208 volt, and 480 volt substations is Friday May 27, 2022 and the shipping address is ‘Storage Building 210’, 1457 Recycle Way, East Lansing Michigan 48824. The MSU point of contact for delivery is the High Volt Supervisor Dan Bell, and he can reached at (517) 432-0566 [Office], or (269) 209-6554 [Cell]. Storage Building 210 shall be considered as “Job Site”, and shipping destination shall be F.O.B. “Job site”.

1.3

A. Specification Section 261116 Includes:

1. This Section specifies secondary unit substations for buildings and structures, both single and double-ended, metal enclosed indoor type with secondary distribution switchgear as identified on accompanying drawings.
2. Substation equipment manufacturer and respective electrical distributor shall provide materials and equipment as indicated on the drawings, and as specified herein for a complete operational system.

3. Each unit substation shall include the following items at a minimum:
   a. Medium-voltage Air Terminal Chambers with (2) 4” Infra-Red (‘IR’) windows sufficient to view all (3) cable/phase terminations.
   b. Medium-voltage FR3 EnviroTemp / BioTemp liquid filled transformer sections
   c. Close coupled Low-voltage draw-out power circuit breaker type switchgear sections with Infra-Red ‘IR’ windows in rear switchgear sections for viewing power circuit breaker / feeder cable terminations. Include mechanically adhered mimic bus diagram on all substation sections. Main, Tie, and feeder circuit breakers shall be 100% rated.
   d. Digital trip units for each circuit breaker shall include requisite inter-connecting control wiring for ‘Zone Selective Interlock’ tripping and power reporting functions.
   e. Metering provisions in the ‘Main’ cubicle sections including terminal blocks, wiring, and ‘cut-outs’ to accept MSU provided power and energy meters. Separate switchgear manufacturer meters, C.T.’s and P.T.’s shall be provided to convey substation power information to the power monitoring system independent of those provided for connection to the owner supplied and installed revenue grade metering.
   f. Provide separate customer metering compartment with barriers to isolate current transformers with factory wired shorting type terminal blocks; fused terminal block with voltage reference tap for 600V rotary type disconnect for owner connection.
   g. Surge Protective Devices (SPD’s) for each incoming switchgear section (two per double-ended substation)
   h. Control Power supply - 120V A.C. from internally mounted C.P.T’s.; provided on each source / side of substation
   i. Instrumentation and Control
   j. Remote circuit breaker racking devices capable of racking out Main, Tie, and all Feeder breakers.
   k. Substation Commissioning Services provided by the switchgear manufacturer, to include current injection tests and trip setting verification / validation. Trip settings will be input by the switchgear manufacturers field representative during commissioning.

B. Related Sections:

   1. Applicable sections of Division 26 – Electrical as provided with this package.

1.4 SUBMITTALS

   A. Shop Drawings – Provide shop drawings for each substation section / component that clearly identifies dimensions, weights, capacities, profiles, operating and electrical characteristics, elevations, wiring diagrams, control diagrams, mimic bus diagrams, power circuit breakers and
trip unit data sheets. Manufacturer shall also include shop drawings for intended ‘IR’ windows. Shop drawings shall be provided for the following substation sections:

1. Medium-voltage incoming line sections (Air Terminal Chamber – ATC)
2. Medium-voltage transformer transition sections
3. Low-voltage switchgear sections
4. Substation Transformers
5. Infrared viewing windows.
6. Circuit Breaker Trip Units
7. Current Sensors (Phase & Ground)

B. Operation and Maintenance Data

1. Secondary unit substations – Provide installation, operation, and maintenance manuals for all transformers, circuit breakers, SPD’s, trip units, current sensors, test equipment, and all associated low voltage communications components and gateways.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a NETA certified testing agency acceptable to Michigan State University, the authority having jurisdiction, and marked for intended use.

B. Comply with NFPA 70, “National Electrical Code” – Current edition accepted by the State of Michigan

C. The unit substation shall conform to the following:

1. ANSI/IEEE C37.20.1 – Switchgear assemblies
2. ANSI/IEEE C37.20.2 – Metal Clad Switchgear
3. ANSI/IEEE C37.20.3 – Metal Enclosed Switchgear
4. ANSI/IEEE C37.13 – Low voltage power circuit breakers
5. ANSI/IEEE C37.17 – Trip unit devices
7. ANSI/IEEE C37.50 – Testing of Low Voltage power circuit breakers
8. NEMA SG-3 – Low voltage power circuit breakers
9. NEMA SG-5 – Power switchgear assemblies
10. ANSI/UL1066 – Low voltage AC and DC circuit breakers used in enclosures
11. ANSI/UL1558 – Switchgear Assemblies
12. Transformers shall be in accordance with the latest applicable standards as recommended by DOE (2016), N.E.M.A., and I.E.E.E.

D. Guarantee

1. Furnish full parts and labor warranty to cover the unit substation for two years from date of ‘In-Service’ energization.

2. Term of Sale freight prepaid and allowed – F.O.B. Jobsite

1.6 MATERIAL TURNED OVER TO OWNER

A. Products Supplied But Not Installed Under This Section

1. Manufacturer’s distributor shall provide a metal cabinet for the electrical room sized to house remote racking devices, manuals and special tools. Cabinet shall be Tennsco No. 7824MGY or Grainger item no. 1UBT8, 24 x 36 x 78.

1.7 DESIGN REQUIREMENTS

A. The secondary Main, Tie, and feeder breakers shall be capable of being completely coordinated between upstream and downstream overcurrent protective devices. Coordination means shall include Zone Selective Interlock on both 480V and 208V substations and all requisite internal control wiring. Shop drawing submittals shall include coordination curves for the breakers furnished.

