

SECTION 26 12 13 – LIQUID-FILLED MEDIUM VOLTAGE TRANSFORMERS

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.

1.2 SUMMARY

- A. This Section includes the following types of transformers with medium-voltage primaries:
 - 1. Liquid-filled distribution and power transformers that form a part of unit substation assemblies.
 - 2. Stand Alone, Pad-mounted, Liquid-filled transformers.
- B. Related Requirements:
 - 1. Section 26 11 16 "Secondary Unit Substations" for requirements for transformers that form a part of a unit substation.
 - 2. Section 01 91 13 "General Commissioning Requirements" for commissioning requirements.

1.3 DEFINITIONS

- A. NETA ATS: Acceptance Testing Specification.

1.4 ACTION SUBMITTALS

- A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, location of each field connection, and performance for each type and size of transformer indicated.
- B. Material Safety Data Sheet (MSDS) for insulating fluid.
- C. Shop Drawings: Diagram power, signal, and control wiring.
- D. Seismic Performance: Transformer shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 - 1. The term “withstand” means the unit will remain in place without separation of parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event.”

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Floor plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Underground primary and secondary conduit stub-up location.
 - 2. Dimensioned concrete base, outline of transformer, and required clearances.
 - 3. Ground rod and grounding cable locations.

- B. Source quality-control test reports.
- C. Field quality-control test reports.
- D. Follow-up service reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For transformer and accessories to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of transformers and are based on the specific system indicated.
 - 1. Product Selection for Restricted Spaces: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with IEEE C2.
- D. Comply with ANSI C57.12.10, ANSI C57.12.28, IEEE C57.12.70, and IEEE C57.12.80.
- E. Comply with NFPA 70.
- F. Comply with FM Global requirements.
- G. Comply with Using Agency Design Standards.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store transformers protected from weather and so condensation will not form on or in units. Provide temporary heating according to manufacturer's written instructions.

1.9 PROJECT CONDITIONS

- A. Service Conditions: IEEE C37.121, usual service conditions except for the following:
 - 1. Altitudes from sea level to 1000 feet (300 m).
 - 2. Ambient Temperature: Minus 15 to plus 50 deg C.
 - 3. Relative Humidity: 0 to 95 percent.
 - 4. Unusual transportation or storage conditions.
 - 5. Unusual grounding-resistance conditions.
 - 6. Unusual space limitations.

1.10 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate installation of louvers, doors, spill retention areas, and sumps. Coordinate installation so no piping or conduits are installed in space allocated for medium-voltage transformers except those directly associated with transformers.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. All products supplied for this project must comply with the Illinois Procurement of Domestic Products Act (30 ILCS 517).
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Weg Transformers USA.
 - 2. Eaton Cutler-Hammer. (IL)
 - 3.2. Cooper Industries; Cooper Power Systems Division.
 - 4. Square D; Schneider Electric.
 - 5.3. GE Electrical Distribution & Control, GE Consumer & Industrial - Electrical Distribution.

2.2 PAD-MOUNTED, LIQUID-FILLED TRANSFORMERS

- A. Description: ANSI C57.12.13, ANSI C57.12.26, IEEE C57.12.00, for pad-mounted, 2-winding transformers, stainless-steel tank base, cabinet, and sills, typically installed outdoors.
- B. Insulating Liquid: Less flammable, silicone-based dielectric The dielectric coolant shall be listed less-flammable fluid shall be derived from 100% derived from edible seed oils and food grade performance enhancing additives and UL listed as complying with NFPA 70 requirements for fire point of not less than 300 deg C when tested according to ASTM D 92. Liquid shall be FM approved and have low toxicity and be nonhazardous. The dielectric coolant shall be listed less-flammable fluid, 100% derived from edible seed oils and food grade performance enhancing additives and UL listed as complying with NFPA 70 requirements for fire point of not less than 300 deg C when tested according to ASTM D 92. Liquid shall be FM approved and have low toxicity and be nonhazardous.
- C. Insulation Temperature Rise: 65 deg C when operated at rated kVA output in a 40 deg C ambient temperature. Transformer shall be rated to operate at rated kilovolt ampere in an average ambient temperature of 30 deg C over 24 hours with a maximum ambient temperature of 40 deg C without loss of service life expectancy.
- D. Basic Impulse Level: 95 for 15 kV.
- E. Impedance: 3 - 5 . 7 5 % (+/- 7-1/2%).
- F. Full-Capacity Voltage Taps: Four 2.5 percent taps, 2 above and 2 below rated high voltage; with externally operable tap changer for de-energized use and with position indicator and padlock hasp.

