

COVERED COPPER LINE WIRE

SASKPOWER CODE
Refer to Section 3.3

LS-4007

2017 October 25

PREPARED BY

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SUPERSEDES

DE-4007

1978 January

1. Scope

This specification describes Covered Copper Line Wire to be built in accordance with Section 2 Reference Publications except where specific requirements of this specification shall take precedence.

2. Reference Publications

Reference is made in this specification to the following standards, the latest issues, amendments, and supplements of which shall apply:

2.1 CSA Standards

C22.2 No. 38-14 – Thermoset-insulated wires and cables

C22.2 No. 75-14 – Thermoplastic insulated wires and cables

C68.9-09 (R2014) – Covered overhead distribution line wire

2.2 Other Standards

ANSI/ICEA S-70-547 – Standard for Weather-Resistant Polyethylene covered conductors

ASTM B2-13 – Standard Specification for Medium-Hard-Drawn Copper Wire

ASTM B3-13 – Standard Specification for Soft or Annealed Copper Wire

ASTM B8-11 (2017) – Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

NEMA WC 26-2008 / EEMAC 201-2008 – Binational Wire and Cable Packaging

3. Requirements

3.1 General Requirements

The finished bare conductors shall meet or exceed the requirements of ASTM B2 or ASTM B3, as applicable for the temper specified in Section 3.3.

The covering material used for the weatherproof outer cover of the finished conductor shall meet the requirements of CSA C22.2 No. 38, CSA C22.2 No. 75, CSA C68.9 and/or ANSI/ICEA S-70-547. The cover shall be black.

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Cables shall be rated for ambient temperatures of 75°C. RW90 conductors shall be rated for ambient temperatures of 90°C.

Cables shall be rated for 600V.

3.2 Physical Requirements

Welds and brazes may be made in the strands, provided they are not closer than 15 metres to one another.

There shall be no joints in any given length of conductor or finished cable.

The lay of the layer of wires shall not be less than 8 nor more than 16 times the outside diameter of that layer.

3.3 Stock Codes

| Stock Code | AWG Size | Strands | Temper | Coil/Reel Length | Insulation Material |
|------------|----------|---------|-------------|------------------|---------------------|
| 2 84 02 | 2 | Solid | Medium Hard | 150m coil | PE |
| 2 84 06 | 6 | Solid | Medium Hard | 300m coil | PE |
| 2 84 08 | 8 | Solid | Medium Hard | 300m coil | PE |
| 2 86 02 | 2 | 7 | Medium Hard | 600m reel | PE |
| 2 86 20 | 2/0 | 7 | Medium Hard | 300m reel | PE |
| 2 87 40 | 4/0 | 19 | Medium Hard | 300m reel | PE |
| 2 91 86 | 4/0 | 19 | Soft | 300m reel | RW90/XLPE |
| 2 91 90 | 350 | 37 | Soft | 300m reel | RW90/XLPE |
| 2 91 92 | 500 | 37 | Soft | 300m reel | RW90/XLPE |

4. Packaging

All solid conductors shall be packed in coils. All stranded conductors shall be shipped on wooden reels with sufficient lagging to protect the conductor during shipping and handling.

Lengths shall be as given in Section 3.3. Lengths per coil or reel shall be within -0% to +5% tolerances. Lengths shorter than 100 metres will not be accepted.

Each coil or reel shall bear a corrosion resistant metal tag stamped to indicate the following:

- a) Manufacturer
- b) Manufacturer part number and modification numbers, if any
- c) Date of manufacture
- d) Conductor size and stranding
- e) Length of the conductor in metres

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- f) SaskPower stock code number
- g) SaskPower purchase order number
- h) Gross mass in kilograms

All reels shall be suitable for forklift handling and shipped on an open flat-deck trailer.

Alternate packaging requires prior approval before shipping.

5. Inspection

All shipments of Covered Copper Line Wire are subject to inspection by SaskPower when they are received. Acceptance will be based on the requirements of this specification.

6. Rejection

Failure of a representative sample of any shipment to meet requirements of this specification shall be the basis for rejection of the shipment. SaskPower will have the discretion to determine the sample size to be inspected for such purposes.

**600V UNDERGROUND SECONDARY
CABLE TYPE USEI90**

SASKPOWER CODE
Refer to Section 3.2

LS-4023

2017 October 30

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SUPERSEDES

LS-4023

1997 February 06

1. **Scope**

This specification describes 600V Underground Secondary Cable Type USEI90 to be built in accordance with Section 2 Reference Publications except where specific requirements of this specification shall take precedence.

2. **Reference Publications**

Reference is made in this specification to the following standards, the latest issues, amendments, and supplements of which shall apply:

2.1 **CSA Standards**

C22.2 No. 38-14 – Thermoset-insulated wires and cables

C22.2 No. 52-15 – Underground secondary and service-entrance cables

C68.7-11 (R2015) – Underground secondary and service-entrance cable for electrical distribution utilities

2.2 **Other Standards**

ASTM B400/B400M-14 – Standard Specification for Compact Round Concentric-Lay-Stranded Aluminum 1350 Conductors

ASTM B800-05(2015) – Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes—Annealed and Intermediate Tempers

ASTM B801-16 – Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation

ASTM B836-00(2015) – Standard Specification for Compact Round Stranded Aluminum Conductors Using Single Input Wire Construction

NEMA WC 26-2008 / EEMAC 201-2008 – Binational Wire and Cable Packaging

3. **Requirements**

3.1 **Service Conditions**

The cable shall have -40°C Low Temperature rating.

The cable shall be rated for continuous operation at 90°C conductor temperature.

Portions of cable are expected to be exposed to sunlight where terminated at the pole and while in storage.

3.2 Cable Construction and Reel Details

| Stock Code | Number of Conductors and Size | Nominal Reel Length (m) | Reel Size Flange/Traverse/Drum (inch) |
|------------|-------------------------------|-------------------------|---------------------------------------|
| 29451 | 2/c #4 | 300 | 27/18/12 |
| 29462 | 3/c #2 | 300 | 36/18/16 |
| 29464 | 3/c 1/0 | 300 | 42/24/24 |
| 29466 | 3/c 4/0 | 300 | 48/24/24 |
| 29467 | 3/c 350kcmil | 300 | 66/36/40 |
| 29468 | 3/c 500kcmil | 300 | 66/36/40 |
| 29482 | 4/c #2 | 300 | 42/24/24 |
| 29484 | 4/c 1/0 | 300 | 48/24/24 |
| 29486 | 4/c 4/0 | 300 | 54/32/32 |
| 29487 | 4/c 350kcmil | 300 | 66/36/40 |
| 29488 | 4/c 500kcmil | 250 | 68" max |

3.3 Conductor

All conductors shall be of aluminum. In addition to the phase conductor(s), all cables shall have a full sized neutral conductor, also constructed of aluminum.

Aluminum conductors shall be Class B compact, ASTM 1350 aluminum. Temper shall be H16 or similar intermediate temper. Annealed aluminum alloy 8000 series may also be acceptable with prior approval.

Conductors shall be compact stranded unless otherwise specified.

Strand sealant or water blocking material is not desired.

3.4 Insulation

The insulation shall be cross-linked polyethylene rated 600 V as per CSA C22.2 No. 38.

3.5 Jacket

Conductors shall be individually jacketed with PVC. The jacket shall be readily stripped from the conductor insulation.

