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## POLE MOUNTED SINGLE PHASE MV-MV DISTRIBUTION TRANSFORMERS SPECIFICATION

## REVISION SHEET

Revision	Description of Change	Date	Initial
0	Original Document	2011-02-23	bh/fk
1	General Revision	2021-05-04	bh/ss/mw

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# 1. Introduction

This specification covers pole-mount single phase MV-MV transformers manufactured for Hydro Ottawa Limited (HOL) and for use in HOL's service territory. This specification is an amendment to CSA standard C2.1-06 "Single-phase and Three-phase Liquid-Filled Distribution Transformers."

The numbering of Section 4 and up of in this specification is identical to that used in CSA standard C2.1-06 "Single-phase and Three-phase Liquid-Filled Distribution Transformers." Where no reference is made, the CSA Specification shall apply. Additional or modifying statements, as given in this specification, shall govern.

It is not intended that this specification restrict bidder's ideas, inventions, advances in the state of the art, or technological improvement, and therefore all bids will be given careful consideration. It must be noted, however, that HOL requires sufficient explanations and descriptions to be able to make a good value judgment. Any variation from the requirements of this specification shall be quoted as additional bids.

# 2. References

CSA C2.1-06, *Single-Phase and Three-Phase Liquid-Filled Distribution Transformers*  
CAN/CSA C802.1, *Maximum Losses for Distribution, Power, and Dry-Type Transformers*  
IEEE C57.12.35, *IEEE Standard for Bar Coding for Distribution Transformers*

# 3. Definitions

The definitions from CSA C2.1-06 apply in addition to the following definitions:

**Certified Test Report** means a report that contains sufficient information to allow the distributor's competent person to approve the electrical equipment. The report shall provide sufficient information to ensure the equipment meets or exceeds the applicable industry standard or distributor developed equipment specification. A Certified Test Report must be signed by a P.Eng or an Engineer where the licensure's obligation to public safety of the home jurisdiction are substantially equivalent to those required by Ontario.

**HOL** means "Hydro Ottawa Limited".

**PCB** means any chlorobiphenyl described in item 1 of the List of Toxic Substances in Schedule 1 to the Canadian Environmental Protection Act.

## 4. Electrical Characteristics

### 4.1. kV-A Ratings

Preferred kV-A Ratings shall be 100, 250 and 500 kV-A.

### 4.5. Insulation Class and Preferred Voltages

Preferred Voltage ratings shall be as per Table 4-1.

Table 4-1 Preferred Voltages Ratings for Single Phase Transformers

Voltage Rating HV-LV (V)
16000/27600Y – 4800/8320Y
16000/27600Y – 7200/12470Y
16000/27600Y – 7600/13200Y
7600/13200Y – 2400/4160Y

Revise CSA C2.1-06 Table 1 to show the following:

Rated High Voltage 7600/13200Y for the 15 kV HV Insulation Class.

Rated Low Voltage insulation class of 8.7 kV for rated Low Voltage of 4800/8320Y.

## 5. Electrical Connection Designation

### 5.2. Grounding

#### 5.2.1. Tank Grounding

All transformers shall have provisions to accept a 2/0 AWG tank ground.

## 6. Bushings and Terminals

### 6.1. Bushings, general

#### 6.1.2.

Where a high-voltage bushing and clamp is required on the transformer sidewall, this bushing and clamp shall not extend more than 230mm [9"] from the transformer sidewall surface.

## 8. Mechanical Characteristics

### 8.1. Construction

Welded covers on transformer tanks shall not be accepted.

### 8.10. Liquid Insulant

#### 8.10.2. Oil Specification

When the transformers are inspected at Hydro Ottawa, the oil shall be transparent and there shall be no traces of debris, dust, paper shreds or metal filings in the tank. HOL will reject transformers containing the above.

Coolant shall not contain PCBs.

#### 8.10.3. Liquid Level

For all transformers, the cold liquid levels shall be below the high-voltage and the low-voltage sidewall bushings. HOL shall reject all transformers with oil above the primary or secondary sidewall bushings.

### 8.12. Hardware

#### 8.12.1. General

Exposed fastening hardware shall include all components, interior and exterior of the transformer tank, including oil-immersed components.

## 9. Tests

### 9.2. Routine Tests

- (c) No-load losses at 105% of rated voltage
- (d) Exciting current at 105% of rated voltage

A Certified Test Report, acknowledging that all the routine tests have been performed, documenting the values of the tests (a), (b), (c), (d) and (e), and signed by a professional engineer, has to be submitted to HOL for each manufacturing lot.

A Certified Test Report shall be submitted for acceptance to HOL before shipping transformers in PDF/A format.

### 9.3. Tolerances for Routine Tests

#### 9.3.2. Losses and Exciting Current

##### 9.3.2.2. Individual Transformers

Preference shall be given to transformers that meet the minimum efficiency of CSA C802.1.

Distribution transformers will be evaluated on the basis of tender price and Loss Evaluation Formula. This formula will be provided in the summary for tender.

##### 9.3.2.3. Average for Two or More Transformers

A loss penalty shall be assessed on the average of each stock item on a given release order from HOL.

### 9.4. Type Tests

#### 9.4.1. General

Certified Test Reports for type tests shall be provided to and approved by HOL before the transformers are shipped.

Type tests on the specified transformer may not be necessary provided the manufacturer can prove that test results from a similar designed transformer are equivalent. A Certified Test Report shall be provided to confirm this.

### 9.4.3. Optional Type Tests

The following optional type tests shall be performed:

- (a) audible sound level
- (b) short-circuit in accordance with clause 9.7 of CSA C2.1-06

## 10. Markings

The manufacturer shall attach a permanent bar code label in accordance with IEEE Standard C57.12.35. The bar code shall contain the manufacturer ID number and the transformer serial number. The attachment location shall be as per IEEE C57.12.35.

### 10.2. Nameplate and Connection Diagram

#### 10.2.3. Information on Nameplate

- n) HOL Specification Number including revision number

### 10.4. Tank Markings

- (c) H1, H2.
- (e) X1, X2
- (f) Serial No. just below kV·A

## 12. Optional Items

- (o) All transformers shall be supplied with Cooper AH46A1 surge arrester mounting bracket, or an equivalent bracket, installed for the H1 and X1 bushings.

## 13. Packaging

Transformers shall be fastened to pallets, oriented to allow removal with a forklift. Pallets shall have a minimum height of 89mm [3½"] and a 51mm x 102mm [2" x 4"] support at the balance point with a minimum of 305mm [12"] clear on both sides of the support.

Upon delivery, the exterior of all transformers shall be free of any salt spray, dirt or oil residue.

Electronic data for all nameplate and testing information for each transformer shall be provided to and approved by HOL with each shipment of transformers. The electronic format shall be PDF/A.