MEDIUM-VOLTAGE TRANSFORMER SPECIFICATIONS

PART 1 - GENERAL

1.01 SUMMARY:

A. Work in this section includes furnishing the following: Furnish labor, materials, equipment, and incidentals necessary to design, manufacture, fabricate, test and deliver transformers meeting the following specifications:

B. Furnish Equipment suitable for operation on 12,470-volt line-to-line, 3-phase, 4-wire, solidly grounded neutral systems.

1.02 SUBMITTALS REQUIRED WITH BID:

A. Submit sufficient information to determine compliance with these specifications. Identify submittal data with the specific equipment tags and/or service descriptions to which they pertain. Submittal data shall be clearly marked to identify the specific model numbers, options, and features of equipment and work proposed.

B. Submit required product data and shop drawings specific to each product and accessory proposed including:

a. Standard cabinet, tank, and pad dimensions including the space available for conduit based on kVA rating.
b. Device description.
c. Product data sheet.
d. Bills of material.
e. Short circuit withstandability of equipment, bus and lowest rated device.

C. Submit sufficient information to determine manufacturer's qualifications based on requirements described in section 1.05(B).

1.03 SUBMITTALS 30 DAYS AFTER RECEIPT OF ORDER:

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. Shop Drawings:

a. Arrangement and outline drawings including the space available for conduit.
b. Installation drawings.
c. Device description.
d. Product data sheet.
e. Bills of material.
f. Spare parts list.
g. Factory test report.
h. Nameplate schedule.
i. AC Three-line diagrams.
j. AC Schematic diagrams.

Wiring diagrams: Show both power and control wiring, including external connection terminals.

Protective device coordination curves: Provide all time current characteristic curves for all possible fuses and settings in PDF format and hard copy.

k. Complete rating.

Short circuit with standability of equipment, bus and lowest rated device.

l. Instruction books.

C. Operation and Maintenance Manuals:

a. Submit manuals with instructions for installation, adjustment, operation and maintenance of the equipment.

b. Maintenance Data: For each type of product include in operation and maintenance manuals all features and operating sequences.

Manuals shall be prepared by the equipment manufacturer and shall also incorporate appropriate final certified shop drawings, and test data. Manuals may be the manufacturer's standard instructions but shall be supplemented as necessary to cover any special features not included in the standard material.

D. Qualification Data: For testing agency.

E. Source quality-control test reports.

1.04 QUALITY ASSURANCE:

Product Options: Drawings indicate size, profiles, and dimensional requirements of transformers and are based on the specific system indicated.

Manufacturer Qualifications: The Manufacturer shall be a firm engaged in the manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of ten years.

The manufacturer shall have a valid ISO 9001 certification and an applicable quality assurance system that is regularly reviewed and audited by a third-party registrar. Manufacturing, inspection, and testing procedures shall be developed and controlled under the guidelines of the quality assurance system.

a. The manufacturer or their representative shall have service, repair, and technical support services available 24 hours 7 days a week basis.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Handle equipment carefully to prevent internal components damage, breakage and denting and scarring the enclosure finish, in accordance with manufacturer's recommendations.

B. Protect from dirt, fumes, water, construction debris and physical damage.

C. Transformers shall be shipped FOB to Clemson University, Clemson SC, to a campus destination as directed by Owner.

1.06 PROJECT CONDITIONS:

Service Conditions: IEEE C57.12.00, usual service conditions.

PART 2 - PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with IEEE C2.

C. Comply with ANSI C57.12.10, ANSI C57.12.28, IEEE C57.12.34, IEEE C57.12.70, IEEE C57.12.80 and IEEE C57.12.90.
D. Comply with NFPA 70.