In the case of multiple conductor cables, conductor designation shall be as follows:

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| | Neutral | 1 st Conductor | 2 nd Conductor | 3 rd Conductor |
|-----|---------|---------------------------|---------------------------|---------------------------|
| 2/c | White | Black | | |
| 3/c | White | Black | Red | |
| 4/c | White | Black | Red | Blue |

3.6 Conductor Lay

Conductors shall be twisted while cabled and the resulting lay may be either right- or left-hand lay.

3.7 Cable Marks and Labeling

Cable lengths shall be demarcated in 1 meter increments.

Cable identification marks at minimum shall include manufacturer name/trademark, insulation type, and cold weather rating.

Flame rating and CSA markings are not required.

4. Product Qualifications

Prior to shipment of all materials, detailed Specifications Drawings showing dimensions, materials and all other specified requirements shall be submitted to SaskPower for approval.

Test reports from a certified laboratory shall be provided, upon request.

5. Packaging

All shipments of 600V Underground Secondary Cable Type USEI90 shall be shipped as 300 meters per reel, unless otherwise noted. Lengths per reel shall be within -0% to +5% tolerances. Lengths shorter than 100 meters will not be accepted.

Each reel shall bear a weatherproof marking or tag showing the following minimum information:

- a) Purchaser's "Ship To" Location
- b) Manufacturer's name
- c) Name of item or description
- d) Manufacturer part number and modification numbers, if any
- e) Date of manufacture
- f) SaskPower purchase order number
- g) SaskPower stock code number
- h) Reel length in metres
- i) Reel Serial Number (if steel)
- j) Gross, net and tare mass in kilograms

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Reels shall be shipped on an open flat-deck trailer suitable for forklift handling from the sides.

Shipping protection for cables shall be capable of providing protection during handling and outside storage for a minimum period of one year, and shall be in one piece where possible.

In addition, the ends of the cable on each reel shall be tightly sealed by application of a heat shrink cap which has been coated internally with mastic to ensure adhesion to the cable jacket.

Alternate packaging requires prior approval before shipping.

6. **Inspection**

All shipments of 600V Underground Secondary Cable Type USEI90 are subject to inspection by SaskPower when they are received. Acceptance will be based on the requirements of this specification.

7. **Rejection**

Failure of a representative sample of any shipment to meet requirements of this specification shall be the basis for rejection of the shipment. SaskPower will have the discretion to determine the sample size to be inspected for such purposes.

STRANDED BARE COPPER WIRE

SASKPOWER CODE

2 83 02, 2 83 04, 2 83 20, 2 98 01, 2 98 04

LS-4006

2017 October 25

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SUPERSEDES

LS-4006

1996 November 20

1. Scope

This specification describes Stranded Bare Copper Wire to be built in accordance with Section 2 Reference Publications except where specific requirements of this specification shall take precedence.

2. Reference Publications

Reference is made in this specification to the following standards, the latest issues, amendments, and supplements of which shall apply:

2.1 Other Standards

ASTM B2-13 – Standard Specification for Medium-Hard-Drawn Copper Wire

ASTM B3-13 – Standard Specification for Soft or Annealed Copper Wire

ASTM B8-11(2017) – Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

NEMA WC 26/EEMAC 201-2008 – Binational Wire and Cable Packaging Standard

3. Requirements

3.1 General Requirements

The conductors shall be class ‘B’ for bare conductors usually used in overhead lines. The finished bare conductors shall meet the requirements of ASTM B2 or ASTM B3, as applicable to the temper as specified in Section 3.3. The finished conductors and wire used for stranding shall also meet the requirements of ASTM B8.

3.2 Physical Requirements

The conductors shall be bare, concentric lay stranded, uncoated round drawn wires.

The central core wire in the stranded conductor shall be of the same type and temper as the concentric layer wires

Welds and brazes may be made in the individual wires provided they are not closer than 15 metres to one another, before final drawing.

There shall be no joints in any given length of finished conductors.

The preferred lay of a layer of wires is 13.5 times the outside diameter of that layer, but shall not be less than 10, or more than 16 times, this diameter.

3.3 Stock Codes

| Stock Code | Size | Stranding | Temper | Reel/Coil Length |
|------------|-----------|-----------|-------------|------------------|
| 2 83 02 | #2 AWG | 7 | Soft | 300m Reel |
| 2 83 04 | #4 AWG | 7 | Soft | 150m Coil |
| 2 83 20 | 2/0 AWG | 19 | Soft | 300m Reel |
| 2 98 01 | 4/0 AWG | 19 | Medium-Hard | 300m Reel |
| 2 98 04 | 500 kcmil | 37 | Soft | 105m Reel |

3.4 Conductor Identification

The centre strand shall be indent stamped with the designation "SP" at least every 3 metres.

4. Packaging

Cable shall be suitable for forklift handling and shipped on an open flat-deck trailer.

Alternate packaging requires prior approval before shipping.

4.1 Coils

Coils shall be packaged in 150 m lengths, spiral wrapped with paper in such a manner to ensure the paper will not unravel in shipment and handling.

4.2 Reels

Reels shall be wooden reels with lengths as specified in Section 3.3. The reels shall be lagged to protect the conductor during shipment and handling.

4.3 Marking

Each reel shall be tagged with a non-corrosive metal label. The metal label shall bear the following:

- a) Manufacturer
- b) Name of item, catalogue, number and modification numbers, if any
- c) Date of manufacture
- d) Wire size, stranding, strand size, and temper
- e) SaskPower purchase order number
- f) SaskPower Stock Code Number
- g) Reel length in metres

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- h) Reel serial number
- i) Gross mass of reel, including wire and protective layers

5. Inspection

All shipments of Stranded Bare Copper Wire are subject to inspection by SaskPower when they are received. Acceptance will be based on the requirements of this specification.

6. Rejection

Failure of a representative sample of any shipment to meet requirements of this specification shall be the basis for rejection of the shipment. SaskPower will have the discretion to determine the sample size to be inspected for such purposes.

25 AND 28 KV PRIMARY CABLE

SASKPOWER CODE
See Section 3.2

LS-4004

2017 November 16

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SUPERSEDES

LS-4004

2017 October 23

1. Scope

This specification describes 25 and 28 kV Primary Cable to be built in accordance with Section 2 Reference Publications except where specific requirements of this specification shall take precedence.

2. Reference Publications

Reference is made in this specification to the following standards, the latest issues, amendments, and supplements of which shall apply:

2.1 CSA Standards

C68.5-13 – Shielded and concentric neutral power cable for distribution utilities

2.2 Other Standards

NEMA WC 26/ EEMAC 201-2008 – Binational Wire and Cable Packaging Standard

3. Requirements

3.1 Service Conditions and General Requirements

All materials, construction and testing of the cable shall be fully in compliance with CSA C68.5. All specifications, dimensions and tolerances of CSA C68.5 shall apply except where requirements of this specification shall take precedence.

The cable shall be so designed to accommodate continuous operating temperatures of 90°C and emergency operation at 130°C.

Cable voltage class shall be nominal system voltage phase-to-phase.

Cables shall be expected to operate both continuously at a voltage 105% of the rated phase-to-phase voltage, and at 110% of nominal voltage for a maximum of 15 minutes, without damage to the cable or an accelerated loss of life.

All cables specified are single conductor jacketed concentric neutral power cables, unless otherwise noted.

3.2 Stock Codes

The core conductor shall be in one of the following configurations:

| Stock Code | Conductor |
|---------------------|---|
| 2 92 25* | #2 AWG, Aluminum, Solid, Unjacketed |
| 2 94 22 | #2 AWG, Aluminum, Solid |
| 2 94 31 | #1 AWG, Aluminum, 19 Strand, Compact, non-strandblocked |
| 2 94 32 | #1 AWG, Aluminum, 19 Strand, Compact |
| 2 94 33 | #1 AWG, Aluminum, Solid |
| 2 94 36 | 4/0 AWG, Aluminum, Compact Stranded |
| 2 94 37 | 500 kcmil, Aluminum, Compact Stranded |
| 2 94 38 | 500 kcmil, Copper, Compact Stranded |

* Conductor has been obsoleted and is included for reference only.

