



**State of Rhode Island
Department of Administration / Division of Purchases
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**Solicitation Information
February 17, 2014**

ADDENDUM # 2

RFP# 7548414

**TITLE: TRANSFORMER AND SWITCHGEAR EQUIPMENT PRIMARY
ELECTRICAL SERVICES UPGRADE – RIC**

Submission Deadline: Monday February 24, 2014 at 11:00 am (Local Time)

Notice to Vendors:

- Attached is information related to this solicitation. Questions received have been addressed and clarified in the attached documents. No further questions will be answered.

**Thomas Bovis
Interdepartmental Project Manager**

Interested parties should monitor this website, on a regular basis, for any additional information that may be posted.



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RDK Understands How Engineering Affects People

**Campus Primary Electrical Services Upgrade – Pre-Purchase
Rhode Island College
Providence, RI**

Issued February 13, 2014

Under the provisions of Article 7 of Section 00200, Instructions to Bidders, Bidders are informed that the Bidding Documents for the above mentioned Project are modified, corrected, and/or supplemented as follows. Addendum No. 1 becomes part of the Bidding Documents and Contract Documents.

Acknowledge receipt of this addendum by inserting its name and number in Article 1 of the Bid form. Failure to acknowledge receipt of the Addendum may subject the Bidder to disqualification.

Project Manual Changes

Note: Updated specification sections are attached herewith. Modifications are indicated with an outside border to the left of the effected text.

Item 1-1 Section 00410 – Bid Form

Delete Section 00410 – Bid Form in its entirety and replace with the attached Section 00410 – Bid Form.

Item 1-2 Section 01200 – Price and Payment Procedures

Delete Section 01200 – Price and Payment Procedures in its entirety and replace with the attached Section 01200 – Price and Payment Procedures.

Item 1-3 Section 01200 - Attachment A – Price and Payment Procedures

Delete Section 01200 - Attachment A – Price and Payment Procedures in its entirety and replace with the attached Section 01200 - Attachment A – Price and Payment Procedures.

**Item 1-4 Section 016000 – Pad Mounted Distribution Substation Transformer
Pre-Purchase Specification**

Delete Section 016000 – Pre-Purchase Specification in its entirety and replace with the attached Section 016000 – Pre-Purchase Specification.



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Clarifications

Item 1-5 The microprocessor relay that is specified will require special equipment for trouble shooting, which may not be readily available during an emergency. This should be reviewed and considered for revision.

Provide microprocessor-based multifunction relay, as specified. Relay shall be Eaton type EDR-5000, or approved equal.

Item 1-6 How will the MBE requirements be met?

Contractor must fill out appropriate documents from the MBE Office. A waiver could be requested.

Item 1-7 Will delivery time of 12 weeks be maintained in the documents? Typical delivery time for a transformer is 16-20 weeks and the switchgear takes at least 20 weeks.

Contractor shall allow for a total of 20 weeks lead time (including shop drawings, manufacture and delivery) on Medium-Voltage switchgear and transformer. Provide Add-Alternate for expedited delivery as noted in updated specifications.

Item 1-8 A maintenance contract was specified in the documents. Is this something the contractor is expected to provide?

The Contractor is expected to provide service and maintenance for a period of one year from Substantial Completion.

Item 1-9 There is a note to have the equipment stored at a site in Providence.

The goal is to have it delivered to RIC when the Contractor for Phase 1 is ready to install it, but provide a monthly storage rate in case the Phase 1 Contractor is not ready to install it.

Item 1-10 How can we provide a warranty if we don't install it?

Transformer and switchgear shall be installed by the Phase 1 Contractor per the manufacturer's requirements. Transformer and Switchgear Contractor to provide factory representatives during installation as noted in the contract documents. The warranty shall be provided by the manufacturer.

END OF ADDENDUM NO. 1

DOCUMENT 00410 - BID FORM

Date: February 13, 2014

To: Rhode Island College
Purchasing Office
600 Mount Pleasant Avenue
Providence, RI 02908-1991

Project: Primary Electrical Service Electrical Equipment Pre-Purchase Phase 1
Rhode Island College, Providence, Rhode Island

Submitted by: _____
(include address, tel. & FAX nos., and license no. if applicable)

1. BID

Having examined the Place of The Work and all matters referred to in the Bid Documents and in the Contract Documents prepared by RDK Engineers for the above mentioned project, we, the undersigned, hereby offer to enter into a Contract to perform the Work for the Sum of:

_____ (\$ _____.)
(written, and numerically)

- We have included the specified Allowances from Section 01200 in Division 1 of the Specifications in the above Bid sum as follows:

Insert Allowance name	\$Amount
Insert Allowance name	<u>\$Amount</u>
Total Allowances	\$Amount

- We have included the required Bid security in the above Bid Sum. We have included 100% Payment and Performance Bonds in the above Bid Sum.
- We have included the original Bid and required additional "public copy" if required by Document 00210 – Supplemental Instructions to Bidders.

2. ACCEPTANCE

This offer shall be open to acceptance and is irrevocable for sixty days from the bid closing date. If this bid is accepted by the Owner within the time period stated above, we will:

- Proceed under the Agreement, subject to compliance with required State regulatory agency approvals as described in the Bid Documents.
- Furnish the required bonds in compliance with amended provisions of the Instructions to Bidders.
- Commence work within seven days after receipt of a Purchase Order from RIC Purchasing.

If this bid is accepted within the time stated, and we fail to commence the Work, or we fail to provide the required Bonds, the security deposit shall be forfeited to the Owner by reason of our failure, limited in amount to the lesser of the face value of the security deposit or the difference between this bid and the bid upon which a Contract is signed.

In the event our bid is not accepted within the time stated above, the required security deposit shall be returned to the undersigned, in accordance with the provisions of the Instructions to Bidders; unless a mutually satisfactory arrangement is made for its retention and validity for an extended period of time.

3. CONTRACT TIME

If this Bid is accepted, we will achieve delivery of equipment within twenty (20) calendar weeks from the date of purchase order issue. We have included all premium time or additional staffing required to accommodate this schedule.

Provide an ADD Alternate Price for a delivery time of sixteen (16) weeks.

4. LIQUIDATED DAMAGES

Time is of the Essence: If we fail to achieve certification of delivery of equipment at the expiration of the agreed upon Contract Time indicated above, we acknowledge that we will be assessed Liquidated Damages for each calendar day the project continues to be in default of Substantial Completion, as follows:

\$ 750.00 per calendar day.