PART 2 - PRODUCTS

2.1 GENERAL

A. Unit substations including transformers and MV Air Terminal Chambers shall be arranged according to the electrical drawings. Dimensions for the switchgear sections are approximate and shall be verified by the switchgear manufacturers Applications Engineer via on-site inspection prior to equipment release for manufacture. Equipment shall be furnished such that the overall dimensions of the complete substation unit suit the room dimensions and aisle space, subject to the approval of Michigan State University. Complete dimensioned shop drawings shall be submitted to the Engineer before fabrication.
B. Each unit substation shall be metal enclosed with separate self-contained, individual compartments for breakers, meters, SPD’s and instruments. Include a centralized bus compartment, rear cable compartment and vents for ventilation and access. Complete unit shall be rustproofed and painted with two coats of manufacturers standard ANSI Gray. Units shall be mounted on leveling channels in or on concrete bases furnished and installed by MSU.

C. Circuit breaker cells shall be segregated from adjacent compartments and equipped with draw-out rails, and primary and secondary disconnecting contacts. Current transformers for each breaker shall be provided with shorting terminal blocks in a front wireway located in each cubicle.

D. Solderless lugs and ground connections shall be provided at each end of the structure and a copper ground bus shall be furnished running the entire length internal to the structure providing positive ground connections.

E. Unit substations shall be as manufactured by: Eaton “Magnum ‘DS’ series”, General Electric/ABB “Entellisys 5.0” w/EntelliGuard Breakers, Siemens “WL” Series, or Square ‘D’ “PZ4” w/ MasterPact ’NW’ or ‘MTZ’ series breakers.

2.2 INCOMING LINE SECTIONS

A. Incoming line medium voltage line section for each substation shall be pad mounted Air Terminal Chambers with (2) 4” ‘IR’ scanning windows, (one in each door), also referred to as ATC’s. Ratings for transformer medium voltage spades protruding into the ATC’s shall be as follows:

1. kV, Nominal 13.8
2. kV, Maximum Design 15.5
3. kV, BIL 95
4. Main Bus Continuous, Amperes 600
5. Short-Circuit Ratings
   a. Amperes, RMS Symmetrical 25,000
   b. MVA Three-Phase Symmetrical at Rated Nominal Voltage 650
6. Duty-Cycle Fault-Closing Amperes, RMS Asymmetrical 40,000

2.3 TRANSFORMER SECTIONS

A. All transformers shall be liquid filled with ABB BIOTEMP or Cooper FR3 Envirotemp and each provided with four 2-1/2% fully rated taps in the high-voltage winding, two above and two below nominal primary voltage, with externally operated no-load tap changer.

B. Temperature Ratings: Average temperature rise 55/65 degrees C maximum when transformer operated at full nameplate rating in 30 degree C ambient (average), 40 degree C maximum per ANSI/IEEE C57.
C. Transformer Cooling and Power Rating: Self-cooled (ONAN)

D. Transformer voltages shall be 13,200 volt, 3Ø-3W “DELTA” primary (95kV BIL); and either 480/277V-3Ø-4W or 208/120V-3Ø-4W (30 kV BIL) “Grounded WYE” secondary as indicated on the one-line diagram and plans.

E. High voltage bushings shall be rigid and provided with two-hole spades for 15KV cable terminations similar to 3M Quick-Term III terminations.

F. A low-voltage neutral bushing shall be included on each transformer.

G. Maximum transformer width (flange-to-flange) shall be 66”; transformer depth shall require special removable cooling fin configurations so as to allow for an adequate egress path out from behind the substation.

H. Sound Level: Maximum sound levels per NEMA publication TR-1.

I. The transformer secondary shall be bus connected to the low-voltage switchgear section; flexible braided straps are acceptable.

J. Transformers shall be provided with the following accessories:
   1. Drain and sampling valves.
   2. Filter-press and filling connections.
   3. Top liquid dial-type thermometer wired to alarm contacts.
   4. Liquid level gauge wired to alarm contacts.
   5. Pressure-vacuum gauge wired to alarm contacts
   6. Pressure relief device.
   7. Sudden Pressure (Rapid Rise) relay wired to alarm contacts
   8. Ground pad.
  12. Alarm contacts shall be wired to a central terminal block suitable for terminating power system monitoring wiring and an external communications gateway that may also perform remote alarm monitoring.

K. Transformers shall have sealed tanks with welded on cover for preservation of the insulating liquid. The transformer base construction shall be of the fabricated type and suitable for using rollers or skidding in any direction.

L. Exterior surfaces shall be painted an ANSI gray, similar to the switchgear.

M. Tests and characteristics shall be in accordance with latest ANSI standards.
N. Information supplied by the Manufacturer shall include dimensional sketches, installation requirements, instruction books, guaranteed efficiencies at full, 3/4, 1/2, and 1/4 loads, guaranteed regulation at unity and 80% P.F., and core loss.

O. Surface mount NEMA wiring termination box for alarm wiring points. Temperature, pressure, and liquid level gauges, and sudden pressure relay shall be connected to the substation power monitoring system. Provide alarm and relay contacts connected to the terminal junction box with flexible, watertight conduit.

P. Surge Arresters: Provide distribution class metal oxide-type surge arrestors, with maximum continuous voltage of 10kV, or as recommended by manufacturer. Surge arrestors shall be located in the medium voltage air terminal chambers (ATC’s). Provide arrester mounting supports and ensure cable connections are made with bolted two-hole termination lugs.