3.3 Core Conductor

Conductors shall meet the requirements of Section 4.2 of CSA C68.5.

Stranded aluminum conductors shall be of intermediate temper, whereas solid aluminum conductors may be of annealed or intermediate temper.

With the exception of solid conductors, all conductors shall be of a compact stranded configuration.

3.4 Strand Sealant

With the exception of stock code 2 94 31, the interstitial voids in stranded conductors shall contain a water blocking material.

The material shall be tested for compatibility with the conductor shield material as per Section 4.3 of CSA C68.5, and the resulting conductor shield resistivity shall not exceed the limits set forth in Section 5.6.1 of CSA C68.5.

The material shall not reduce the efficacy of compression connectors and other common cable accessories.

Stock code 2 94 31 is to be used for splicing into existing installations and must be compatible with cable injection rejuvenation techniques.

3.5 Conductor Shielding

Conductor shielding shall be an extruded, thermosetting, semiconducting, “supersmooth” compound. The compound shall be Dow #HFDA-0800 BK EC, Dow #HFDA-0802 BK EC, Borealis #0500, or Borealis #0504. Other compounds employing Acetylene carbon black may be acceptable with prior written SaskPower approval.

Conductor shielding thickness shall be 0.30 mm (12 mils) for all cables up to 4/0 AWG inclusive and 0.41 mm (16 mils) for sizes up to 500 kcmil. A reduction of the shield thickness, even for conductors with eccentricity of less than 0.051 mm (2 mils), shall not be acceptable.

The conductor shielding, insulation and insulation shielding shall all be applied in the same extrusion pass in true triple extrusion process and shall meet the requirements of CSA C68.5. These three core layers shall be dry cured.

3.6 Insulation

Insulation shall be an “extra clean”, tree-retardant, cross-linked polyethylene (TRXLPE) compound. This compound shall be Dow #HFDC 4202 EC or Borealis #4212. Other compounds may be acceptable with prior written SaskPower approval.

TRXLPE Class III insulation shall not be required.

The insulation shall meet the requirements of CSA C68.5. The diameter over the insulation shall meet the requirements in the following table:

| Conductor Size | Voltage Class, kV | Insulation Class | Diameter Over Insulation, mm (mils) | |
|-----------------------------|-------------------|------------------|-------------------------------------|---------------|
| | | | Minimum | Maximum |
| #2 AWG, Solid | 28 | 100% | 20.574 (810) | 22.987 (905) |
| #1 AWG, 19 Strand, Compact | 25 | 100% | 20.701 (815) | 22.987 (905) |
| #1 AWG, Solid | 25 | 100% | 20.447 (805) | 22.733 (895) |
| 4/0 AWG, Compact Stranded | 25 | 100% | 25.146 (990) | 27.432 (1080) |
| 500 kcmil, Compact Stranded | 25 | 100% | 32.004 (1260) | 34.290 (1350) |

The Insulation Eccentricity shall be in accordance with Table 11 of CSA C68.5.

3.7 Insulation Shielding

Insulation shielding shall be an extruded, thermosetting, semi-conducting compound, applied directly over the insulation. This compound shall be Dow #HFDA-0693LS BK or Borealis #0520. Other compounds may be acceptable with prior written SaskPower approval.

The insulation shielding shall be removable without damaging the insulation and without conductive residue remaining after removal of the insulation shielding. A thermally strippable non-metallic component shall not be used.

The insulation shield shall meet the requirements of CSA C68.5, except the stripping test shall be performed at a temperature of -20°C.

A tape layer between the extruded insulation shielding and the concentric neutral conductors shall not be applied.

3.8 Concentric Neutral

The concentric neutral conductors shall be in compliance with Section 8 of CSA C68.5. Concentric neutral conductors shall be round uncoated annealed copper wires.

The number and size of the concentric neutral wires shall be in accordance with the following table and shall be applied in accordance with CSA C68.5:

| Phase Conductor Size | Concentric Neutral | |
|--------------------------------|--------------------|-----------------|
| | 100% Conductance | 33% Conductance |
| #2 AWG Al, Solid | 10 x #14 | — |
| #1 AWG Al, Solid or Compact | 13 x #14 | — |
| 4/0 AWG Al, Compact Stranded | — | 11 x #14 |
| 500 kcmil Al, Compact Stranded | — | 25 x #14 |
| 500 kcmil Cu, Compact Stranded | — | 26 x #12 |

NOTE: Concentric neutral conductance of less than 50% is to be used only for three-phase applications.

A concentric neutral layer that requires a combination of nonmagnetic metallic tape and wire shall not be acceptable.

3.9 Jacket

The overall jacket shall be extruded-to-fill of a nonconductive black linear low-density polyethylene compound. The compound shall be Dow #DFDG-6059 or Borealis #8707. Other compounds may be acceptable with prior written SaskPower approval.

The minimum thickness shall be in accordance with Table 21 of CSA C68.5.

3.9.1 Jacket Striping

The cable jacket shall incorporate 3 red, equally spaced longitudinal stripes in accordance with Section 9.2.4 of CSA C68.5 and of a compound meeting the requirements of the test in Section 4 of this specification.

3.10 Sealing

The ends of each length of cable shall be hermetically sealed as soon as possible after manufacture.

3.11 Cable Marking

Cable marking shall be in accordance with Section 10.2 of CSA C68.5.

4. Tests and Test Procedures

4.1 Qualification Tests

Qualification tests shall be performed by the manufacturer in accordance with CSA C68.5. Test results shall be submitted in a certified test report and conforming to CSA C68.5.

4.1.1 Cold Bend Test

A cold bend and partial discharge test shall be performed on samples of the finished cable, as specified in CSA C68.5 and for engineering information only. The cold bend test shall be performed at -40°C.

4.1.2 Strand Blocking Tests

Strand blocking tests shall be performed as specified in Sections 12.4.2 and 12.4.9 of CSA C68.5.

4.1.3 Jacket Striping Material Tests

4.1.3.1. Weather Resistance Test

The jacket shall meet or exceed the requirements of Section 12.3.3 of CSA C68.5.

4.1.3.2. Environmental Stress Cracking Test

The jacket shall meet or exceed the requirements of Section 12.3.4 of CSA C68.5

4.2 Production Tests

Test results shall be submitted in a certified test report and conforming to the respective Sections of CSA C68.5.

- a) Conductor Diameter Measurement as per Section 11.3.2
- b) AC Voltage as per Section 11.12
- c) Partial Discharge Extinction as per Section 11.13
- d) Strand Blocking as per Section 11.14

5. Qualification

Product qualification shall depend upon evaluation of the test results supplied by the manufacturer under Section 4.1.

The manufacturer shall upon request permit SaskPower personnel or their representatives to examine the production process and allow them to perform any inspections or witness any tests they deem necessary to determine whether the product conforms to the requirements of this specification.

After the award of tender, test reports shall be forwarded electronically to the Distribution Asset Management and Planning Department within SaskPower to the attention of the Manager, Standards.

The manufacturer shall retain detailed test reports for a period of not less than 5 years.

Any deviation from the stated dimensions, materials or specifications shall not be accepted without prior written permission from SaskPower.

