

**PUBLIC NOTICE**  
**INVITATION TO BID #1263**

The Springfield Electric Department will be accepting sealed bids for the following:

**Two (2) 69/13.2 kV, 30/40/50 MVA Substation Transformers for the  
Springfield Electric District Substation Facility**

Specifications and bid requirements may be downloaded at [www.springfieldtn.gov](http://www.springfieldtn.gov).

All questions or inquiries regarding this bid should be directed to:

Gresham Smith  
Contact: Scott Ribble, P.E. or Jeff Prentiss, P.E.  
222 Second Avenue South  
Suite 1400  
Nashville, TN 37201  
(615)770-8100

Please reference **BID NUMBER 1263** on the outside of the sealed envelope. Sealed bids must be received in the Office of the City Recorder, 405 North Main Street, Springfield, TN 37172 by 10:15 AM local time, Thursday, November 30, 2023.

The City of Springfield reserves the right to reject any or all bids and to waive any informalities or technicalities therein. Bids must be lump sum, and no bidder may withdraw his bid for a period of sixty (60) days after date of actual bid opening without the City of Springfield's consent.

Lisa H. Crockett  
City Recorder

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Sealed proposals for two (2) 69/13.2 kV, 30/40/50 MVA Substation Transformers for the Springfield Electric District Substation facility will be received until 10:15 am Central Time on November 30, 2023, and immediately thereafter will be opened reviewed.

Proposals shall be received by:

Office of the City Recorder  
405 N. Main Street  
Springfield, TN 37172

All questions or inquiries concerning this bid should be directed to:

Gresham Smith  
222 Second Avenue South, Suite 1400 Nashville, Tennessee 37201  
Phone: (615) 770-8100  
Primary Contact: Scott Ribble, P.E.  
Secondary Contact: Jeff Prentiss, P.E.

The Owner reserves the right to reject any or all bids and to waive any informalities or technicalities therein. Bids shall be Lump Sum.

No Bidder may withdraw his bid for a period of sixty (60) days after date of actual bid opening, without Owner's consent.

**END OF SECTION**

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**1.1 DEFINED TERMS.**

- A. Terms used in these INSTRUCTIONS TO BIDDERS have the meanings assigned to them in the GENERAL CONDITIONS.

**1.2 EXAMINATION OF CONTRACT DOCUMENTS AND SITE.**

- A. It is the responsibility of each Bidder before submitting a Bid, to (a) examine the Contract Documents thoroughly, (b) visit the site to become familiar with the local conditions that may affect cost, progress, performance or furnishing of the Work, (c) consider federal, state and local Laws and Regulations that may affect cost, progress, performance or furnishing of the Work, (d) study and carefully correlate Bidder's observations with the Contract Documents, and (e) notify Engineer of all conflicts, errors or discrepancies in the Contract Documents.
- B. The Proposal provides for quotation of a price for one or more Bid Items, which may be lump sum prices, alternate Bid prices, or a combination thereof. No payment will be made for any Items not set up in the Proposal, unless otherwise provided by a Contract Amendment. All Bidders are cautioned that they should include in the prices quoted for the various Bid Items, all necessary allowances for the performance of all work required for the satisfactory completion of the Project.

**1.3 BIDDING REQUIREMENTS**

- A. Bidder will submit two (2) copies of Section 00 4143 – BID FORM and all supporting documents specified.
- B. Bids that are sent by U.S. Postal Service or private carrier, shall be clearly marked “**BID ENVELOPE ENCLOSED BID NUMBER 1263**”. The Bid shall be sealed in a separate envelope and shall have the following information shown on the outside of the envelope:

BID FOR:           SPRINGFIELD ELECTRIC DISTRICT BID NUMBER 1263  
BID DUE:           SUBSTATION NOVEMBER 30, 2023  
OWNER:            SPRINGFIELD ELECTRIC

- C. As an alternative option, the Label provided in Section 00 4140 – BID FORM ENVELOPE LABEL can be filled out and secured to the outside of the envelope.
- D. The Engineer for this project is:

Gresham Smith  
222 Second Avenue South, Suite 1400  
Nashville, Tennessee 37201  
Phone: (615) 770-8100  
Primary Contact: Scott Ribble, P.E.  
Secondary Contact: Jeff Prentiss, P.E.

**1.4 CHECKLIST FOR BIDDERS.**

- A. Submit two (2) copies of Section 00 4143 – BID FORM, and verify the following information has been included as required:
  - a. Date
  - b. Bid Price
  - c. Delivery Site and Date
  - d. Alternative Delivery Date
  - e. Required Submittal Data
  - f. Addenda (if any)
  - g. Exceptions to the Specifications (if any)
  - h. Iran Divestment Act Notice **\*\*Must be Signed/Dated and returned in bid submittal\*\***
  - i. Signature

**END OF SECTION**

**1.1 GENERAL**

- A. This form is for the Bidder’s convenience as noted in Section 00 2113 – INSTRUCTIONS TO BIDDERS.

This form is not required, however, **the information IS required on the front of the Bid Envelope.**

PROJECT: \_\_\_\_\_

OWNER: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

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**BIDDER IDENTIFICATION**

BIDDER: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

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**BIDDER’S CONTRACTOR’S LICENSE INFORMATION**

LICENSE NUMBER: \_\_\_\_\_

LICENSE CLASSIFICATION APPLICABLE TO PROJECT: \_\_\_\_\_

LICENSE EXPIRATION DATE: \_\_\_\_\_ DOLLAR LIMIT: \_\_\_\_\_

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**SUBCONTRACTORS TO BE USED ON THIS PROJECT**

Provide following for each listed subcontractor or so designate if Bidder is providing the Work Classification.  
Indicate “NONE” if Work Classification is not applicable.

Type of Work	License No.	Expires	Classification

- B. Cut and tape securely to front of Bid Envelope. **The Bid Envelope shall be separate from the postal/ mailing/ delivery service Deliver Envelope (when delivery envelope is required. See also INSTRUCTIONS TO BIDDERS).**

**END OF SECTION**

Bid Number 1263

**BID FORM**

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Project Identification: Springfield Electric District Substation

This Bid shall be submitted as follows:

**By Regular Mail, In Person, or By Overnight Delivery:**

Office of the City Recorder  
405 N. Main Street  
Springfield, TN 37172

This Bid is submitted from:

Contractor Name: \_\_\_\_\_

Address: \_\_\_\_\_

City, State, Zip: \_\_\_\_\_

The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an agreement with Owner in the form included in the Contract Documents to sell and deliver the material described in these Specifications, for the Price and within the Time indicated in this Bid and in accordance with other terms and conditions of the Contract Documents.

**BASE BID:**

ITEM	QTY	DESCRIPTION	UNIT BID PRICE	TOTAL BID PRICE
1	2	69/13.2 kV, 30/40/50 MVA Substation Transformers		

**PROJECT LOCATION AND SCHEDULE:**

Delivery Site: Josephine Street & Industrial Drive  
Springfield, Tennessee

Delivery Period: August 1, 2025

Completion Date: January 1, 2026

Site Conditions: Substation Circuit Breakers will be delivered to substation under construction and off-loaded on prepared foundation(s).

Bid Number 1263

**BID FORM****Section 00 4143 - Page 2 of 5**

An alternate Delivery Date of \_\_\_\_\_ is proposed by the Bidder. If this alternate Delivery Date is accepted by the Owner, a bid price **DEDUCT per unit** of \$ \_\_\_\_\_ is offered.

The Bidder shall provide shop drawings, as specified in Section 33 7230, Section 1.5.B, \_\_\_\_\_ weeks after receipt of order.

The Bidder shall provide "FOR CONSTRUCTION" drawings at least **four (4) weeks** prior to shipping.

**GENERAL:**

In submitting this BID FORM, the Bidder agrees as follows:

The prices set forth herein do not include any sums which are or may be payable by the Bidder on account of taxes imposed by any taxing authority upon the sale, purchase, or use of the equipment. If any such tax is applicable to the sale, purchase, or use of the equipment, the amount thereof shall be added to the purchase price and paid by the Owner.

The prices set forth herein are firm if accepted by the Owner within **forty-five (45) days** and shall include the cost of:

1. Delivery to the job site.
2. Offloading onto an Owner furnished foundation(s).
3. Field inspection, testing, and certification.
4. All other labor or other cost to provide the Owner with transformer filled with oil and ready for external connection.

The metal clad medium voltage switchgear shall be delivered to the Delivery Site during the Delivery Period specified above. The Delivery Period defines the time during the project schedule from completion of the concrete pad until other project tasks could make the pad inaccessible. Delivery outside the specified Delivery Period could result in liquidated damages being assessed.

The Bidder shall be responsible for securing all permits required for shipping to the Delivery Site and shall be responsible for any damages to road and utilities or other damages caused by the Bidder or his Delivery Agent during shipment to Delivery Site.

