Section 16620
Dry Type, Computer Grade Transformer Specification

1.0 General Requirements

1.01 Scope

A. Furnish factory assembled Computer Grade Transformer in accordance with the contract documents and the following specification with all elements to conform to all relevant standards of manufacturing and construction, including but not limited to ANSI C57.110-1986, UL-506, NEMA ST-20, UL-1561, CSA Standards, NEC and all relevant local codes.
   A. Work of this section, as shown or specified shall be in accordance with the requirements of the contract documents.
   B. The bidder shall participate in determining of the means available for receiving and handling the equipment.
   C. Off-loading, installation, interconnecting cables and lugs and all associated costs are the responsibility of the contractor. Installation shall be in accordance with the manufacturer's recommendations.

1.02 Work Included

   A. Furnish components for Computer Grade Transformer units as herein specified for installation under another contract.
   B. Provide all materials and services for manufacturing, testing, and delivery to a designated jobsite. The work required under this contract shall include the following:
      1. Furnishing Computer Grade Transformer as herein specified.
      2. Complete configuration drawings and installation drawings.
      3. Factory tests as herein specified.

1.03 Submittal Requirements

   A. The information with the bid shall include, at a minimum, the following items.
      1. Technical proposal, including specification and description of all components, lug sizes, transformer ratings, frame sizes and current ratings of circuit breakers and operation.
      2. Outline and installation drawings showing dimensions and weight of the equipment, along with external power cable connections and recommended cable entrances and exits.
      3. Proposed fabrication schedule, factory test dates and delivery date per contract documents.
      4. Warranty schedule
   B. Bidders shall provide a compliance review of all specifications and addenda. The review will be a paragraph-by-paragraph review designating Compliance ("C"), Deviation ("D"), Exception ("E") with numbered footnotes explaining reasons for the proposed deviations or exceptions and how the intent of the specification will be satisfied.

1.04 Shop Drawings

   A. The Seller shall submit a minimum of four (4) sets of shop drawings within two weeks of receipt and acceptance of purchase order and prior to proceeding with any fabrication or assembly of equipment.
   B. All submittals shall be a complete package properly indexed and cross referenced. Submittals shall contain all required and detailed information.

1.05 Operating and Maintenance Instructions and Manuals

   A. The seller shall submit a minimum of one (1) set of operating and maintenance instructions and manual, covering completely the operation and maintenance of the equipment furnished hereunder to the owner.
   B. The Seller shall provide sufficient operation and maintenance instruction for building operators, with on-the-job factory trained engineers representing the manufacturers. The instruction shall be scheduled at time(s) convenient to the Owner's personnel.

1.06 Installation

A. Installation shall be in compliance with all the manufacturer's recommendations and local codes. All warranty troubleshooting shall be performed by the manufacturer or an authorized representative. Site testing shall be done by qualified electricians on site.

1.07 Guarantee

A. The Computer Grade Transformer shall be warranted by the manufacturer to be free from defects in workmanship and material for a period of one (1) year. Warranty shall include all costs of repair, parts, labor, travel and living expenses for the service personnel.

1.08 Standards

A. The complete System shall be in accordance with the standards previously listed and in compliance with the applicable portions of Underwriters Laboratories. All equipment is to be listed and labeled prior to shipment by UL, ETL or CSA.

2.0 Product Specification

2.01 General

A. The Computer Grade Transformer shall be a transformation system that delivers computer grade power from a single input power source. The **Computer Grade Transformer** shall be custom configured and assembled in a cabinet with the **Transformation Module** for voltage transformation, isolation, and/or harmonic reduction.

2.02 Construction

A. The enclosure for the **Computer Grade Transformer** shall be a NEMA Type-1 constructed from 14 gauge sheet metal sized in accordance with UL and NEC requirements. The exterior enclosure surfaces shall be primed and painted to prevent rust. Color shall be manufacturer's standard: ANSI Gray. The entire system shall be housed within a cabinet no larger than 52"W x 30"D x 60"H.

B. Each **Computer Grade Transformer** cabinet shall be designed for mounting on both fixed and raised flooring.

C. The cabinet enclosure shall provide for input / output side installation.

2.03 System Modules

A. Transformer Module

1. The Computer Grade Transformer shall be fed from an integral three (3) phase, copper-wound, high isolation transformer rated XXX kVA and Kxx. Each unit is complete with electrostatic shielding and six (6) full load two and one-half percent (2 1/2%) compensation taps (two [2] above and four [4] below nominal. The transformer is specifically designed for this application and provides voltage transformation, high isolation, conditioning, shielding, and voltage adjustment.

-OR OPTIONAL Quad Wye Harmonic Cancellation Module

2. The Transformation Module shall utilize PDI's patented Quad Wye Technology. This UL Listed method shall reduce the harmful effect of load generated harmonics by combining the negative energy of these to cancel each other. This cancellation effect occurs through the multiple output windings of the Transformation Module.

