

ITEM OPPORTUNITY SYNOPSIS

Scouting Number:	2024-217
Name of the item to be scouted:	Pad-mounted Liquid Filled Transformer
State item to be used in:	Vermont
Describe the Item:	
Please describe the item application/the end use of the item.	Medium voltage transformer step down to building utilization voltage to serve the new proposed building.
Supplier Information:	
Type of Supplier Being Sought (select from the list below):	
Manufacturer	x
Contract Manufacturer	
Distributor	
Other (Please Specify)	
Reason for Scouting Submission (select from the list below)	
2nd Supplier	
Price	
Re-Shore	
Past supplier no longer available	
New Product Startup	
BABA	x
Other (Please Specify)	
Summary of Technical Specifications and Performance Requirements:	
Describe the manufacturing processes (elaborate to provide as much detail as possible)	The transformer cores are laminated magnetic metals that have circular windings made out of copper wires. The transformer is then impregnated with insulating material. Then as one unit it is submerged into an enclosure that consists of less-flammable fluid and sealed to avoid any material leakage. The transformer exterior enclosure is painted to withstand outdoor climate.
Provide dimensions / size / tolerances / performance specifications of the item	Transformer shall be rated for 750kVA. 15kV-208/120V wye-wye type. Refer to specification section 263210 for MV transformer information.
List required materials needed to make the product, including materials of product components, if applicable	Transformer has cores made out of laminated soft iron or ferrite material, copper wire windings, fabricated sheet metals for enclosure, less-flammable fluid such as (RTEMP Fluid, Envirottemp FR3, or equivalent), and conservator or radiators to dissipating heat.
Are there applicable certification requirements?	
Yes	x
No	
Please explain:	ISO 9001 UL Other ANSI, ASTM, ADA, AEIC, CSA, IEEE, EEI, EPA, FM, FCC, FIPS Pub 94, ICEA, IBC, IEC, IECC, OSHA, NEC, NESC, NEMA, NFPA
Are there any applicable regulations that apply to the production of this item?	
Yes	x
No	
Please explain:	See provided specifications 263210 (1.1) (B.) APPLICABLE STANDARDS for more information.
Are there any other standards / requirements?	
Yes	
No	x
Please explain:	
NAICS CODES:	
NAICS 1	335311 Power, distribution, and specialty transformer manufacturing
NAICS 2	
Additional Comments:	
Additional technical comments:	

Volume and Pricing:	
Estimated Potential Business Volume (i.e. #units per day, month, year):	1 MV Transformer is needed for this project
Estimated Target Price/Unit Cost Information:	\$100,000/unit
Delivery Requirements:	
When is it needed by? (Immediate, 30 days, 6 months, etc.)	Construction is scheduled to start in February of 2025.
Describe packaging requirements (i.e. individually/group packaging, etc.)	Palletized
Where will this item be shipped?	Norwich University, Northfield, VT
Additional Comments:	
Is there other information you would like to include?	Contact information for questions including BABA/Buy American compliance: Jones Architecture Alya Staber alya@jonesarch.com Please copy scouting@nist.gov on all correspondence.

SECTION 263210

DISTRIBUTION TRANSFORMERS

PART 1 – GENERAL

1.1 GENERAL

A. This specification pertains to the requirements for:

1. A DOE 2016 rated, three-phase loop-feed fused distribution transformer, pad mounted; rated 750 KVA with a primary voltage of 4160/2400 volts and a secondary voltage of 208Y/120 volts.