Q. Transformer windings can be aluminum and it is anticipated that physical space will allow, however it is required of all bidders to field investigate the substation room during bidding to field verify dimensional needs of aluminum wound transformers.

2.4 LOW-VOLTAGE SWITCHGEAR SECTIONS - GENERAL

A. Furnish and install low-voltage feeder switchgear sections for each unit substation as indicated on the drawings and as follows:

B. The complete switchgear structure shall be metal enclosed and fabricated from sheet steel with separate bus, instrument, and circuit breaker compartments. Vertical switchgear sections shall be separated by full height – full depth metal segregation barriers. No live parts shall be exposed and air vents and general design of the housing shall match that of transformer and A.T.C. sections.

C. A full height rear compartment shall be provided for the bus work, instrument transformers, and outgoing feeder cable connections. All bus bars shall be insulated silver plated copper. Bus supports shall be designed to withstand the stress produced by a fault current of 65,000 amperes.

D. Main, tie, and feeder breakers shall be of quantities, capacities, and ratings as indicated on the One-Line diagram drawing and in sub-section E below.

E. Provide spare breakers and prepared space compartments, completely bussed and wired ready to accept breakers in the future as indicated on the one-line diagrams.

F. Provide traveling breaker lifting device (hoist) mounted on top of the low-voltage sections. Lifting device shall include guide tracks, travel carriage, movable hoist, pulleys, supports, cable of adequate strength, lifting hook, etc., as required for complete installation.
G. The rear of each breaker cubicle (in rear doors) for the Main, Tie, and Feeder breakers, shall be provided with a 4” I.D., polymer “IR” window to allow for scanning visibility of each breakers cable terminations. “IR” windows shall be IRISS ‘VPT’ Series, model ‘VPT-100’, or equal as manufactured by ‘Fluke’ or ‘Flir’. A separate viewing window shall be provided for each individual breaker.

H. Rear doors for each low voltage switchgear section shall be full height with a single continuous, or four individual hinges, lockable, three latching mechanisms, and have rolled steel edges.

I. Each substation incoming main breaker section shall be provided with a specified manufacturers internally mounted, service entrance rated Surge Protective Device (SPD) located in a separate cubicle below the main breaker. SPD’s shall be Type 1, UL1449 – 4th Edition certified and provided with a separate overcurrent protective device. SPD’s shall meet IEEE Standards C62.41 and C62.72; and be Exposure Category ‘C’ rated. SPD units shall have a Peak kA rating per phase (Nominal Discharge Current I_n) of 20kA, a Short Circuit Current Rating (SCCR) of 200kA (minimum), and a surge current minimum rating of 240kA per mode. SPD’s shall be furnished with an audible alarm, indicator lights, surge counter w/reset button, and Form ‘C’ contacts (N.O. / N.C.) for remote monitoring.

J. Switchgear sections of each substation shall be provided with full-length mechanically adhered mimic bus illustrating the bussing/breaker arrangements. 480 volt mimic bus shall be black in color, the 208 volt bus shall be red.

2.5 LOW-VOLTAGE SWITCHGEAR SECTIONS – POWER CIRCUIT BREAKERS

A. Low voltage power circuit breakers (Air circuit breakers) in the low-voltage switchgear shall be draw-out type, 100% rated, rated 600 volts, front removable, and provided with digital trip units capable of measuring, capturing, and storing power, energy, and harmonic data. Trip units shall wired to communicate relevant information externally to a power monitoring system through a internal gateway.

B. Low voltage power circuit breakers (Mains, Tie, & feeder breakers) shall be provided with a separate, remotely located breaker control panel located either above or below the breaker. Control panel shall include an “Open / Close” breaker control selector switch, a Green illuminated “Breaker Open” lamp, Red illuminated “Breaker Closed” lamp, Blue Arc Flash maintenance mode selector switch under a clear lockable cover, allowing operator to “Enable” or “Disable” the arc reduction mode; and a Blue illuminated lamp to indicate when the arc reduction mode has been enabled. Breakers shall be electrically operated for remote operation.

C. Draw-out type power circuit breakers shall include the following:

1. Solid state trip devices which require no external power connections. Trip devices shall be provided with adjustable long-time delay and pick-up, instantaneous, and short-time delay and pick-up over current/short circuit protection. Adjustable ground fault time delay and pick-up, integral to the solid state trip device shall be provided for all breakers (Mains, Tie,
& Feeders) on 480 Volt secondary substations. Trip units shall have indicators for overload, short circuit, and ground fault; and be capable of metering power, energy, and harmonic data. Additional trip unit functions shall include ‘Zone Selective Interlock’ (ZSI) and inter-connect modules and wiring tied to an output gateway for remote power system monitoring. Provide separate breaker trip unit, and Zone Selective Interlock test kits for each substation.

2. Ability to move from connected to test and then to disconnect position, or be removed completely for inspection, maintenance, or replacement.

3. Mechanical interlocks to prevent withdrawing or inserting breakers when in the closed position.

4. Padlocking provisions to receive up to three padlocks when the breaker is open and in the disconnected position to prevent closing of the breaker contacts when padlocks are applied.

5. Solid block silver inlaid main contacts with arc chutes totally enclosing arcing contacts.

6. Manual trip button in the face of each breaker and external target to indicate breaker position.

7. Auxiliary contacts: Provide two normally open and two normally closed aux contacts wired to a terminal block.

8. Insulated flash shields mounted in the upper portion of each breaker compartment to prevent flashover to grounded parts from the arc chutes.