Notice of Shipment - The Bidder shall notify the Owner at the following times:

1. 10 days prior to shipment.
2. 24 hours prior to shipment.
3. 24 hours prior to delivery.

Shipments arriving after 2:00 p.m. on weekdays or arriving on weekends or holidays shall not be offloaded until the next working day and the Bidder shall be responsible for any demurrage.

Failure to provide notice shall result in Bidder being responsible for any demurrage charges resulting from the unavailability of equipment to unload equipment.

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The Bidder agrees that all requests for time extensions shall be in writing, and that only such time extensions as are granted by the Owner in writing shall be considered.

Time is of the essence in order for the Owner to comply with established construction schedules. Should the Bidder fail to complete the terms of this BID FORM by the Completion Date, after all time extensions granted by the Owner have been added, then in that event the Owner shall have and is hereby given the right to deduct and retain out of such monies which may then be due, or which may become due and payable to the Bidder, the DAMAGE AMOUNT per calendar day as liquidated damages for each and every day that Certification is delayed beyond the Completion Date. The Bidder and Owner agree that liquidated damages are for costs associated with project delay and not as a penalty and that proof of such losses or damages shall not be required. The DAMAGE AMOUNT shall be \$\_\_\_\_\_ per day.

The qualifications of the Bidder's Field Services Representative for field inspection, testing and certification shall be attached to this BID FORM. Include the name of the proposed field service firm, if these services are not supplied by employees of the manufacturer. A schedule of field tests, if different from those specified in 33 7230, shall be submitted by the Bidder. The qualifications of the Field Service Representatives or Field Service Firm will be included in the overall evaluation of this BID FORM.

In estimating the lowest cost to the Owner as one of the factors in deciding the award of an order, the Owner will consider, in addition to the price quoted in the BID FORM, the following:

1. Stated exceptions to the specifications.
2. Method of delivery.
3. Warranty.
4. Installation, erection and operating costs.
5. Delivery time.
6. Work history on previous projects.

The bid prices submitted for spare parts will not be used in the evaluation.

Failure to submit bid evaluation data as specified can lead to bid rejection.

Title of each equipment item shall pass to the Owner upon:

1. Delivery and placement of equipment onto foundation at location specified.
2. Satisfactory inspection for in transit damage.
3. Satisfactory installation and field test by the Materialman's Field Services Representative and Certification that the unit is ready to place in service.
4. Acceptance by the Owner following completion of Item 3.

The Bidder shall submit bids on this BID FORM. Submit complete BID FORM in (2) two unaltered copies with all blank spaces completed. There shall be no exceptions for basic bid submitted by the Materialman; however, an alternate, with exceptions, may be bid as an attachment to a basic bid.





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It is understood by the undersigned that the Owner retains the privilege of accepting or rejecting all or any part of this BID FORM and to waive any informalities or technicalities therein.

BIDDER: \_\_\_\_\_

BY: \_\_\_\_\_

TITLE: \_\_\_\_\_

DATE: \_\_\_\_\_

MAILING ADDRESS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

STREET ADDRESS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

TELEPHONE: \_\_\_\_\_

FAX: \_\_\_\_\_

PRIMARY CONTACT: \_\_\_\_\_

ALTERNATE CONTACT: \_\_\_\_\_

**END OF SECTION**

**1.1 SECTION INCLUDES**

- A. Submittal Procedures
- B. Construction and Progress Schedules

**1.2 RELATED SECTIONS**

- A. Section 01 3323 – SHOP DRAWINGS
- B. Section 01 7839 – PROJECT RECORD DOCUMENTS

**1.3 SUBMITTAL PROCEDURES**

- A. Transmit each submittal with transmittal letter or Engineer accepted form. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.
- B. Submit shop drawings as specified in Section 01 3323 - SHOP DRAWINGS.
- C. Identify project, Contractor, subcontractor or supplier; pertinent drawing sheet and detail number(s), and specification section number, as appropriate.
- D. Schedule submittals to expedite the project, and deliver to Engineer with copy of transmittal letter to Owner's representative as identified in Section 01 3113 - PROJECT COORDINATION.
- E. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of the completed Work.
- F. Provide space for Contractor and Engineer review stamps.
- G. Revise and resubmit submittals as required, identify all changes made since previous submittal.
- H. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

**1.4 SUBMITTAL SCHEDULE**

- A. Provide schedule for project submittals in accordance with the specifications and as agreed to by Engineer and Contractor.

**1.5 CONSTRUCTION AND PROGRESS SCHEDULE**

- A. Submit initial progress schedule in duplicate within 30 days after date established in Notice to Proceed for Architect/Engineer review.
- B. Revise and resubmit as required.

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- C. Submit revised schedules with each Application for Payment, identifying changes since previous version.
- D. Submit computer generated network analysis diagram using the critical path method, generally as outlined in Associated General Contractors of America (AGC) publication "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry".
- D. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
- E. Indicate estimated percentage of completion for each item of Work at each submission.
- F. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and under Allowances.

**END OF SECTION**

**1.1 SECTION INCLUDES**

- A. Submit Shop Drawings and product data required by contract documents.

**1.2 RELATED SECTIONS**

- A. DIVISIONS 0 and 1 – PROCUREMENT AND CONTRACTING REQUIREMENTS and GENERAL REQUIREMENTS: These shall apply to all work included in this section.
- B. Section 01 3219 – SUBMITTALS
- C. Section 01 7839 – PROJECT RECORD DOCUMENTS

**1.3 SHOP DRAWINGS**

- A. Shop drawings shall include: fabrication information; material lists; manufacturer's catalog sheets and/or descriptive data, showing dimensions, performance characteristics, and capacities; electrical characteristics, and capacities; and other pertinent information as required to obtain approval of the items involved.
- B. Drawings shall be presented in a clear and thorough manner.
  - 1. Details shall be identified by reference to sheet and detail numbers shown on Contract Drawings and Specification Sections.

**1.4 PRODUCT DATA**

- A. Preparation:
  - 1. Clearly mark each copy to identify pertinent products or models.
  - 2. Show dimensions and clearances required.
- B. Manufacturer's standard drawings and diagrams:
  - 1. Modify drawings and diagrams to delete information which is not applicable to the Work.
  - 2. Supplement standard information to provide information specifically applicable to the Work.

**1.5 CONTRACTOR RESPONSIBILITIES**

- A. Designate in the construction schedule, or in a separate coordinated schedule, the dates for submission and the dates that reviewed Shop Drawings and product data will be required to maintain construction schedule.

- B. Review Shop Drawings and Product Data prior to submission.
- C. Contractor is responsible for review of all Subcontractor and supplier submittals.
- D. Determine and verify:
  - 1. Field measurements
  - 2. Field construction criteria
  - 3. Catalog numbers and similar data
  - 4. Conformance with specifications
- E. Coordinate each submittal with requirements of the Work and of Contract Documents.
- F. Notify the Owner/Engineer in writing, at time of submission, of any deviations in the submittals from requirements of the Contract Documents.
- G. Begin no fabrication or work which required submittals until return of submittals with satisfactory review.

#### **1.6 SUBMISSION REQUIREMENTS**

- A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the work or in the work of any other contractor.
- B. Number of submittals required:
  - 1. Shop Drawings: Submit three (3) paper copies of shop drawings of all items for which shop drawings are specified in other sections, and for all major equipment items.
  - 2. Product Data: Submit three (3) copies of product data of all items for which product data is specified in other sections and for all major items.
  - 3. One (1) copy of electronic data files of all drawings prepared for the project. Format shall be either CAD format (.DGN or .DWG), or PDF format. Media shall be CD-ROM.
- C. Submittals shall contain:
  - 1. Submittal identification number. Submittals shall be numbered consecutively.
  - 2. Re-submittals shall use the same submittal number with an alphabetic suffix added.
  - 3. The date of submission and the dates of any previous submissions.
  - 4. The project title and number.

4. The names of:
  - a. Contractor
  - b. Subcontractor
  - c. Supplier
  - d. Manufacturer
5. Identification of the project, with the specification section number.
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the work or materials.
8. Applicable standards, such as ASTM or Federal Specification numbers.
9. Identification of deviations from Contract Documents.
10. Identification of revisions on resubmittals.
11. An 8"x3" blank space for Contractor and Engineer stamps.
12. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work of Contract Documents.

#### **1.7 RETURN FOR RE-SUBMISSION**

- A. The Engineer will return for resubmission all shop drawings submitted without the above specified approval and certification which in the Engineers opinion contain numerous discrepancies, have not been checked, or do not meet the requirements for submission.