3. The Quad Wye **(Qty) __ (Two, Three, four) output** harmonic cancellation transformer is designed to cancel load generated harmonics. The core and coils shall be constructed to withstand the effects of nonlinear loads. Harmonic balanced loads shall reduce the **sum of all 3^{rd}, 5^{th}, 7^{th}, 9^{th}, 15^{th}, 17^{th}, 19^{th}, 21^{st}, and higher triplens for dual output, OR sum of all 3^{rd}, 5^{th}, 7^{th}, 9^{th}, 11^{th}, 13^{th}, 15^{th}, 21^{st}, 23^{rd}, 25^{th}, and higher triplens for three output, OR sum of all 3^{rd}, 5^{th}, 7^{th}, 9^{th}, 11^{th}, 13^{th}, 15^{th}, 17^{th}, 19^{th}, 21^{st}, 27^{th} and higher triplens for four output** to less than 5% of the fundamental.

4. Output Characteristics
   A. Quad Wye: two (2) outputs, each individual output shall be rated at 100%;
      or three (3) output, each individual output rated at 50% ;
      or four (4) outputs, each individual output rated at 33%.
   B. 208/120 Volts AC
   C. 3 Phase, 4 Wire Plus Ground
   D. 60 Hz
   E. Operating frequency shall be a nominal 60 Hertz with an overall range of 57 to 63 Hertz.
   F. Magnetic field strength around the Quad Wye Computer Grade Transformer shall be less than 0.1 gauss at 1.5 feet.
   G. Common mode attenuation shall be a minimum of -120 dB.
   H. Transverse mode attenuation shall be a minimum of -30 dB per decade
   I. Efficiency shall be 98% nominal
   J. Voltage match between outputs shall be a maximum of 0.5%.
   K. Impedance (phase to phase) match shall be a maximum of 0.5%.
   L. Impedance (line to neutral) match shall be a maximum of 0.5%.

B. Optional Modules
   1. OPTIONAL Transient Suppression Network
      The Computer Grade Transformer shall have an internal high energy surge suppressor system with a solid state, bipolar, clamping device designed to suppress both positive and negative transients from either the line or the critical load, and integral capacitors for noise attenuation The TSN shall be designed to turn on in less than 5 nanoseconds. The line to neutral suppression levels should be equivalent to 160 volts rms. (nominal rms. of 120 volts) and line to line suppression limit to 300 volts rms. (120 v nominal line to line). The total surge capacitance shall be 40,000 amperes.

   2. OPTIONAL Lightning Arrestor/Surge Suppressor
      The Computer Grade Transformer shall include a Lightning Arrestor/Surge Suppressor which features an air gap device engineered to attenuate high energy impulses to within 3,000 volts. The unit should be a three phase secondary class Lightning Arrestor to divert high energy transients to ground. It shall be mounted in parallel ahead of all electrical components to provide maximum protection and be capable of repeated transient voltages and surge currents. The device should utilize zinc oxide elements to limit the voltage being subjected to sensitive circuits. The Lightning Arrestor should be UL listed and rated 650 volts maximum rms. with a discharge current of 20,000 amperes. The Surge Suppressor shall provide an additional surge element to reduce the rate of rise of high energy transient voltages to increase the effectiveness of the Lightning Arrestor. The system shall consist of a three phase capacitor designed to coordinate with the Lightning Arrestor for high speed, high energy operation.

2.04 Electrical Characteristics

A. Computer Grade Transformer Input Source voltage: 480 Vac nominal three-phase, three-wire plus ground.
B. Computer Grade Transformer kVA rating: XXX kVA
C. Input Frequency: 60 Hz. +/- 5 Hz, 50 Hz optional
D. Power factor from .5 leading to .5 lagging.

2.05 Environmental Requirements

A. Storage temperature shall be between -36°C to +70°C (-33°F to 158°F).
B. Operating temperature shall be between 0°C to +40°C (32°F to 104°F).
C. Relative humidity from 0% to 95% non-condensing.
D. Altitude to a maximum of 10,000 feet.

3.0 Execution

3.01 Factory Tests

A. The manufacturer shall provide test reports upon request for each Computer Grade Transformer certifying that the unit has passed the following tests.
   1. Hi-pot test at 2 kV for 1 minute
   2. Excitation Current
   3. Ratio of Input and Output Vac
   4. High Potential
   5. Induced Potential (NEMA STD ST-20 Table 4-2)
   6. DC Resistance
   7. Core Loss
   8. Polarity

3.02 Packaging and Shipping

A. The manufacturer shall provide adequate packaging to ensure there is not damage to the unit(s) while in transport.
B. The manufacturer shall provide adequate notice to the contractor of shipping and arrival times.
C. The contractor shall provide for receiving and storage of any units prior to installation. Unit storage should be provided in accordance with the environmental conditions outlined in this specification.

3.03 Field Service

A. A 24 hour telephone service organization shall be provided and the phone numbers displayed on the door of each enclosure.

3.04 Installation

A. The contractor shall provide labor for the installation of the new equipment in accordance with the manufacturer. All rigging for unloading and installation shall be the responsibility of the contractor. The manufacturer shall assist the contractor as required in interpreting the installation instructions.
B. The manufacturer shall provide all inter-cabinet wiring as required.
C. The contractor shall install the equipment as shown on the drawings and ensure all required working clearances are maintained.
D. Following installation, the manufacturer shall verify the correct installation of the C+omputer Grade Transformers.

3.05 Acceptance

Final Acceptance shall occur when the units are shipped and received with no damage to the jobsite.