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LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:

1. Two-Winding Transformers
2. Two-Winding Transformers Rated for Nonlinear Loads

1.2 RELATED SECTIONS

- A. Contents of Division 26, Electrical and Division 01, General Requirements apply to this Section.

1.3 REFERENCES AND STANDARDS

- A. References and Standards as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. UL 1561: Dry-Type General Purpose and Power Transformers.

1.4 SUBMITTALS

- A. Submittals as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

1.5 QUALITY ASSURANCE

- A. Quality assurance as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

B. In addition, meet the following:

1. Production test each unit according to NEMA Standard 20.

1.6 WARRANTY

- A. Warranty of materials and workmanship as required by Section 26 00 00, Electrical Basic Requirements and Division 01, General Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Eaton

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- B. ABB/General Electric
- C. Siemens
- D. Schneider Electric/Square D
- E. Or approved equivalent.
- F. Basis of Design: Schneider Electric/Square D. Manufacturers listed are allowed on condition of meeting specified conditions including available space for equipment and Code required working clearances. Remove and replace equipment installed that does not meet these conditions at no cost to Owner.

2.2 TWO-WINDING TRANSFORMERS

- A. Description: Factory assembled, air cooled dry type transformer. Efficiency compliant with Federal Code 10 CFR Part 431 and DOE 2016 efficiency requirements. NEMA TP-1 efficiency levels are not acceptable.
- B. Primary Voltage: 480 volts, 3 phase.
- C. Secondary Voltage: 208Y/120 volts, 3 phase.
- D. Windings: Copper.
- E. Insulation system and average winding temperature rise for rated kVA as follows:
  - 1. 1-15 kVA: Class 220 with 115 degrees C rise.
  - 2. 16-500 kVA: Class 220 with 115 degrees C rise.
- F. Maximum Winding Temperature: Do not exceed 30 degrees C rise above 40 degrees C ambient at warmest point at full load.
- G. Winding Taps:
  - 1. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.
  - 2. Transformers 15 kVA and Larger: NEMA ST 20.
- H. Conductor Termination Lugs: Mechanical.
- I. Sound Levels: NEMA ST 20.
- J. Basic Impulse Level: 10 kV.

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- K. Impedence: 3 to 5 percent, unless otherwise noted on drawings. Minimum reactance 2 percent.
- L. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- M. Mounting:
  - 1. 1-15 kVA: Suitable for wall mounting.
  - 2. 16-75 kVA: Suitable for wall mounting.
  - 3. Larger than 75 kVA: Suitable for floor mounting.
- N. Coil Conductors: Continuous windings with terminations brazed or welded.
- O. Transformer Enclosure: NEMA ST 20.
  - 1. Interior: Type 1.
  - 2. Exterior: Type 3R.
  - 3. Ventilated.
  - 4. Provide lifting eyes or brackets.
- P. Isolate core and coil from enclosure using vibration-absorbing mounting pads.
- Q. Nameplate: Reference Section 26 05 53, Identification for Electrical Systems.

2.3 TWO-WINDING TRANSFORMERS RATED FOR NONLINEAR LOADS

- A. Description: Factory assembled, air cooled dry type transformer. K-4 rated, per UL 1561. Efficiency compliant with Federal Code 10 CFR Part 431 and DOE 2016 efficiency requirements. NEMA TP-1 efficiency levels are not acceptable. NEMA Premium or CSL3 compliant transformers are acceptable.
- B. Primary Voltage: 480 volts, 3 phase.
- C. Secondary Voltage: 208Y/120 volts, 3 phase.
- D. Windings: Copper.
- E. Core Flux Density: Below saturation at 10 percent primary overvoltage.
- F. Insulation and Temperature rise: Class 220 insulation system with 115 degrees C average winding temperature rise. 150 degrees C rise is not acceptable.