#### **1.8 REVIEW OF SUBMITTALS**

- A. The Engineer will review, mark and date all submitted shop drawings. Two (2) sets will be returned to the Contractor and remaining sets will be retained by the Engineer. Contractor shall make corrections and changes as indicated.
- B. Resubmit shop drawings as specified above, until satisfactory review has been obtained. Corrections and/or changes indicated on shop drawings by Engineer/Owner shall not be considered as an extra work order.
- C. After satisfactory "Review" or "Furnish as Corrected" has been obtained for all shop drawings, three (3) copies of shop drawings marked "FOR CONSTRUCTION" shall be furnished to the Owner/Engineer within 21 days of receipt of approval drawings by Contractor. Format of electronic data files shall be as specified in Article 1.06, above.

- D. Review of shop drawings by the Owner/Engineer will be general only, and such review will not relieve the Contractor of responsibility for accuracy of such shop drawings, proper fitting, coordination, construction of work, and furnishing materials required by the Specifications but not indicated on shop drawings. Review of shop drawings shall not be construed as approving departures from the Specifications.

#### **1.9 DISTRIBUTION**

- A. Distribute copies of Shop Drawings and copies of Product Data which carry the Engineer stamp of approval to:
  - 1. Job site file
  - 2. Record Documents File
  - 3. Other affected contractors
  - 4. Subcontractors
  - 5. Supplier or fabricator

#### **1.10 OWNER / ENGINEER DUTIES**

- A. Review submittals with reasonable promptness and in accordance with schedule.
- B. Affix stamp and initials or signature, and indicate requirements for resubmittal, or satisfactory review of submittal.
- C. Return submittals to Contractor for distribution, or for resubmission.

**END OF DOCUMENT**



**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Record of changes
- B. Final "As-Built" drawings
- C. Operation and maintenance manuals

**1.2 RELATED SECTIONS**

- A. DIVISIONS 0 and 1 – PROCUREMENT AND CONTRACTING REQUIREMENTS and GENERAL REQUIREMENTS: These shall apply to all work included in this section.
- B. Other requirements affecting Project Record Documents may appear in pertinent other Sections of these Specifications.

**1.3 SUBMITTALS**

- A. Comply with pertinent provisions of Section 01 3219 - SUBMITTALS
- B. The Engineer's approval of the current status of Project Record Documents may be a prerequisite to the Engineer's approval of requests for progress payment and request for final payment under the Contract.
- C. Prior to submitting each request for progress payment, secure the Engineer's approval of the current status of the Project Record Documents.
- D. Prior to submitting request for final payment, submit the final Project Record Documents to the Engineer for approval.

**1.4 QUALITY ASSURANCE**

- A. Delegate the responsibility for maintenance of Record Documents to one person on the Contractor's staff as approved by the Engineer.
- B. Accuracy of records:
  - 1. Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to show the change properly.
  - 2. Accuracy of records shall be such that future search for items shown in the Contract Documents may rely reasonably on information obtained from the approved Project Record Documents.

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- C. Make entries within 24 hours after receipt of information that the change has occurred.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Maintain the job set of Record Documents completely protected from deterioration and from loss and damage until completion of the Work and transfer of all recorded data to the final Project Record Documents.
- B. In the event of loss of recorded data, use means necessary to again secure the data to the Engineer's approval.
  - 1. Such means shall include, if necessary in the opinion of the Engineer, removal and replacement of concealing materials by Contractor at his cost.
  - 2. In such case, provide replacements to the standards originally required by the Contract Documents by Contractor at his cost.

**PART 2 PRODUCTS****2.1 RECORD DOCUMENTS**

- A. Job set: Promptly following the Effective Date of Agreement secure from the Engineer at no charge to the Contractor one complete set of all Documents comprising the Contract.

**PART 3 EXECUTION****3.1 MAINTENANCE OF JOB SET**

- A. Immediately upon receipt of the job set described in Paragraph 2.01-A above, identify each of the Documents with the title, "RECORD DOCUMENTS - JOB SET."
- B. Preservation:
  - 1. Considering the Contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed, devise a suitable method for protecting the job set to the approval of the Engineer.
  - 2. Do not use the job set for any purpose except entry of new data and for review by the Engineer, until start of transfer of data to final Project Record Documents.
  - 3. Maintain the job set at the site of Work as that site is designated by the Engineer.
- C. Making entries on Drawings:

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1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe the change by graphic line and note as required.
  2. Date all entries.
  3. Call attention to the entry by a "cloud" drawn around the area or areas affected.
  4. In the event of overlapping changes, use different colors for the overlapping changes.
- D. Make entries in the pertinent other Documents as approved by the Engineer.
- E. Drawings shall clearly show actual installed locations, depth, and sizes of:
1. Pipework of all descriptions below ground outside of building and structures, including locations of cleanouts, manholes, inlets, hydrants, and underground valves.
  2. Electrical conduits, electrical ducts, ground grid conductors, and directly buried conductors underground outside of buildings and structures, including locations of pull and junction boxes, electric manholes and handholes, pad mounted electrical equipment, utility poles, electrical outlets, and lighting fixtures.
- F. Conversion of schematic layouts:
1. In some cases on the Drawings, arrangements of conduits, circuits, piping, ducts, and similar items, is shown schematically and is not intended to portray precise physical layout.
    - a. Final physical arrangement is determined by the Contractor, subject to the Engineer's approval.
    - b. However, design of future modifications of the facility may require accurate information as to the final physical layout of items which are shown only schematically on the Drawings.
  2. Show on the job set of Record Drawings, by dimension accurate to within one inch, the centerline of each run of items such as are described in Article 3.01-E above.
    - a. Clearly identify the item by accurate note such as "cast iron drain," "galv. water," and the like.
    - b. Show, by symbol or note, the vertical location of the item ("under slab," "in ceiling plenum," "exposed," and the like).
    - c. Make all identification so descriptive that it may be related reliably to the Specifications.
  3. The Engineer may waive the requirements for conversion of schematic layouts where, in

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the Engineer's judgment, conversion serves no useful purpose. However, do not rely upon waivers being issued except as specifically issued in writing by the Engineer.

- G. Review and submittal:
1. Submit the completed set of Project Record Documents to the Engineer as described in Paragraph 1.02-D above.
  2. Participate in review meetings as required.
  3. Make required changes and promptly deliver the Project Record Documents to the Engineer.

**3.2 FINAL DRAWINGS**

- A. At completion of project, the Contractor shall incorporate all revisions into the shop drawings to provide a complete set of final drawings. The drawings shall be marked as "Final-As Constructed".
- B. Submit three (3) paper copies of all shop drawings. Maximum size of all drawings is 22"x34".
- C. One (1) copy of electronic data files of all drawings prepared for the project. Format shall be CAD format (.DGN or .DWG) or PDF format. Media shall be CD-ROM.

**3.3 OPERATION AND MAINTENANCE MANUALS**

- A. The Contractor shall provide four (4) complete sets of Operations and Maintenance Manuals covering all equipment furnished for the project.
- B. Contents of Operations and Maintenance Manuals
  1. Manufacturer's technical literature; descriptive bulletins; installation, operation and maintenance instructions; and parts list.
  2. As-Constructed shop drawings.
  3. Certified factory test results.
- C. Format
  1. All Operations and Maintenance Manuals shall be bound in a three ring binder of suitable size (maximum 2") for the material to be inserted.
  2. Binders shall be white in color with clear jacket for the insertion of printed cover and edge identification sheets.

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3. All information bound shall be 8½" x 11" or accordion folded to this size.
  4. Page dividers with plastic reinforced holes and tabs shall be used to organize Operations and Maintenance Manuals.
  5. Binder cover and edge inserts shall contain project name, date and subject matter of the manual.
- D. Organization
1. Table of Contents shall list all information contained.
  2. Contact information for all major equipment suppliers, Contractor, and subcontractors.
  3. Organize manual by equipment item. Contents as specified above.

**3.4 FINAL SUBMITTAL**

- A. All Record Documents including, job set, final drawings and Operation and Maintenance Manuals shall be submitted to Engineer prior to submitting final payment request.

**3.5 CHANGES SUBSEQUENT TO ACCEPTANCE**

- A. The Contractor has no responsibility for recording changes in the Work subsequent to Final Completion, except for changes resulting from work performed under Warranty.

**END OF SECTION**

**HIGH VOLTAGE POWER TRANSFORMER**

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**PART 1. GENERAL****1.1 SECTION INCLUDES**

- A. This specification includes the fabrication and delivery and unloading/assembly of two (2) power transformers, as required to meet the Contractor's obligations, as stated in the proposal section of these specifications.