9. Provide mechanically actuated safety shutters in the rear of each breaker cell / compartment that engages automatically to barrier-off line and load bus stabs when breakers are withdrawn from the cell.

10. Solderless compression type load side lugs, sized in accordance with feeder sizes as shown on riser diagrams.

11. Draw-out circuit breakers shall be enclosed within an individual compartment fashioned from sheet steel. Steel doors shall be provided with concealed hinges and formed edges. Circuit breaker cells shall be equipped with draw-out rails, primary and secondary disconnecting contacts, and current transformers with shorting terminal blocks located in a front wire-way within the cubicle.

12. Main-Tie-Main breaker arrangement shall be such that a “closed transition” function is standard so as to not drop building load when isolating one end of the substation for maintenance purposes. By equipment arrangement, all transformers are served by the same medium voltage circuit, and all medium voltage circuits are synchronized at the T.B. Simon power plant. Kirk-Key Interlock functionality is not required.
13. Bussing ‘Run-Backs’ from individual breaker cells to the main bussing arrangement for all 
feeder breakers 800 amps and larger shall be a minimum 1,600 amp rated to allow MSU 
Electrical trades the flexibility to move breakers within the substation as needed.

D. Each breaker cubicle shall have a sealed door design that allows for insulated operating handles 
to extend to operate the manual charging system, lever breaker between positions, open and close 
the breaker, examine and adjust trip unit settings, and read circuit breaker ratings.

2.6 LOW-VOLTAGE SWITCHGEAR TIE BREAKER SECTION AND TIE BUS

A. Each unit substation shall be arranged for secondary selectivity by means of an insulated tie bus 
and normally open (N.O.) tie breaker, fed from the main bus of one end, to the main bus of the 
other end.

B. Tie bus shall be furnished complete with all accessories, supports, fillings, etc., suitable for easy 
connection in the field. Bus shall be copper with adequate capacity and a 65kA short circuit rating, 
and totally enclosed. Tie bus shall run the full length through switchgear sections within the unit 
substation.

C. Tie breakers shall be normally open, 3 pole, draw-out type, the same as that specified for the main 
breakers.

2.7 INSTRUMENTS

A. Refer to Section 262713 Electricity Metering for metering at the substation.

B. Install a 120 volt, 20 amp, Ground Fault protected type duplex receptacle in a surface mount box 
within each Main Metering Compartment. The outlets shall be wired to a dedicated 20 amp circuit 
breaker in the nearest emergency power system panel-board with two #12 AWG THWN, one #12 
ground in a one-half inch conduit by MSU Electrical trades.

C. MSU Electrical trades will install a 3/4 inch conduit from the Main Metering Compartments to a 
network data hub room to allow for Ethernet cable connection from substation power monitoring 
system to the Campus network.

2.8 HUMAN-MACHINE INTERFACE

A. Provide a modular, scalable HMI interface for each low-voltage switchgear lineup mounted in a 
surface mount enclosure (20” wide Max.). All wiring and hardware internal to the substation, 
requisite to interface with the HMI shall be provided. Each HMI shall be capable of remotely 
opening (tripping) and closing all circuit breakers in their respective substations.
SECONDARY UNIT SUBSTATIONS WITH SECONDARY DISTRIBUTION SWITCHGEAR
PAGE 261116-11

B. The dashboard system is defined to include, but not to be limited to, electronic devices for metering, monitoring, control and protection, any necessary Ethernet communications devices, communication wiring, HMI, and ancillary equipment.

C. The dashboard software shall run on a dedicated processor installed in each switchgear lineup. Each processor shall offer monitoring and control for the switchgear lineup to which it is interfaced.

D. Each HMI shall be wall-mounted by MSU at a location remote from the substation and at a convenient viewing height, outside the arc flash boundary. The enclosure shall include a disconnect and power supply to power the HMI.

E. Each HMI shall support intuitive multi-touch functionality permitting user to pinch, zoom, scroll and swipe. The HMI shall use CAT6 cable as physical media to communicate with the processor located within the switchgear.

F. Local viewing of the dashboard on the HMI shall not require a login. All other access shall require a username and password subject to configurable password rules.

G. Remote access to view information on the dashboard processor shall be available through a web interface. The web interface shall be accessible on personal computers, tablets or phones. All remote breaker control through the web interface shall be disabled unless the MSU Medium Voltage Supervisor enables this access for specific users.

H. Using the onboard SMTP support, a user shall have the ability to customize and direct email to notifications to up to 10 users in their organization. These shall be selectable from alarm notifications, waveform notifications, trend log, alarm log, and daily emails.

I. The dashboard shall display the appropriate PPE level and ARMS status based on data provided from an arc flash study and status of the main breaker’s Arc Flash Reduction Mode on all the screens. Arc flash incident energy levels shall be shown for each switchgear bus both on the one line and elevation screens. Changes in ARMS status shall cause the energy levels to update based on the arc flash study data.

J. HMI units shall operate in parallel to the substation controls and functionality and in no way inhibit separate or remote Main-Tie-Main related switching operations.

K. Manufacturer: provide a product similar to the Eaton “Power Xpert Dashboard” or equal by pre-approved low-voltage switchgear manufacturer.

2.9 TEST EQUIPMENT

A. Substation manufacturer shall supply a circuit breaker tester for setting and calibrating the power circuit breakers. Provide one tester for the building to be stored in the specified storage cabinet.
B. Substation manufacturer shall also supply a “Zone Selective Interlock” (ZSI) test kit for testing ZSI functionality between the Main, Tie, and Feeder breakers. If required, provide separate test kits for both the 208 volt and 480 volt substations.

