

## **1. HIGH VOLTAGE DEADFRONT PADMOUNT**

### **1.1 Description**

- .1 Provide one transformer to transform primary [\_\_\_\_] kV three (3) phase supply voltage to main secondary distribution voltage of [\_\_\_\_] V, three (3) phase, four (4) wire.
- .2 The transformers shall be totally enclosed and shall be suitable for outdoors installation.

### **1.2 Codes and Standards**

- .1 The transformers are to be designed, manufactured and tested in accordance with the latest editions of the applicable Canadian Standards Association (CSA), Electrical and Electronic Manufacturer's Association of Canada (EEMAC), American National Standards Institute (ANSI), Institute of Electrical and Electronic Engineers (IEEE), National Electrical Manufacturers Association (NEMA) and International Electrotechnical Commission (IEC) Standards.

### **1.3 Related Work**

- .1 General Electrical Requirements:

### **1.4 Source Quality Control**

- .1 The Contractor shall implement a quality assurance program in accordance with ISO 9001:2000.

### **1.5 Inspections and Factory Tests**

- .1 The transformer shall be inspected at each stage of manufacture in accordance with the Manufacturer's Quality Assurance Program and shall be completely assembled in the works. All deficiencies shall be corrected before shipment.
- .2 Each transformer shall be completely factory tested and the results certified, proving the performance of the units to provide capacities as listed in these Specifications.
- .3 The following tests shall be performed in accordance with CSA C88:
  - .1 Resistance measurements of all windings.
  - .2 Ratio test at rated connection and on all taps.
  - .3 Polarity and phase relation tests.
  - .4 Audible sound level tests. (Type Test)
  - .5 No-load loss at rated voltage and losses at 25%, 50%, 75%, and 100% load.
  - .6 Exciting current at rated voltage.

- .7 Impedance and load loss test.
- .8 Laboratory test of insulating liquid.
- .9 Applied potential test.
- .10 Induced potential test.
- .11 Impulse tests: Primary & Secondary (Type Test)
- .12 Pressure test.
- .13 Dissipation factor test.
- .14 Heat run, temperature rise tests on one of each design of transformer. (Type Test)

The above heat run tests and impulse tests may be witnessed by the Customer. Submit test certificate to the Customer.

- .4 Carry out following insulation tests using megger with 20,000 megohm scale and resulting insulation resistance corrected to base of 20°C:
  - .1 High voltage to ground with secondary grounded for duration of test.
  - .2 Low voltage to ground with primary grounded for duration of test.
  - .3 High to low voltage.
- .5 Inspect primary and secondary connections for tightness and for signs of overheating.
- .6 Inspect and clean bushings and insulators.
- .7 Check oil level and temperature indicators.
- .8 Set transformer taps to rated voltage as specified.
- .9 Inspect for oil leaks and excessive rusting.
- .10 Inspect for oil level.
- .11 Check for grounding and neutral continuity between primary and secondary circuits of transformer.

## **1.6 Shop Drawings**

- .1 Submit Shop Drawings for Pad Mount [ ] kV Transformer.

.2 Contractor shall submit the following information within eight (8) weeks of receipt of order:

- .1 Outline Drawings showing shipping and installed weights.
- .2 Requirements for transformer pad; pad dimensions; openings for cable entry.
- .3 Detail Drawings indicating compliance with this and other Specifications.
- .4 Dimensioned positions of mounting devices.
- .5 Dimensioned positions of terminations.
- .6 Insulating liquid capacity.
- .7 Transformer grounding pad location.

**1.7 Maintenance Data**

- .1 Provide maintenance data for liquid cooled transformers for incorporation into an Instruction & Maintenance Manual.
- .2 Include insulating liquid maintenance data.

**1.8 Maintenance Materials**

- .1 Provide recommended Spare Parts List.

**1.9 Delivery and Storage**

- .1 Ship the transformer completely assembled and oil filled suitably protected from damage during transportation.

**1.10 Manufacturer**

- .1 The transformer shall be manufactured by Partner Technologies Incorporated of Regina, Saskatchewan.

**1.11 Ratings**

- .1 Type: liquid insulated, self-cooled:

Phase	Three (3)
Cycles	60 Hz +/- 1Hz
Capacity kVA	[ ] kVA
Cooling	naturally cooled (ONAN)
Winding Temperature Rise	65°C measured by resistance
Insulation	Class A
Primary Voltage	[ ] kV delta
Secondary Voltage	[ ] volts wye
Primary Impulse Level	[ ] kV BIL
Secondary Impulse Level	[ ] kV BIL

Noise Level	[ ] dBA
No Load Watts Loss	refer to CSA C802.3-01
Max Impedance	[ ]%
Primary Taps Above Normal	2 – 2.5% full capacity
Primary Taps Below Normal	2 – 2.5% full capacity
Off circuit Tap selection shall be by manually operated with position indicator and suitable for padlocking in all tap positions.	

