DTS ISOLATION TRANSFORMER SPECIFICATIONS

1.1 Scope of Work:

The DTS transformers shall be designed to supply isolated power to sensitive computer based equipment. The DTS units will meet or exceed the U. S. Federal Government strict telecommunications standards for isolation. The equipment will have multiple voltage capability with delta primary windings and wye secondary windings. They are equipped with an electrostatic shield for noise attenuation as well as surge protection. They are capable of operation at either 50 or 60 Hertz with no drop in the capacity rating. The transformers are to be constructed with copper windings for higher reliability and higher efficiency. They will also have multiple taps for maximum flexibility in adjusting to variable or unknown supply voltages.

The equipment construction and operating criteria specified herein shall be strictly adhered to unless otherwise directed in writing by the Contracting Officer. The contractor shall provide the qualified personnel, facilities and equipment to meet contract terms.

1.2 Applicable Publications:

The following documents of the issue in effect on the date of manufacture form a part of this specification to the extent specified herein:

1.2.1 American National Standards Institute, Inc. (ANSI):
   a. C-89.2 Impulse Level Capability

1.2.2 National Bureau of Standards (NBS):
   a. NBS-H-28 Screw Thread Standard for Federal Services

1.2.3 National Electrical Manufacturer’s Association (NEMA):
   a. ST-1 Dry Transformers, 600-volt and below
   b. ST-20 Dry Transformers for General Applications
   c. TR-1 Transformer Sound Levels
   d. TR-27 Dry Transformers for Industrial, Commercial, and Institutional
   e. WC-1 Wire
1.2.4 **Underwriters Laboratories (UL):**

a. UL 506 Dry Transformers

b. USAS C-57 Transformers

1.3 **General Description:**

1.3.1 Each transformer shall consist of wound copper conductor coils. The core steel shall be high-grade, low-loss, high permeability, non-aging, oriented silicon steel. The core steel shall be annealed, coated, and be free of all burrs and turned edges. The core shall be mounted in a NEMA 1 enclosure that is suitable for floor mounting. A manufactures nomenclature data plate will be attached to the NEMA 1 enclosure with the transformer specified input and output voltages, operating frequencies, KVA rating, temperature operating range, primary DELTA input winding and secondary WYE output winding connection methods, isolation shielding between primary and the secondary winding and any other data required by manufacturing standards not listed. The standard DTS platform will include a minimum rating of K-13 in order to mitigate waveform distortion, high neutral currents and load harmonics.

1.3.2 NEMA 3R enclosure modification can be added after the units are installed or ordered with the DTS unit from the factory. The NEMA 3R covers add 2 inches to the front and back if the DTS units.

1.4 **Primary and Secondary Voltage:**

1.4.1 The primary winding shall be DELTA, 3-wire, that is tapped for the following voltages:

480, 415, 380, 208

1.4.2 The secondary winding shall be WYE, 4-wire, that is tapped for the following voltages:

480/277, 380/220, 208/120

**NOTE:** The transformer shall be capable of any combination of the foregoing primary and secondary voltages.
1.5 **Taps:**

1.5.1 Taps shall be provided as follows:

Two each full capacity above nominal (FCAN), and two each full capacity below nominal (FCBN) with each tap step rated at two and a half percent. Copper windings and copper bars with copper screw compression lugs will be provided as specified. AL/CU lugs are not acceptable.

1.6 **Temperature Ratings:**

1.6.1 Temperature ratings are as follows:
220 degrees C insulation, 115 degrees C rise over 40 degrees C ambient temperature. Class “H” insulation shall be used.

1.7 **Shielding:**

1.7.1 An electrostatic shield shall be provided between the primary and the secondary windings. This shielding along with the grounding strap shall be terminated on a stud located on the center support leg in the center of the wiring compartment. The grounding lug (size will be comparable to the transformer power rating) shall be provided for external connection by others.

