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| Version | Date | Description of Revisions |
| 1 | August 30, 2006 | Approved final document. |
| 2 | February 19, 2010 | Modified ‘Related Sections’ and approved suppliers |
| 3 | July 2, 2013 | Incorporation of new Commissioning and Computerized Maintenance Management System Data Requirements Specification cross references. Incorporated several enhancements from Newfoundland Labrador Specifications. |
| 4 | August 6, 2014 | Changes to reflect renaming of commissioning specification and final review (AV) |
| **5** | **February 4, 2015** | **Finalized Specification – Reference eDOCS #5630505 v7 (AV) with updated standards** |
| 6 | February 10, 2017 | Removed all listed manufacturers. (CPD PMO, OMM) (AV)  Updated Reference Standards (ANSI/IEEE 386-2016, CAN/CSA-C2.1-06(R2017), CAN/CSA-C227.3-06 (R2017), CAN/CSA C227.4-06 (R2017)) (AAM) |

NOTE:

This is a CONTROLLED Document. Any documents appearing in paper form are not controlled and should be checked against the on-line file version prior to use.

**Notice:** This Document hardcopy must be used for reference purpose only.

**The on-line copy is the current version of the document.**

# GEneral

## Related Sections

### [Under "Related Sections", identify other Sections that are related to, and/or dependent on, the work results or information specified elsewhere. The list should be limited to Sections with specific information that the reader might expect to find in this Section, but is specified elsewhere. For example, if hardware for aluminum entrances is specified in the aluminum entrance Section, a cross-reference would be appropriate in the finish hardware Section. The purpose of this cross-referencing is for information only, to aid in finding those other requirements—not to define the scope of the Section.

### Cross-referencing here may also be used to coordinate assemblies or systems whose components may span multiple Sections and which must meet certain performance requirements as an assembly or system.

### Contractor is responsible for coordination of the Work. Contractor is responsible for being familiar with and incorporating all required elements of cross-referenced Specifications cited.

### This Section is to be completed/updated during the design development by the Consultant. If it is not applicable to the section for the specific project it may be deleted.]

### [List Sections specifying installation of products supplied but not installed under this Section and indicate specific items.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: Execution requirements for ...[item]... specified under this Section.

### [List Sections specifying products installed but not supplied under this Section and indicate specific items.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: Product requirements for ...[item]... for installation under this Section.

### [List Sections specifying related requirements.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: [Optional short phrase indicating relationship].

### Section 01250 – Substitutions

### Section 01300 – Submittals

### Section 01425 - Computerized Maintenance Management System Data Requirements

### Section 01430 – Operation and Maintenance Data

### Section 01740 - Cleaning

### Section 01760 – Warranty Work

### Section 01780 – Contract Closeout

### Section 01810 – Equipment Testing and Facility Commissioning

### Section 03300 – Cast-In-Place Concrete

### Section 16010 – Electrical General Requirements

### Section 16670 – Lightning Protection System

### [Division 13 – SCADA and Instrumentation- insert applicable specifications]

### Product requirements for [item]... for installation under this Section

## References

*[Delete .1 if Section 01060 – Regulatory Requirements is included in Contract Documents.]*

### Comply with the latest edition of the following statutes, codes, standards, and all amendments thereto:

#### American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers, Inc. (IEEE)

##### ANSI/IEEE 386-2016, IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5 kV through 35 kV.

#### Canadian Standards Association (CSA)

##### CAN/CSA-C2.1-06(R2017), Single-Phase and Three-Phase Liquid-Filled Distribution Transformers.

##### CAN/CSA-C227.3-06 (R2017), Low-Profile, Single-Phase, Pad-Mounted Distribution Transformers with Separable Insulated High-Voltage Connectors.

##### CAN/CSA C227.4-06 (R2017), Three-Phase Pad-Mounted Distribution Transformers with Separable Insulated High-Voltage Connectors.

## Measurement and Payment

*[Choose one of the following payment language provisions that best suits the individual project.*

*If this Section is not specifically referenced by an item in the Bid Form, please use the following language:*

### The work of this Section will not be measured separately for payment. All costs associated with the work of this Section shall be included in the Contract Price.