6. Packaging

Alternate packaging requires prior written SaskPower approval before shipping.

6.1 Cable Lengths

Cables shall be shipped with quantities as outlined below.

| Stock Code | Quantity per reel, metres |
|------------|---------------------------|
| 2 94 22 | 1600 |
| 2 94 31 | 300 |
| 2 94 32 | 900 |
| 2 94 33 | 1000 |
| 2 94 36 | 650 |
| 2 94 37 | 450 |
| 2 94 38 | 450 |

Nominal tolerances for cable lengths shall be -0%/+5% per reel. Reduced lengths may be acceptable at the option of SaskPower.

No lengths will be accepted less than 50% of minimum.

6.2 Reels

The cable shall be supplied on returnable reels.

Reels shall be suitable for rolling on their rims and shall be capable of withstanding the normal handling necessary in transportation and installation.

The conductor adjacent to the reel and the outermost layer shall be adequately protected to prevent the cable from being scraped, chafed, or nicked. The outer layer of cable on the reel is to be wrapped with a suitable material to prevent dirt or grit from coming in contact with the cable. The protective material shall be securely banded to the reel.

6.3 Marking

Each reel shall be tagged with a non-corrosive metal label as per Section 10.3 of CSA C68.5. The metal label shall, at minimum, bear the following information:

- a) Manufacturer
- b) Date of manufacture
- c) SaskPower stock code number
- d) Purchase order number
- e) Product description
- f) Cable length (m)
- g) First and Last of the sequential cable length markers
- h) Reel serial number
- i) Shipping mass of reel, including conductor and protective layers

7. Inspection

All shipments of 25 and 28 kV Primary Cable are subject to inspection by SaskPower when they are received. Acceptance will be based on the requirements of this specification. Inspection by

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2017 November 16

SaskPower does not relieve the manufacturer of their obligation to ensure quality and that requirements of this specification are met..

8. Rejection

Failure of a representative sample of any shipment to meet requirements of this specification shall be the basis for rejection of the shipment. SaskPower will have the discretion to determine the sample size to be inspected for such purposes.

Distribution Transformers Single-Phase Pad-Mounted, Low Profile, Deadfront

SASKPOWER CODE
See Section 1.3.1

LS-304

2017 November 21

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SUPERSEDES

LS-304

2017 October 03

1. Scope

1.1 Purpose of the Specification and Precedence

This specification for Distribution Transformers Single-Phase Pad-Mounted, Low Profile, Deadfront (the “Specification”) outlines various specifications (including, without limitation, technical specifications, physical characteristics, performance characteristics, manufacturing and assembly requirements, finishing requirements and marking requirements) for Distribution Transformers Single-Phase Pad-Mounted, Low Profile, Deadfront (referred to in this Specification as the “Transformers” and each as a “Transformer”) to be supplied to SaskPower. All of the Transformers are to be built in accordance with the requirements of this Specification and the Reference Publications. Where the specific requirements of this Specification vary from the requirements of the Reference Publications, the specific requirements of this Specification shall take precedence.

When any of the reference publications contradict, CSA C227.3 shall have precedence.

1.2 Deviation

Any deviation of design of any Transformer from any requirement outlined in this Specification shall have prior written approval from SaskPower.

1.3 Information Relating to Transformers

1.3.1 Voltage Ratings

The following chart outlines the high and low voltage rating, insulation classes and BIL for each of the Transformers (listed by the first four digits of the SaskPower stock code for the Transformers):

| Stock Code | High Voltage (V) | Low Voltage (V) | Insulation Class | | BIL | |
|------------|-------------------|-----------------|------------------|----------|-----------|----------|
| | | | High (kV) | Low (kV) | High (kV) | Low (kV) |
| 16 72 XX | 24940 Grd Y/14400 | 240/120 | 18.0 | 1.2 | 125 | 30 |
| 16 73 XX | 24940 Grd Y/14400 | 480/240 | 18.0 | 1.2 | 125 | 30 |
| 16 74 XX | 4160 Grd Y/2400 | 240/120 | 5.0 | 1.2 | 60 | 30 |

1.3.2 *kVA Rating*

The following chart outlines the kVA rating for each of the Transformers (listed by the last two digits of the SaskPower stock code for the Transformers):

| Last two digits of Stock Code | kVA |
|-------------------------------|------|
| 25 | 25 |
| 37 | 37.5 |
| 50 | 50 |
| 75 | 75 |
| 76 | 100 |
| 78 | 150 |
| 79 | 167 |

1.3.3 *Minimum Impedance*

The following chart outlines the minimum impedance required for each of the Transformers according to the kVA rating of each of the Transformers:

| Size in kVA | Minimum %IZ |
|---------------|-------------|
| Up to 50 | 1.5% |
| 75 | 2% |
| 100 and above | 2.5% |

2. Reference Publications

All Transformers supplied to SaskPower shall be made in accordance with and conform to the specifications and other requirements outlined in the following standards (referred to in this Specification as the “Reference Publications”), the latest issues, amendments, and supplements of which shall apply:

2.1 **CSA Standards**

C2.1-06 (R2017) – Single-Phase and Three-Phase Liquid-Filled Distribution Transformers

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

2.2 **Other Standards**

DTWG-02 (99) – Low-Profile, Single Phase, Dead-Front Pad-Mounted Distribution Transformers

2.3 **SaskPower Drawings**

E1-546 Rev U – Farm Power Center C/W Splitter

E1-562 Rev C – Fiberglass Box Pad for Underground Use

E1-609 Rev E – Typical RUD Padmount Transformer and Meter Attachment Provisions

E1-614 Rev B – 3/4 x 3 Galvanized Conduit Nipple

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E1-768 Rev A – Fibreglass Box Pad for URD Use

M1-175 Rev C – Pallet for Transformer Specifications

3. Electrical Characteristics

3.1 Rating

Ratings shall be based on a maximum temperature rise of 65°C. The Transformer shall be oil-immersed, self-cooled (ONAN) type.

3.2 Loadbreak Switch

Transformers in the 16-72-XX and 16-73-XX series shall have a four-way, make-before-break switch installed. The switch shall be Cooper catalogue number LS4RH1T12M or SaskPower approved equivalent. The switch will be used to alternately disconnect A bushing, B bushing or the Transformer coil. The switch shall be mounted and connected in the following manner:

| Switch Position | Switch Connection |
|-----------------|-------------------|
| Up - 12:00 | A-B-T |
| Right - 3:00 | B-T |
| Down - 6:00 | A-B |
| Left - 9:00 | A-T |

The switch shall be located in the cable entrance compartment of the Transformer in such a position that it will not be obscured by incoming cables to the Transformer.

The Cooper catalogue LS4RH1T12M switch is normally provided with an externally installed limiting plate. This plate and the corresponding weld pins are not required. The limiting plate shall be removed.

3.3 Taps

High voltage taps are not required.

4. Mechanical Characteristics

4.1 Dimensions

Transformer dimensions for 75kVA or less shall not exceed 1070mm to fit the fibreglass box pad specified in Drawing E1-562. Transformer dimensions for 100kVA or more shall not exceed 1245mm deep x 1060mm wide to fit the fibreglass box pad specified in Drawing E1-768. Overhang will not be allowed.

4.2 Sight Glass

Transformers with loadbreak switches installed as per Section 3.2 of this specification shall have a sight glass installed to allow the operator to check that the switch is under oil before operating.

