

University of Houston Master Specification

<Insert Project Name>

<Insert Issue Name>

<Insert U of H Proj #>

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SECTION 26 1219 – MEDIUM VOLTAGE PAD MOUNTED TRANSFORMERS

Maintain Section format, including the UH master spec designation and version date in the center columns of the header and footer. Complete the header and footer with Project information.

Revise this Section by deleting and inserting text to meet Project-specific requirements.

This Section uses the terms "Architect" and "Engineer." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

Delete hidden text after this Section has been edited for the Project.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
 - 1. The current version of the *Uniform General Conditions for Construction Contracts*, State of Texas, available on the web site of the Texas Facilities Commission.
 - 2. The University of Houston's *Supplemental General Conditions and Special Conditions for Construction*.

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide transformer work as shown, scheduled, indicated, and as specified.
- B. Types: The types of transformers required for the Project include, but are not limited to, oil-filled pad-mounted transformers.

1.3 STANDARDS

- A. Products shall be designed, manufactured, tested, and installed in compliance with the following standards:
 - 1. ANSI C33.4
 - 2. ANSI C57.12
 - 3. ANSI C89.2

1.4 QUALITY ASSURANCE

- A. Manufacturers: Provide products complying with these Specifications and produced by one of the following:
 - 1. Cooper Power
 - 2. General Electric Company
 - 3. Square D Company

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B. UL Label: All transformers shall be UL labeled.

1.5 SUBMITTALS

A. Shop Drawing submittals shall include, but not be limited to, the following:

1. Cut sheets of the transformers with load ratings, sound ratings, and all associated accessories clearly indicated.
2. Include outline and key dimensions of enclosures and accessories; unit weight, voltage, kVA, impedance ratings and characteristics, loss data, sound level, tap configurations, insulation system type and rated temperature rise.
3. Additional information as required in Section 26 0501 "Electrical Basic Materials and Methods."

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Store transformers in a clean and dry space and protect from weather. Handle transformers carefully to avoid damage to material components, enclosure and finish. Use only lifting eyes and brackets provided for that purpose. Damaged transformers shall be rejected and not be installed on Project.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. General: Except as otherwise indicated, provide transformer manufacturer's standard materials and components as indicated by its published product information, designed and constructed as recommended by the manufacturer, and as required for a complete installation.

2.2 OIL-FILLED PAD MOUNTED TRANSFORMERS

A. General: Provide an oil-filled pad mounted transformer, dead front, loop feed, copper windings for building service. Transformer rating shall be as follows:

1. Three phase.
2. Oil-immersed, self-cooled.
3. 60 Hz.
4. 65°C rise.
5. Refer to riser for transformer kVA ratings.
6. Voltage 12,500 volts, delta primary (verify campus distribution voltage prior to ordering).
7. Loop feed.
8. Two 2-1/2% taps above and two 2-1/2% taps below rated voltage.
9. 277/480 volts wye secondary.
10. Copper windings.
11. 95 KV BIL primary
12. 30 KV BIL secondary

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13. Mineral Oil. The transformer tank shall be filled with new virgin hydrocarbon specifically manufactured for electrical insulating oil that has been tested and certified to meet ASTM D3487, Type II.
 14. Transformer overcurrent protection shall be reviewed and approved by Engineer; option selection for a fused or non-fused to be decided during Project design.
 15. 120 Degrees Insulation class 65°C rise over 30° AVG – 40°C max ambient
 16. Lightning Arrestors: Provide transformers with 10 KV primary side lightning arrestors.
- B. Standards: Units shall be constructed in accordance with ANSI Standard C57.12.26 (dead front) (latest revision). All characteristics, definitions, terminology, and voltage designations and tests, except as otherwise specified herein, shall be in accordance with the following American National Standard Requirements, Terminology, and Test Code for Distribution, Power, and Regulating Transformers:
1. General Requirements C57.12.26 (IEEE Standard 462) (latest revision).
Terminal Markings and Connections, C57.12.70 (latest revision).
 2. Terminology, C57.12.80, including Supplement C57.12.80a (latest revision).
 3. Test Code, C57.12.90 (IEEE Standard 262) (latest revision).
- C. The pad-mounted, compartmental-type transformer shall consist of the transformer tank with high- and low-voltage cable terminating compartment. The transformer tank and compartment shall be assembled as an integral unit for mounting on a pad. There shall be no exposed screws, bolts, or other fastening devices which are externally removable. There shall be no openings through which foreign objects such as sticks, rods, or wires might contact live parts. There shall be means for padlocking the compartment door(s). The construction shall limit the entry of water (other than flood water) into the compartment so as not to impair the operation of the transformer.
- D. Full-height, air-filled incoming and outgoing terminal compartments with hinged doors shall be located side-by-side separated by a steel barrier, with the incoming compartment on the left. The high-voltage (incoming) compartment will be accessible only after the door to the low-voltage (outgoing) compartment has been opened. To facilitate making connections and permit cable pulling, the doors and compartment hood shall be removable. Removable door sill on compartments shall be provided to permit rolling or skidding of unit into place over conduit stubs in foundation.
- E. The compartments will have hinged doors equipped for latching in the open position. The high-voltage compartment door will have a fastening device which is accessible only through the low voltage compartment. The hinge assemblies shall be made of corrosion-resistant material with stainless steel hinge pins. Both compartment doors must be capable of being secured with a single padlock. Lifting provisions in accordance with ANSI Standards shall be provided. Jacking and rolling provisions shall be provided.
- F. The instruction nameplate is to be located in the low-voltage portion of the compartment and shall be readable with cables in place. Where the nameplate is mounted on a removable part, the manufacturer's name and transformer serial number shall be permanently affixed to a non-removable part.
- G. Transformer tank shall be sealed-tank construction with a welded main cover. A bolted tamper-resistant handhole shall be provided in the tank cover for access to internal