**1.2 RELATED SECTIONS**

- A. DIVISIONS 0 and 1 – PROCUREMENT AND CONTRACTING REQUIREMENTS and GENERAL REQUIREMENTS: These shall apply to all work included in this section
- B. Section 33 7300D – HIGH VOLTAGE TRANSFORMER DATA SHEET

**1.3 REFERENCE STANDARDS**

- A. Published Specifications, standards, tests, or recommended methods of trades, industry, or governmental organizations apply to work in this section in the listing below.
  - 1. ANSI B16.5, Slip-on Welding Flanges
  - 2. ANSI C80.1, Standard Specifications for Rigid Steel Conduit
  - 3. IEEE C57.12.10, Requirements for Transformers 230-kV and Below, 833/958 through 8,333/10,417-kVA Single-Phase and 750/862 through 60,000/ 80,000/100,000-kVA Three-Phase
  - 4. IEEE C57.12.70, Terminal Markings and Connections for Distribution and Power Transformers
  - 5. IEEE C57.91, Guide for Loading Mineral-Oil Immersed Power Transformers
  - 6. IEEE C57.12.00, General Requirements for Liquid-Immersed Distribution, Power and Regulating Transformers
  - 7. IEEE C57.12.11, Guide for Installation of Oil-Immersed Transformers (10 MVA and Larger, and 69-kV to 287-kV Ratings)
  - 8. IEEE C57.12.80, Terminology for Power and Distribution Transformers
  - 9. IEEE C57.12.90, Test Code for Liquid-Immersed Distribution, Power and Regulating Transformers and Guide for Short-Circuit Testing of Distribution and Power Transformers
  - 10. IEEE C57.13, Standard Requirements for Instrument Transformers
  - 11. IEEE C57.13.1, Guide for Field Testing of Relaying Current Transformers
  - 12. IEEE C57.13.3, Guide for the Grounding of Instrument Transformer Secondary Circuits and Cases
  - 13. IEEE C57.19.00, Standard General Requirements and Test Procedures for Outdoor Power Apparatus Bushings

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14. IEEE C57.19.01, Standard Performance Characteristics and Dimensions for Outdoor Apparatus Bushings
15. IEEE C57.19.100, Guide for Application of Power Apparatus Bushings
16. IEEE C57.93, Guide for Installation of Liquid-Immersed Power Transformers
17. IEEE C57.98, Guide for Transformer Impulse Tests (Appendix to ANSI/IEEE C57.12.90)
18. IEEE C57.120, Loss Evaluation Guide for Power Transformers and Reactors
19. IEEE C62.11, Standard for Metal-Oxide Surge Arresters for Alternating Current Systems
20. IEEE C62.33, Guide for the Application of Metal-Oxide Surge Arresters for Alternating Current Systems
21. IEEE Std 693-2005, IEEE Recommended Practice for Seismic Design of Substations
22. ASCE 7, Minimum Design Loads for Buildings and other Structures
23. ASTM B3-74, Specification for Soft or Annealed Copper Wire
24. ASTM B48-68, Specification for Soft Rectangular and Square Bare Copper Wire for Electrical Conductors
25. ASTM B187-83, Specification for Copper Bus Bar, Rod, and Shapes
26. ASTM D-3487, Mineral Insulating Oil Used in Electrical Apparatus
27. NEMA ICS-1, Industrial Control and Systems: General Requirements
28. NEMA TR-1, Transformer, Regulators and Reactors
29. NEMA WC5, Thermoplastic insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
30. NEMA WC7, Cross-linked Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
31. NEMA WC8, Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
32. NFPA 70, National Electrical Code (NEC), Current Rating of Control Wiring

**1.4 DESIGN AND PERFORMANCE REQUIREMENTS****A. Design Requirements**

1. Furnish oil-immersed, 3-phase power transformers applied as distribution substation step-down and step-up transformers.
2. Design and manufacture: Standard design with components by same Manufacturer.
3. Design equipment, accessories, and supporting structures to meet requirements of project site conditions.
4. Design transformers to operate in parallel under normal conditions with multiple transformer of like rating.

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1. Loss Evaluation: In accordance with the Procurement Agreement and General Conditions
  - a. Guaranteed losses provided in the bid data will be used to calculate the total evaluated cost of losses. This cost will be a component of the bid evaluation.
  - b. Test data will be compared to the guaranteed loss values. If the actual losses exceed the guaranteed losses a penalty will be assessed according to the loss evaluation formula. No credit will be given for tested losses lower than the guaranteed values in either category.
  - c. The cost of losses for each transformer will be calculated by multiplying the appropriate dollars/kW values by the guaranteed load losses as 65°C rating and no-load losses at 100% voltages. This cost will be added to the bid price for evaluation.
2. Audible Sound Level: Average A-weighted, measured in accordance with ANSI C57.12.90:
  - a. 30 MVA: 73 dB
  - b. 40 MVA: 75 dB
  - c. 50 MVA: 76 dB
3. Overload Capabilities
  - a. In accordance with ANSI/IEEE C57.91
    - i. Design bushings, connectors, leads, and all auxiliary equipment for continuous full load duty and for emergency service at 1.4 times the transformer full load current at the ONAF, ONAF rating for a period of eight hours.
4. Seismic Performance
  - a. The transformer(s) shall be seismically qualified to moderate seismic qualification.
  - b. Transformer(s) shall be designed so there will be neither structural damage nor loss of function immediately after an earthquake when subject to design seismic loads occurring simultaneously with dead and normal operation loads.
  - c. The following methods shall be used for the qualification:
    - i. The transformer(s) (transformer tank, core, coils, anchorage, and other components) except the bushings and surge arresters shall be qualified by static analysis.
    - ii. The high side bushings shall be qualified by time history shake table tests. The low side bushings are inherently acceptable.
    - iii. The high side surge arresters:
      1. shall maintain correct operational state during seismic event
      2. shall be qualified by time history shake table tests
    - iv. The low side surge arresters are inherently acceptable.
  - d. Static Analysis



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- i. Static analysis calculations shall include verification of the load path from the core, coils, tank and base to the anchorage for all three orthogonal axes. All components of the load path shall have sufficient rigidity to restrain the core and coil and coil from shifting. Sketches shall be provided with the analysis that clearly shows a complete load path to the anchorage. Load path parts and members shall be clearly labeled and dimensioned. Section properties, calculated stresses and allowables of all load path parts and members shall be provided.
- ii. Appendages, such as radiators and control cabinets, shall be qualified by static analysis, where acceleration is multiplied by 3.
- iii. Static analysis shall be per IEEE 693-2018, A.1.3.1 Static analysis.
- e. Time History Test shall be per IEEE 693-2005, A.1.2.2 Time history shake table test, specifically A.1.2.5 composite insulator and bushing test.
- f. Acceptance criteria shall be per IEEE 693-2005, A.2 and D.5, Acceptance criteria.
- g. Anchorage welds: All transformers shall be designed to be field welded to embedded plates or beams. The outline drawings shall include locations, size and length of field welds.
- h. Report. For components qualified by testing, the report shall meet the requirements of IEEE 693-2005, A.5, Static test qualification report. For components qualified by analysis, the report shall meet the requirements of IEEE 693-2005 A.6, Analysis report.
- i. A seismic identification plate shall be attached to transformer as specified in IEEE 693-2005 A.8, Seismic qualification identification plate

**1.5 PROJECT / SITE CONDITIONS**

- A. Altitude: Less than 3,000 feet above mean sea level
- B. Ambient Temperature: -20°F (-28.89°C) to +110°F (43.33°C)
- C. Seismic: Loading per ASCE 7.10,  $S_s=0.134$  g, Importance Factor 1.5, site class C
- D. Keraunic Level: 60 thunderstorm days per year
- E. Extreme Wind loading per ASCE 7.10, basic wind speed of 115 mph, importance factor 1.15, exposure category C
- F. Combined ice and wind loading district: NESC Medium

**HIGH VOLTAGE POWER TRANSFORMER****Section 33 7300 - Page 5 of 19****1.6 SUBMITTALS**

- A. Schedule submittals to expedite furnishing the Goods and coordinate submission of related items. Deliver each submittal to Engineer with copy to Buyer.
- B. Submit the following quantities:
  - 1. Shop drawings - One electronic copy (in PDF format). including pre-printed manufacturers' data, brochures, suppliers' information, testing reports, certifications, and manufacturer's installation and testing instructions.
  - 2. Catalogs and cut sheets - One electronic copy (in PDF format). including pre-printed manufacturers' data, brochures, suppliers' information, testing reports, certifications, and manufacturer's installation and testing instructions.
  - 3. Operation, maintenance, and instruction manuals - One electronic copy (in PDF format) and two paper copies.
  - 4. Submit the following:
    - a. Product data: Catalogs and cut sheets
    - b. Shop Drawings:
      - i. Outline showing general arrangement, legend, plan, elevation, base details, weights, dimensions, and gallons of oil with location of center of gravity with and without oil on outline
      - ii. Connection, alarm, control, current, voltage, and auxiliary schematic diagrams
      - iii. Internal wiring and connection diagrams (tabular format is not acceptable)
      - iv. Bushing current transformers:
        - 1. Excitation and ratio correction factor curves for each secondary ratio
        - 2. Resistance of current transformer secondary and connecting leads for each ratio
        - 3. Actual current ratio and turn ratio for each tap
        - 4. Mechanical and thermal short time (one-second) rating
      - v. Nameplate data, including type and brand of insulating oil, and all current transformer taps. Resubmit nameplate drawing after factory tests with all test data completed.
      - vi. Physical drawings showing equipment arrangement, terminal block locations, cable entrance, and panel layout
      - vii. Terminal block connections
      - viii. Bushing lifting accessories and ground pad outlines
      - ix. Notes and symbols
      - x. Bill of material

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- xi. Detailed description of procedure for vacuum filling of transformers with insulating oil
- c. Quality Assurance/Control Submittals
  - i. Design Data:
    - 1. Certified seismic qualification tests and analyses, in accordance with IEEE Std. 693-2018.
    - 2. Certified short circuit withstand test results on units of comparable rating and design.
  - ii. Test Reports, including seismic static analysis
  - iii. Manufacturer's instructions
  - iv. Manufacturer's field reports

**1.7 DELIVERY, STORAGE AND HANDLING**

- A. Attach impact recorder to the transformers during transportation periods. Unseal impact recorder only in presence of Buyer or Engineer.
- B. Deliver transformer oil to Buyer's site, including all necessary equipment for the oil filling operation.