*OR If this Section is specifically referenced in the Bid Form, use the following language and identify the relevant item in the Bid Form:*

### All costs associated with the work of this Section shall be included in the price(s) for Item No(s). \_\_\_ in the Bid Form.

*If the work of this Section is to be measured and paid for by several different methods, please amend the standard wording given above to reflect the different methods of measurement and payment.*]

## Source Quality Control

### Submit to the Consultant standard factory test certificates of each transformer and type test of each transformer with high voltage accessories in accordance with CSA C2.1-06 (R2011).

## Shop Drawings

### Submit shop drawings in accordance with Section 01300 – Submittals.

### Indicate:

#### Anchoring method and dimensioned foundation template.

#### Dimensioned cable entry locations.

#### Dimensioned cable termination and pothead height.

#### Identified internal and external component layout on assembly drawing.

#### Insulating liquid capacity.

### Submit the primary fuse and secondary breaker time-current characteristics.

### Product Data:

#### Submit the manufacturer's printed product literature, specifications and datasheet, including Product characteristics, performance criteria, and limitations.

## Operation and Maintenance Data

### Provide operation and maintenance data for pad mounted distribution transformers for incorporation into the manual specified in Section 01780 – Contract Closeout and Section 01300 - Submittals.

### Include insulating liquid maintenance data.

### Submit all other required information as detailed in Section 01425 - Computerized Maintenance Management System Data Requirements in an electronic format suitable for upload to the Region’s CMMS (Maximo) and as required by Section 01430 – Operation and Maintenance Data.

## Maintenance Manuals

### Provide maintenance materials in accordance with the manufacturer’s recommendations.

### Include: [\_\_\_\_\_\_].

# PRODUCTS

## Equipment

### Three-phase pad mounted transformers: in accordance with CAN/CSA C227.4-06 (R2017).

### Low profile single-phase pad mounted distribution transformers: in accordance with CAN/CSA-C227.3-06 (R2011).

### Three-phase dead front pad mounted distribution transformers: in accordance with CAN/CSA C227.4-06 (R2017).

### Separable insulated connectors for power distribution systems above 600 V: in accordance with ANSI/IEEE 386-2016.

### Oil filled pad mounted distribution transformer[s] complete with primary and secondary cable compartments, primary un-fused disconnecting switch options and accessories to form complete factory assembled, self contained, steel fabricated unit for mounting on concrete pad. FR3 coolant shall be used and no containment is required.

### The transformer shall have High voltage bushing[s] or high voltage bushing well[s] for connection to distribution system through separable insulated connectors for dead front operation.

### The transformer shall have separable insulated connectors.

### The primary cable terminals shall have a hole for 9.5 mm diameter 16 thread bolt for attachment of solder lug or clamp connector in vertical plane.

### Spade type low voltage terminals.

### Connectors shall be provided for primary and secondary cables.

### [One 3 way primary fused switch; Three fused, Consultant to define] primary disconnect switches.

#### Single source primary feed.

#### Loop primary feed.

### Primary protection: [Consultant to add details of primary protection].

### Three - [\_\_\_\_\_\_] kV, lightning arresters. Refer to Section 16670 – Lightning Protection System.

### Load break inserts for elbow connectors.

### Stays to hold compartment doors in open position.

## Transformer Characteristics

### Primary voltage: [\_\_\_\_\_\_] V, 60 Hz, [delta] [wye] connected, [\_\_\_\_\_\_] phase, [neutral] [un-grounded].

### Secondary voltage: [\_\_\_\_\_\_] V, [delta] [wye] connected, [\_\_\_\_\_\_] phase, [[\_\_\_\_\_\_] wire], [neutral] [un-] [grounded]. The Contractor shall confirm with the Local Distribution Company [*Insert Local Distribution Company name]* whether a wye/wye connection is required. Transformers operating in parallel shall have the same impedance. The details shall be submitted to the Consultant for review and approval.