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connections. Provisions for tank grounding shall be supplied in both the high-voltage and low voltage compartments. There shall be two transformer tank ground connections designed to allow a NEMA two-hole pad to be attached.

- H. Low-voltage bushings shall be tinned plated copper, spade-type with 9/16 inch holes spaced on 1-3/4 inch centers in accordance with the Latest Revisions of ANSI.
- I. The incoming primary section shall be equipped with six 200 amp bushing wells in accordance with ANSI Standard 386 (dead front). Bushing wells shall be provided with parking stands.
- J. The following accessories are to be provided:
 - 1. One inch (1 inch) filling provision.
 - 2. One inch (1 inch) drain provision.
 - 3. Liquid-level indication.
 - 4. Dial Type Thermometer.
 - 5. Pressure Relief valve.
 - 6. Pressure Vacuum Gauge.
 - 7. Protective Undercoating.
 - 8. LV/HV pentahead bolts.
 - 9. Port for nitrogen addition while transformer is still energized.
 - 10. Tubing and transformer oil sample valves shall be provided to allow for a transformer oil sample to be taken without opening or de-energizing the pad mount transformer.
- K. Tap Changer: The tap changer control is for de-energized operation only and must be externally operable with a hot stick and required at least two operator actions to change taps. The preferable location for the control is in the primary compartment.
- L. Lightning Arrestors: Provide transformers with 10 KV primary side lightning arrestors connected with load break elbows to the outgoing bushings.
- M. Testing: Pad-mounted transformers shall be factory-tested in accordance with ANSI Test Code C57.12.90, latest edition.

PART 3 - EXECUTION

3.1 INSTALLATION OF TRANSFORMERS

- A. General: Install transformers where shown, in accordance with the manufacturer's written instructions and recognized industry practices to ensure that the transformers comply with the requirements and serve the intended purposes. Comply with the requirements of NEMA and NEC standards and applicable portions of NECA's "Standard of Installation," for installation of transformers.
- B. Pad-mounted Transformers: Install transformer on a pad with oil retention trough as detailed on the Structural Drawings. Primary, secondary, and metering conduits shall stub up through the pad into the transformer primary and secondary compartments.
- C. Identification and additional information: Refer to Section 26 0501, "Electrical Basic Materials and Methods," Section 26 0553 "Identification for Electrical Systems", and

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Section 26 0519 "Insulated Conductors, Cables, Wires and Terminations" for additional information.

- D. Install grounding bushings on all conduits entering transformer primary and secondary compartments.

3.2 TESTING

- A. Insulation Tests: Prior to energization, check transformer windings for continuity. Test the insulation resistance from primary phase winding to winding, primary winding to secondary winding, secondary phase winding to winding, and from each winding to ground. Tests shall be made with a Biddle Megger or equivalent test instrument at a voltage of not less than 1000 volts DC with readings taken after 30 and 60 seconds of operation at Megger slip speed. Transformers that do not meet or exceed manufacturer's winding insulation resistance specifications shall be replaced and the new transformer shall be re-tested, until an acceptable resistance is obtained.
- B. Winding Current: During initial no-load energization, check current in each primary winding.
- C. Tap Settings: Measure and record load current and voltage of transformers while loaded to verify proper transformer tap settings.
- D. Transformer testing shall be performed per NETA ATS latest revision. Transformer turn to turn, winding resistance, and power factor testing shall be performed prior to energization.
- E. Test Submittals: Contractor shall furnish all instruments and personnel required for tests. Submit four copies of certified test results to Architect and Engineer for review. Reports shall include transformer tested, date and time of tests, tap setting, input and output voltages, primary and secondary winding currents, insulation test results, manufacturer's winding insulation resistance specifications, relative humidity, temperature, and weather conditions.
- F. Notification: Notify Architect and Engineer in writing of any deviation from manufacturer's pre-shipment test data.

END OF SECTION 26 1219