5. REQUIREMENT FOR LICENSE NUMBER

In compliance with the requirements of Rhode Island General Law, Section 5-65-23, my Rhode Island license number for the work to be performed by this firm as prime contractor is:

LICENSE NUMBER: _____

6. BID FORM SIGNATURE(S)

(Bidder's name)

By: _____

Title: _____

Corporate Seal:

END OF DOCUMENT

SECTION 01200 - PRICE AND PAYMENT PROCEDURES**PART 1 - GENERAL**

SECTION INCLUDES

- 1.01 Allowances.
- 1.02 Testing and inspection allowances.
- 1.03 Schedule of values.
- 1.04 Applications for payment.
- 1.05 Warranty inspection retainage.
- 1.06 Sales tax exemption.
- 1.07 Change procedures.
- 1.08 Defect assessment.
- 1.09 Alternates.

1.01 ALLOWANCES

- A. See General Conditions Article 3.8 for Allowance provisions.
- B. Design Agent Responsibility:
 - 1. Consult with Contractor for consideration and selection of products, suppliers, and Installers.
 - 2. Select products in consultation with Owner and transmit decision to Contractor.
 - 3. Prepare Change Order to adjust final cost.
- C. Contractor Responsibility:
 - 1. Assist Design Agent or its Consultants in selection of products, suppliers and installers.
 - 2. Obtain proposals from suppliers and installers, and offer recommendations.
 - 3. On notification on selection by Design Agent, execute purchase agreement with designated supplier and installer.
 - 4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery. Contractor shall supply shop drawings, product data, and samples to Owner and Design Agent at least 10 business days prior to product installation. Any installation performed by the Contractor prior to review and acceptance of the shop drawings, product data, and samples by the Owner shall be at the Contractor's risk.
 - 5. Promptly inspect products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
 - 6. Contractor shall submit all shop drawings within seven (7) calendar days of receipt of purchase order. Design agent will perform review of shop drawings within seven (7) calendar days. Approval of shop drawings must occur within twenty-one (21) calendar days of purchase order receipt.
- D. Schedule of Allowances: See Attachment A.

1.02 TESTING AND INSPECTION ALLOWANCE

- A. All costs of regularly scheduled testing are included in the Base Bid. See Attachment A for allowance to cover costs of additional testing to be provided when directed by the Owner.
- B. See Section 01400 and its attachment for testing requirements.

1.03 SCHEDULE OF VALUES

- A. Submit Schedule of Values in duplicate, one original and one copy.
- B. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the major specification Section. Identify site mobilization, bonds, insurance and closeout.
- C. Include in each line item, the amount of Allowances specified in this Section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.
- D. Include separately for each line item, a direct proportional amount of Contractor's overhead and profit.
- E. Revise schedule to list approved Change Orders, with each Application for Payment.

1.04 APPLICATIONS FOR PAYMENT

- A. Submit invoice in format acceptable to RIC, with three copies. Applications submitted without the following items described in this section will be returned for resubmittal.
- B. Provide one hard copy of the updated construction schedule with each Application for Payment submission, prepared per Section 01330.
- C. Include with each monthly Application for Payment, following the first application, Certified Monthly Payroll Records with proper compliance cover sheet for the previous month's pay period. See Attachment A this section for current State and Federal requirements and other submittal requirements.
- D. Beginning with the second Application for Payment, Contractor's right to payment must be substantiated by documenting, on a copy of the RIC Waiver of Lien Form included in Document 00614 - Waiver of Lien Form in this Project Manual, that payment monies due, less retainage not exceeding ten percent, have been paid in full to subcontractor and suppliers for work, materials, or rental of equipment billed for under specific line item numbers in the immediately preceding application.
- E. Substantiating Data: When the Owner or Design Agent requires additional substantiating information, submit data justifying dollar amounts in question.
- F. Payment Period: Submit at monthly intervals unless stipulated otherwise in the Supplemental General Conditions.

1.05 WARRANTY INSPECTION RETAINAGE

- A. A percentage of job cost as defined in Attachment A will be retained from Final Payment for a duration of ten months. If, after ten months, all systems including mechanical and electrical, are determined by the Owner to be properly functioning, the Warranty Inspection Retainage will be released.
- B. If, after ten months, there are found to be modifications, adjustments, or corrections necessary to be made to address any system or product malfunction, in order to fulfill specified performance or requirements of such systems or products, release of the warranty inspection retainage will be delayed until such malfunctions are rectified.
- C. If, after twelve months from the date of Final Completion, all systems have not been fully addressed, the Owner may utilize the Warranty Inspection Retainage to hire others to execute necessary modifications, adjustments, or corrections.

1.06 SALES TAX EXEMPTION

- A. Owner is exempt from sales tax on products permanently incorporated in Work of the Project.
 - 1. Obtain sales tax exemption certificate number from Owner.
 - 2. Place exemption certificate number on invoice for materials incorporated in the Work of the Project.
 - 3. Furnish copies of invoices to Owner.
 - 4. Upon completion of Work, file a notarized statement with Owner that all purchases made under exemption certificate were entitled to be exempt.
 - 5. Pay legally assessed penalties for improper use of exemption certificate number.

1.07 CHANGE PROCEDURES

- A. Submittals: Submit name of the individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. The Design Agent will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time by issuing supplemental instructions on AIA Form G710.
- C. The Design Agent may issue a Proposal Request which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required, and the period of time during which the requested price will be considered valid. Contractor will prepare and submit an estimate within 15 days.
- D. The Contractor may propose changes by submitting a request for change to the Design Agent, describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation, and a statement describing the effect on Work by separate or other Contractors. Document any requested substitutions in accordance with Section 01600.
- E. Stipulated Sum Change Order: Based on Proposal Request, and Contractor's fixed price quotation, or Contractor's request for a Change Order as approved by Design Agent.
- F. Unit Price Change Order: For contract unit prices and quantities, the Change Order will be executed on a fixed unit price basis. For unit costs or quantities of units of work which are not pre-determined, execute the Work under a Construction Change Directive. Changes in the Contract Sum or Contract Time will be computed as specified for a Time and Material Change Order.
- G. Construction Change Directive: Design Agent may issue a directive, on AIA Form G713 Construction Change Directive signed by the Owner, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in the Contract Sum or Contract Time. Promptly execute the change.
- H. Time and Material Change Order: Submit an itemized account and supporting data after completion of the change, including timeslips signed by Owner's representative, within the time limits indicated in the Conditions of the Contract. The Design Agent will determine the change allowable in the Contract Sum and Contract Time as provided in the Contract Documents. Only Owner-representative-signed timeslips will be

considered.