G. High-Voltage Switch: Separately mounted 15 kV metal-enclosed fused interrupter switch complying with Section 26 13 00. The primary switching scheme provided with the transformer shall be on-off under-oil load-break switch.

G.H. Winding material shall be copper.

H.I. Surge Arresters: Distribution class, one for each primary phase; complying with IEEE C62.11 and NEMA LA 1; support from tank wall within high-voltage compartment. Externally mounted, Distribution Class M.O.V.E. Dead-front elbow arresters shall be supplied. M.O.V.E. arresters are for installation on 200 A rated dead-front bushing interfaces only.

I.J. High-Voltage Terminations and Equipment: Live front with externally clamped, wet process, porcelain bushings and cable connectors suitable for terminating primary cable. The high voltage bushings shall be 15KV, 200A bushing wells with bushing well inserts installed. The bushings shall be externally removable and be supplied with a removable stud.

J.K. Accessories:

1. Drain Valve: 1 inch (25 mm), with sampling device.
2. Dial-type thermometer.
3. Liquid-level gage.
4. 1 inch upper filter press and filling plug.
5. Pressure-vacuum gage.
6. Pressure Relief Device: Self-sealing with an indicator.
7. ANSI tank grounding provisions shall be furnished in both compartments.

2.3 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Division 26 Section "Identification for Electrical Systems."

2.4 SOURCE QUALITY CONTROL

A. Factory Tests: Perform design and routine tests according to standards specified for components. Conduct transformer tests according to IEEE C57.12.90, for liquid filled transformers.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for medium-voltage transformers.

B. Examine roughing-in of conduits and grounding systems to verify the following:

1. Wiring entries comply with layout requirements.
2. Entries are within conduit-entry tolerances specified by manufacturer and no feeders will have to cross section barriers to reach load or line lugs.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

- D. Verify that ground connections are in place and that requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install pad mounted transformers on concrete bases designed by the Structural Engineer.
- B. Install transformers on minimum 4-inch high concrete housekeeping pads.
 - 1. Anchor transformers to concrete pads according to manufacturer's written instructions and requirements in Division 26 Section "Hangers and Supports for Electrical Systems."
 - 2. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 03 Sections.
 - 3. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- C. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and NFPA 70.

3.3 IDENTIFICATION

- A. Identify field-installed wiring and components and provide warning signs as specified in Division 26 Section "Identification for Electrical Systems."

3.4 CONNECTIONS

- A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- C. Verify tightness and torque all accessible bolted electrical connections to manufacturer's specified values using a calibrated torque wrench. Provide a list of all torqued connections and values.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing transformers but before primary is energized, verify that grounding system at substation is tested at specified value or less.
 - 2. After installing transformers and after electrical circuitry has been energized, test for compliance with requirements.

3. Perform visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

D. Test Reports: Prepare written reports to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective actions taken to achieve compliance with requirements.

3.6 FOLLOW-UP SERVICE

A. Infrared Scanning: Perform as specified in Division 26 Section "Medium-Voltage Switchgear."

PART 4 - CONTRACTOR'S QUALITY CONTROL REQUIREMENTS

4.1 GENERAL

A. Comply with applicable provisions of division 01 Section "Quality Requirements" for requirements for Contractor's Quality Control Program.

END OF SECTION 26 12 13