2.02 PAD-MOUNTED, LIQUID-FILLED TRANSFORMERS – THREE-PHASE:

A. Description: ANSI C57.12.13, IEEE C57.12.34, IEEE C57.12.00, pad-mounted, 2-winding transformers suitable for 3-phase, 4-wire multi-point grounded system.
B. Insulating Liquid: Less flammable, edible-seed-oil based, and UL listed as complying with NFPA 70 requirements for fire point of not less than 300ºC when tested according to ASTM D92. Liquid shall be biodegradable and nontoxic.
C. Insulation Temperature Rise: 65ºC when operated at rated kVA output in a 40ºC ambient temperature. Transformer shall be rated to operate at rated kilovolt ampere in an average ambient temperature of 30ºC over 24 hours with a maximum ambient temperature of 40ºC without loss of service life expectancy.
D. Basic Impulse Level: 95 kV.
E. Full-Capacity Voltage Taps: Four 2.5% 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.
F. High-Voltage Switches: 600A, make-and-latch rating of 15kA RMS, symmetrical, arranged for loop feed with 3-phase, ON-OFF, gang-operated, load-break switches that are oil immersed in transformer tank with hook-stick operating handle in primary compartment. Three individual switches configured to open and close the transformer connection and each loop connection to the common bus, all separately switched. Four position rotary switches will not be accepted.
G. Primary Fuses: 15-kV fuse assembly with fuses complying with IEEE C37.47
    1. Bay-O-Net Dual Sensing Fuse in Series with Parallel Current Limiting Fuse. Bay-O-Net fuses are to be externally replaceable with a hot stick without opening the transformer tank. Fuse interrupting rating of 25kA RMS.
H. Primary Winding Terminations and Equipment: Dead front with integral bushings suitable for 600A deadbreak elbow connectors, complying with IEEE 386. **Lowest bushing shall be a minimum of 25" high on center.** Six bushings total.
    1. Surge Arresters: Provide six distribution class, complying with IEEE C62.11 with each transformer. Dead-front, deadbreak elbow-type, metal-oxide-varistor units. Rating 10kV, 8.4kV MCOV.
I. Secondary Winding Terminations and Equipment: Live front with spade terminals and cable connectors suitable for terminating secondary cable. Quantity of holes in each spade terminal as indicated. Terminals equipped with 10-hole or more spades shall be furnished with additional support. A manufacturer designed support shall be attached at the end that is the farthest from the tank wall and mounted in such a way that it will not interfere with the use of any of the holes of the spade.
J. Termination cabinet depth: Specified depth where indicated.
K. Sound level may not exceed sound levels listed in NEMA TR 1.
L. Accessories:

    1. Drain Valve: 1 inch, with sampling device, located on the primary side.
    2. Dial-type thermometer.
    3. Liquid-level gage.
    4. Pressure-vacuum gage.
    5. Pressure Relief Device: Self-sealing with an indicator.
    6. Alarm contacts for gauges and thermometer listed above.
M. Finish Color: Munsell #7.0GY3.29/1.5 green.

2.03 IDENTIFICATION DEVICES:

Nameplates: Engraved, laminated-plastic or metal nameplate for each transformer, mounted with corrosion-resistant screws.

2.04 SOURCE QUALITY CONTROL:

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

A. Factory Tests: Perform the following factory-certified tests on each transformer:

1. Resistance measurements of all windings on rated-voltage connection and on tap extreme connections.
2. Ratios on rated-voltage connection and on tap extreme connections.
3. Polarity and phase relation on rated-voltage connection.
4. No-load loss at rated voltage on rated-voltage connection.
5. Excitation current at rated voltage on rated-voltage connection.
6. Impedance and load loss at rated current on rated-voltage connection and on tap extreme connections.
7. Applied potential.
8. Induced potential.

2.05 WARRANTY

A. The manufacturer shall warrant products against defects in material and workmanship for a minimum of 12 months from the date of commissioning or a minimum of 18 months from the date of shipment – whichever comes first. During the warranty period the manufacturer shall repair or replace defective products. The warranty shall exclude normal wear and tear under normal usage and any damage caused by abuse, modification, or improper maintenance by entities other than the manufacturer or its approved representative.