**1.8 MAINTENANCE MATERIALS**

- A. Make interchangeable with, and some material and workmanship as, corresponding original parts.
- B. Furnish and deliver with units to project storage facilities.
- C. Required Materials or Parts:
  - 1. Touch-up paint: ANSI No. 70 (Light Gray), three 1-quart containers
- D. Other parts recommended: at Buyer's option.

**1.9 WARRANTY**

- A. Provide five-year manufacturer's warranty from date of Energization for repair or replacement of all materials, oil, and equipment under this specification against any failure due to the Supplier's design or defects in materials or workmanship.

**1.10 POWER TRANSFORMER**

- A. Principal ratings and electrical characteristics:
  - 1. Overload capabilities: In accordance with ANSI C57.91 and the requirements specified in Article 3 of this specification.

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- a. Continuous Ratings:
  - i. ONAN, 65° Celsius rise: 30 MVA
  - ii. ONAF, 65° Celsius rise, first stage forced cooling: 40 MVA
  - iii. ONAF, 65° Celsius rise, second stage forced cooling: 50 MVA
- b. Number of phases: 3
- c. Frequency: 60 Hz
- d. Cooling class: ONAN, ONAF, ONAF
- e. Primary to secondary impedance:
  - i. 8.5 % @ 30 MVA Base (ONAN)
- f. Primary winding:
  - i. Rated voltage: 69-kV
  - ii. Connection: Delta
  - iii. No-load tap changer:  $\pm 5$ -percent in four 2.5-percent steps
- g. Secondary winding:
  - i. Rated voltage: 13.2-kV
  - ii. Connection: Wye with neutral brought out to ground (Solidly Grounded)
- h. Basic Impulse Level (BIL)
  - i. H winding: 350-kV
  - ii. X winding: 110-kV
- i. Maximum Temperature Rise
  - i. By resistance: 65° Celsius
  - ii. By hot spot: 80° Celsius
- j. Duty: Continuous
- k. Angular phase displacement: Per ANSI C57.12.00-2017, Primary to Secondary: 30° lagging (to be verified during detailed design)

**1.11 COMPONENTS**

- A. Transformer Tank:
  - 1. Construction: Welded steel plate, liquid tight, with bolted and gasketed manhole on top of tank, mounted on steel skid base, and suitable for skidding in any direction.
  - 2. Provide with jacking lugs and pulling eyes for lifting or moving along either axis when completely assembled and oil filled.
  - 3. Mount a fall control ring on the top of each transformer tank to accommodate worker safety device attachment. Form 4-inch rings from  $\frac{1}{2}$  inch diameter rod. Locate so that a worker

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wearing a 6.5-foot safety tether can work anywhere on top of the transformer, including the bushings, while hooked into the fall control ring.

4. Provide two copper faced ground pads at diagonal corners near base, with two bolt terminal connectors.
  5. Mount separate blocks on both corners of the tank on the high voltage and low voltage sides, in a vertical line spaced no more than 3' apart to support the ground cable loop when connected to the high voltage surge arresters.
  6. Maintain positive pressure continually to prevent ingress of moisture during shipping.
- B. Core:
1. Material: Highest quality, non-aging, cold rolled, grain oriented, stress free, thin silicon steel laminations, with high permeability and low hysteresis loss.
  2. Properly anneal with smooth surfaces at edges.
  3. Provide each sheet with an insulated surface treatment impervious to hot transformer oil.
  4. Carefully assemble, rigidly clamp, and block to prevent deteriorating vibrations, interference with oil circulation, objectionable noise conditions, and distortions due to short circuit and shipment.
  5. Securely ground to the tank at the top of each transformer in a location accessible from manhole so grounding device can be unbolted without lowering transformer oil level or losing nitrogen pressure.
  6. Provide with means for properly lifting and moving core assembly when un-tanked.
- C. Windings:
1. Material: Electrolytic copper with high conductivity characteristics, conforming to ASTM B3-74 or B48-68.
  2. Insulation: thermally upgraded paper insulation system of high dielectric and mechanical strength, arranged to permit free circulation of oil.
  3. Make up, shape, and brace to provide for expansion and contraction due to temperature changes and to avoid abrasion of insulation.
  4. Adequately clamp and brace to prevent distortion or increase in noise above specified limits due to aging in continuous service at rated operating conditions.
  5. Circular helical. Rectangular windings will not be acceptable.
- D. Cooling Equipment
1. Type: Two-stage ONAF/ONAF, conforming to ratings previously specified.
  2. Radiators:
    - a. Nominal dimensions and interchangeable
    - b. Welded construction, with flanged connections and provisions for draining and venting
    - c. Provided with lifting eyes or lugs

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- d. Furnished with oil tight valves at all connections to main tank that will allow removal of radiators without taking transformers out of service
  - e. Locate on sidewall of Segment 3
3. Fans:
- a. Power supply volts: 240 VAC, single-phase, 60 Hz.
  - b. Provide magnetic motor starter, and protective devices and manual/automatic selector switch.
  - c. Provide individual thermal protection for each fan motor.
  - d. Provide individual disconnecting means for each fan motor in the form of a weatherproof, locking plug for each.
  - e. Fan impellers: one-piece construction
  - f. Fan meets OSHA safety requirements
  - g. Automatic and manual switch
4. Controls:
- a. Mounted in main transformer control cabinet
  - b. Cooling equipment automatically controlled by the winding temperature device
  - c. Designed so that either stage of cooling equipment can be selected for operation with first stage forced cooling.
  - d. Protected with air circuit breakers of suitable rating
  - e. Automatic starting switches
  - f. Auxiliary relays and alarm contacts wired to the transformer monitor to provide status indication of all stages of cooling equipment
  - g. Selector switches for AUTOMATIC/OFF/MANUAL operation
  - h. Provide any other necessary devices
5. Transformer Oil:
- a. Pure mineral oil obtained by fractional distillation, unmixed with other substances, meeting the requirements of ASTM D3487
  - b. Prepared and refined especially for transformer use; free of moisture, acid, alkali, PCBs, and injurious sulfur compounds
  - c. Free of deposit formation under normal operating temperatures
  - d. Dielectric strength: Not less than 26,000 volts between 1" discs spaced 1/10" apart
  - e. Oil shall be tested for corrosive sulfur according to ASTM D1275 extended test
  - f. Oil shall be procured by a verified supplier
6. Oil Preservation System: Positive pressure nitrogen:

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- a. Include adequate amount of bottled nitrogen to place transformers in service.
  - b. Nitrogen control equipment: Mounted in easily accessible, weatherproof, lockable enclosure with adequate space for nitrogen bottles mounted on the transformer tank. Enclosure shall include stainless steel, 3-point latching system.
  - c. Nitrogen leads: Soft drawn copper tubing
  - d. Provide a certificate of ownership with nitrogen tank. Manufacturer to provide additional tank.
7. Bushings:
- a. Bushing studs: Threaded, stud type, silver plated
  - b. Porcelain: Manufactured by the wet process
  - c. Glazing: Free of imperfections
  - d. Color: ANSI No. 70, Light Gray
  - e. High Voltage Bushings:
    - i. Type: Interchangeable
    - ii. BIL rating: 350-kV
    - iii. Creepage distance: Medium
    - iv. Mounting: On tank cover Segment 3
    - v. Tap: Capacitive, for bushing potential device
    - vi. Connectors: Stud to flat, tinned NEMA 4-hole pad
    - vii. Material: Porcelain manufactured by Wet Process
  - f. Low Voltage Bushings:
    - i. BIL rating: 110-kV
    - ii. Creepage distance: Medium
    - iii. Mounting: On tank cover Segment 1
    - iv. Connectors: Stud to flat, tinned NEMA 4-hole pad
  - g. Neutral Bushings:
    - i. BIL rating: 110-kV
    - ii. Creepage distance: Medium
    - iii. Mounting: On tank cover Segment 1
    - iv. Connectors: Stud to flat, tinned NEMA 4-hole pad
8. Bushing Current Transformers (BCT):
- a. Windings: Fully distributed
  - b. Leads:

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- i. Terminate at 6-point short-circuiting type terminal blocks in control housing.
  - ii. Terminate each BCT on separate block.
  - iii. Mark leads with permanent sleeve markers to indicate taps and polarity.
  - iv. Use No. 10 AWG stranded copper with oil proof insulation.
  - v. Type: Multi-ratio, 5 lead, bushing type
  - vi. Accuracy Class: C400
  - vii. Rating Factor: 2
  - viii. Number and Ratio:
    1. Two 600:5 on each high voltage bushing
    2. Three 3000:5 on each low voltage bushing
    3. Two 600:5 on neutral bushing
9. No-Load Tap Changer (NLTC):
- a. Provide for external operation when transformers are de-energized.
  - b. Provided with indicating pointer, dial, and means for locking in any position.
  - c. Mounted on sidewall approximately 5' above the base of the transformer.
  - d. Capable of withstanding full transformer short circuit current without damage.
  - e. Configured to prevent leaving a winding open or short circuited when operating handle is in locked position.
  - f. Provided with two 2½-percent taps above and two 2½-percent taps below rated voltage.
10. Automatic Load Tap Changer (LTC)
- a. Location: Low voltage winding
  - b. Type: Reinhausen Type RMVII complete with tank and motor operator, or other Manufacturer as approved by the Owner.
  - c. Regulating range: 10-percent above to 10-percent below rated voltage in thirty-two ⅕-percent steps, with a total of 33 positions.
  - d. Rating: Deliver full-kVA capacity for normal and emergency ratings at all LTC positions and at all combinations of LTC and NLTC positions.
  - e. Tap Selector Switch and Mechanism
    - i. Mount in oil-filled compartment separate from main transformer tank.
    - ii. Mount on sidewall of Segment 1.
    - iii. Maintain physical isolation so it is not necessary to drain oil or break the seal of the main transformer tank when servicing the LTC.
    - iv. Type: Vacuum
    - v. Tap Step Changes:



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1. Smooth transition with no low voltage circuit interruption due to contact bounce or failure to maintain contact bypass bridging.
  2. Phase-to-phase and phase-to-neutral transient voltage dip (flicker) during any step transition: Maximum 2-percent of nominal voltage.
- vi. Replacement Ratings:
1. Contacts: Capable of 500,000 operations without contact replacement.
  2. Mechanical Rating: Capable of 1,000,000 operations.
- vii. Tank Accessories:
1. Hinged maintenance door with oil-resistant gasket
  2. Drain, filter, and sampling valves
  3. Magnetic liquid level indicator with low level alarm contacts at 125 VDC
  4. Breather
  5. Manhole for inspection of contacts without lowering oil level
- viii. Tap switch, motor drive mechanism, control devices, position indicator, and operation counter, in accordance with ANSI C57.12.10.
- f. Controls:
- i. Type: Automatic, microprocessor-based, Beckwith model M-2001D with Beckwith Adaptor Panel Option and DNP communications protocol, or approved equal.
  - ii. Features:
    1. Controls for parallel operation by the circulating current method
    2. Controls shall facilitate independent or parallel operation with an identical unit purchased under this contract, including parallel balancing module, and AC current relay
    3. USB interface on front of control and fiber optic Ethernet and serial interface on back of control.
  - iii. Equipment:
    1. Voltage reduction control switch with three positions, off, step one, and step two
    2. Provisions for testing control mechanism
    3. Overcurrent relay for inhibit of LTC
    4. One copy of software for settings and communications included
    5. All indication lamps shall be LED type
    6. Current transformer for line drop compensation
    7. Position indicator with upper and lower drag hands to indicate maximum travel and electrical reset button mounted in the control cabinet.

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8. Limit switches and stops to prevent travel beyond extreme tap position
  9. Crank or handwheel for manual operation during maintenance activities.
  10. Position indication to LTC control using Beckwith M-2948 Tap Position Sensor, Beckwith Current Loop Interface, and loop power supply.
  11. Operations counter
  12. Form B dry contacts wired to transformer monitor for lower limit, upper limit, and hung-up alarms
  13. Control circuit protective devices
  14. Control switches for RAISE/LOWER, AUTOMATIC/MANUAL, and LOCAL/REMOTE (Device 69). Local/remote switch to be configured for use with remote control via communications protocol (not remote contacts).
  15. OFF-position contact: Wired to indicating light in main cabinet and input on transformer monitor
- iv. Mounting: In easily accessible control cabinet
  - v. Wiring: Extended to main terminal cabinet and connected to terminal blocks. Wire power supply switch, light and convenience outlet, space heater, and switch to main terminal cabinet.
  - vi. All control switches shall be located near the LTC control device.
11. Surge Arresters:
- a. Polymer, station class, metal-oxide type, Ohio Brass or approved equal
  - b. Ratings:
    - i. Primary voltage: 54-kV duty cycle (42-kV MCOV)
    - ii. Secondary voltage: 10-kV duty cycle (8.4-kV MCOV)
  - c. Mount 3 arresters on the high voltage side of the tank and 3 arresters on the low voltage side of the tank.
12. Wire and Terminal Blocks:
- a. Wiring:
    - i. 600 volt insulated copper, Class B stranding, 90° Celsius rating
    - ii. No. 12 AWG minimum for current transformer and branch circuits
    - iii. No. 14 AWG minimum for control
    - iv. All external wiring shall be run in rigid galvanized steel conduits painted to match the transformer tank.
    - v. Terminated with crimp type, ring tongue connectors with non-insulated short shanks; maximum of two terminations per terminal point
    - vi. Connected to separate power terminal blocks for power circuits

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- vii. Clearly identified with permanent sleeve markers at all terminations
  - viii. All wiring originating within transformer shall be color-coded
  - ix. Internal device and terminal block identification shall be based on the functional device code and not the physical location of the device. Both may be used, but functional identification must be present.
- b. Terminal Blocks:
- i. Provided with bases and barriers molded integrally with brass inserts
  - ii. Rated at 600 volts
  - iii. Able to accommodate up to two No. 10 AWG wires per terminal
  - iv. Provided with marking strips
  - v. Installed in sufficient quantity to provide 20-percent minimum spares for each type of block
  - vi. Short circuiting type for current transformers
  - vii. Marked to identify source and function
  - viii. Manufacturer: General Electric Type EB25 and EB27
13. Control Cabinet:
- a. Provide a weatherproof cabinet.
  - b. Mount on the sidewall of Segment 1.
  - c. Fasten securely to each transformer tank. Stand control cabinet 18" off tank.
  - d. Doors: Vertically hinged with locking provisions, stainless steel, single-handle, 3-point latching system
  - e. All external hardware and fasteners shall be stainless steel
  - f. Conduit entrance: removable, gasketed bottom plate, field drilled
  - g. Mount terminal blocks and equipment at least 6" above bottom plate.
  - h. Provide space heaters, partly or totally controlled by thermostat.
  - i. Provide a copper ground bus inside the cabinet suitable for connecting a 2/0 copper cable to external ground. Ground bus shall be accessible from the front door without disassembly of components. All connections to ground shall be through the ground bus.
14. Nitrogen Cabinet:
- a. Provide weatherproof cabinet.
  - b. Fasten securely to each transformer tank
  - c. Doors: Vertically hinged with locking provisions and single-handle, 3-point latching system
  - d. All external hardware and fasteners shall be stainless steel.