- I. Maintain detailed records of work done on a Time and Material basis. Submit timeslips daily for verification and sign-off by Owner's representative on-site. Provide full information required for an evaluation of the proposed changes, and to substantiate costs for the changes in the Work.
- J. Document each quotation for a change in cost or time with sufficient data to allow an evaluation of the quotation. Provide detailed breakdown of costs and estimates for labor and materials including a detailed breakdown for subcontractor's or vendor's Work. Include copies of written quotations from subcontractors or vendors.
- K. Change Order Forms: AIA G701 Change Order.
- L. Execution of Change Orders: The Design Agent will issue Change Orders for signatures of the parties as provided in the Conditions of the Contract.
- M. Correlation Of Contractor Submittals:
 - 1. Promptly revise the Schedule of Values and the Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum. Promptly revise progress schedules to reflect any change in the Contract Time, revise sub-schedules to adjust times for any other items of work affected by the change, and resubmit.
 - 2. Promptly enter changes in the Project Record Documents.

1.08 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Design Agent, it is not practical to remove and replace the Work, the Design Agent will direct an appropriate remedy or adjust payment. If so directed, the defective Work may remain, but the unit sum will be adjusted to a new sum at the discretion of the Design Agent.
- C. The defective Work will be partially repaired to the instructions of the Design Agent, and the unit sum will be adjusted to a new sum at the discretion of the Design Agent.
- D. The individual Specification Sections may modify these options or may identify a specific formula or percentage sum reduction.
- E. The authority of the Design Agent to assess the defect and identify a payment adjustment, is final.
- F. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Products not completely unloaded from the transporting vehicle.
 - 4. Products placed beyond the lines and levels of the required Work.
 - 5. Products remaining on hand after completion of the Work.
 - 6. Loading, hauling, and disposing of rejected products.

1.09 ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at the Owner's option. Accepted Alternates will be identified in the Purchase Order. Coordinate related work and modify surrounding work as required.

B. Schedule of Alternates: See Attachment A.

END OF SECTION

Attachment A – 01200

A. Alternates

1. Provide an add alternate for delivery time of sixteen (16) weeks.

B. Payroll Reporting

2. Forms for the submission of Certified Payroll Records may be found from the Rhode Island [Prevailing Wage Website](#) in either PDF or Excel formats. These forms must be used on monthly submittals.
3. Identify MBE/DBE subcontractors and hours worked in a format acceptable to RIC.
4. A Minority Utilization Report for minority subcontractors must be included. Use the form provided as Attachment B.

C. Warranty Inspection Retainage

1. One-half of one percent of the cost of the Work will be retained from Final Payment for this purpose.

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SECTION 16000
PAD MOUNTED DISTRIBUTION SUBSTATION TRANSFORMER

PRE-PURCHASE SPECIFICATION

SECTION 16000 – ELECTRICAL

PART 1 - GENERAL

1.00 SYSTEM DESCRIPTION

- A. The following specification covers the requirements for providing one (1) new 6000 kVA, 3-phase step-down transformer.

1.01 GENERAL REQUIREMENTS

- A. Furnish pad mounted transformer to serve the proposed new underground distribution system. The transformer shall be provided as follows:

- | | | |
|----|--------------------|----------------|
| 1. | Quantity: | 1 |
| 2. | kVA: | 6,000 |
| 3. | Primary Voltage: | 22,900V, Delta |
| 4. | Secondary Voltage: | 4160Y/2400V |

- B. Provision of alternatives to Contract Documents shall require submission (with bids) of the following information to Engineer through Owner for approval:

1. Indicate change in base design.
2. Give the add or deduct amount to be applied to the Base Bid.
3. Detail the effect of the change; i.e. performance, dimensions, capacities, heat rejection to mechanical room, etc. as may be pertinent to evaluate the impact of the change.

- C. Definition of Terms

1. In this specification, Rhode Island College is hereinafter referred to as the Owner and RDK Engineers, Boston, MA as the Engineer.
2. The word "Seller" used herein means the Transformer Vendor awarded to the contract.
3. When submittals or correspondence are required by Engineer and/or Owner, such submittals or correspondence shall be forwarded through the Owner or his assignee.

1.02 REFERENCES

- A. The pad mounted distribution transformer by these specifications shall be designed, tested and assembled in strict accordance with all applicable standards of ANSI, U.L., IEEE and NEMA.

1.03 DEFINITIONS

- A. Work means obligations undertaken by Transformer Vendor under the Contract. Work includes, unless specifically excepted, furnishing materials, fabrication, testing, equipment, supplies, tools, storage, transportation, superintendence, testing, start-up, training, applicable taxes and other services, facilities and expenses necessary for full performance and completion of requirements of the specification.
- B. "Furnish" means to purchase and deliver to the project site complete with every necessary appurtenance and support.

1.04 CODES, REFERENCES AND STANDARDS

- A. Materials, installation of systems and equipment provided under this section shall be done in strict accordance with State of Rhode Island Public Safety Codes, Federal Department of Environmental Protection, Rhode Island Building Code and any other Codes and Regulations having jurisdiction including but not limited to:
 - 1. All Applicable NFPA Standards
 - 2. National Electrical Code
 - 3. Occupational Safety and Health Administration (OSHA)
 - 4. State and Local Building Codes
 - 5. Underwriters' Laboratories, Inc (UL)
- B. Unless otherwise specified or indicated, materials, workmanship and equipment performance shall conform with the latest governing edition of the following standards, codes, specifications, requirements, and regulations, except when more rigid requirements are specified or are required by applicable codes but not limited to:
 - 1. American National Standards Institute (ANSI)
 - 2. American Society of Testing and Materials (ASTM)
 - 3. Institute of Electrical and Electronics Engineers (IEEE)
 - 4. Insulated Cable Engineers Association (ICEA)
 - 5. National Electrical Contractors Association (NECA)
 - 6. National Electric Manufacturers Association (NEMA)
 - 7. Thermal Insulation Manufacturers Association (TIMA)
 - 8. National Fire Protection Association (NFPA 75)
 - 9. Federal Information Processing Standards Publication 94 (FIPS Pub 94)
 - 10. ISO 9001
 - 11. Factory Mutual
- C. The Transformer Distributor shall have an ISO 9001 Certified Quality Program in order to be accepted as an acceptable supplier. Details of the Quality Certification shall be included with the Approval Submittal Documentation.