B. Applicable Standards: The standards listed below form a part of this specification to the extent referenced. Contractor shall conform to the latest editions of the following standards, unless otherwise specified herein:

1. Military Specification (Mil. Spec.):

MIL-P-28641	Primer Coating, Vinyl Chloride-Acetate Copolymer, High-Build (For Steel and Masonry)
-------------	---

2. American National Standards Institute (ANSI) Publications:

C2	National Electric Safety Code
C57.12.26	Pad-Mounted Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers, Separable Insulated High-Voltage Connectors; High-Voltage 34,500 GRDY/19920 Volts and Below; 2500 KVA and Smaller.
Z35.1	Specifications for Accident Prevention Signs

3. American Society for Testing and Materials (ASTM) Publications:

D 92	Test Method for Flash and Fire Points by Cleveland Open Cup
D 117	Test Method for Electrical Insulating Oils of Petroleum Origin
D 877	Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes
D 3487	Standard Specification for Mineral Insulating Oil Used in Electrical Apparatus

4. Institute of Electrical and Electronic Engineers Inc. (IEEE) Publication:

386	Separable Insulated Connectors for Power Distribution Systems Above 600 V
-----	--

5. National Electrical Manufacturer's Association (NEMA) Publication:

LA 1	Surge Arresters
------	-----------------

6. National Fire Protection Association (NFPA) Publication:

70	National Electrical Code
----	--------------------------

- C. Acceptable Manufacturers: Subject to compliance with requirements in this specification, provide pad mounted transformers as manufactured by:
1. Eaton (Cooper Power Systems)
 2. ABB/GE
 3. Square D
- D. Submittals:
1. Product data:
 - a. Transformer: Submit manufacturer's technical product data including rated KVA, frequency, primary and secondary bus material, primary and secondary voltages, percent taps, no-load and full-load losses in watts, % impedance at 85°C, hot-spot and average temperature rise at 30°C ambient temperature, sound level in decibels and standard published data.
 2. Time current curves: Submit manufacturer time current curves for the transformer primary fuse.
 3. Transformer evaluation: Submit manufacturer loss data for standard loss and low-loss transformers.
 4. Shop drawings: Submit manufacturer's drawings and specifications stamped, signed and certified for construction, showing all transformer dimensions, mounting details and electrical connections. In addition, the vendor shall provide technical documents relating to the manufacturer's recommended installation, adjustment operation and maintenance procedures for all equipment supplied.
 - a. 750 KVA pad-mounted, three-phase.
 5. No equipment shall be delivered to Norwich University that has not been approved through the submittal process.
 6. Certifications: Provide manufacturer's certification that all applicable products were manufactured in United States and meet the requirements of the Build America, Buy America Act (BABA) (part of Infrastructure Investment and Jobs Act).

PART 2 – PRODUCTS

2.1 DISTRIBUTION PAD-MOUNTED COMPARTMENTAL-TYPE TRANSFORMER

- A. The unit shall contain the transformer, loop-feed switches, and separate compartments in a drip-proof weather-resistant, tamper-resistant enclosure, arranged for pad-locking. The transformer shall be Factory Mutual Approved Code Listed and Labeled, designed in accordance with the requirements of ANSI/IEEE C57.1200 and labeled by Factory Mutual Research Corporation as meeting the requirements of FMRC Approval Standard Class 3990, insulated with FM approved less-flammable fluid (R-Temp or Envirotemp FR3) all in compliance with the NEC Sections 110-3 and 450-23. High-voltage and low-voltage compartments shall be isolated from each other in a manner to require a separate unlatching or unbolting action to give access to the high-voltage compartment.

2.2 TRANSFORMER

- A. DOE 2016 rated, dead-front, loop-feed, two position loadbreak switching, containing less-flammable liquid, self-cooled type, three-phase, two winding, five-legged core, 60 Hz, 65 deg. C rise, low-voltage 208/120 volt wye secondary, high-voltage 4160/2400 volt wye primary, with two

2-1/2 percent full capacity taps above and below rated primary voltage, copper primary and secondary windings, rated KVA capacity shall be 750. Provide external tap changing for de-energized operation only. Basic impulse level shall be 60 KV for the primary, and 30 KV for the secondary. Impedance shall be standard or less, with a minimum impedance of 5.18 percent. Provide lifting lugs.

- B. Tank Construction: Transformer tank shall be sealed except for bolted handhole access.