4.3 Attached Meter Cabinet Provision – 167225 and 167250 Only

Three 28.6mm (1-1/8") punch outs C/W locking plate shall be provided on the flashing of the cable compartment to accommodate conduit fittings as shown on E1-614. The punch outs are to allow for secondary conductors to run to a meter cabinet from the right side of the cable compartment. The locking plate shall impede any effort by the public to access the punch outs while still attached. The transformer hood shall be capable of opening and closing normally without detaching the meter cabinet when installed.

Transformer lifting bosses and punch outs C/W locking plate dimensions and location shall be as per E1-609 where applicable and shall be able to accommodate items 'J' as shown on E1-546.

4.4 Hold Down Provision

Two foundation hold down clamps complete with two (2) - 3/8" x 16 TPI x 1-1/4" Grade 5 cadmium or zinc plated cap screws and nuts and four (4) - 1" x 3/16" washer with 7/16" hole shall be supplied with each pad-mounted Transformer. They shall be attached for shipping inside the pad-mount in a location suitable for ease of removal.

4.5 Cable Entrance Compartment

The cable entrance compartment shall be constructed as per Section 5.2.2 of CSA C227.3.

4.5.1 Hood

The hood shall be capable of being opened through a minimum angle of 180°.

The hood and sill shall be constructed as per Section 5.2.2.2 of CSA C227.3 with a 1/2" pentahead bolt.

4.5.2 Roof

The interior of the roof of the hood shall not be covered with a condensation inhibiting material.

4.6 Drip Tray

A metal oil spill tray, conforming to Section 5.3.3 (Drip Tray) of CSA C227.3, shall be welded to the tank below the Bay-O-Net fuses.

4.7 Liquid Insulating Fluid

The PCB (Polychlorinated Biphenyl) content of all insulating fluids shall be less than two (2) parts per million by weight.

4.8 Fusing

4.8.1 Fuse Assembly

Fuses shall be provided on the HV windings and be mounted on the left side of the tank above the HV bushings. The fuses must be isolating and externally

accessible. An R.T.E. Bay-O-Net fuse, complete with flapper valve, is required together with an internal E.L.S.P. current limiting back-up fuse.

4.8.2 Bay-O-Net Fuse Sizes for 1Ø Padmounts

| Voltage | kVA | R.T.E. Bay-O-Net Fuse | | E.L.S.P. Link | |
|---|------|-----------------------|-----------|---------------|-----------|
| | | Cat. No. | Fuse Size | Cat. No. | Fuse Size |
| 24940GrdY/ 14400 Stock Code 16-72-XX 16-73-XX | 25 | 4000358C03 | 3A | CBUC15030C100 | 30A |
| | 50 | 4000358C05 | 8A | CBUC15030C100 | 30A |
| | 75 | 4000358C05 | 8A | CBUC15080C100 | 80A |
| | 100 | 4000358C08 | 15A | CBUC15080C100 | 80A |
| | 167 | 4000358C10 | 25A | CBUC15125C100 | 125A |
| Voltage | kVA | R.T.E. Bay-O-Net Fuse | | E.L.S.P. Link | |
| | | Cat. No. | Fuse Size | Cat. No. | Fuse Size |
| 4160GrdY/ 2400 Stock Code 16-74-XX | 25 | 4000358C10 | 25A | CBUC08125C100 | 125A |
| | 37.5 | 4000358C10 | 25A | CBUC08150D100 | 150A |
| | 50 | 4000353C12 | 40A | CBUC08150D100 | 150A |
| | 100 | 4000353C14 | 65A | CBUC08165D100 | 165A |
| | 150 | 4000353C17 | 140A | CBUC08150D100 | 300A* |

NOTE: * - 2 Fuses in Parallel.

Shading of numbers is meant to distinguish them from other similar numbers in the table.

5. Bushings, Terminals and Grounding

5.1 HV Bushings

The HV bushings shall consist of short loadbreak bushing inserts with integral partial vacuum flashover solution: Elastimold Cat. No. 2701A4A, Cooper LBI225, or a SaskPower approved equivalent. The high voltage bushing wells shall conform to Section 6.2 of CSA C227.3: Central Moloney Cat. No. 3-70191873 (round removable stud), Cooper BW150R, or SaskPower approved equivalent.

A #14 solid bare copper wire at least 150 mm in length shall be provided for grounding purposes between the HV bushing inserts and HV bushing wells. The HV bushing insert end shall be looped through a drain wire hole provision and twisted onto itself. The bushing well end shall be looped through a drain wire hole provision on one of the bushing well mounting studs and twisted onto itself. The bushing well end shall be terminated using a ring terminal.

There shall be a minimum 100 mm clearance around the HV bushings, with the exception of parking stands, measured from the center of the bushing.

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HV elbows will not be supplied by the Transformer manufacturer.

5.2 LV Bushings

All LV bushings shall be in accordance with Section 6.3 of CSA C227.3. For Transformers rated 150 kVA use the same LV bushings as a 167 kVA rated Transformer.

5.3 Grounding

A grounding bracket as per CSA C227.3, Detail A of Figure 5 shall be welded to the Transformer tank.

The grounding spade terminal located below the high voltage bushings shall be marked H2. The grounding spade terminal located below the low voltage bushings shall be marked X2.

The grounding spades shall be as per CSA C227.3 Figure 2 (e) complete with two solderless terminal lugs, Utilco #TSG-350P, Ilsco #TA-250I or SaskPower approved equivalent, and capable of accommodating from 250 kcmil to #6 AWG copper or aluminum conductors.

A metal grounding tab drilled to accommodate a strand of 2.05 mm (#12 AWG solid) diameter neutral wire shall be securely attached to one of the bolts on each HV bushing well clamp assembly.

An external, removable, copper grounding strap shall be provided and connected between the low-voltage neutral terminal X2 and the grounding spade. This grounding strap shall be attached at each end with a 1/2" diameter by 2 1/2" long silicon bronze bolt and nut, two stainless steel flat washers and 1 stainless steel Bellville washer .

6. Workmanship and Finish

6.1 Finish Performance

The exterior finish performance shall conform to CSA C227.3 Section 9.

6.2 Color

The Transformers shall be powder coated Equipment Green – Munsell 9GY 1.5/2.6.

7. Markings

7.1 Combination Nameplate

The combination nameplate shall be in accordance with Section 10.2 of CSA C227.3. The SaskPower specification number and revision date shall be included on the nameplate in addition to the CSA Standard as per CSA C227.3 Section 10.2.3 (o).

The combination nameplate shall clearly specify core material; as either amorphous core or as cold rolled grain oriented steel (CRGO) core.

One full size nameplate is to be provided in the LV compartment.

7.2 Transformer Markings

All internal markings, except where adhesive labels are used, shall be stencilled in white.

7.2.1 Warning Labels

a) Fusing

The letters "C.L." shall be stencilled on the tank wall in the vicinity of the Bay-O-Net fuses and above the bushings so not as to be obscured by the elbows.

b) Electrical Hazard Warning Signs

A self-adhesive warning label, CSA 227.3 Figure 13, supplied by the manufacturer, shall be attached to the inside hood of the Transformer. A second self-adhesive warning label, SaskPower Stock Code #5641385, supplied by SaskPower, shall be attached to the front of Transformer. A "Keep Clear" label, SaskPower stock code #5641384, supplied by SaskPower, shall be applied to the front of the Transformer centered to the left of the aforementioned "High Voltage Do Not Open" decal. Three additional warning labels, SaskPower stock code #5646582, shall be supplied by SaskPower. One label shall be placed in the same elevation as and to the left of the "Danger High Voltage" warning label. The remaining two labels shall each be placed on the sides of the cable entrance compartment, 200 mm from the top and centered front to back.