PART 3 - EXECUTION

3.1 EXAMINATION – SITE CONDITIONS

A. Electrical equipment manufacturers Applications Engineer shall examine site and space conditions, to include dimensions prior to submitting shop drawings to ensure equipment offering is appropriate for the existing substation room conditions. It is recommended, but not required that the manufacturers Applications Engineer make a field visit prior to bid proposal unless it is intended to bid aluminum wound transformers and space validation necessary.

3.2 QUALITY CONTROL

A. Testing Agency: Switchgear manufacturer shall self-perform factory and field tests and inspections and start-up, to include setting, verification and testing of all adjustable trip settings in accordance with the owners provided coordination study. Testing for some components may be conducted at the factory; however copies of factory performed test results shall be shipped with the switchgear components in question.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. General Field Testing Requirements:

1. Comply with the provisions of NFPA 70B Ch. "Testing and Test Methods."
2. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.
3. After installing secondary unit substation but before primary is energized, verify that grounding system in and around the substation is tested at the specified value or less.
4. After secondary unit substation(s) are installed and electrical circuitry has been energized, test for compliance with requirements.
5. Visual and Mechanical Inspection:
   a. Verify equipment nameplate data complies with shop drawing Documents.
   b. Inspect bolted electrical connections for high resistance using one of the following two methods:
      1) Use a low-resistance ohmmeter to compare bolted connection resistance values to values of similar connections. Investigate values that deviate from
those of similar bolted connections by more than 50 percent of the lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels shall be according to manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.

6. Remove and replace malfunctioning units and retest.
7. Prepare test and inspection reports. Record as-left set points of all adjustable devices.

D. Switchgear Field Inspections and Tests:

1. Visual and Mechanical Inspection:
   a. Inspect physical and mechanical condition.
   b. Inspect anchorage, alignment, grounding, and required area clearances.
   c. Verify the unit is clean and shipping bracing, loose parts, and documentation shipped inside cubicles have been removed.
   d. Verify that fuse and circuit-breaker sizes and types correspond to Drawings and coordination study as well as to the address of the circuit breaker that is used to identify it in microprocessor-communication software.
   e. Verify that current and voltage-transformer ratios correspond to Drawings.
   f. Confirm correct operation and sequencing of electrical and mechanical interlock systems.

      2) Make key exchange with devices operated in off-normal positions.

   g. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
   h. Inspect insulators for evidence of physical damage or contaminated surfaces.
   i. Verify correct barrier and shutter installation and operation.
   j. Exercise all active components.
   k. Inspect mechanical indicating devices for correct operation.
   l. Verify that filters are in place and vents are clear.
   m. Inspect control power transformers as follows:

      1) Inspect for physical damage, cracked insulation, broken leads, connection tightness, defective wiring, and overall general condition.
      2) Verify that primary- and secondary-fuse or circuit-breaker ratings match Drawings and comply with manufacturer's recommendations.
      3) Verify correct functioning of draw-out disconnecting and grounding contacts and interlocks.
2. Electrical Tests (Factory or Field):

a. Perform dc voltage insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute. If the temperature of the bus is other than plus or minus 20 deg C, adjust the resulting resistance as provided in NETA ATS, Table 100.11.

1) Insulation-resistance values of bus insulation shall be according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.

2) Do not proceed to the dielectric-withstand-voltage tests until insulation-resistance levels are raised above minimum values.

b. Perform a dielectric-withstand-voltage test on each bus section, each phase-to-ground with phases not under test grounded, according to manufacturer's published data. If manufacturer has no recommendation for this test, it shall be conducted according to NETA ATS, Table 100.2. Apply the test voltage for one minute.

1) If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric-withstand-voltage test, the test specimen is considered to have passed the test.

c. Confirm conductors used for control wiring have passed an insulation-resistance test with respect to ground. That the conductor manufacturer has applied a potential of 500-V dc for 300-V rated cable and 1000-V dc for 600-V rated cable and the test duration was for one minute. For units with solid-state components or control devices that cannot tolerate the applied voltage, follow the manufacturer's recommendation.

1) Minimum insulation-resistance values of control wiring shall not be less than 2 megohms.

d. Voltage Transformers:

1) Perform secondary wiring integrity test. Verify correct potential at all devices.

2) Verify secondary voltages by energizing the primary winding with system voltage.

e. Perform current-injection tests on the entire current circuit in each section of switchgear.

1) Perform current tests by secondary injection with magnitudes such that a minimum current of 1.0 A flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.
f. Verify operation of space heaters.
g. Perform phasing checks on double-ended or dual-source switchgear to ensure correct bus phasing from each source.

E. Medium-Voltage Surge Arrester Inspection and Tests:

1. Visual and Mechanical Inspection:
   a. Inspect physical and mechanical condition.
   b. Inspect anchorage, alignment, grounding, and clearances.
   c. Verify the arresters are clean.
   d. Verify that the ground lead on each device is individually attached to a ground bus or ground electrode.
   e. Verify that the stroke counter is correctly mounted and electrically connected if applicable. Record the stroke counter reading.

2. Electrical Tests (Factory or Field):
   a. Perform an insulation-resistance test on each arrester, phase terminal-to-ground. Apply voltage according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Replace units that fail to meet recommended minimum insulation resistance listed in the table.
   b. Perform a watts-loss test. Evaluate watts-loss values by comparison with similar units and test equipment manufacturer's published data.