### **1.12 Transformer Characteristics**

- .1 Transformers: To CSA C88.1.
- .2 The transformer shall be liquid filled, naturally cooled (ONAN) of the sealed tank design, complete with integral radiators.
- .3 Primary Voltage: [ ] kV, 60 Hz, Delta connected, three (3) phase.
- .4 Secondary Voltage: [ ] V, wye connected, three (3) phase, four (4) wire.
- .5 Capacity: [ ] kVA.
- .6 Transformer windings shall be copper. Coils shall be circular construction. Core steel shall be mitred step-lap design.
- .7 Impedance: [ ]%; on ONAN base rating.
- .8 No load losses not to exceed CSA C802.3-01.
- .9 Full load losses not to exceed CSA C802.3-01.
- .10 A tamper resistant HV enclosure shall be mounted on the front and enclose the HV bushings. The doors shall be secured with penta headed bolts.
- .11 The secondary winding shall be wye connected. The neutral of the transformer shall be brought out and shall be suitable for grounding. The LV bushings will be housed in a tamper resistant enclosure.

### **1.13 Mounting**

- .1 The transformer shall be suitable for outdoor installation and all iron or steel fasteners shall be rust-proofed or galvanized in accordance with CSA standards.
- .2 The base of the transformer shall be suitable for mounting on a flat slab type foundation and suitable for skidding or rolling in any direction.

### **1.14 Voltage Taps Off Circuit**

- .1 Four (4)-2.5% taps, two (2)-FCAN, two (2)-FCBN.

**1.15 Tap Changer**

- .1 Off-circuit type with external operating handle with locking facilities and nameplate with markings to show tap voltages as actual voltages.

**1.16 Sealed Tank**

- .1 Provide adequate capacity for the maximum increase in oil volume due to thermal expansion between extreme operating temperatures. Fill space with nitrogen prior to shipment.
- .2 The tank shall be fabricated from welded steel plate suitable to with stand full vacuum. All welding shall be in accordance with CSA W47.1 and CSA W57 standards.

**1.17 Transformer Insulating Liquid**

- .1 Mineral oil meeting CSA C50

**1.18 Primary Bushings**

- .1 Three high voltage bushings shall be deadfront Pfisterer type suitable for Pfisterer connex separable connectors.
- .2 Primary bushings shall be enclosed in a tamper resistant termination box with adequate space provided for termination of incoming power cables.

**1.19 Secondary Bushings**

- .1 Bushings to be suitable for connecting secondary cable using ANSI 386 bushing wells or one piece bushings complying with deadfront construction.
- .2 Low voltage neutral bushing suitable for cable connection and suitably rated, will be brought out to a live front bushing in the LV compartment.
- .3 Secondary terminals shall be enclosed in a tamper resistant termination box that permits connection of incoming cables.
- .4 The secondary neutral is to be solidly grounded.

**1.20 Tamper Resistant Gauge Box**

- .1 Provide a tamper resistant gauge box with hinged door and three point latching padlockable handle. The box is to be easily accessible from ground level.

**1.21 Exterior Finish**

- .1 All exterior surfaces of the transformer shall be grit blasted clean, all foreign materials to be removed prior to powder paint application. The exterior shall be powder painted or coated and finished with one (1) coat zinc primer and one (1) final powder coat minimum dry. Color [            ]

- .2 Provide four (1) can of spray paint for touch-up after installation.

**1.22 Accessories**

- .1 The transformer shall be provided with all standard accessories as required by CSA Standard CAN3-C88.
- .2 Filter press connection.
- .3 Liquid Celsius temperature measuring devices, maximum indicating type, dial size 100 mm.
- .4 Liquid level gauge.
- .5 Pressure-vacuum gauge.
- .6 Bi-directional skid base.
- .7 Liquid drain valve, one (1) inch bronze with sampling valve.
- .8 Pressure relief device with an operating pressure of eight (8) PSI, self re-sealing complete with hood deflector and directed pipework inside HV kiosk enclosure.
- .9 Anodized aluminum nameplate and connection diagram.
- .10 Ground pads, two (2) stainless steel complete with two (2) taped holes NEMA spaced.
- .11 Ground studs and lugs.
- .12 Bolted sealed cover.
- .13 Four (4) heavy duty lifting lugs suitable for securing the transformer for transportation.

**END OF SECTION**