7.2.2 Switch Identification

Transformers with loadbreak switches installed as per Section 3.2 of this specification shall have the switch positions (ie: "A-B-T", "B-T", "A-B" and "A-T") stencilled around the switch operating handle. Additionally, a warning label stating "Caution – Check oil level sight glass to ensure switch is under oil before operating" shall be affixed near the switch operating handle.

7.2.3 Information on Exterior of the Transformer

a) Information Tag

A self-adhesive tag shall be attached to the exterior of the tank, on the upper left side of the hood. The Transformer kVA, serial number, and SaskPower stock code shall be indicated on the tag.

b) Gross Weight

c) Non-PCB Sticker

A non-PCB decal, as per Figure 11 of CSA 227.3 shall be affixed to the Transformer hood below the information tag.

d) Stock Code Number

SaskPower Stock Code number shall be stencilled on the exterior of the Transformer hood. Transformers with loadbreak switches installed as per

Section 3.2 of this specification shall have the letter ‘S’ appended to the stock code number.

e) Amorphous Core

Amorphous core Transformers shall be stencilled or labelled on the Transformer tank, just below the non-PCB decal. The stencil or label shall be of an “A”, in 38 mm (1.5”) Helvetica font lettering, in fluorescent green graphic film (3M Scotchcal 7725SE-406 or a SaskPower approved equivalent).

7.3 Barcode/QR Code Asset Tags

SaskPower will supply 102 x 32mm assets tags to the manufacturer to be attached adjacent to the exterior nameplate or other approved location using two stainless steel screws or rivets by the manufacturer.

The manufacturer shall be responsible for providing the following information in an electronic spreadsheet (Excel) format for each transformer supplied to SaskPower. Each column in the Excel Spreadsheet must match the title of each field exactly as shown below and in the same order from left to right;

- 1) Asset ID
 - Must be in correct format; “UT#####”
- 2) Manufacturer
 - Must be entered exactly as is found within Electric Office (EO). Confirm entry with the email address found below prior to submitting
- 3) Date Manufactured
 - Must be in correct format; “MM/DD/YYYY”
- 4) Type of installation
 - Will always be entered as “Underground”
- 5) Live Front
 - Will always be entered as “Yes” or “No”
- 6) Manufacturer Serial Number
- 7) SaskPower Stock Code
 - Must be in the correct 6 digit format with no spaces or dashes
- 8) Rated Apparent Power (kVA)
- 9) HV Level (kV)
- 10) LV Level (kV)
- 11) Phase Type

- Will always be entered as “1 Phase” or “3 Phase”
- 12) Number of bushing HV
 - Does not include grounding lugs or spades and must be in the correct numerical format (i.e. 6)
- 13) Number of bushing LV
 - Does not include grounding lugs or spades and must be in the correct numerical format (i.e. 3)
- 14) Total mass (kg)
- 15) Oil Volume (L)
- 16) Core Type
 - For Example; “Amorphous”
- 17) Impedance (%)
 - Must be in correct format; “#.#”
- 18) Dimension of the transformer (mm)
 - Must in the correct format; “### (Depth) x ### (Width) x ### (Height)”
- 19) RTE Bay-o-net fuse size and catalogue number
 - Must in the correct format; “##A, 40003##C##”
- 20) CL Fuse (ELSP fused link) size and catalogue number
 - Must in the correct format; “##A, #####”
- 21) Purchase Order Number
- 22) Governing Specification and Specification Revision Date
 - Must in the correct format; “LS-####, MM/DD/YY”
- 23) Transformer Approval Reference Number
 - Must in the correct format; “##-##”

This information shall be supplied with every shipment and shall be sent to distributionassettags@saskpower.com.

The Excel Spreadsheet Templates can be requested from the email address above.

8. Packaging

Each Transformer shall be banded to a pallet with metal banding and must be suitable for forklift handling. Transformers shall be placed upon the pallets such that the stock code labelling on the Transformer is clearly visible to the forklift driver as it is being lifted.

Transformers are to be shipped on open flatdeck trailers in a manner suitable for offloading from the sides.

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Alternate packaging requires prior approval from SaskPower before shipping.

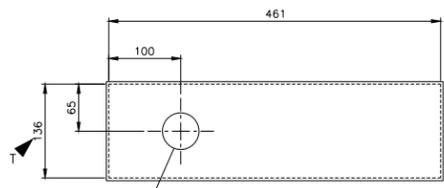
9. **Design Documents**

An initial preliminary design document including a drawing of the Transformer must be provided to SaskPower for the purpose of review of conformance of the preliminary design of the Transformer to the requirements of this Specification prior to any manufacture or supply of the Transformer, which design document must include at a minimum the following information:

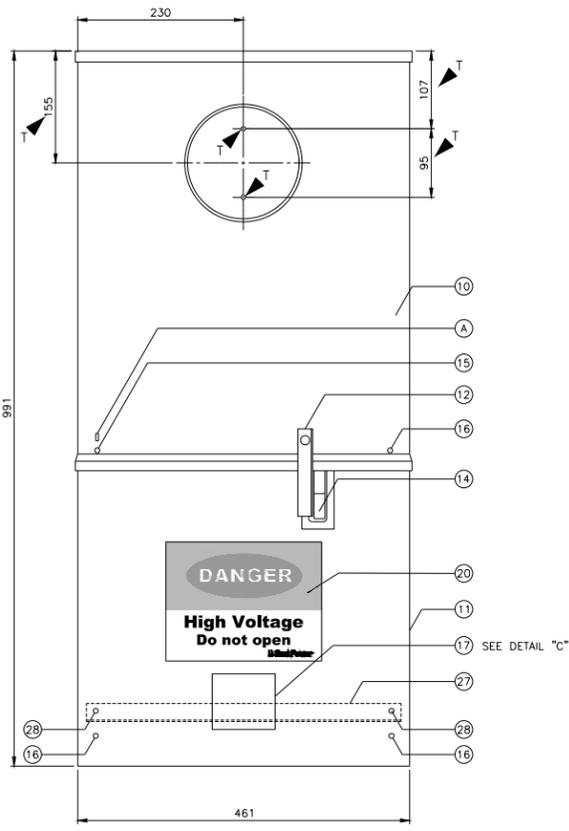
- Six digit SaskPower Stock Code number for the Transformer;
- Dimensions of the Transformer;
- High voltage level and low voltage level of the Transformer in volts;
- High and low insulation class of the Transformer in kV;
- BIL (basic insulation level) of the Transformer;
- Calculated percent regulation of the Transformer at 1.0 PF and 0.8 PF;
- Estimated total weight of the Transformer in kilograms; and
- Location of all bushings, terminals, applicable HV tap changers and accessories.

Prior to the supply of each Transformer, a final design drawing of each Transformer must be provided to SaskPower for approval, which design drawing must include all information required for SaskPower to confirm that the Transformer will comply with the requirements of this Specification.

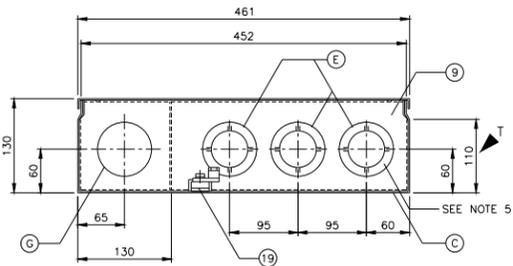
All design drawings shall be forwarded to tdstandards@saskpower.com.