F. Instrument Transformer Tests (Factory or Field):

1. Visual and Mechanical Inspection:
   a. Inspect physical and mechanical condition.
   b. Verify correct connection of transformers with system requirements.
   c. Verify that adequate clearances exist between primary and secondary circuit wiring.
   d. Verify the unit is clean.
   e. Verify that required grounding and shorting connections provide contact.
   f. Verify correct operation of transformer withdrawal mechanism and grounding operation.
   g. Verify correct primary- and secondary-fuse sizes for voltage transformers.
   h. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

2. Electrical Tests of Current Transformers:
   a. Perform insulation-resistance test of each current transformer and its secondary wiring with respect to ground at 1000-V dc for one minute. For units with solid-state components that cannot tolerate the applied voltage, comply with manufacturer's
recommendations. Insulation-resistance values of instrument transformers shall not be less than values shown in NETA ATS, Table 100.5.

b. Perform a polarity test of each current transformer according to IEEE C57.13.1. Polarity results shall agree with transformer markings.

c. Perform a ratio-verification test using the voltage or current method according to IEEE C57.13.1. Ratio errors shall comply with IEEE C57.13.

d. Perform an excitation test on transformers used for relaying applications according to IEEE C57.13.1. Excitation results shall match the curve supplied by the manufacturer or shall comply with IEEE C57.13.1.

e. Measure current circuit burdens at transformer terminals according to IEEE C57.13.1. The measured burdens shall match the instrument transformer Accuracy Class rating.

f. Perform insulation-resistance tests on the primary winding with the secondary grounded. Test voltages shall comply with NETA ATS, Table 100.5. The insulation-resistance value shall be according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.5.

g. Perform dielectric-withstand-voltage tests on the primary winding with the secondary grounded. Test voltages shall comply with NETA ATS, Table 100.9. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application, the primary winding is considered to have passed the test.

h. Perform power-factor or dissipation-factor tests according to test equipment manufacturer's published data. Power-factor or dissipation-factor values shall be according to manufacturer's published data. In the absence of manufacturer's published data, comply with test equipment manufacturer's published data.

i. Verify that current-transformer secondary circuits are grounded and have only one grounding point according to IEEE C57.13.3.

3. Electrical Tests of Voltage and Potential Transformers:

a. Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Apply the test voltage for one minute according to NETA ATS, Table 100.5. For units with solid-state components that cannot tolerate the applied voltage, follow manufacturer's recommendations. Insulation-resistance values of instrument transformers shall be according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.5.

b. Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Test voltages shall be applied for one minute according to NETA ATS, Table 100.5. Insulation-resistance values of the transformers shall not be less than values shown in NETA ATS, Table 100.5.

c. Perform a polarity test on each transformer to verify the polarity marks or H(1)-X(1) relationship. Polarity results shall agree with transformer markings.

d. Perform a turns-ratio test on all tap positions. Ratio errors shall not exceed the tolerances specified in IEEE C57.13.

e. Measure voltage circuit burdens at transformer terminals. Measured burdens shall be compared to instrument transformer ratings. The measured burdens shall match the instrument transformer Accuracy Class rating.
f. Perform a dielectric-withstand-voltage test on the primary windings with the secondary windings connected to ground. The dielectric voltage shall comply with NETA ATS, Table 100.9. The test voltage shall be applied for one minute. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric-withstand-voltage test, the primary windings are considered to have passed the test.

g. Perform power-factor or dissipation-factor tests according to test equipment manufacturer's published data. Power-factor or dissipation-factor values shall be according to manufacturer's published data. In the absence of manufacturer's published data, comply with test equipment manufacturer's published data.

h. Verify that voltage-transformer secondary circuits are grounded and have only one grounding point according to IEEE C57.13.3.

G. Liquid-Filled Transformer Field Inspection and Tests:

1. Visual and Mechanical Inspection:
   a. Inspect physical and mechanical condition.
   b. Inspect impact recorder prior to unloading.
   c. Test dew point of tank gases if applicable.
   d. Inspect anchorage, alignment, and grounding.
   e. Verify the presence of PCB content labeling.
   g. Verify the bushings are clean.
   h. Verify that alarm, control, and trip settings on temperature and level indicators are set and operate within manufacturer's recommended settings.
   i. Verify that cooling fans and pumps operate correctly and have appropriate overcurrent protection.
   j. Verify that liquid level in tanks and bushings is within manufacturer's published tolerances.
   k. Perform specific inspections and mechanical tests recommended by the manufacturer.
   l. Verify presence of transformer surge arresters and that their ratings are as specified.
   m. Verify that as-left tap connections are as specified.
   n. Verify the presence of surge arresters and that their ratings are as specified.

2. Electrical Tests (Factory or Field):
   a. Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Apply voltage according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.5. Calculate polarization index; the value of the index shall not be less than 1.0.
   b. Perform power-factor or dissipation-factor tests on all windings according to test equipment manufacturer's published data. Maximum winding insulation power-factor/dissipation-factor values shall be according to manufacturer's published data.
In the absence of manufacturer's published data, comply with NETA ATS, Table 100.3.

c. Measure core insulation resistance at 500-V dc if the core is insulated and the core ground strap is removable. Core insulation-resistance values shall not be less than 1 megohm at 500-V dc.

d. Perform a power-factor or dissipation-factor tip-up test on windings greater than 2.5 kV.

e. Perform turns-ratio tests at tap positions. Turns-ratio test results shall not deviate by more than one-half percent from either the adjacent coils or the calculated ratio. If the test fails, replace the transformer.

f. Perform an excitation-current test on each phase. The typical excitation-current test data pattern for a three-legged core transformer is two similar current readings and one lower current reading. Investigate and correct if the test shows a different pattern.

g. Measure the resistance of each winding at each tap connection, and record temperature-corrected winding-resistance values in the Operations and Maintenance Manual.

h. Perform an applied-voltage test on high- and low-voltage windings-to-ground. Comply with IEEE C57.12.91, Sections 10.2 and 10.9.

i. Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.

j. Remove a sample of insulating liquid according to ASTM D923 and perform dissolved-gas analysis according to IEEE C57.104 or ASTM D3612; as well test for water in insulating fluid and dielectric breakdown.