1.05 SCOPE OF WORK

- A. Furnish material, equipment and labor as specified under this Section.
- B. Although such work is not specifically shown or specified, furnish, as part of this work, supplementary or miscellaneous items, appurtenances, devices or materials incidental to or necessary for sound, secure and complete systems as described below.

C. The work shall include but not be limited to the following:

1. The Transformer Vendor shall provide complete, delivered to the Owner's site, one (1) 6000 kVA liquid filled pad mounted distribution transformer. The transformer and all its accessories shall be factory wired, piped, properly aligned and ready for connection after rigging into the Owner's site is complete.
2. Review and coordination of the transformer specifications and shop drawings for the interface and interlock requirements.
3. All required technical service and supervision during major component rigging into the Owner's site, including parts, labor and expense of factory engineers, technicians and certified mechanics and electricians (including relocation, reinforcement, or addition of equipment rigging points to facilitate installation if required).
4. Technical service and supervision during major component installation and field reassembly at the Owner's site, as required, including parts, labor and expense of factory engineers, technicians and certified mechanics and electricians.
5. Allow for two (2) engineering meetings with utility company prior to manufacture to coordinate any specific requirements of the utility company.
6. All required technical service and supervision, including parts, labor and expense of factory engineers, technicians and certified mechanics and electricians for transformer start-up adjustments (including coordination with, factory or field performance testing), training and operating and maintenance instruction after installation is complete per specification. Documentation of all start up services, including work of sub-contractors shall be submitted to Owner for review and approval.
7. Delivery of equipment to storage site in Providence, RI as directed by the Owner. Delivery shall be scheduled for a maximum of **twenty (20) weeks from purchase order issuance**. Transformer Vendor's agent shall be at delivery site to check condition of equipment prior to unloading. Delivery to job site shall be as coordinated by contractors. Storage off site until July 31, 2014 shall be included in bid price; provide a line item cost per monthly storage **beyond the delivery time**.
8. Provide an add alternate for delivery time of twelve (12) weeks.
9. Delivery time beyond **twenty (20) weeks from purchase order issuance** will be considered late and vendor will be assessed for liquidated damages of \$750.00/day.
10. Provisions of six (6) sets of complete bulletins, manuals and instructions, warranties and spare parts list.
11. Coordination with the Owner and Engineer.
12. Submit certified factory tests. Refer to Part 2 for requirements.
13. Complete technical proposal and breakdown of pricing and technical data

1.06 QUOTATION PROPOSAL

- A. The quotation proposal shall include a complete bill of material for all items listed in this specification.

- B. The quotation proposal shall include a schedule indicating the time required for complete submission of all shop drawings, descriptive literature, material lists, time allowed for the approval process and lead time for manufacture, testing and shipment of all equipment.
- C. As a minimum, the technical proposal shall include the following:
 - 1. Description of the proposed transformer outlining all applicable rating, physical size, weight, etc.
 - 2. Outline Drawings of all proposed equipment in plan and elevation views including overall dimensions, weights and clearances required.
 - 3. The technical proposal shall include catalog cut sheets and/or other descriptive material of major components.
 - 4. Required delivery time from release of submittals.
 - 5. Quick delivery option (if applicable) with cost and improved delivery time.
- D. Provide separate line item pricing for a recommended spare parts kit.
- E. Transformer proposal shall include alternate pricing for Cooper Power Systems, Eaton, Square D and G.E.

1.07 CONTRACT DOCUMENTS

- A. Work to be performed under this Section is shown primarily in this specification.
- B. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the specifications, carries with it the instruction to furnish the items factory installed or have installed on-site by an approved service contractor or factory representative, regardless of whether or not this instruction is explicitly stated as part of the indication or description.
- C. Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete work.

1.08 PERMITS, FEES, RULES AND REGULATIONS

- A. Give the proper Authorities all requisite notices or information relating to the work under this Section. Comply with the rules and regulations of all Local, State and Federal Authorities having jurisdiction, Building Codes, the rules and regulations of the National Board of Fire Underwriters and the Public Utility Companies serving the building.
- B. Coordinate and provide all requirements per State of Rhode Island and City of Providence requirements.
- C. Perform work in accordance with Nationally Recognized Testing Laboratory (NRTL) listing or labeling requirements, OSHA regulations, NFPA Standards, Electrical Code, and The Americans with Disabilities Act Accessibility Guidelines (ADAAG). The Drawings and Specifications do not attempt to indicate all work required by codes, regulations and authorities.
- D. Nothing in these Contract Documents shall be construed to permit work not conforming with applicable codes and regulations. When conflicts occur the more restrictive requirements shall govern.

- E. Toxicity: Comply with applicable codes and regulations regarding toxicity of combustion products of materials used, toxic, or hazardous materials used or disposed of.
- F. Legally dispose of all material. Adhere to all regulations regarding disposal of hazardous material. Recycle hazardous materials where recycling is possible. Submit certificates of legal recycling or disposal to the Engineer. Include copy in the Operating and Maintenance Manual.
- G. Most recent editions of applicable specifications and publications of the following organizations form part of Contract Documents. All equipment and material supplied shall be in accordance with the latest edition and amendments of all applicable standards, codes, laws and regulations listed below:
 - 1. American National Standards Institute (ANSI)
 - 2. ANSI C57.13 Requirements for Instrument Transformers
 - 3. ANSI C37.20.1 Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
 - 4. National Electric Manufacturer's Association (NEMA)
 - 5. NEMA ICS 1 General Standards for Industrial Control and Systems
 - 6. American Society for Testing and Materials (ASTM)
 - 7. Institute of Electrical and Electronics Engineers (IEEE)
 - 8. ANSI/IEEE C39.1 Requirements for Electrical Analog Indicating
 - 9. Insulated Cable Engineers Association (ICEA)
 - 10. Instrumentation Society of America (ISA)
 - 11. National Instrumentation Standards Institute (NISI)
 - 12. Heat Exchange Institute (HEI)
 - 13. NFPA 70 National Electric Code
 - 14. NFPA 110 Emergency and Standby Systems
 - 15. Underwriters' Laboratories, Inc. (UL 1558)

1.09 DISCREPANCIES IN DOCUMENTS

- A. Where Specifications conflict or are unclear, advise the Engineer, in writing, before submitting bid. Otherwise, Engineer's and Owners interpretation of Contract Documents shall be final, and no additional compensation shall be permitted due to discrepancies or unclarities thus resolved.
- B. Where specifications do not coincide with manufacturer's recommendations, or with applicable codes and standards, alert Engineer in writing before bid. Otherwise, make changes in work as Engineer and Owner require within Contract Price.
- C. If the required material, fabrication or work can be interpreted differently, the Transformer Vendor shall provide that Material, fabrication or work which is of the higher standard.
- D. It is the requirement of these contract documents to have the Transformer Vendor provide systems and components that are fully complete and operational and fully

suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem. In cases such as this, where the Transformer Vendor has failed to notify the Engineer of the situation in accordance with Paragraph (A) above, the Transformer Vendor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational and in a workmanlike manner.

