SECTION 26 22 10
DRY TYPE TRANSFORMERS

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Two winding transformers
- B. Two-winding transformers rated for nonlinear loads
- C. Shielded Transformers

1.2 REFERENCES
- A. NEMA ST 1 - Specialty Transformers
- B. NEMA ST 20 - Dry Type Transformers for General Applications
- C. NFPA 70 - National Electrical Code

1.3 SUBMITTALS FOR REVIEW
- A. Section 01 33 00 - Submittals Procedures for submittals.
- B. Product Data: Provide outline and support point dimensions of enclosures and accessories, unit weight, voltage, KVA, and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.
- C. Test Reports: Indicate the loss data efficiency at 25, 50, 75, and 100 % rated load and indicate the sound level.
- D. Submit manufacturer's installation instructions.
  1. Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements.
  2. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.4 DELIVERY, STORAGE, AND HANDLING
- A. Section 01 60 00 - Material Equipment and approved equals, transport, handle, store, and protect products.
- B. Store in a clean, dry space
  1. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle in accordance with manufacturer's written instructions.
  1. Life only with lugs provided for that purpose.
  2. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 TWO-WINDING TRANSFORMERS
- A. Manufacturers:
  1. Square D
  2. Cutler Hammer
  3. General Electric
  4. Substitutions: Under provisions of Section 01 60 00
- B. NEMA ST 20 factory-assembled air-cooled dry type transformers, shown on the drawings
- C. Primary Voltage: 480 volts, 3 phase
- D. Secondary Voltage: 208/120 volts, 3 phase
- E. Insulation system and average winding temperature rise for rated KVA as follows:
  1. 1-15 KVA: Class 185 with 115°C rise

2. 16-500 KVA: Class 220 with 80°C rise
3. Transformers shall not depend on mechanical ventilation to maintain required temperatures due to heat rise (transformers with integral fans are not allowed.)

F. Case temperature: Do not exceed 35°C rise above ambient at warmest point at full load.
G. Winding Taps:
1. Transformers less than 15 KVA: Two-5% below rated voltage, full capacity taps on primary winding.
2. Transformers 15 KVA and Larger: NEMA ST 20.
H. Sound Levels: Maximum sound levels are as follows:
1. 1-5 KVA: 40 dB
2. 6-25 KVA: 45 dB
3. 26-150 KVA: 50 dB
4. 151-225 KVA: 55 dB
5. 226-300 KVA: 55 dB
6. 301-500 KVA: 60 dB
I. Basic Impulse Level for 10 kV for transformers shall be less than 300 KVA, 30 kV for transformers 300 KVA and larger.
J. Ground core and coil assembly to enclosure by means of a visible flexible copper-grounding strap.
K. Mounting:
1. 1-15 KVA: Provide unit suitable for wall mounting.
2. 16-75 KVA: Provide unit suitable for wall, floor, or trapeze mounting.
3. Larger than 75 KVA: Suitable for floor or trapeze mounting.
L. Coil Conductor: Continuous windings with terminations brazed or welded.
M. Enclosure: Use a NEMA ST 20 Type 1 or Type 3R ventilated or non-ventilated.
N. Isolate core and coil from enclosure using vibration-absorbing mounts.
O. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.
P. Transformers shall meet the energy efficiency standards requirements of NEMA Standard TP-1.

2.2 TWO-WINDING TRANSFORMERS RATED FOR NONLINEAR LOADS
A. Manufacturers:
1. Square D
2. Cutler Hammer
3. General Electric
4. Substitutions: Under provisions of Section 01 60 00
B. Description: NEMA ST 20, factory-assembled, air-cooled, dry type transformers, ratings as shown on the drawings, designed to supply a 100% nonlinear load as noted on the drawings.
C. Primary Voltage: 480 volts, 3 phase
D. Secondary Voltage: 208Y/120 volts, 3 phase
E. Core Flux Density: Below saturation at 10% primary over voltage
F. Insulation and temperature rise:
1. Provide a class 220 insulation system with 80°C average winding temperature rise.
2. Transformers shall not depend on mechanical ventilation to maintain required temperatures due to heat rise (transformers with integral fans are not allowed.)
G. Case temperature: Do not exceed 35°C rise above ambient at its warmest point at full load.
H. Winding Taps:

1. Transformers less than 15 KVA: Two 5% below rated voltage, full capacity taps on primary winding.
2. Transformers 15 KVA and Larger: NEMA ST 20.