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- G. Case Temperature: Do not exceed 30 degrees C rise above ambient at warmest point at full load.
- H. Winding Taps:
  - 1. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.
  - 2. Transformers 15 kVA and Larger: NEMA ST 20.
- I. Sound Levels: NEMA ST 20.
- J. Basic Impulse Level: 10 kV.
- K. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- L. Mounting:
  - 1. 1-15 kVA: Suitable for wall mounting.
  - 2. 16-75 kVA: Suitable for wall mounting.
  - 3. Larger than 75 kVA: Suitable for floor mounting.
- M. Coil Conductors: Continuous windings with terminations brazed or welded. Individually insulate secondary conductors and arrange to minimize hysteresis and eddy current losses at harmonic frequencies. Size secondary neutral conductor at twice secondary phase conductor ampacity.
- N. Electrostatic Shield: Copper, between primary and secondary windings.
- O. Impedance Range: 3 to 5 percent. Minimum reactance 2 percent.
- P. Transformer Enclosure: NEMA ST 20.
  - 1. Interior: Type 1.
  - 2. Exterior: Type 3R.
  - 3. Ventilated.
  - 4. Provide lifting eyes or brackets.
- Q. Isolate core and coil from enclosure using vibration-absorbing mounting pads.
- R. Nameplate: Include transformer connection data.

LOW-VOLTAGE TRANSFORMERS

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set transformers plumb and level.
- B. Use flexible conduit, 2-foot minimum length with slack, for connections to transformer case. Make conduit connections to side panel of enclosure.
- C. Mount wall-mounted transformers using integral flanges or accessory brackets furnished by manufacturer. Mount to allow a minimum of 6-feet, 6-inches headroom below unit.
- D. Mount trapeze-mounted transformers as indicated.
- E. Provide seismic restraints.
- F. Provide grounding and bonding in accordance with Section 26 05 26, Grounding and Bonding of Electrical Systems.
- G. Clearance: Minimum 6-inches clear on sides and back. Front clearance per NEC 110.26. Maintain minimum clearance from combustible materials per NEC. Comply with manufacturers recommendations.
- H. Exterior Installations: Weather resistant enclosure.
  - 1. Provide 8-inches diameter by 24-inches (above and below grade) concrete filled steel bollards where subject to vehicular traffic.
  - 2. Where grouped with switchgear refinish as required so that transformers and switchgear match in color.
- I. Unacceptable Humming and Noise Levels: Revise installation as required to achieve a noise level less than or equal to those defined in NEMA ST-20 for associated transformer size or replace with a new unit with an acceptable sound level.
- J. Stacked Transformer Support: Unistrut structure to support transformers shown on Drawings to be stacked above another transformer. Also provide sheet metal heat diversion shield between stacked transformers. Install shield at an angle as not to trap heat.
- K. Provide Concrete Housekeeping Pad:
  - 1. Interior Pads: Extend pad 4-inches beyond transformer width and depth dimensions. Top of pad minimum 3-inches above finish floor. Install pad plumb and level.



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2. Exterior Pads: Provide concrete pads of 2,500 to 3,000 PSI concrete reinforced with 8 gauge wire fabric or No. 6 reinforcing bars on 12-inch centers. Provide 10-inch thick base of gravel below pad for support. Pad extends 6-inches on all sides from exterior most prominent dimension. Provide 3/4-inch by 10-foot ground rod at each corner bonded to No. 2 AWG bare copper grounding conductor, bonded to transformer and concrete reinforcement.
3. Housekeeping pads provided under provisions of Division 03, Concrete.
- L. Provide equipment nameplates per Section 26 05 53, Identification for Electrical Systems.
- M. Provide arc flash labels per Section 26 05 73, Electrical Distribution System Studies.

3.2 FIELD QUALITY CONTROL

- A. Perform field inspection, testing, and adjusting.
- B. Perform inspections and tests listed in accordance with manufacturers requirements. In addition including following:
  1. Perform turns ratio tests at tap positions.
  2. Verification that as-left tap connections are as specified.
  3. Perform excitation-current tests on each phase.
  4. Measure resistance of each winding at each tap connection.
  5. Overpotential test on high- and low-voltage windings-to-ground.
- C. Check for damage and tight connections prior to energizing transformers.

3.3 ADJUSTING

- A. Measure primary and secondary voltages and make appropriate tap adjustments.

3.4 TESTING

- A. Reference Section 26 08 05, Electrical Acceptance Testing.

END OF SECTION