- E. In cases covered by Paragraph (D) above, where the Transformer Vendor believes he needs engineering guidance, he shall submit a sketch identifying his proposed solution and the Engineer shall review, note if necessary and approved or reject the sketch.

1.10 WARRANTY

- A. Warranty material and equipment provided under this section in writing for three (3) years following the date of start-up and final acceptance of the installation contract. Repair or replace defective materials, equipment, workmanship and installation that develop within this period promptly and to Owner's and Engineer's satisfaction and correction damage caused in making necessary repairs and replacements under warranty at no cost to Owner. Include expendables (and other service items made unusable by the defect) used during the course of repair. Acceptance of the installation will be when the units are fully operational and successfully field tested, including all control interfaces and accepted by Owner and Engineer.
- B. The Transformer Vendor shall have factory trained service representatives and tooling necessary to install, test, maintain and repair all provided equipment and shall be located within 50 miles of the customers site.
- C. The Transformer Vendor shall have sufficient parts inventory to maintain over the counter availability of at least 90% of any required parts and shall guarantee 100% parts availability within 48 hours from the time an order is entered with the dealer.
- D. Replace material and equipment that require excessive service during warranty period as defined and as directed by Owner and Engineer.
- E. Written warranty must be submitted to Owner before final payment.
- F. This Section shall not limit any additional Owner's rights under applicable codes and laws and under applicable Contract Documents.
- G. During warranty period furnish without cost to the Owner required service as per Generator Vendor's standard operation and maintenance publications, using only Generator Vendor's service personnel. Such publication shall be submitted with Generator Vendor's bid.
- H. The Transformer Vendor shall provide a full maintenance and service contract for three (3) full years commencing from the date of final acceptance of the installed switchgear and control systems. The maintenance and service shall include all parts and labor including all lubricants.
- I. Use of systems provided under this Section for temporary services and facilities during commissioning shall not constitute final acceptance of work and shall not institute warranty period.
- J. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during warranty period immediately. Advise Owner in writing, describe efforts to rectify situation, and provide analysis of cause of problem and solution.

1.11 BULLETINS, MANUALS, AND OPERATING INSTRUCTIONS, AND PROTECTION

- A. Obtain, before shipment of equipment, six copies of operation, lubrication and maintenance manuals for all items. Assemble literature in coordinated manuals with additional information describing combined operation of field assembled units, including as-built wiring diagrams. Manual shall contain names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment. Divide manuals as follows:
 - 1. Directions for and sequence of operation of each item of equipment or system. Sequence shall list values, switches, and other devices used to start, stop and control system. Detail procedure to be followed in case of malfunctions. Include detailed diagrams, etc. as appropriate for systems provided.
 - 2. Detailed maintenance and trouble shooting manuals containing data furnished by manufacturer for complete maintenance.
- B. Furnish six copies of manuals to the Engineer for approval and distribution to Owner. Deliver manuals no less than 15 days prior to delivery of equipment to permit Owner's personnel to become familiar with equipment and operation prior to delivery.
- C. Operating instructions: Upon completion of installation and during the startup and commissioning period, instruct Owner's operating personnel in any or all parts of various systems. Instructions shall be performed by factory-trained personnel. Owner shall determine which systems require additional instructions. Duration of instructions shall take equipment through complete cycle of operation (at least two eight hour working days). Make adjustments under actual or simulated operating conditions.
- D. Furnish final documentation, including as-built drawings in AutoCAD format including wiring diagrams, test certificates, inspection reports, and shop and field operating tests.
- E. In addition to the hard copy manuals, furnish two (2) electronic copies of manual to the Engineer for approval and distribution to the Owner. Electronic copies shall be furnished on CD-ROM disks.

1.12 SUBMITTALS

- A. This paragraph supplements additional sections of Contract Documents.
- B. Prepare and submit shop drawings in accordance with the requirements hereinbefore specified, and with the Shop Drawings, Product Data. All shop drawings shall have clearly marked the appropriate specification number of drawing designation, for identification of the submittal.
- C. Issuance of shop drawings shall be within one (1) week of issuance of purchase order.
- D. Disposition of shop drawings shall not relieve the Manufacturer from the responsibility for deviations from drawing or specifications, unless he has submitted in writing a letter itemizing or calling attention to such deviations at time of submission and secured written approval from the Engineer, nor shall such disposition of shop drawings relieve the Manufacturer from responsibility for errors in shop drawings or schedules.
- E. Submittal Procedures and Format
 - 1. Review submittal packages for compliance with Contract Documents and then submit to Owner and Engineer for review. Submit eight sets, after review, five sets of each shop drawing will be returned with reviewer's marks.

2. Each Shop Drawing shall indicate in title block and each Product Data package shall indicated on cover sheet, the following information:
 - a. Title.
 - b. Equipment ID number.
 - c. Name and location of project.
 - d. Names of Owner, Engineer and Transformer Vendor.
 - e. Names of Manufacturers, suppliers, vendor, etc.
 - f. Date of submittal
 - g. Whether original submittal or resubmitted.
3. Shop drawings showing manufacturer's product data shall contain detailed dimensional drawings, accurate and complete description of materials of construction, manufacturer's published performance characteristics and capacity ratings (performance data, alone, is not acceptable) electrical requirements, and wiring diagrams. Drawings shall clearly indicate location (terminal block or wire number), voltage and function for all field terminations and other information necessary to demonstrate compliance with all requirements of Contract Documents. Include/add the following items to the data to be submitted:
 - a. Transformer information shall include but not be limited to:
 - 1) Component List – A breakdown of all components and options.
 - 2) Wiring Diagrams – Wiring diagrams, schematics and control panel outline drawings published by the manufacturer for controls and switchgear showing interconnect points and logic diagrams for use by Contractor and Owner. Include electrical Power connection drawing for all components and interconnection wiring to control panel, detailed information on control diagrams, termination diagrams and all control interfaces.
 - 3) Outline drawings showing plan and elevation views of each piece of equipment and containing the following information for each item: Size; Weight; Dimensions and weight of the equipment shipping splits; Typical conduit entry areas.
 - 4) Base plans for the location of the equipment floor channels, anchoring bolt holes and conduit entrance spaces.
 - 5) Short-circuit rating and interrupting and withstand ratings.
 - 6) Detailed long lead-time bill of material.
 - 7) Detailed front drawings with all required nameplate information, indication of each major component's device identification, description and manufacturer.
 - 8) System delivery schedule.
 - 9) Proposed protective relay diagram(s) showing all major protective relaying and any metering components.

