1. GENERAL

1.01 SECTION INCLUDES

.1 Materials and components for dry type transformers up to 600 V primary, equipment identification and transformer installation.

1.02 REFERENCES

.1 ANSI/ASHRAE/IES Standard 90.1-2013 – Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 CSA Group:

.1 CSA C22.1:21, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Ontario Electrical Safety Code (28th edition/2021).

.3 CSA C22.2 No. 47-13 (R2018), Air-cooled transformers (dry type).

.4 CSA C9-17, Dry-type transformers.

.5 CSA C802.2-18, Minimum Efficiency Values for Dry-Type Transformers.

.3 IEEE C57.110-2018, IEEE Recommended Practice for Establishing Liquid-Immersed and Dry-Type Power and Distribution Transformer Capability When Supplying Nonsinusoidal Load Currents: this standard defines how K-factor is calculated.

.4 National Electrical Manufacturers Association (NEMA):

.1 NEMA ST-20-2014, Dry-Type Transformers for General Applications: sound levels.

.5 NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment (published by the International Electrical Testing Association).

.6 Ontario Building Code and its referenced standards.

.7 UL 1561, Standard for Dry-Type General Purpose and Power Transformers.

1.03 ACTION SUBMITTALS

.1 Product Data: Provide outline and support point dimensions of enclosures and accessories, unit weight, voltage, power, and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.

1.04 INFORMATIONAL SUBMITTALS

.1 Test Reports: Indicate loss data, efficiency at 25, 50, 75, and 100 per cent rated load, and sound level.

.2 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.

1.05 CLOSEOUT SUBMITTALS

.1 Record actual locations of transformers in project record documents.

.2 Document test results from NETA ATS.

.3 Copies of completed factory reports and testing reports.

1.06 DELIVERY, STORAGE, AND HANDLING

.1 Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from potential damage from weather and construction operations.

.2 Store so condensation will not form on or in the transformer housing and if necessary, apply temporary heat where required to obtain suitable service conditions. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

.3 Handle to manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

.4 Handle transformer using proper equipment for lifting and handling, use when necessary lifting eye, and/or brackets provided for that purpose.

1.07 WARRANTY

.1 The transformer shall carry a 1 year warranty from the time of substantial performance.

2. PRODUCTS

2.01 GENERAL

.1 Transformers shall be standard general purpose dry type unless otherwise indicated on drawings as K-Rated or Harmonic Mitigation type.

.2 Use transformers of one manufacturer throughout project and in accordance with CSA C22.2 No. 47 and CSA C9.

2.02 MANUFACTURERS

.1 Manufacturer List:

.1 Bemag.

.2 Delta Transformer.

.3 Eaton.

.4 Hammond.

.5 Powersmiths.

.6 Rex Power Magnetics.

.7 Siemens.

.8 Schneider Electric.

.9 STI.

.2 [Substitutions: permitted if approved by the Consultant prior to Tender closing date.]

2.03 REGULATORY REQUIREMENTS

.1 Products: Listed and classified by CSA (Canadian Standards Association).

.2 Efficiency ratings:

.1 Meet or exceed the efficiency levels indicated in CSA C802.2-12, and ASHRAE 90.1-2013, Table 8.4.4.

2.04 GENERAL PURPOSE TRANSFORMERS

.1 NEMA ST-20, factory-assembled, air cooled low-inrush dry type transformer, ratings and voltages as indicated on drawings.

.2 Single or three phase as indicated on drawings.

.3 Type: AN/AA ventilated self-cooled.

.4 Copper windings.

.5 Finish: Final coating to be ANSI 61 Grey Epoxy Powder.

.6 T-connected transformers are not acceptable.

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

.8 Impedance: standard (3% to 5% nominal for up to 75 kVA, 4% to 6% for transformers 112.5 kVA and greater).

2.05 [K-FACTOR RATED TRANSFORMERS]

.1 Provide where indicated on drawings.

.2 K-Factor Rating: Transformers shall be K-Factor 7, 13, or higher rated and comply with UL 1561 requirements for non-sinusoidal load current-handling capability to the degree defined by designated K-factor.

.1 Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.

.2 Indicate value of K-factor on transformer nameplate.

2.06 [HARMONIC MITIGATING TRANSFORMERS]

.1 Provide where indicated on drawings.

2.07 PRIMARY VOLTAGE

.1 600 V delta, 3 phase;

2.08 SECONDARY VOLTAGE

.1 120/208 V, 3 phase wye.