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15. Auxiliary and Control Power:
  - a. 120/240 VAC single-phase for fans, space heaters, and other accessories
  - b. 125 VDC for control functions

**1.12 ACCESSORIES**

- A. Provide power transformers with the following accessories:
  1. Sudden pressure relay device 63SP Qualitrol model 900 wired to a Qualitrol model 909 seal-in relay (Device 63SPX): 125 VDC control voltage, with separate, isolated alarm and trip contacts. All items needed for testing the relay mechanism shall be provided with the unit. Provide two (2) alarm contacts and two (2) trip contacts.
  2. Oil level indicator: Magnetic type with two low level nonadjustable 125 VDC alarm contacts wired to transformer monitor
  3. Oil temperature indicator: Dial type with adjustable, two separate, 125 VDC isolated alarm and trip contacts wired to transformer monitor
  4. Temperature sensors for remote monitoring: provide 1 RTD for top oil temperature sensing and 1 RTD for ambient temperature sensing. Wire both RTD's to the input card on the transformer monitor.
  5. Winding temperature indicator: Four sequential operating contact stages, operating from a current transformer in one phase of the low voltage winding: (2 contacts for the operation of cooling equipment, 2 contacts for alarm, and 2 contacts for tripping). Indicator shall be located not less than 5' or more than 6' above the base of the transformer and shall not be obstructed.
  6. Cover-mounted, automatic reseal, shielded pressure relief valve device with spring loaded visual signal flag and two 125 VDC alarm contacts, Qualitrol XPRD. Pipe discharge to level of transformer base
  7. High inert gas-pressure and vacuum gauge with 2 alarm contacts
  8. Low inert gas pressure gauge: 2 alarm contacts for nitrogen supply cylinder with contacts set to activate when cylinder pressure drops below 200 psi
  9. Furnish a 120 volt, 1600 lumen LED light fixture with SPST switch and a 120 volt, 20 ampere single phase duplex GFI type receptacle, complete with protective circuit breaker.
  10. Gas sampling valve
  11. Other standard accessories: Per ANSI C57.12.10.
  12. Transformer alarm monitor. SEL Model 2414, or approved equal.
    - a. 125 VDC power supply (provided by others)
    - b. Fiber optic serial and fiber optic ethernet communications ports with SEL, Modbus and DNP3.0 protocols
    - c. RTD inputs:

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- i. Top Oil Temperature
    - ii. Ambient Temperature
  - d. 125 VDC digital inputs for monitoring:
    - i. Sudden Pressure Alarm
    - ii. Oil Level
    - iii. Oil Temperature Alarm
    - iv. Winding Temperature Alarm and Trip
    - v. Pressure Relief Device Operated
    - vi. High N<sub>2</sub> Pressure
    - vii. Low N<sub>2</sub> Cylinder Pressure
  - e. 3 ACI / 3 AVI card:
    - i. The CT 5A secondary current used for input to the winding hot spot indicator shall be routed through the CT current input card on the transformer monitor in series with the winding temperature gauge.
    - ii. Voltage inputs: wired to terminal blocks for connection by others
- 13. All indicators shall be located not less than 5 feet or more than 6 feet above the base of the transformer and shall not be obstructed. Liquid temperature and winding temperature indicators shall be mounted within 1 foot of each other.

**1.13 FINISHES**

- A. All external hardware shall be stainless steel.
- B. Clean and treat tank interior and exterior surfaces according to manufacturer's standards.
- C. Apply one prime coat to the exterior surface.
- D. Apply two finish coats, ANSI Color No. 70, Light Gray, to the exterior surface. Minimum paint thickness: 6 mils.
- E. Apply non-skid coating to top of transformer tank.
- F. Paint interior of cabinets white.
- G. Paint interior of transformer tank white.

**1.14 SOURCE QUALITY CONTROL**

- A. Assemble, adjust, and complete manufacturer's standard production tests in accordance with Table 14 of ANSI C57.12.00, C57.12.90; NEMA TR-1 and the following:
  - 1. Impulse Test:
    - a. Perform on terminals of high voltage winding as specified ANSI C57.12.90, Items 10.3. and 10.5. (Front of wave test not required.)

**HIGH VOLTAGE POWER TRANSFORMER****Section 33 7300 - Page 17 of 19**

- b. Use voltage oscillograms and ground current oscillograms taken simultaneously as specified in ANSI C57.12.90, Items 10.3.1.6 and 10.3.4.1, respectively, for one method of detecting insulation failure. The height of each individual trace at maximum deflection is 30 millimeters minimum.
  - c. Do not perform additional impulse tests after the tests have been accepted.
  - d. After impulse tests are completed, use the average absolute voltage voltmeter method to measure excitation loss.
2. Winding Impedance:
    - a. Provide impedance test results for positive and zero sequence values of  $Z_{ps}$ .
  3. Induced Voltage Test:
    - a. Use test equipment and general method in accordance with IEEE C57.12.90, Item 10.8.
    - b. Test at full induced-test voltage level.
    - c. Apparent charge: Maximum 300 picocoulombs (pc), Maximum charge for 1 hour: 100 pc
    - d. Include results of corona test and measured apparent charge level in certified test report.
  4. Insulation Resistance Test
  5. Insulation Power Factor Test:
    - a. Use test procedure in accordance with ANSI C57.12.90, Item 10.10.
    - b. Include results of insulation power factor test in certified test report.
  6. Short-circuit capability: Warrant that the transformers will meet requirements of ANSI C57.12.00.
  7. Pressure test tank with nitrogen tubing installed
  8. Noise tests for each stage of cooling
  9. Temperature rise test for ONAN and maximum load, test shall be conducted on both units.
  10. Dielectric tests on control devices and wiring per NEMA ICS-1.
  11. Current Transformer:
    - a. Low frequency, one minute 2,500 volts to ground dielectric test on secondaries.
    - b. Proper nameplate and polarity markings check.
    - c. Polarity and ammeter ratio check after installation of bushing.
  12. Core ground megger test

**1.15 MANUFACTURER'S SERVICE ENGINEER (SPECIAL SERVICES)**

- A. Visually inspect Goods upon delivery. Prior to the Buyer accepting delivery, provide a written report to the Buyer and the Engineer itemizing any damage incurred.

**HIGH VOLTAGE POWER TRANSFORMER**

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**Section 33 7300 - Page 18 of 19**

- B. Unseal impact recorders and inspect impact recorder tapes in the presence of Buyer and Engineer immediately upon delivery. Ensure that impact recorders are reinstalled prior to placement on foundations.
- C. Perform the following under the direction of Buyer's construction contractor:
1. Perform unloading and re-inspect each impact recorder readings after placement onto foundations.
  2. Perform transformer field assembly under direction of Buyer's construction contractor. Record shipping gas pressure prior to assembly.
  3. Thoroughly inspect all visible assembled parts and connections.
  4. Check all gages and relays to ensure proper working condition.
  5. Check and operate all cooling equipment.
  6. Thoroughly search for leaks.
  7. Test oil prior to filling and prior to energizing to determine if the dielectric strength is acceptable. Filter the oil, if necessary. Testing shall be done by an Independent Testing Laboratory. Results shall be immediately sent to Buyer and Engineer for approval.
  8. Visually inspect and operate tap changers to verify satisfactory operation.
  9. Test all wiring and components for continuity and megger for insulation resistance.
  10. Verify operation of heater, auxiliary, convenience outlet, and light circuits.
  11. Verify operation of LTC, LTC controls, and position indicators, including automatic tap changing with Seller-supplied input voltage.
  12. Provide equipment for and perform vacuum filling of transformer with insulating oil in accordance with ANSI C57.12.11.
  13. Disconnect the main core ground and megger the core insulation resistance. Reconnect the ground upon completion of the test.
  14. Perform manufacturer's standard and optional field tests and field test in accordance with ANSI C57 12.11.8-1980, and submit written results of tests performed, including the following:
    - a. Insulation power factor test on all windings and bushings.
    - b. Turn ratio test.
    - c. Insulation and winding resistance test.
    - d. Dielectric absorption test.
    - e. Megger, Ratio, and Polarity test all CT's.
    - f. Additional tests as determined by the manufacturer.

**HIGH VOLTAGE POWER TRANSFORMER**

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Revision Tracking

REV. #	ISSUED	DATE	REV. #	ISSUED	DATE
0	Original Submittal	11.03.23			

**END OF SECTION**



**HIGH VOLTAGE TRANSFORMER DATA SHEET**

**Section 33 7300D - Page 1 of 5**

**1.1 SECTION INCLUDES**

- A. This specification includes the fabrication and delivery and unloading/assembly of power transformers, as required to meet the Contractor’s obligations, as stated in the proposal section of these specifications.

**1.2 WORK CONDITIONS**

- A. The Contractor shall take all necessary precautions and use the appropriate safety work methods for working on energized facilities as may be specified by Federal, State, Local, or other appropriate regulatory authority.

**1.3 TRANSFORMER TECHNICAL INFORMATION**

- A. The chosen supplier shall complete and return the following detailed information with Proposal.