1.7.2 An optional double or triple shield can be added depending upon “threat level” requirements.

1.8 **Frequency:**

1.8.1 All transformers shall be rated 50/60 Hertz regardless of the KVA rating or voltage strapping utilized.

1.9 **Sound Levels:**

1.9.1 Maximum allowable decibel levels shall be as follows:

1.9.1.1 10 to 150kVA – 50 dB
1.9.1.2 151 to 300kVA – 55 dB
1.9.1.3 301 to 500kVA – 60 dB
1.9.1.4 501 to 700 kVA – 62 dB
1.9.1.5  701 to 1000 kVA – 64 dB

1.9.1.6  1001 to 1500 kVA – 65 dB

1.9.2  Transformer cores shall be mounted on rubber vibration isolators to reduce noise levels.

1.10  **Corrosion Protection:**

1.10.1  **Protection:** All exposed items such as bolts, screws, nuts, washers, and other such parts shall be of an approved corrosion-resistant material or shall be suitably treated to resist corrosion.

1.10.2  **Corrosion Resistant Treatment:** Uniform coatings of a sufficient thickness of cadmium, chromium, copper, nickel, silver, or zinc are approved corrosion-resistant treatments.

1.10.3  **Dissimilar Metals:** Contact between dissimilar metals which would cause deterioration of parts by galvanic corrosion shall be avoided wherever practicable.

1.10.4  **Threaded Parts:** All screw threads shall be in accordance with the National Bureau of Standards Handbook H-28.

1.11  **Drawings and Descriptive Literature:**

1.11.1  **Drawings:** The contractor shall furnish to the contracting officer, or his representative, a complete set of reproducible (film) drawings within 30 days after award of contract. These drawings shall comply with Industry Standards (minimum military controls) and the requirements specified herein. Drawings shall show all weights, dimensions, relative location of components and terminals, and electrical connections.

1.11.2  **Descriptive Literature:** Manufacturer’s catalog data, sketches, and other pertinent information required to show the general arrangement and adequacy of the equipment shall be submitted with the bid. If the bidder submits drawings and/or standard published descriptive data of his product with the intention of making modifications to meet the requirements of the specification, the proposed changes shall be fully described in the submittal.
1.12 Ratings and Wire/Lugs Sizes:

1.12.1 10 kVA (Model Number DTS10XTMV)
Primary: 1 each #8 AWG per phase
Secondary: 1 each #8 AWG per phase

1.12.2 15 kVA (Model Number DTS15XTMV)
Primary: 1 each #6 AWG per phase
Secondary: 1 each #6 AWG per phase

1.12.3 25 kVA (Model Number DTS25XTMV)
Primary: 1 each #2 AWG per phase
Secondary: 1 each #2 AWG per phase

1.12.4 30 kVA (Model Number DTS30XTMV)
Primary: 1 each #2 AWG per phase
Secondary: 1 each #2 AWG per phase

1.12.5 45 kVA (Model Number DTS45XTMV)
Primary: 1 each 1/0 AWG per phase
Secondary: 1 each 1/0 AWG per phase

1.12.6 62.5 kVA (Model Number DTS62.5XTMV)
Primary: 1 each 4/0 AWG per phase
Secondary: 1 each 4/0 AWG per phase

1.12.7 100 kVA (Model Number DTS100XTMV)
Primary: 2 each 2/0 AWG per phase
Secondary: 2 each 2/0 AWG per phase

1.12.8 125 kVA (Model Number DTS125XTMV)
Primary: 2 each 2/0 AWG per phase
Secondary: 2 each 2/0 AWG per phase

1.12.9 150 kVA (Model Number DTS150XTMV)
Primary: 2 each 350MCM per phase
Secondary: 2 each 350MCM per phase

1.12.10 225 kVA (Model Number DTS225XTMV)
Primary: 2 each 350MCM per phase
Secondary: 2 each 350MCM per phase

1.12.11 250 kVA (Model Number DTS250XTMV)
Primary: 3 each 350MCM per phase
Secondary: 3 each 350MCM per phase

1.12.12 350 kVA (Model Number DTS350XTMV)
Primary: 4 each 350MCM per phase
Secondary: 4 each 350MCM per phase