H. Low-Voltage Power Circuit-Breaker Field Inspections and Tests:

1. Visual and Mechanical Inspection:

   a. Inspect physical and mechanical condition.
   b. Inspect anchorage, alignment, and grounding.
   c. Verify that all maintenance devices are available for servicing and operating the breaker.
   d. Verify the unit is clean.
   e. Verify that the arc chutes are intact.
   f. Inspect moving and stationary contacts for condition and alignment.
   g. Verify that primary and secondary contact wipe and other dimensions vital to satisfactory operation of the breaker are correct.
   h. Perform mechanical operator and contact alignment tests on both the breaker and its operating mechanism according to manufacturer's published data.
   i. Verify cell fit and element alignment.
   j. Verify racking mechanism operation.
   k. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
l. Perform adjustments for final protective-device settings according to coordination study provided by end user.

m. Record as-found and as-left operation counter readings.

2. Electrical Tests (Factory or Field):

a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage according to manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.1. Insulation-resistance values shall be according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Values of insulation resistance less than this table or manufacturer's recommendations shall be investigated.

b. Measure contact resistance across each power contact of the circuit breaker. Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in manufacturer's published data. If manufacturer's published data is not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.

c. Determine long-time pickup and delay by primary current injection. Long-time pickup values shall be as specified, and the trip characteristic shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors. If manufacturer's curves are not available, trip times shall not exceed the value shown in NETA ATS, Table 100.7.

d. Determine short-time pickup and delay by primary current injection. Short-time pickup values shall be as specified, and the trip characteristic shall not exceed manufacturer's published time-current tolerance band.

e. Determine ground-fault pickup and delay by primary current injection. Ground-fault pickup values shall be as specified, and the trip characteristic shall not exceed manufacturer's published time-current tolerance band.

f. Determine instantaneous pickup value by primary current injection. Instantaneous pickup values shall be as specified and within manufacturer's published tolerances. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.8.

g. Test functions of the trip unit by means of secondary injection. Pickup values and trip characteristic shall be as specified and within manufacturer's published tolerances.

h. Perform minimum pickup voltage tests on shunt trip and close coils according to manufacturer's published data. Minimum pickup voltage of the shunt trip and close coils shall conform to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.20.

i. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
j. Verify correct operation of any auxiliary features, such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free operation, anti-pump function, and trip unit battery condition. Reset trip logs and indicators. Auxiliary features shall operate according to manufacturer's published data.

k. Verify operation of charging mechanism. The charging mechanism shall operate according to manufacturer's published data.

I. Metering Device Field Inspection and Tests:

1. Visual and Mechanical Inspection:

   a. Inspect physical and mechanical condition.
   b. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.
   c. Verify the unit is clean.
   d. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

   a. Verify accuracy of meters at cardinal points. Meter accuracy shall be according to manufacturer's published data.
   b. Calibrate meters according to manufacturer's published data. Calibration results shall be within manufacturer's published tolerances.
   c. Verify instrument multipliers. Instrument multipliers shall be according to system design specifications.
   d. Verify that current-transformer and voltage-transformer secondary circuits are intact. Test results shall confirm the integrity of the secondary circuits of current and voltage transformers.

3.3 MANUFACTURER’S SERVICES

a. Furnish manufacturer’s representative for the following services at jobsite or classroom as designated by Owner for minimum work-days listed below (travel time excluded):

   (5) workdays for installation assistance and inspection of installation.
   (3) workdays for functional and performance testing.
   (3) workdays for plant startup.
   (1) workday for instruction of 5 site personnel.

b. Training Program: Instructions on assembly, including primary equipment, transformer, and secondary equipment such as circuit breakers, protective devices, and other major components.
c. Manufacturer’s Certification by a Qualified Factory-Trained Manufacturer’s Representative: Certify in writing that the equipment has been installed, adjusted, and tested in accordance with manufacturer’s recommendations.

END OF SECTION 261316
ELECTRICAL NEW INSTALLATION NOTES:

1. NEW 1500KVA 3,000 AMP, 208/120V-3 ɸ -4W, SUBSTATION SUPPLIED AND INSTALLED BY MSU ELECTRICAL TRADES.
2. REMOVE LOWER CABLE TRAY TO PROVIDE ROOM FOR 208V SUBSTATION.
3. PROVIDE NEW OUTWARD OPENING DOORS W/ PANIC TYPE HARDWARE.
4. MSU ELECTRICAL TRADES TO SUPPLY & INSTALL A NEW 400A-3P/400A FUSED, 480V DISCONNECT SWITCH FOR PROVIDING POWER TO FIRE PUMP TRANSFER SWITCH. ROUTE 3# 500 KCMIL, 1#3 (GND) - 3" C TO BOTH THE 'ATS', AND A TAP AHEAD OF THE MAIN BREAKER IN THE TRANSITION SECTION AT BOTH ENDS OF THE SUBSTATION.
TRANSFORMER T-1
1,000 KVA
13.2KV-3ɸ-4W (PRI)
480/277V-3ɸ-4W (SEC)

TRANSFORMER T-2
1,000 KVA
13.2KV-3ɸ-4W (PRI)
480/277V-3ɸ-4W (SEC)