I. Sound Levels: NEMA ST 20, Maximum sound levels are as follows:
1. 1-5 KVA: 40 dB
2. 6-25 KVA: 45 dB
3. 26-150 KVA: 50 dB
4. 151-225 KVA: 55 dB
5. 226-300 KVA: 55 dB
6. 301-500 KVA: 60 dB

J. Basic Impulse Level for 10 kV for transformers shall be less than 300 KVA, 30 kV for transformers 300 KVA and larger.

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, floor, or trapeze mounting
3. Larger than 75 KVA: Suitable for floor or trapeze mounting

M. Coil Conductor:
1. Continuous windings with terminations brazed or welded.
2. Individually insulate secondary conductors and arrange to minimize hysteresis and eddy current losses at harmonic frequencies.
3. Size the secondary neutral conductor at twice the secondary phase conductor ampacity.

N. Electrostatic Shield: Use copper between primary and secondary windings.

O. Enclosure:
1. Use a NEMA ST 20 Type 1 or Type 3R ventilated or non-ventilated.
2. Provide lifting eyes or brackets.

P. Isolate core and coil from enclosure using vibration-absorbing mounts.

Q. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.

R. Transformers shall meet the energy efficiency standards requirements of NEMA Standard TP-1.

2.3 SHIELDED TRANSFORMERS

A. Manufacturers:
1. Square D
2. Cutler Hammer
3. General Electric
4. Substitutions: Under provisions of Section 01 60 00

B. Description: Use NEMA ST 20 factory-assembled air-cooled dry type transformers, with ratings as shown on the drawings.

C. Primary Voltage: 480 volts, 3 phase.

D. Secondary Voltage: 208Y/120 volts, 3 phase.

E. Insulation system and average winding temperature rise for rated KVA as follows:
1. 10-15 KVA: Class 185 with 115°C rise
2. 16-500 KVA: Class 220 with 150°C rise
3. Transformers shall not depend on mechanical ventilation to maintain required temperatures due to heat rise (transformers with integral fans are not allowed.)

F. Case temperature: Do not exceed 50°C rise above ambient at warmest point at full load.

G. Winding Taps:
   1. Transformers less than 15 KVA: Two 5% below rated voltage, full capacity taps on primary winding.
   2. Transformers 15 KVA and Larger: NEMA ST 20.
H. Sound Levels: NEMA ST 20 Maximum sound levels are as follows:
   1. 1-5 KVA: 40 dB.
   2. 6-25 KVA: 45 dB.
   3. 26-150 KVA: 50 dB.
   4. 151-225 KVA: 55 dB.
   5. 226-300 KVA: 55 dB.
   6. 301-500 KVA: 60 dB.
I. Basic Impulse Level for a 10 KV for transformers shall be less than 300 KVA, 30 kV for transformers 300 KVA and larger.
J. Ground core and coil assembly to enclosure with visible flexible cooper grounding strap.
K. Winding Shield: Electrostatic, with separate insulated grounding connection.
L. Mounting:
   1. 1-15 KVA: Suitable for wall mounting
   2. 16-75 KVA: Suitable for wall, floor, or trapeze mounting
   3. Larger than 75 KVA: Suitable for floor or trapeze mounting
M. Coil Conductors: Continuous windings with terminations brazed or welded.
N. Enclosure:
   1. Use a NEMA ST 20 Type 1 or Type 3R ventilated or non-ventilated.
   2. Provide lifting eyes or brackets.
O. Isolate core and coil from enclosure using vibration-absorbing mounts.
P. Nameplate: Include transformer connection data.
Q. Transformers shall meet the energy efficiency standards requirements of NEMA Standard TP-1.

2.4 ALTERNATIVE SYSTEM
A. Transformers combined with integrated power distribution system containing switchboard, panel boards, transformers, transient voltage-surge suppression devices (TVSS), and other electrical equipment will be acceptable.

PART 3 EXECUTION

3.1 INSTALLATION
A. Set transformer plumb and level.
B. Use flexible conduit, under the provisions of Section 26 05 33, 2' minimum length, for connections to transformer case.
   1. Make conduit connections to side panel of enclosure.
C. Mount wall-mounted transformers using integral flanges or accessory brackets furnished by the manufacturer.
D. Mount floor-mounted transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure.
E. Mount trapeze-mounted transformers as indicated.
F. Provide grounding and bonding in accordance with Section 26 05 26.

3.2 FIELD QUALITY CONTROL
A. Check for damage and tight connections prior to energizing transformer.
B. Measure primary and secondary voltages and make appropriate tap adjustments.

C. Provide disconnecting means, for the primary, adjacent to power transformer.
D. Provide power transformers with a grounding bar attached to the enclosure for all grounding conductors.

END OF SECTION