1.12.13 500 kVA (Model Number DTS500XTMV)
Primary: 4 each 500MCM per phase
Secondary: 4 each 500MCM per phase

1.12.14 750 kVA (Model Number DTS750XTMV)
Primary: 6 each 500MCM per phase
Secondary: 6 each 500MCM per phase

1.12.15 1000 kVA (Model Number DTS1000XTMV)
Primary: 8 each 500MCM per phase
Secondary: 8 each 500MCM per phase

1.12.16 1250 kVA (Model Number DTS1250XTMV)
Primary: 8 each 750MCM per phase
Secondary: 8 each 750MCM per phase

13.1 Enclosures

1.13.1 All enclosures above 25 kVA rating are to have three (3) steel I-beam support legs equally spaced for floor loading. “J” or “U” nuts are to be used to secure the front and rear cover plates. All enclosures are to be painted with one coat of primer and one finish coat.

1.13.2 An installation/maintenance manual and wiring diagram are to be enclosed within each unit.

1.13.3 Provide a red or yellow tag affixed to the front-right mounting bolt stamped: “LOosen All 4 MOUNTing Bolts To Finger Tight Torque.”

1.14 Testing:

Each transformer design shall be tested using a production unit from orders as they are received and the transformers built. Each transformer will continue to receive production tests, and these test reports shall be made available upon request. Computer test reports from the design testing shall be submitted for review upon request.

1.14.1 The tests shall include:

1.14.1.1 Induced potential test at 400 Hertz
1.14.1.2 Applied voltage test
1.14.1.3 No-load losses measurements (watts)
1.14.1.4 Full-load losses measurements (watts)
1.14.1.5 Impedance measurements
1.14.1.6 Exciting currents
1.14.1.7 Temperature tests at full load to confirm full load losses

1.15 Packing:

1.15.1 Unless otherwise specified by the contracting officer or his representative, all isolation transformers shall be individually packed in accordance with level A/A of the export packing specifications MIL-C-104.

1.15.2 Two methods of marking each unit shall be utilized. First, the outer crate shall be stenciled on at least two sides with the Mark/For number and DTS option number (one-inch letters minimum). Second, metal tags of approximately one-half-inch in height identifying the Mark/For number and DTS option number shall be permanently affixed to the crate at a noticeable location.
GUIDE FOR INSTALLATION / MAINTENANCE OF DTS TRANSFORMERS

CAUTION

DO NOT REMOVE COVERS OR WORK ON TRANSFORMER UNLESS POWER HAS BEEN TURNED OFF AND ALL CIRCUITS DE-ENERGIZED AND DISCONNECTED. USE PROPER SAFETY PRECAUTIONS WHEN WORKING ON THIS EQUIPMENT.

SCOPE

This guide covers general recommendations for the O&M of DTS Transformers.

LOCATION

Ventilated DTS transformers normally are designed for installation indoors in dry locations. They will operate successfully where the humidity is high but under this condition it may be necessary to take precautions to keep them dry if they are shut down for appreciable periods. Locations where there is dripping water should be avoided. If this is not possible, suitable protection should be provided to prevent water from entering the transformer case. Precautions should be taken to guard against accidental entrance of water, such as might be obtained from an open window, by a break in a water or steam line, or from use of water near the transformers.

Adequate ventilation is essential for the proper cooling of transformers. Clean dry air is desirable. Filtered air may reduce maintenance if the location presents a particular problem. When transformers are installed in vaults or other restricted spaces, sufficient ventilation should be provided to hold the air temperature within established limits when measured near the transformer inlets. This usually will require approximately 100 cubic feet of air per minute per kilowatt of transformer loss. The area of ventilating openings required depends on the height of vault, the location of openings, and the maximum loads to be carried by the transformers. For self-cooled transformers, the inlet and outlet per 100 kva of rated transformer capacity, after deduction of the area occupied by screens, gratings, or louvers.