2.3 REQUIREMENTS

- A. All units shall meet the requirements of ANSI C57.12.00-1980 or latest revision, NEMA TR1-1980 or latest revision, and all other applicable IEEE, NEMA, and/or ANSI Standards unless otherwise indicated.
- B. All units shall be liquid-filled, Class OA, 60-cycle, 65EC rise. Liquid in all units shall be the less-flammable type (RTEMP Fluid, Envirotemp FR3, or equivalent).
- C. The manufacturer's warranty or guarantee policy in writing shall be submitted to the Owner.
- D. The pad-mounted cabinet shall meet the security requirements of W.U.C. Guide 2.13.
- E. The transformer enclosure must undergo an eight-stage pretreatment process, three-step epoxy powder coat finish, or undercoat the underside of the transformer enclosure including the steel base and the lowest 1 inch on the sides of the cabinet with a 4-mil thickness of a corrosion-resistant mastic-type undercoating material.
- F. Transformer enclosure shall be designed to prevent water from dripping or splashing on the high voltage and low voltage components.
- G. No labels or decals shall be attached to the outside of the transformer.
- H. Enclosure: Enclosure shall be constructed in accordance with ANSI C57.12.26. Provide manufacturer's standard green Munsell finish.
 - 1. The nameplate shall comply with ANSI C57.12.26. In addition, the number of gallons of coolant shall be shown as well as weight. The transformer impedance, month and year of manufacture shall be readily visible on the nameplate. The nameplate shall also indicate that the transformer does not contain PCBs. In addition, a separate "non-PCB" label shall be affixed to the transformer on the inside of the secondary compartment.
 - 2. The nameplate shall be readily visible and affixed to the transformer on the inside of the door of the secondary compartment, as a minimum.
 - 3. The transformer shall have an additional nameplate with the FM approval mark specifying the following data: Tank Pressure rating, Fuse Part Number, Pressure relief device part number, and requirements particular to the installation.
- I. Tank Construction: Liquid-immersed transformer shall have a totally sealed bolted or welded cover. Transformer tank rupture strength shall be a minimum of 15 psi.
- J. Five-legged core or equivalent design.
- K. Ground pads shall be provided for the transformer in both the low and high voltage compartments. Ground pad connectors shall be capable of accepting #4/0 AWG bare copper ground cable.

- L. The transformer tank shall be provided with a pressure relief device to vent internal over-pressures. The device must be capable of venting a minimum specified flow rate, based on the KVA of the transformer per the table in Section 2.3.3 of the FMRC Standard.
- M. Transformer shall be equipped with an externally operable manual tap changer for de-energized operation. Taps shall be two 2-1/2 percent above and two 2-1/2 percent taps below rated primary voltage.
 - 1. Provide the no-load tap changer operating handle in the primary compartment. The tap settings shall be clearly visible upon opening the primary compartment door.
- N. Primary Switching: Provide three-phase two-position primary oil-immersed loadbreak switches located within the transformers as indicated on the transformer one-line drawings. Two separate loadbreak switches are required for each transformer. Switches must be gang-operated for hook-stick operation. Interlock the transformer load-break switch with the fuse holders. The on-off positions shall be clearly labeled. Minimum switch ratings shall be 15 KV, 200 amps continuous current, 60 KV BIL, and 10,000 amps symmetrical for momentary fault close.
- O. Units shall be supplied with externally clamped bushings to allow external replacement.
- P. Provide Bay-O-Net under oil fusing in series with Current limiting ELSP fusing for the 4160 V primary. The transformer primary circuit shall have over-current protection which limits the I2T let-through to a specified maximum value, based on the table in Section 2.3.5 of the FMRC standard.
- Q. Surge Arresters: Provide metal oxide distribution-type, insulated arresters, rated 3 KV for transformer protection at the primary voltage of 4160 VAC wye, mounted and directly connected to the high-voltage winding inside the transformer tank. Arresters shall meet or exceed the requirements of the latest edition of ANSI C26.1 and NEMA LA1.
- R. Secondary terminals 600 V and less shall be NEMA 4-hole or 6-hole spade-type.
- S. Transformer Accessories: Provide the accessories listed below:
 - 1. Exterior drain and sampling valves (in lockable box).
 - 2. Filter-press connections.
 - 3. Ground pads in each enclosure compartment.
 - 4. Provisions for lifting and jacking.
 - 5. Pressure-vacuum gauge.
 - 6. Pressure-relief device.
 - 7. Primary connected no-load tap changer.
 - 8. Two primary two-position gang operable load break switches.
 - 9. Primary overcurrent protection on the transformer.
 - 10. Three phase two-piece bushings.
 - 11. Low-voltage phase spade bushings 1.2 KV class.
 - 12. Low-voltage neutral spade bushing 1.2 KV class.
 - 13. Transformer nameplate.
 - 14. Under-oil primary surge arresters.
 - 15. Parking stands, one for each bushing.
 - 16. Magnetic liquid level gauge.
 - 17. Liquid dial-type thermometer.
 - 18. One spare set of primary 4160V fuses.
- T. Time current characteristic curves shall be provided for all transformer protective device(s).