METER
E2

METER
E1

MAIN TIE
3

TRANSFORMER TRANSITION SECTION (TTS)

AIR TERM. CHAMB. (ATC)

NORTH SOUTH

3

MAIN
1600A SPARE
800A SPARE

DP-BC
MCC 32

1234567

A
B
C
D

MCC 2

9

SPD

INSTRUMENT COMPART

SPD

7

11

DP-BA

MCC 1

1200 SPARE

10

ARC REDUCTION MODE ACTIVATION SWITCH (W/ CLEAR LOCKABLE COVER)

ARC REDUCTION MODE STATUS LIGHT (BLUE)

BREAKER 'CLOSED' STATUS LIGHT (RED)

BREAKER 'OPEN' STATUS LIGHT (GREEN)

BREAKER CONTROL SWITCH

#1

9

10

11

10

10

10

10

10

4. 4" 'IR' SCANNING WINDOW ON MANUFACTURERS AIR TERMINAL CHAMBER (ATC).

5. SUBSTATIONS SHALL BE PREPARED TO ACCOMMODATE A SET OF THREE 'IR' SCANNING WINDOWS ON BOTH SIDES OF THE TRANSFORMER SECONDARY TRANSITION SECTIONS..Views of the internal vertical bracing shall not interfere with the bus termination viewing angle of the 'IR' window.

6. "IR" SCANNING WINDOW ON MAIN FACTORY AIR TERMINAL CHAMBER (ATC).

7. SUBSTATIONS SHALL BE PROVIDED WITH A 4" X 8" IR SCANNING WINDOW ON BOTH SIDES OF THE TRANSFORMER SECONDARY TRANSITION SECTIONS. Views of the internal vertical bracing shall not interfere with the bus termination viewing angle of the 'IR' window.

8. SUBSTATIONS SHALL BE PROVIDED WITH A 4" X 8" IR SCANNING WINDOW ON BOTH SIDES OF THE TRANSFORMER SECONDARY TRANSITION SECTIONS. Views of the internal vertical bracing shall not interfere with the bus termination viewing angle of the 'IR' window.

9. SUBSTATIONS SHALL BE PROVIDED WITH A 4" X 8" IR SCANNING WINDOW ON BOTH SIDES OF THE TRANSFORMER SECONDARY TRANSITION SECTIONS. Views of the internal vertical bracing shall not interfere with the bus termination viewing angle of the 'IR' window.

10. DETACHABLE FIN ASSEMBLY.

11. CONTROL SWITCHES AND INDICATOR LIGHTS FOR TOP TIER BREAKERS SHALL BE MOUNTED BELOW THE BREAKERS AND NOT ABOVE SO AS TO KEEP ALL CONTROLS AT A MAINTAINABLE HEIGHT.
208/120V SUBSTATION KEY NOTES:
1. SUBSTATION TRANSFORMER DETAIL NOTES:
   1. TRANSFORMER CONTROL ENCLOSURE
   2. TAP CHANGER
   3. NAME/ DATA PLATE
   4. FLUID TEMPERATURE GAUGE
   5. VACUUM PRESSURE GAUGE
   6. LIQUID LEVEL GAUGE
   7. PRESSURE RELIEF DEVICE
   8. SCHRADER VALVE & FILL PLUG
   9. DRAIN SPIGOT W/ SAMPLER
   10. SUDDEN PRESSURE RELAY
   11. DETACHABLE RADIATOR FIN ASSEMBLY

2. 66" MAX

NEW 208/120V SUBSTATION ELEVATION VIEW

NEW 208/120V SUBSTATION INFRARED (IR) WINDOW PLAN

TRANSFORMER HIGH SIDE AIR TERMINAL CHAMBER
PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Substation project drawings and Secondary Unit Substation specification section 26116 apply to this Section.

1.2 SUMMARY
   A. This Section includes the following:
      1. This Section specifies metering equipment for each substation.
      2. Provide all labor, materials, and equipment as necessary to complete all work as indicated on the drawings, and as specified herein.
   B. Related Sections include the following:
      1. Applicable sections of Division 26 – Electrical (26116)

1.3 SUBMITTALS
   A. Shop Drawings
      1. Metering equipment.

1.4 QUALITY ASSURANCE
   A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   B. Comply with NFPA 70, “National Electrical Code”
PART 2 - PRODUCTS

2.1 METERING EQUIPMENT

A. Electrical substations shall be supplied with Current Transformers of the appropriate ratio, wired to shorting type terminal blocks, and Voltage transformers as necessary to provide 3-phase 120V phase to neutral voltage wired to a dedicated terminal block. Terminal blocks shall be located in a reasonable location for access such as the control power/fuse compartment.

B. All Energy meters will be supplied and installed by the MSU Power and Water Department.

C. Current metering transformers shall be utility revenue class, donut type, with mounting base as manufactured by ABB/GE Multilin or approved equal by Siemens, Eaton, or Square D.

D. Voltage metering transformers shall be utility revenue class, with mounting base as manufactured by ABB/GE Multilin or approved equal by Siemens, Eaton, or Square D.

E. Electrical meters furnished by MSU Power and Water department for use in substations shall be Electro Industries Nexus 1272 (switchboard case) and Electro Industries Shark 200 meters. The Nexus 1272 meter is typically mounted on the left end of the substation and the Shark 200 series meter on the right.

PART 3 - EXECUTION

3.1 METERING EQUIPMENT

A. Voltage and current transformers shall be mounted to a back plate in the metering compartment and wired to terminal blocks located in the same compartment as described above.

END OF SECTION 262713