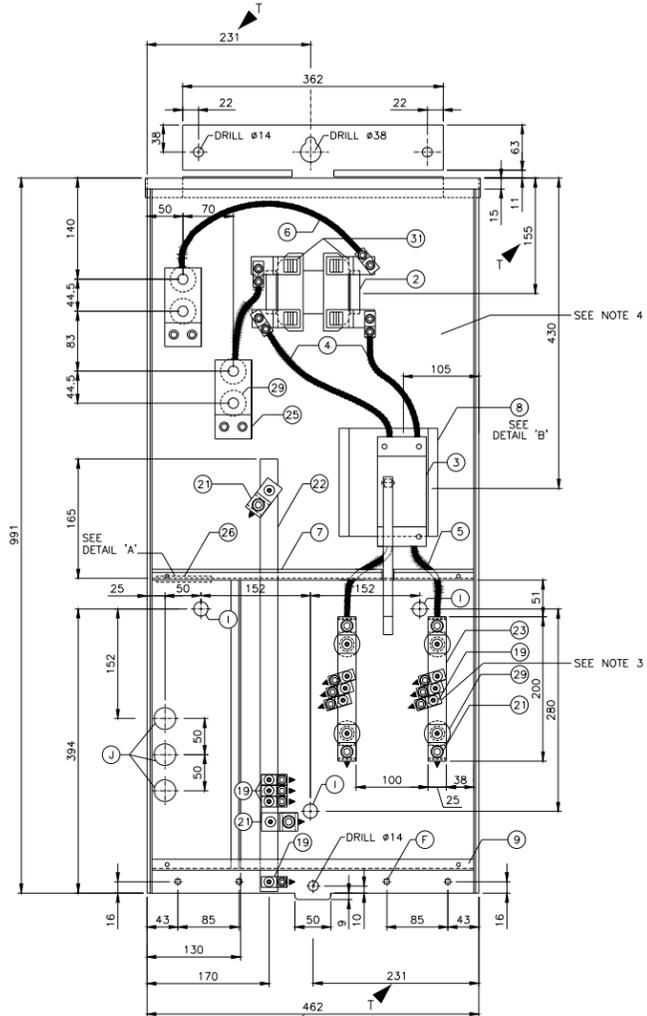
TOP VIEW
1:5



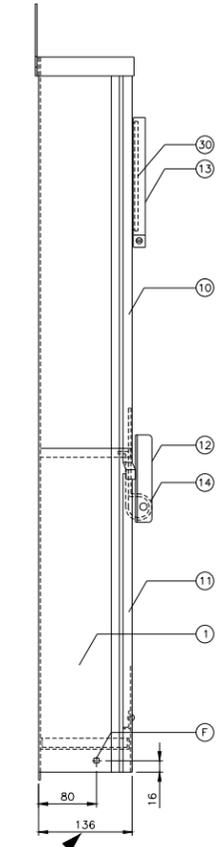
FRONT VIEW
(C/W COVER)
1:5



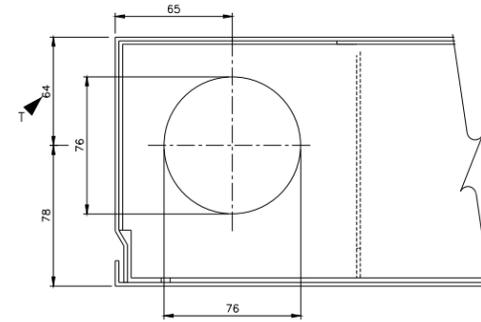
BOTTOM VIEW
1:5



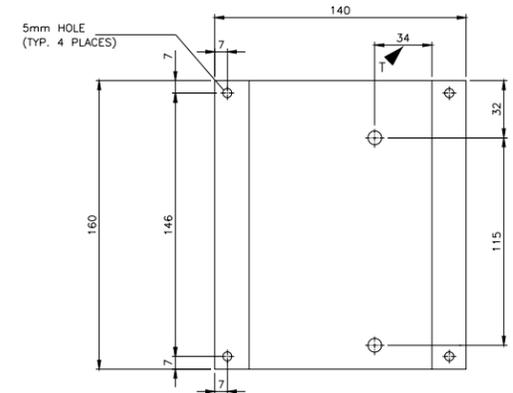
FRONT VIEW
(W/O COVER)
1:5



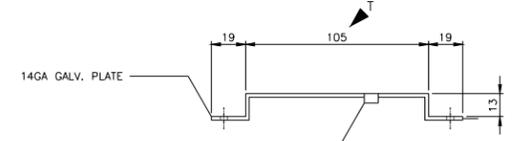
LEFT SIDE VIEW
(RIGHT SIDE SIM.)
1:5



DETAIL 'A'
(BARRIER HOLE)
1:2



DETAIL 'B'
(BREAKER BRACKET)
1:2



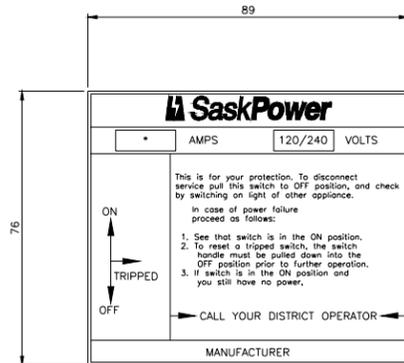
DETAIL 'C'
(RATING NAMEPLATE)
1:1

| ITEM | QTY. | DESCRIPTION |
|------|------|--|
| 1 | 1 | ENCLOSURE ASS'Y 14 GA. MILL GALV. STEEL |
| 2 | 1 | 200 AMP 4 JAW METER JAW ASS'Y (PLASTIC MOUNTS) |
| 3 | 1 | MAIN BREAKER W/(2) BOX AL LUGS |
| 4 | 2 | 1/0 CU 600V TWU/RWU -40°C |
| 5 | 2 | 1/0 CU 600V TWU/RWU -40°C |
| 6 | 2 | 1/0 CU 600V TWU/RWU -40°C |
| 7 | 1 | BARRIER |
| 8 | 1 | BREAKER BRACKET DETAIL 'B' |
| 9 | 1 | BOTTOM ENDWALL C/W KNOCKOUTS |
| 10 | 1 | METER AND BREAKER COVER |
| 11 | 1 | POWER COVER |
| 12 | 1 | HANDLE LOCK "OFF" BRACKET |
| 13 | 1 | METER SEALING RING SCREW TYPE |
| 14 | 1 | MAIN BREAKER HANDLE |
| 15 | 1 | SEALING SCREW (WITH PEM NUT) ZINC PLATED, (SLOTTED) FILLISTER HEAD MACHINE SCREW WITH HOLE DRILLED THROUGH HEAD. |
| 16 | 3 | COVER SCREW (WITH PEM NUT) ROBERTSON-FLAT COMBINATION SCREW -ZINC PLATED |
| 17 | 1 | RATING NAMEPLATE-89mm x 76mm |
| 18 | 4 | TAKEOFF LUG-WIRE RANGE: #4-350 MCM CU/AL(ALLEN SCREW SOCKET) |
| 19 | 10 | TAKEOFF LUG-WIRE RANGE: #14-#2/0 CU/AL (ALLEN SCREW SOCKET) |
| 20 | 1 | DECAL DANGER "DO NOT OPEN" (SASKPOWER CODE 05-641-385)(SUPPLIED BY SASKPOWER) |
| 21 | 6 | TAKEOFF LUG-WIRE RANGE: #4-350 MCM CU/AL(ALLEN SCREW SOCKET) |
| 22 | 1 | NEUTRAL BUS 9.525mm x 25.4mm ALUMINUM 6061-T6 |
| 23 | 2 | LOAD BUS 9.525mm x 25.4mm ALUMINUM 6061-T6 |
| 25 | 2 | LUG FOR TWO: #6 - 350MCM CU/AL (ALLEN SCREW SOCKET) TWO ATTACHMENT 1 3/4" NEMA |
| 26 | 1 | PLASTIC GROMMET INSERT |
| 27 | 1 | 14 GA. MILL GALV. STEEL FORMED 25mmx13mmx440mm |
| 28 | 2 | RIVET, SEMI-TUB 3/16" DIA. x 9/32" LONG |
| 29 | 8 | INSULATOR BUS SUPPORT 600VOLT |
| 30 | 1 | METER OPENING COVER PLATE - PLASTIC TEMPORARY |
| 31 | 2 | RED INSULATED JAW COVER (LINE SIDE ONLY) |

