



**.1 General**

- .1 Dry type medium voltage transformers shall be designed and included in the primary unit substation. The transformer shall be rated for 115,00kV and 25,000kV primary but connected to and fused for 15,000kV.
- .2 The unit shall be kept heated and dry to prevent moisture and dampness from penetrating transformer.

**.2 Shop Drawings**

- .1 Shop drawings shall include:
  - .1 Dimensioned drawing showing enclosure, mounting devices, terminals, taps, internal and external component layout.
  - .2 Technical data shall include kVA rating, primary and secondary voltages, frequency, three phase, polarity or angular displacement, full load efficiency, regulation at unity pf, BIL, insulation type, and sound rating.

**.3 Control Submittals**

- .1 Submit to [Department Representative] [Consultant] [6] copies of standard factory test certificates of each transformer and type test of each transformer in accordance with CSA C9.

**.4 Transformer Characteristics**

- .1 Transformer shall be as follows:
  - .1 Type: 3-phase, dry type natural air ventilated, ANN (T type or Scott connection type not acceptable).
  - .2 Rating: [300] kVA
  - .3 Voltages: Primary: 25000 V delta.
  - .4 Secondary: 120/208 V wye, solidly grounded.
  - .5 Frequency: 60 Hz
  - .6 Coil Winding Material: Copper
  - .7 Insulation Class: Class H (Class 220 system) non-hygroscopic, VIP type
  - .8 Impedance: Approximately 6.0% at 135°C.
  - .9 Voltage Taps: 4 full capacity taps, 2½% each, 2 above and 2 below rated voltage.
  - .10 Sound Level: Maximum 68 dB when installed on vibration isolators within enclosure at ANN rating.
  - .11 Voltage Class: 15 kV
  - .12 BIL: 95 kV
  - .13 Max. Full Load Temperature Rise: 115°C average temperature rise for the windings measured by resistance when operating continuously at full load in 40°C maximum ambient.
  - .14 Max. Magnetizing Inrush Current: 12 times rated full load current.
- .2 Provide a ventilated formed sheet-steel enclosure with bolted removable sides compatible with enclosures of adjacent cubicles. Enclosure panels shall be well braced and reinforced to prevent vibration. Provide transformer with "coil-face taps" behind a hinged locked door key-interlocked with the transformer primary disconnecting device such that it is impossible to open the door with the switch closed. Identify the door as to function and affix thereto a nameplate with detailed connection diagram, key-interlocks, and instructions for tap-changing.
- .3 Provide for transformer an enclosure-mounted thermometer and a thermostat having its temperature-sensing element affixed to the core and coil assembly in such a way as to best



- sense the winding temperature. Remote current actuated sensing devices are not acceptable. Set the thermostat to operate main fusible load interrupter shunt trip mechanism and a remote bell when the temperature reaches 100% of this rating. Wire via identified terminals in the control cubicle section of the low voltage switchboard for extension by others to remote Building Alarm Panel/Building Automation System.
- .4 Insulation panels on the interior of transformer enclosures shall be provided if necessary to maintain electrical clearances.
  - .5 Provide flexible connections between transformer and high voltage and low voltage bus bars.
  - .6 Each transformer shall have vibration dampers placed between core/coil and structural members.
  - .7 Provide terminal board, tap changing links, and suitable solderless connections.
  - .8 Mount transformer core and coil assemblies on vibration isolators and restrain with Mason Industries Type 'Z1011' snubbers.
  - .9 Special additional features shall be as follows:
    - .1 All terminations shall use a minimum of 2 bolts.
    - .2 All connections shall be made from flat bus bar for solid bolting (clamped round rod not allowed).
    - .3 Solid material shall be used for coil end blocks.
    - .4 All bus bars shall be fully insulated.
    - .5 All bus bar mounting hardware shall include Belleville washers.
    - .6 All non-conductor mounting shall have 2 lock nuts.
  - .10 Transformers shall be supplied with a copper grounding pad at the base.
  - .11 Nameplate shall be installed on transformer clearly showing the following information:
    - .1 Manufacturer's name.
    - .2 Transformer serial number and year of manufacture.
    - .3 Rated kVA.
    - .4 Rated high and low voltage levels.
    - .5 Rated frequency.
    - .6 Connection diagram and physical terminal markings.
    - .7 Percentage impedance at rated voltage.
    - .8 Temperature rise (or total temperature).
    - .9 Insulation class.
    - .10 HV BIL.
    - .11 Voltage tap data.
    - .12 Total weight of transformer.
  - .12 Transformer shall be manufactured and tested (production tests) in accordance with CSA C9-M1981 incorporating modifications as specified herein. Submit production test reports.
  - .13 Transformer shall be manufactured by Square D, Hammond Manufacturing Co. Ltd., Canadian General Electric Co. Ltd., ABB Inc., Skyway, Magnetek-Polygon, Tracon Engineering, or approved equal subject to compliance with these specifications.
  - .14 Transformer manufacturers listed above as well as all manufacturers requesting approval during the tender period must submit the following information pertaining to total losses (iron, copper, and other miscellaneous losses) no later than 10 days prior to tender closing. The figures shall include transformer enclosure losses:
    - .1 No load.



- .2 25% load.
- .3 50% load.
- .4 75% load.
- .5 100% load.

**.5 Enclosure**

- .1 Fabricated from sheet steel.
- .2 Bolted removable panels for access to tap connections, enclosed terminals [fan brackets] [fans] [other accessories].
- .3 Conductor entry:
  - .1 Knockouts.
  - .2 Potheads.
  - .3 Junction boxes.
  - .4 Bushings.
  - .5 Clamping rings.
  - .6 Entry for [busbars] [cable].

**.6 Accessories**

- .1 Winding temperature detector relay and sensing elements two sets of SPDT contacts.
- .2 Wiring and terminal box for protective devices.
- .3 Digital type winding temperature indicator with alarm contacts.
- .4 Fans for forced air cooling, [\_\_\_] V, [\_\_\_] phase, 60Hz, with thermostat control.
- .5 Grounding terminal: inside of enclosure.

**.7 Field Quality Control**

- .6 Energize transformers and apply incremental loads:
  - .1 0% for 4 hours.
  - .2 10% for next 1 hour.
  - .3 25% for next 2 hours.
  - .4 50% for next 3 hours.
  - .5 Full load.
  - .6 At each load change, check temperatures ambient, enclosure and winding.
  - .7 Adjust cooling fan controls if required.