- 10) Make, model and manufacturer of all major components of the devices.
- b. Successful bidder shall provide installation and erection information including; lifting requirements, and any special rigging or installation requirements.
- c. Use of Acceptable Manufacturers on this Project:
 - 1) Substitution of products other than those of the Acceptable Manufactures specified herein shall not be made. Only the specified items or the comparable product by one of the specified Alternate Manufactures shall be submitted. Products by other manufactures shall not be used on this project.

F. Deviations

1. Concerning deviations other than substitutions, proposed deviations from Contract Documents shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the deviation to the attention of the Engineer and Owner.
2. Without letters flagging the deviation to the Engineer and Owner, it is possible that the Engineer may not notice such deviation or may not realize its ramifications. Therefore, if such letters are not submitted, the Generator Vendor shall hold the Engineers and the Owner harmless for any and all adverse consequences resulting from deviations being implemented. This shall apply regardless of whether the Engineer has reviewed or approved shop drawings containing the deviation, and will be strictly enforced.
3. Approval of proposed deviations, if any, will be made at discretion of Engineer.

- G. Schedule: Incorporate shop drawing review period into construction schedule so that Work is not delayed. Switchgear Vendor shall assume full responsibility for delays caused by not incorporating the following shop drawing review time requirements into his project schedule: Allow at least 5 working days (10 days for first submittal), exclusive of transmittal time, for review each time shop drawing is submitted or resubmitted.

H. Responsibility

1. Intent of Submittal review is to check for capacity, rating, and certain construction features. Switchgear Vendor shall ensure that work meets requirements of Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other Sections. Work shall comply with submittals marked "REVIEWED" to extent that they agree with Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the shop drawing errors or deviations from requirements of Contract Documents. The Engineer's noting of some errors while overlooking others will not excuse the Generator Vendor from proceeding in error. Contract Documents requirements are not limited, waived nor superseded in any way by review.
- I. Material and equipment requiring Shop Drawing Submittals shall include but not be limited to:

1. Distribution transformer and accessories (including list of all items requiring field installation).
2. Detailed wiring and piping diagrams.

1.13 QUALITY ASSURANCE

- A. The manufacturers listed within this specification have been pre-selected for use on this project. No submittal will be accepted from a manufacturer other than specified.
- B. The manufacturer shall have a local, authorized dealer who can provide full time factory service engineers with the required stock of replacement parts, technical assistance and warranty administration within 50 miles of the project.
- C. Listing and Labeling: Provide switchgear assemblies that are listed and labeled.
 1. The terms "listed" and "labeling" shall be defined in the National Electrical Code, Article 100.
 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL)
- D. Field-Testing Organization Qualifications: To qualify for acceptance, a testing organization must demonstrate, based on evaluation of organization-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated.
- E. Electrical Component Standard: Components and installation shall comply with the latest edition of NFPA 70, "National Electrical Code."
- F. American National Standards Institute (ANSI – Latest Edition):
- G. National Electrical Manufacturer's Associates (NEMA – Latest Edition)

1.14 GENERAL START-UP SUPERVISION AND OPERATING INSTRUCTIONS

- A. Prior to start-up, factory service engineer shall check out field and factory-installed wiring and piping connections and controls for conformance with Manufacturer's equipment requirements. Factory certified pre-start, checkout and startup checklist shall be submitted to Owner and Engineer for review and approval. After approval of these checklists and field connections, factory service engineer shall supervise starting running of equipment through complete trouble-free 4 hour cycles. Provide fully documented test reports of all equipment and, breaker and transfer switch function testing. Allow minimum of three days for this supervision.
- B. Factory service technician shall supervise the rigging, installed and reassembly of the major equipment.

1.15 DELIVERY, STORAGE, AND HANDLING

- A. Deliver the transformer preassembled packages, as indicated.
- B. Deliver and Handle Transformer in accordance with manufacturer's instructions. Use factory-installed lifting provisions.
- C. Coordinate a location with Owner for suitable storage for equipment.

1.16 EXTRA MATERIALS

- A. Touch-up Paint: Two Cans of ANSI 61 Gray Paint.

1.17 CONSTRUCTION PLANNING MEETING AND SCHEDULE

- A. The successful bidder shall arrange multiple meetings to discuss in detail those items that pertain to installation that will affect construction, engineering, and Supplier's planning, shipping sequence, shipping schedule and other coordination items.
- B. Coordinate components factory performance tests and field performance test with the Owner and Owner's Representative outlined in Part 2 Paragraphs of these specifications.
- C. Coordinate shipping schedule with the Owner and the Engineer for the project. Inform the Owner and the Engineer immediately of exact time of departure of equipment from plant and estimated time of arrival at the Rigger's designated receiving facility.

1.18 EQUIPMENT IDENTIFICATION

- A. Equipment nameplates shall be furnished on the unit.
- B. Nameplates shall be laminated phenolic with white outer layers and black center layer. Lettering shall be vertical gothic engraved into phenolic to produce black letters on white background. Letters shall be 3/16" high, minimum. Edges of the nameplates shall be beveled. Attach nameplates with cadmium plated No.6 slotted pan head screws.
- C. Nameplates shall list unit number, serial number, date built and capacities.

1.19 PACKING AND SHIPPING

- A. Cover and crate, as required, to provide protection against the weather and possible damage in handling, transportation and storage. Any weather damaged equipment will not be accepted.
- B. The equipment shall be rigged, lifted, jacked, moved, etc. in strict accordance with the recommendations of the Transformer Supplier.

PART 2 - PRODUCTS

2.00 PAD MOUNTED DISTRIBUTION SUBSTATION TRANSFORMER

- A. General
 - 1. This specification covers the electrical and mechanical characteristics of the 6,000 kVA 3-phase Step-Down Pad-Mounted Distribution Transformer.
- B. Applicable Standards
 - 1. All characteristics, definitions, and terminology, except as specifically covered in this specification, shall be in accordance with the latest revision of the following ANSI/IEEE, NEMA, and Department of Energy standards.
 - a. C57.12.00: IEEE Standard for Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.
 - b. C57.12.28: Pad-Mounted Equipment - Enclosure Integrity.