U. Test Reports:

1. Manufacturer shall provide certified test reports in accordance with ANSI C57.12.26.
2. All loss data for no-load losses and full-load losses.

PART 3 – EXECUTION

3.1 DELIVERY SCHEDULE

- A. All transformers purchased for the Contract shall be guaranteed to be on site at Norwich University by the date agreed upon with the owner, for installation during the scheduled outage period.

3.2 INSPECTION

- A. Contractor must examine areas and conditions under which power distribution transformers and ancillary equipment are to be installed, and notify Owner in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until satisfactory conditions have been corrected in a manner acceptable to the Owner.

3.3 INSTALLATION OF TRANSFORMERS

- A. Install transformers as indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NESC, NEMA, ANSI and IEEE standards, and in accordance with recognized industry practices to ensure that products fulfill requirements.
- B. Coordinate transformer installation work with site work.
- C. Connect transformer unit to electrical wiring system; comply with requirements of the Owner.
- D. Provide clearances between transformer locations and adjacent structures, as indicated on the Drawings.
- E. Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486A and B, and the NEC.

3.4 GROUNDING

- A. Connect the transformer ground pads to the existing local grounding system. Existing system impedance shall be 10 ohms or less in accordance with the National Electrical Code (NEC). Engineer shall be contacted and a course of action determined if the existing grounding system does not meet NEC requirements.

PART 4 – TESTING

4.1 TESTING

- A. Prior to energizing of transformers, check all accessible connections for compliance with manufacturer's torque tightening specifications.

- B. Prior to energization, check circuitry for electrical continuity, for short-circuits and measure the winding resistance. Record the winding resistance of each winding.
- C. Upon completion of the transformer installation, energize the primary circuitry at rated voltage and frequency from the normal power source and test the transformer, including, but not limited to, audible sound levels and the secondary voltage to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units or components, and proceed with retesting.
- D. Field Tests and Inspections:
 - 1. Acceptance Checks, Setting and Tests: Perform in accordance with the manufacturer's recommendations and the latest IEEE standards. Perform work in a careful and safe manner so as not to endanger personnel or equipment.
 - 2. Acceptance Checks and Test: Shall include, but not be limited to the following:
 - a. Compare actual connections with wiring diagrams. If differences are found, determine if error is in diagram or in actual wiring and correct as necessary.
 - b. Inspect all devices, equipment, etc., for damage or maladjustment caused by shipment or installation.
 - c. Assure that tightness of bolted connections are in accordance with manufacturer's recommendations (use calibrated torque wrench).
 - d. Remove wedges, ties and blocks installed by the manufacturer to prevent damage during the shipment.
 - e. Verify minimum resistance to ground of all grounding systems.
 - 3. Transformer test: Test transformer secondary voltages and adjust the voltage at the transformers to provide a secondary voltage of 208Y/120 volts, in accordance with the transformer nameplate.
 - 4. Follow-up verification: Upon completion of all acceptance checks, setting and tests, the Contractor shall show by demonstration in service at the final acceptance that all circuits and devices are in good operating condition and properly performing their intended function. Test shall be such that each item will perform its function not less than three (3) times. As an exception to requirements that may be stated elsewhere in the contract, the Owner shall be given ten (10) working days' advance notice of the dates and times for all checks, settings and tests. Certified copies of all test results shall be provided to the Owner.