### Capacity: [\_\_\_\_\_\_] kVA.

### Basic impulse level: [\_\_\_\_\_\_] kV.

### Maximum rms short-circuit: [\_\_\_\_\_\_] times base current for [\_\_\_\_\_\_] cycles.

### Impedance: [minimum of [\_\_\_\_\_\_]%] [maximum of [\_\_\_\_\_\_]%] [[\_\_\_\_\_\_]% to match existing].

### No load losses not to exceed [\_\_\_\_\_\_]% of kW rating.

### Full load losses not to exceed [\_\_\_\_\_\_]% of kW rating.

## Voltage Taps

### Four-2.5% taps, 2-FCAN, 2-FCBN.

## Tap Changer

### Internally operated off-load tap changer, with provision for padlocking on 3 phase units.

## Accessories

### Liquid temperature thermometer with two sets of contacts.

### Liquid level gauge with two sets of contacts.

### Pressure relief device.

### 20 mm drain valve.

### [ 25 ] mm filler plug.

### Tap Switch: [Consultant to define requirements]

## Grounding

### Copper grounding bus size [\_\_\_\_\_\_] mm x [\_\_\_\_\_\_] mm.

### Connectors for grounding conductor[s] size as indicated in the Contract Documents.

## Finish

### Finish the exterior of the unit in accordance with Section 16010 - Electrical General Requirements.

## Equipment Identification

### Provide equipment identification in accordance with Section 16010 - Electrical General Requirements.

### The transformer shall be equipped with a nameplate showing information in accordance with CAN/CSA-C2.1-06 (R2011).

## Warning Signs

### Provide warning signs in accordance with Section 16010 - Electrical General Requirements.

# EXECUTION

## Inspection

### Check the factory made connections of the transformer unit for mechanical security and electrical continuity.

### Check the transformer insulating liquid for correct quantity and specification according to the manufacturer's instructions.

## Installation

### Ensure that the concrete pad is fully cured before transformer is installed.

### Set and secure transformer unit in place, rigid, plumb and square.

### Make all necessary electrical connections to the transformer(s).

### Connect the transformer unit ground bus to the system ground.

### Wire one set of contacts on [liquid temperature thermometer], [liquid level gauge], to [sound alarm when unsafe condition reached], [wire second set of contacts to] [trip transformer circuit interrupter].

### All I/O shall be conveyed to SCADA with the appropriate SCADA graphics developed in accordance with the process narratives detailed in Division 13 – SCADA and Instrumentation which are included in the Contract’s SCADA Appendices. *[Consultant to ensure the complete process narratives are part of the Contract Documents and that SCADA integrators (subcontracted to the Contractor) have a sufficiently comprehensive Process Narrative to understand how to program all the processes and SCADA graphics associated with the project].*

### Ensure that care is taken to prevent contamination of liquid and components when field filling the transformer[s].

### Use only metal hose when field-filling transformer with oil: never, under any circumstances, use a rubber hose.

### Set taps to produce the rated secondary voltage at no-load.

### Ensure that care is taken to prevent the contamination of liquid and components when field filling transformers. The use of PCB containing liquids is prohibited.

### Set taps to produce rated secondary voltage at no-load.

### Check the voltage at full load and nominal load and adjust taps to suit system.

## Field Quality Control

### Perform tests in accordance with Section 16010 - Electrical General Requirements and Section 01810 – Equipment Testing and Facility Commissioning.

### Carry out following insulation tests using megger with 20,000 mega-ohm scale and resulting insulation resistance corrected to the base temperature of 20ºC.

#### High voltage to ground with secondary grounded for the duration of the test.

#### Low voltage to ground with primary grounded for the duration of the test.

#### High to low voltage.

### Inspect primary and secondary connections for tightness and for signs of overheating.

### Inspect and clean bushings and insulators.

### Check oil level and temperature indicators.

### Set transformer taps to rated voltage as specified on the Contract Drawings.

### Inspect for oil leaks and excessive rusting.

### Inspect oil level.

### Check fuses for correctness of type and size.

### Check for grounding and neutral continuity between primary and secondary circuits of transformer.

## Cleaning

### Proceed in accordance with Section 01740 – Cleaning.

### On the completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment from the Site.

## Warranty

### Provide manufacturer product warranty against defects in operation and material as defined by Section 01760 – Warranty Work for a period of [one year] from the date of Substantial Performance of the Work.

## Commissioning

### For all commissioning activities on systems where components of this Specification are integral to functionality, refer to Section 01810 – Equipment Testing and Facility Commissioning. All inspection and testing activities shall be completed in accordance with the commissioning plan that shall be provided to the Consultant prior to the commencement of commissioning activities.

**END OF SECTION**