		Base Unit at 65°C Rating	Alternate Unit at 65°C Rating
1.	Guaranteed no-load losses (@ rated voltage and frequency)		
2.	Guaranteed TOTAL losses at each nameplate rating, less auxiliary cooling losses	30 MVA: _____ 40 MVA: _____ 50 MVA: _____	30 MVA: _____ 40 MVA: _____ 50 MVA: _____
3.	Guaranteed exciting current at rated voltage and frequency	_____ _____ _____	_____ _____ _____
4.	Cooler losses (fans/pumps) for each stage of cooling (watts)	_____/_____ _____/_____ _____/_____	_____/_____ _____/_____ _____/_____
5.	Efficiency at 25, 50, 75, 100, 133 and 167% of ONAN ratings	(25%) _____ (50%) _____ (75%) _____ (100%) _____ (133%) _____ (167%) _____	(25%) _____ (50%) _____ (75%) _____ (100%) _____ (133%) _____ (167%) _____
6.	Percent regulation at: 70 percent pf..... 80 percent pf..... 100 percent pf.....	30 MVA: _____ 40 MVA: _____ 50 MVA: _____	30 MVA: _____ 40 MVA: _____ 50 MVA: _____
7.	Exciting current at percent of rated voltage on HV winding: 100 percent..... 110 percent..... 115 percent.....	_____ _____ _____	
8.	Guaranteed percent impedance, on 30MVA ONAN base, for LTC on maximum, neutral and minimum positions: Maximum..... Neutral..... Minimum.....	_____ _____ _____	_____ _____ _____

**HIGH VOLTAGE TRANSFORMER DATA SHEET**

**Section 33 7300D - Page 2 of 5**

9.	Required number of groups of forced cooling equipment		
10.	Guaranteed maximum noise level at each rating in db (based on NEMA-TR1) ONAN ..... db ONAN/ONAF ..... db ONAN/ONAF/ONAF ..... db ONAN/ONAF/OFAF ..... db ONAN/ODAF/ODAF ..... db ONAN/ONAF/ODAF ..... db (Strike enhanced operation configurations that do not apply)	_____ db _____ db _____ db _____ db _____ db _____ db	_____ db _____ db _____ db _____ db _____ db _____ db
11.*	Guaranteed maximum internal corona, microvolts At rated voltage ..... At 115% operating voltage ..... At full induced test voltage .....	_____ _____ _____	_____ _____ _____
12.	Type of core construction (shell or core form)		
13.	Winding Construction – Primary • Helical • Disk • Copper • Other _____	_____	_____
14.	Winding Insulation System 69kV ..... 13.2kV .....	_____ _____	_____ _____
15.	Winding Construction – Secondary • Helical • Disk • Copper • Other _____	_____	_____
16.	Winding Rating – Continuous Circuit MVA (Max.) LTC on max. (raise) kV ..... LTC on neutral (rated) kV ..... LTC on minimum (lower) kV .....	_____ MVA _____ MVA _____ MVA	_____ MVA _____ MVA _____ MVA
17.	State whether transformer will withstand the short circuit conditions specified in the Technical Requirements		
18.	Approximate overall shipping data of transformer (inches): Height ..... Length ..... Width ..... Weight ..... Define Shipping Configuration: HV Bushings _____ ON/OFF	_____ In. _____ In. _____ In. _____ lbs.	_____ In. _____ In. _____ In. _____ lbs.

**HIGH VOLTAGE TRANSFORMER DATA SHEET**

**Section 33 7300D - Page 3 of 5**

	LV Bushings _____ ON/OFF Dielectric _____ Filled / Empty		
19.**	Approximate dimensions of fully assembled transformer (inches): Height (overall) ..... Length ..... Width .....	_____ In. _____ In. _____ In.	_____ In. _____ In. _____ In.
20.	Approximate dimensions of fully assembled transformer (inches): Tank and Fittings ..... Core and Coil ..... Shipping ..... Oil (main tank, radiators & LTC) (weight and gallons)	_____ lbs. _____ lbs. _____ lbs. _____ lbs. / _____ gal.	_____ lbs. _____ lbs. _____ lbs. _____ lbs. / _____ gal.
21.	Proposed manner of shipment: Upright, own cover ..... Upright with shipping cover ..... Upright w/ bushings removed ..... Rail or Truck ..... Other (describe) .....	_____ _____ _____ _____	_____ _____ _____ _____
22.	Maximum top oil temperature rise		
23.	Recommended minimum distance to fire barriers		
24.	LTC Compartment Pressure Withstand Value ..... Vacuum Withstand Value ..... Main Tank Pressure Withstand Value ..... Vacuum Withstand Value .....	_____ psig _____ psig _____ psig _____ psig	_____ psig _____ psig _____ psig _____ psig
25.	Transformer Dielectric Fluid Preservation System • Sealed Tank Blanket Gas ..... • Conservator Tank Sealed ..... Bellows ..... Open to Atmosphere ..... Blanket Gas .....	_____ _____ _____ _____ _____	_____ _____ _____ _____ _____

\*Provide description of proposed test values and test procedures

\*\*Provide sketch with sufficient details to allow design of foundation

**1.4 BUSHINGS**

Function	Manufacturer	Type	Catalog Number	Ratings	Voltage (kV)		Stud Dimensions, Size, Thread
				Current (A)	Nominal (RMS)	BIL (Crest)	
HV Line (69kV)							
LV Line							

**HIGH VOLTAGE TRANSFORMER DATA SHEET**

Section 33 7300D - Page 4 of 5

LV Neutral							
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**1.5 HV BUSHING POTENTIAL DEVICE**

Manufacturer	Type / Style	Catalog Number	RATINGS		Capacity (VA)
			Primary (kV)	Secondary (V)	
			138kV		

**1.6 SURGE ARRESTORS**

Voltage Class	Manufacturer	Catalog Number	Type	MCOV
69kV				
13.2kV – Solidly Grounded				
13.2kV – Resistance Grounded				

**1.7 TESTS:**

- A. The chosen supplier agrees that he will perform all tests as specified.

\_\_\_\_\_

**1.8 TYPE OF FORCED COOLING (ONAF, ONAF/ONAF, ONAF/OFAF or ONAF/ODAF)**

- A. 1st Stage: \_\_\_\_\_
- B. 2nd Stage: \_\_\_\_\_

**1.9 LOAD TAP CHANGER**

Manufacturer	Type / Style	Catalog Number	RATING*		RATED OPERATIONS	
			Voltage	kVA	Before Maintenance	Expected Life

\*Include Manufacturer's Catalog Sheets, all Technical Data, and all Performance Data

**1.10 AUXILIARY POWER REQUIREMENTS**

- A. Voltage: \_\_\_\_\_
- B. Phase: \_\_\_\_\_
- C. Amperes: \_\_\_\_\_
- D. # Circuits: \_\_\_\_\_

**HIGH VOLTAGE TRANSFORMER DATA SHEET**

**1.11 EMERGENCY RATING**

A. Provide information below regarding the maximum permitted emergency rating of the transformer based on the given ambient:

- 1. Ambient Temperature: 41°C
  - a. MVA: \_\_\_\_\_
  - b. Projected Hot Spot Temperature: \_\_\_\_\_°C
  - c. Projected Top of Oil Temperature: \_\_\_\_\_°C
  - d. Calculated Regulation at 90% PF: \_\_\_\_\_V
  - e. Projected Loss of Life: \_\_\_\_\_
  - f. Maximum Recommended Duration: \_\_\_\_\_ hours

Revision Tracking

REV. #	ISSUED	DATE	REV. #	ISSUED	DATE
0	Original Submittal	10.23.23			

**END OF SECTION**

# IRAN DIVESTMENT ACT NOTICE

Tenn. Code Ann. § 12-12-106 requires the chief procurement officer to publish, using credible information freely available to the public, a list of persons it determines engage in investment activities in Iran, as described in § 12-12-105.

For these purposes, the State intends to use the attached list of “Entities determined to be non-responsive bidders/offers pursuant to the New York State Iran Divestment Act of 2012.”

While inclusion on this list would make a person ineligible to contract with the state of Tennessee, if a person ceases its engagement in investment activities in Iran, it may be removed from the list.

If you feel as though you have been erroneously included on this list please contact the Central Procurement Office at [CPO.Website@tn.gov](mailto:CPO.Website@tn.gov).

List Date: May 4, 2022

Source: <https://www.ogs.ny.gov/iran-divestment-act-2012>

1. Ak Makina, Ltd.
2. Amona
3. Bank Markazi Iran  
(Central Bank of Iran)
4. Bank Mellat
5. Bank Melli Iran
6. Bank Saderat Iran
7. Bank Sepah
8. Bank Tejarat
9. China Precision Machinery  
Import- Export Corporation  
(CPMIEC)
10. ChinaOil (China National United  
Oil Corporation)
11. China National Offshore Oil  
Corporation (CNOOC)
12. China National Petroleum  
Corporation (CNPC)
13. Indian Oil Corporation
14. Kingdream PLC
15. Naftiran Intertrade Co. (NICO)
16. National Iranian Tanker Co.  
(NITC)
17. Oil and Natural Gas Corporation  
(ONGC)
18. Oil India, Ltd.
19. Persia International Bank
20. Petroleos de Venezuela  
(PDVSA Petróleo, SA)
21. PetroChina Co., Ltd.
22. Petronet LNG, Ltd.
23. Sameh Afzar Tajak Co. (SATCO)
24. Shandong FIN CNC Machine  
Co., Ltd.
25. Sinohydro Co., Ltd.
26. Sinopec Corp. (China  
Petroleum & Chemical  
Corporation)
27. SKS Ventures
28. SK Energy Co., Ltd.
29. Som Petrol AS
30. Unipet (China International  
United Petroleum & Chemicals  
Co., Ltd.)
31. Zhuhai Zhenrong Co.

# IRAN DIVESTMENT ACT

“By the submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not a person included within the list created pursuant to § 12-12-106.”

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Title: \_\_\_\_\_