- c. C57.12.34: IEEE Standard Requirements for Pad-Mounted, Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers (2500 kVA and Smaller) - High Voltage: 34500GrdY/19920 Volts and Below; Low-Voltage: 480 Volt 2500 kVA and Smaller (issued in March 2005 - combines C57.12.22 and C57.12.26).
- d. C57.12.90: IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and IEEE Guide for Short-Circuit Testing of Distribution and Power Transformers.
- e. C57.12.91: Guide for Loading Mineral-Oil-Immersed Transformers.
- f. NEMA TR 1-1993 (R2000): Transformers, Regulators and Reactors, Table 0-2 Audible Sound Levels for Liquid-Immersed Power Transformers.
- g. NEMA 260-1996 (2004): Safety Labels for Pad-Mounted Switchgear and Transformers Sited in Public Areas.
- h. 10 CFR Part 431: Department of Energy – Energy Conservation Program for Commercial Equipment: Distribution Transformers Energy Conservation Standards; Final Rule.

C. Ratings

- 1. The transformer shall be designed in accordance with this specification and the kVA rating shall be 6,000 kVA.
- 2. The primary voltage shall be 22,900V, Delta configuration, and the basic lightning impulse insulation level (BIL) shall be 125 kV.
- 3. The secondary voltage shall be 4,160 GRDY/2,400V configuration, and the basic insulation level (BIL) of the secondary voltage shall be 60 kV.
- 4. The transformer shall be furnished with full capacity high-voltage taps. The tap changer shall be clearly labeled to reflect that the transformer must be de-energized before operating the tap changer as required in Section 4.3 of ANSI C57.12.34. The unit shall have the following tap configurations:
 - a. Two – 2 ½% taps above and below rated voltage (split taps)
- 5. The average winding temperature rise above ambient temperature, when tested at the transformer rating, shall not exceed 55°C, and when tested at 112% of the base rating, shall not exceed 65°C.
- 6. The percent impedance voltage, as measured on the rated voltage connection, shall be 6.5%. The tolerance on the impedance shall be +/- 7.5%.

D. Construction

- 1. The core and coil shall be vacuum processed to ensure maximum penetration of insulating fluid into the coil insulation system. While under vacuum, the windings will be energized to heat the coils and drive out moisture, and the transformer will be filled with preheated filtered degassed insulating fluid. The core shall be manufactured from burr-free, grain-oriented silicon steel and shall be precisely stacked to eliminate gaps in the corner joints. The coil shall be insulated with B-stage, epoxy coated, diamond pattern, insulating paper, which shall be thermally cured under pressure to ensure proper bonding of conductor and paper. Coils

shall be either aluminum or copper (eliminate a metal if one is required over the other).

2. The dielectric coolant shall be listed less-flammable fluid meeting the requirements of National Electrical Code Section 450-23 and the requirements of the National Electrical Safety Code (IEEE C2-2002), Section 15. The dielectric coolant shall be non-toxic*, non-bioaccumulating and be readily and completely biodegradable per EPA OPPTS 835.3100. The base fluid shall be 100% derived from edible seed oils and food grade performance enhancing additives. The fluid shall not require genetically altered seeds for its base oil. The fluid shall result in zero mortality when tested on trout fry *. The fluid shall be certified to comply with the US EPA Environmental Technology Verification (ETV) requirements, and tested for compatibility with transformer components. The fluid shall be Factory Mutual Approved, UL Classified Dielectric Medium (UL-EOUV) and UL Classified Transformer Fluid (UL-EOVK), Envirotemp® FR3 fluid.

*(Per OECD G.L. 203)

3. Tank and Cabinet Enclosure
 - a. The high-voltage and low-voltage compartments, separated by a metal barrier, shall be located side-by-side on one side of the transformer tank. When viewed from the front, the low-voltage compartment shall be on the right. Each compartment shall have a door that is constructed so as to provide access to the high-voltage compartment only after the door to the low-voltage compartment has been opened. There shall be one or more additional fastening devices that must be removed before the high-voltage door can be opened. Where the low-voltage compartment door is of a flat panel design, the compartment door shall have three-point latching with a handle provided for a locking device. Hinge pins and associated barrels shall be constructed of corrosion-resistant material, passivated AISI Type 304 or the equivalent.
 - b. A recessed, captive, penta-head or hex-head bolt that meets the dimensions per ANSI C57.12.28 shall secure all access doors.
 - c. The compartment depth shall be in accordance with C57.12.34, unless additional depth is specified.
 - d. The tank base must be designed to allow skidding or rolling in any direction. Lifting provisions shall consist of four lifting lugs welded to the tank.
 - e. The tank shall be constructed to withstand 7 psi without permanent deformation, and 15 psi without rupture. The tank shall include a 15 psig pressure relief valve with a flow rate of minimum 35 SCFM.
 - f. The exterior of the unit shall be painted Munsell 7GY3.29/1.5 green. The cabinet interior and front plate shall be painted gray for ease of viewing the inside compartment.
 - g. The tank shall be complete with an anodized aluminum laser engraved nameplate. This nameplate shall meet Nameplate B per ANSI C57.12.00.

4. High Voltage Bushings and Terminals
 - a. High voltage bushings will be installed in the high voltage termination compartment located on the front left of the transformer and requiring access via the low voltage termination compartment on the front right.
 - b. Bushing Style
 - 1) The high voltage bushings shall be 25 kV 200A bushing wells with bushing well inserts installed. The bushings shall be externally removable and be supplied with a removable stud (Re: Cooper Power Systems catalog sections 800-32, 500-12, and 500-26).
 - c. Bushing Configuration
 - 1) The transformer shall be provided with six (6) high voltage bushings in accordance Figure 2 dimensions of ANSI C57.12.34 for loop feed configurations. The bushing heights shall be in accordance with Figure 3 minimum dimensions of ANSI C57.12.34.
5. Secondary Bushings and Terminals
 - a. Bushing Style
 - 1) The transformer shall be provided with tin-plated spade-type bushings for vertical takeoff. Bushings shall be 1,200A, porcelain, 4-hole spade.
 - b. Bushing Configuration
 - 1) The transformer shall be provided with bushings in a staggered arrangement.
6. Overcurrent Protection
 - a. INTEGRAL VACCUUM, FAULT INTERRUPTER (VFI): The high-voltage overcurrent protection scheme provided with the transformer shall be an integral Vacuum Fault Interrupter (VFI). The VFI shall have a maximum interrupting rating of 12,000A RMS symmetrical with resettable fault protection. The VFI shall also include a Tri-Phase electronic breaker control with over 100 minimum trip settings and 5 selectable time current curves.
 - 1) VFI shall be in series with ELSP under-oil partial-range current-limiting back-up fuses with an interrupting rating of 50,000 A.
7. Overvoltage Protection
 - a. The overvoltage protection scheme provided with the transformer shall protect the high-voltage or winding.
 - 1) DEAD-FRONT BUSHINGS: Externally mounted, Distribution Class M.O.V.E. Dead-front elbow arresters shall be supplied.