2.09 INSULATION SYSTEM AND AVERAGE WINDING TEMPERATURE RISE

.1 1-15 kVA: Class 185 with [150°C] rise.

.2 16-500 kVA: Class 220 with [150°C] rise.

.3 Above 500 kVA: Class 220 with [150°C] rise.

2.10 CASE TEMPERATURE

.1 Limits in accordance with CSA C22.2 No. 47.

2.11 WINDING TAPS

.1 To NEMA ST-20.

.2 Four full capacity 5 per cent adjustment taps, 2 at 2.5 per cent FCBN (full capacity below nominal) and 2 at 2.5 per cent FCAN (full capacity above nominal).

2.12 BASIC IMPULSE LEVEL

.1 10 kV BIL.

2.13 GROUNDING

.1 Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.

2.14 MOUNTING

.1 1-15 kVA: suitable for wall mounting.

.2 16-75 kVA: suitable for wall, or floor, as shown.

.3 Larger than 75 kVA: suitable for floor mounting.

2.15 COIL CONDUCTORS

.1 Continuous windings with terminations brazed or welded.

2.16 ENCLOSURE

.1 NEMA ST-20, CSA type 2 ventilated, sprinkler-proof. Provide lifting eyes or brackets.

.2 CSA type 3R for outdoor locations.

2.17 CATCHER/DRIP BASE PLATE

.1 Constructed from galvanized steel sheet metal having the minimum thickness as that of the transformer's enclosure.

.2 To be provided for all transformers that are wall mounted, or suspended off the floor.

2.18 SOUND LEVELS

.1 To NEMA ST-20 for transformers up to 300 kVA:

.1 Up to 9 kVA: 40 dB.

.2 10 – 50 kVA: 45 dB.

.3 51 – 150 kVA: 50 dB.

.4 151 – 300 kVA: 55 dB.

.2 Sound levels 3 dB less than NEMA ST-20 for transformers 301 kVA and greater:

.1 301 – 500 kVA: 57 dB.

.2 501 – 700 kVA: 59 dB.

.3 701 – 1000 kVA: 61 dB.

.4 Above 1000 kVA: 3 dB less than NEMA ST-20.

2.19 NAMEPLATE

.1 Transformer shall have embossed aluminum or stainless steel nameplate indicating, but not restricted to the following:

.1 kVA rating.

.2 Voltage rating.

.3 Impedance.

.4 Type.

.5 Insulation class.

.6 Temperature rise.

.7 Connection diagram.

.8 Serial number.

2.20 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 53.

2.21 SOURCE QUALITY CONTROL

.1 Production test each unit according to NEMA ST-20.

3. EXECUTION

3.01 INSTALLATION

.1 Mounting:

.1 Mount dry type transformers up to 75 kVA, on floor, wall, or suspended from celling, as indicated on plans.

.2 Maintain clear space as described in 2021 OESC Rule 2-312.

.3 Mount dry type transformers rated above 75 kVA on floor.

.4 For wall mounted transformers, provide rubber-in-shear isolation mounts above bracket-supported rails secured from the wall.

.5 For ceiling mounted transformers, provide trapeze hangers and provide rubber-in-shear isolation mounts.

.6 Where a transformer is wall mounted or suspended off the floor, provide a metal catcher/drip base plate, and bolt to the bottom of the transformer below the base channel to conform to CSA C22.2 No. 47. Install in accordance with transformer manufacturer's instructions and recommendations.

.7 Mount floor mounted transformers on concrete housekeeping pads, minimum 100 mm (4") thick, and extending a minimum of 150 mm (6") beyond the footprint of the transformer.

.8 Mount vibration isolating pads suitable for isolating the transformer noise from the building structure in accordance with Section 26 05 48.13.

.2 Set transformer plumb and level.

.3 Use flexible conduit, under the provisions of Section 26 05 33.13, 600 mm minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

.4 Provide grounding and bonding to Section 26 05 26.

.5 Ensure adequate clearance around transformer for ventilation.

.6 Install transformers in level upright position.

.7 Remove shipping supports only after transformer is installed and just before putting into service.

.8 Loosen isolation pad bolts until no compression is visible.

.9 Make primary and secondary connections in accordance with wiring diagram.

.10 Energize transformers after installation is complete.

3.02 FIELD QUALITY CONTROL

.1 Section 01 43 00: Field Inspection, Testing, Adjusting.

.2 Perform inspections and tests listed in NETA ATS, Section 7.2.

3.03 ADJUSTING

.1 Measure primary and secondary voltages and make appropriate tap adjustments.

End of Section