END OF SECTION

Energy Efficient Medium Voltage Transformers

2016 Department of Energy Compliance



On April 18, 2013 the United States Department of Energy (DOE) issued its final ruling on transformer efficiency for liquid-filled and dry-type distribution transformers. The ruling impacts single phase (10 kVA to 833 kVA) and three phase (15 kVA to 2,500 kVA). Distribution transformers manufactured in, or imported into the U.S. and its territories on or after January 1, 2016 are required to comply with the new DOE standards.

Schneider Electric medium voltage transformers provide the solution to help end users to comply with this DOE ruling. Our commitment is for you to meet DOE compliance, improve energy efficiency, and create a positive impact on the environment by updating to our energy efficient products.



Make the most of your energySM

by Schneider Electric



Features and Benefits

- > Improved energy efficiency
 - Decreased operating costs equal increased profits
- > Less heat generated
 - Lower A/C and ventilation costs/requirements if located indoors
- > Lower total ownership costs over the life of the transformer

Environmental Impact

According to the DOE (10 CFR Part 431), these new standards provide significant benefits to the nation.

- > Saves 2.74 quads (1,015 BTUs) of energy over 29 years
 - Equivalent to energy used in 27 million U.S. households in a single year
 - Eliminates the need for six new 400 MW power plants
- > Reduces greenhouse gas emission by approximately 238 million tons of CO₂
 - Equivalent to removing 80% of all light vehicles for one year

Medium Voltage Transformers

Power Cast™ II



Liquid-Filled Pad-Mounted



Liquid-Filled Substation



Power Dry II



Schneider Electric meets your needs.

As a sustainable corporation committed to national energy conservation, Schneider Electric™ supports higher energy efficiency standards and regulations. We construct medium voltage distribution transformers designed to achieve the maximum improvement in energy efficiency that DOE demands. With decades of experience meeting DOE established challenges, we have developed expertise on this compliance. Furthermore, we understand the impact this change has on you, and are committed to use our technology and material supply management expertise to meet your needs in 2016 and beyond.

New Medium Voltage Transformer Efficiencies

Single phase

kVA	Liquid-Filled	Dry-Type		
		BIL*		
		20 – 45 kV efficiency (%)	46 – 95 kV efficiency (%)	≥ 96 kV efficiency (%)
10	98.70	—	—	—
15	98.82	98.10	97.86	—
25	98.95	98.33	98.12	—
37.5	99.05	98.49	98.30	—
50	99.11	98.60	98.42	—
75	99.19	98.73	98.57	98.53
100	99.25	98.82	98.67	98.63
167	99.33	98.96	98.83	98.80
250	99.39	99.07	98.95	98.91
333	99.43	99.14	99.03	98.99
500	99.49	99.22	99.12	99.09
667	99.52	99.27	99.18	99.15
833	99.55	99.31	99.23	99.20

Get Ready!

DOE standards
effective date:
January 1, 2016

Three phase

kVA	Liquid-Filled	Dry-Type		
		BIL*		
		20 – 45 kV efficiency (%)	46 – 95 kV efficiency (%)	≥ 96 kV efficiency (%)
45	98.92	98.10	97.86	—
75	99.03	98.33	98.13	—
112.5	99.11	98.52	98.36	—
150	99.16	98.65	98.51	—
225	99.23	98.82	98.69	98.57
300	99.27	98.93	98.81	98.69
500	99.35	99.09	98.99	98.89
750	99.40	99.21	99.12	99.02
1,000	99.43	99.28	99.20	99.11
1,500	99.48	99.37	99.30	99.21
2,000	99.51	99.43	99.36	99.28
2,500	99.53	99.47	99.41	99.33

*BIL - basic impulse insulation level
Note: All efficiency values are at 50% of rated load.

Schneider Electric USA

1415 S. Roselle Road
Palatine, IL 60067
Tel: 847-397-2600
Fax: 847-925-7500
www.schneider-electric.com/us