Ventilated DTS transformers should be installed in locations free from unusual dust producing mediums or chemical fumes. Transformers should be located at least 12 inches away from walls or other obstructions that might prevent free circulation of air through and around each unit. The distance between adjacent transformers should not be less than this value. Also
accessibility for maintenance should be taken into account in locating a transformer. If the transformer is to be located near combustible materials, the minimum separation established by the National Electrical Code should be maintained.

The transformer case is designed to prevent the entrance of most small animals and foreign objects. However, in some locations, it may be necessary to give considerations to additional protection.

If noise is a factor in the location and operation of any transformer, special consideration should be given to the installation of the equipment.

The impulse strength of these transformers is less than that of liquid-immersed units of the same voltage class. If there is any likelihood that transformers will be exposed to lightning or severe switching surges, adequate protective equipment should be provided.

**INSPECTION**

New transformers should be inspected when received for damage during shipment. Examination should be made before removing from cars or trucks and if any injury is evident or any indication of rough handling is visible, a claim should be filed with the carrier at once and the manufacturer should be notified. Subsequently, covers or panels should be removed and an internal inspection made for injury or displacement of parts, loose or broken connections, cracked porcelain, dirt or foreign material, and for the presence of free water or moisture. Corrective measures should be taken where necessary. Shipping braces should be removed if present.

After a transformer is moved, or if it is stored before installation, this inspection should be repeated before replacing the transformer in service.

Before placing in service, the operation of fans, motors, thermal relays, and other auxiliary devices should be checked.

**HANDLING**

Ventilated DTS transformers can be handled very much like liquid-immersed transformers except that somewhat greater care may be required because of the lighter case. If it is necessary to handle ventilated DTS transformers outdoors during inclement weather they should be thoroughly protected against the entrance of rain or snow.

The transformers as supplied have provision for overhead lift (without the use of spreaders) or skid movable.

**GROUNDING**

The case and core assembly of these transformers should be permanently and adequately grounded.
STORAGE

Ventilated DTS transformers preferably should be stored in a warm dry location with uniform temperature. Ventilating openings should be covered to keep out dust. If it is necessary to leave a transformer outdoors it should be thoroughly protected to prevent moisture and foreign material from entering. Condensation and the absorption of moisture can be prevented or greatly reduced by the installation of space heaters or other small electric heaters.

PERIODIC INSPECTION AND MAINTENANCE

Like other electric equipment, these transformers require maintenance from time to time to assure successful operation. Inspection should be made at regular intervals and corrective measures taken when necessary to assure the most satisfactory service from this equipment.

The frequency at which these transformers should be inspected depends on operating condition. For clean dry locations an inspection annually, or after a long period, may be sufficient. However, for other locations, such as may be encountered where the air is contaminated with dust or chemical fumes, an inspection at three to six month intervals may be required.

Usually after the first few inspection periods a definite schedule can be set up based on the existing conditions.

With the transformer de-energized, covers over openings in the case should be removed. Inspections should be made for dirt, especially accumulations on insulating surfaces or for those which tend to restrict air flow, for loose connections, for the condition of the transformer. Observation should be made for signs of overheating and of voltage creepage over insulating surfaces as evidenced by tracking or carbonization.

Evidence of rusting, corrosion, and deterioration of the paint should be checked, and corrective measure taken where necessary.

CLEANING

If excessive accumulations of dirt are found on the transformer windings or insulators when the transformer is inspected, the dirt should be removed to permit free circulation of air and to guard against the possibility of insulation breakdowns. Particular attention should be given to cleaning top and bottom ends of winding assemblies, and to cleaning out ventilating ducts.

The windings may be cleaned with a vacuum cleaner, a blower, or with compressed air. The use of a vacuum cleaner is preferred as the first step in cleaning followed by the use of compressed air or nitrogen. The compressed air or nitrogen should be clean and dry and should be applied at a relatively low pressure (not over 25 pounds per square inch). Lead supports, tap changers and terminal boards, bushings, and other major insulating surfaces should be brushed or wiped with a dry cloth. The use of liquid cleaners is undesirable because some of them have a solvent or deteriorating effect on most insulating materials.