E. Labeling

1. A temporary bar code label shall be attached to the exterior of the transformer in accordance with ANSI C57.12.34.

F. Finish Performance Requirements

1. The tank coating shall meet all requirements in ANSI C57.12.28 including:
 - a. Salt Spray
 - b. Crosshatch adhesion
 - c. Humidity
 - d. Impact
 - e. Oil resistance
 - f. Ultraviolet accelerated weathering
 - g. Abrasion resistance – taber abraser
2. The enclosure integrity of the tank and cabinet shall meet the requirements for tamper resistance set forth in ANSI C57.12.28 including but not limited to the pry test, pull test, and wire probe test.

G. Production Testing

1. All units shall be tested for the following:
 - a. No-Load (85°C or 20°C) losses at rated current
 - b. Total (85°C) losses at rated current
 - c. Percent Impedance (85°C) at rated current
 - d. Excitation current (100% voltage) test
 - e. Winding resistance measurement tests
 - f. Ratio tests using all tap settings
 - g. Polarity and phase relation tests
 - h. Induced potential tests
 - i. Full wave and reduced wave impulse test
2. Minimally, transformers shall conform to efficiency levels for liquid immersed distribution transformers, as specified in Table I.1 of the Department of Energy ruling. "10 CFR Part 431 Energy Conservation Program for Commercial Equipment: Distribution Transformers Energy Conservation Standards; Final Rule; October 12, 2007." Manufacturer shall comply with the intent of all regulations set forth in noted ruling. This efficiency standard does not apply to step-up transformers.

3. In addition, the manufacturer shall provide certification upon request for all design and other tests listed in C57.12.00, including verification that the design has passed short circuit criteria per ANSI C57.12.00 and C57.12.90.
4. Manufacturer shall conform to guaranteed average losses as specified in ANSI C57.12.00. The no-load losses of a transformer shall not exceed the specified no-load losses by more than 10%, and the total losses of a transformer shall not exceed the specified total losses by more than 6%.

H. Approved Manufacturers

1. Cooper Power Systems, Eaton, Square D and GE.

I. Accessories

1. The following accessories and options shall be provided:
 - a. Welded main tank cover with bolted handhole
 - b. 1.0" upper fill plug
 - c. 1.0" drain valve w/ sampling device in LV compartment
 - d. Automatic pressure relief valve
 - e. Ground provisions per C57.12.34 section 9.11.
 - f. Meet NEMA TR-1 sound levels
 - g. Liquid level gauge
 - h. Dial-type thermometer gauge
 - i. Pressure vacuum gauge
 - j. Upper fill valve
 - k. Schrader valve
 - l. Nitrogen blanket
 - m. Ground connectors
 - n. Danger high voltage warning signs
 - o. Non-PCB decal
 - p. Touch-up paint

J. Transformer Evaluation

1. Unit loss evaluation, guaranteed average losses. Criteria to properly evaluate quoted losses:
 - a. Core loss evaluation (A-factor) ____ \$/watt
 - b. Winding loss evaluation (B-factor) ____ \$/watt

- K. Shipping
 - 1. Transformer shall be loaded and unloaded with overhead crane, so a pallet is not to be provided for transformer.
- L. Data With Proposal
 - 1. The following data shall be submitted with the proposal:
 - a. Core losses
 - b. Winding losses
 - c. Percent Impedance
 - d. Typical bid drawing
 - e. Approval drawing – drawings shall show final dimensions and features.
 - f. Record Drawing – drawings shall show final dimensions and features.
- M. Service
 - 1. The manufacturer of the transformer shall have regional service centers located within 2 hours flight time of all contiguous 48 states. Service personnel shall be factory trained in commissioning and routine service of quoted transformers.

PART 3 - EXECUTION

3.00 COORDINATION

- A. The Transformer Manufacturer shall be responsible for providing the coordinating all utility company requirements as applicable.

3.01 FIELD SERVICE

- A. After equipment installation by the Electrical Subcontractor, the Transformer Distributor shall provide the service of a competent factory based service engineer to instruct the Electrical Contractor and Owner. The service engineer shall assist in placing the equipment into operation and provide instruction, as required, to the person or persons who are delegated by the Owner to operate the equipment.
- B. This service shall include three separate visits by the factory service engineer as follows:
 - 1. Pre-installation coordination meeting with the transformer distributor, Electrical Contractor, Consulting Engineer, Utility Company and Owner to coordinate the installation and interconnection of the transformer with the output switchgear and utility company.
 - 2. Post installation start-up and testing assistance, prior to system turnover, and initial instruction and training period for operating personnel. This trip shall include all service required to checkout the system and demonstrate the operation for final acceptance by the owner.
- C. The Transformer Distributor shall maintain a competent service organization that is available on a 24-hour call basis.

3.02 TRANSFORMER SHIPMENT PREPARATION

- A. The Transformer Manufacturer shall coordinate shipping of all equipment and material with the successful Contractor.

3.03 TRANSFORMER FIELD SERVICE START-UP AND TRAINING REQUIRMENTS

- A. The Electrical Contractor shall certify to the Transformer Manufacturer and Owner that the installation has been performed per the latest documents and instructions.
- B. The Transformer Manufacturer shall provide the services of a field service engineer for a pre-installation coordination meeting with the Transformer Vendor and Electrical Contractor to coordinate the installation and interconnection of the switchgear and control system.
- C. The Transformer Manufacturer shall provide a field engineer for an initial visit to checkout the installation of the transformer to allow the energization.
- D. Following installation, the Transformer Manufacturer shall inspect and verify the correct installation of the transformer, including all individual components.
- E. The Transformer Manufacturer shall provide a field engineer for post installation start-up and testing assistance, prior to system turnover and initial instruction and training for the facility's operating personnel.
- F. The preliminary operating and maintenance manual shall include recommended field test procedures.