| ITEM | DESCRIPTION |
|------|--|
| A | RAISED TAB METER SEAL |
| B | |
| C | 5mmx5mm DRAINAGE HOLES, 2 PLACES |
| D | |
| E | KNOCKOUTS (3) - 1 3/4" AND 2 1/2" ACTUAL SIZE (SEE NOTE 5) |
| F | PROVISION FOR MTG. TO PED. ASSM. 6-7mmx7mm |
| G | KNOCKOUT (1) 3" - ACTUAL SIZE |
| H | BARRIER |
| I | KNOCKOUTS (3) 7/8" - ACTUAL SIZE |
| J | KNOCKOUTS (3) 1 1/8" - ACTUAL SIZE |
| K | KNOCKOUT (1) 2" - ACTUAL SIZE |

NOTES:
 1. DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
 2. PEM NUTS TO BE USED WITH ALL ATTACHMENT SCREWS.
 3. ZINC PLATED OR EQUIVALENT ALLEN SOCKET HEAD CAP SCREW WITH FLAT & SPLITE LOCK WASHERS ARE TO BE USED FOR ATTACHING LUGS TO BUS BARS.
 4. THE MANUFACTURER'S TRADEMARK AND YEAR OF MANUFACTURE ARE TO BE STAMPED INSIDE THE MAIN COMPARTMENT.
 5. MULTIPLE KNOCKOUTS ATTACHMENTS ARE TO ALTERNATE BETWEEN INSIDE AND OUTSIDE.
 6. UNLESS OTHERWISE SPECIFIED, THE TOLERANCE SHALL BE +/- 1mm.

REFERENCE SPEC. LS-5043



DETAIL 'C'
(RATING NAMEPLATE)
1:1

| DESIGNED BY | DONAIS | J. PFEIFER | R. BECK | J.JANSEN | C. PREIKCHAT | Sheldon Noe | J.I.L. | J.I.L. | J.I.L. | J.I.L. | J.I.L. | J.I.L. | J.I.L. | J.I.L. | J.I.L. | J.I.L. | J.I.L. | J.I.L. |
|--------------|--|--|----------------------------------|--|----------------------------|---|--|----------------------------------|---|---|--------|--------|--------|--------|--------|--------|--------|--------|
| DESIGNED BY | DONAIS | J. PFEIFER | R. BECK | J.JANSEN | C. PREIKCHAT | Sheldon Noe | J.I.L. | J.I.L. | J.I.L. | J.I.L. | J.I.L. | J.I.L. | J.I.L. | J.I.L. | J.I.L. | J.I.L. | J.I.L. | J.I.L. |
| DRAWN BY | A.GATZKE | DC | TJD | N. CHOW | D. REID | Amrit Juttia | J.C.K. | C. A. Miller | M.B.P. | T. Smith | | | | | | | | |
| APPR'D BY | M.ERETH | M. ERETH | M. ERETH | M. ERETH | M. ERETH | M. Ereth | M. Ereth | M. Ereth | M. Ereth | M. Ereth | | | | | | | | |
| SEALED BY | | | | | | | | | | | | | | | | | | |
| DATE (Y-M-D) | | 2012-03-13 | 2008-03-27 | 2007-12-03 | 2006/10/24 | 2004-03-08 | 00-11-17 | 00-02-17 | 99-11-12 | 97-10-23 | | | | | | | | |
| REVISIONS | -REVISED ITEM 3 IN MATERIAL LIST. -UPDATED TITLE BLOCK. | DIMENSION CHANGES TO ACCOMMODATE NEW T&B METER SOCKET. | -ADDED DIMENSIONS TO BOTTOM VIEW | REVISED DESCRIPTION OF SECURITY SCREW. ADDED DIMENSIONS TO BREAKER BRACKET. | -REVISED MOUNTING BRACKET. | -RESCALED VARIOUS DIMENSIONS -ADDED NOTE 6 -MODIFIED ITEMS 15, 16, 17, 20, 22, 23 & 26. | -ITEM I INCREASED TO 7/8" KO AND CHANGED HORIZ. SPACING TO 152 AND 152. -ITEM 23 CORRECTED TO 1" AL BUS. -NOTES 4 & 5 ADDED -DETAIL 'A', ITEMS 25, 26, 30 & 31 CHANGED. | CHANGED ITEMS 4, 5, 6 TO TW -40" | 1. CHANGE BREAKER LOAD SIDE CONNECTING BUS BARS TO INSULATED WIRE. 2. ADDED NOTES 2 & 3. | 1. ADDED KNOCKOUT L. 2. ADDED RIM NUTS ON BOTTOM COVER ITEM 16. 3. MOVED ITEM 18. 4. UPDATE SASKPOWER LOGO ON NAMEPLATE. | | | | | | | | |

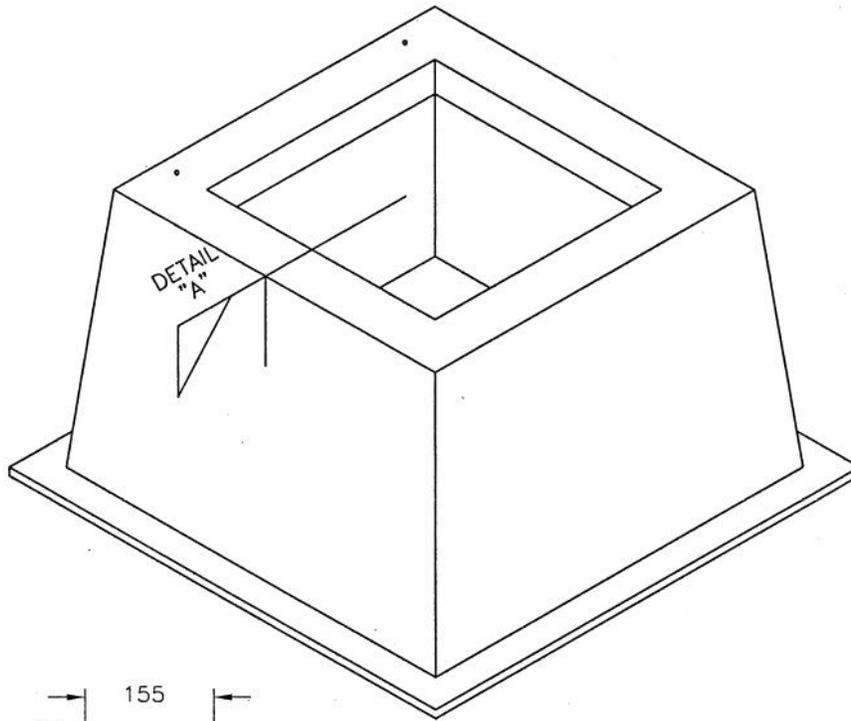
APPROVED FOR CONSTRUCTION

AutoCAD

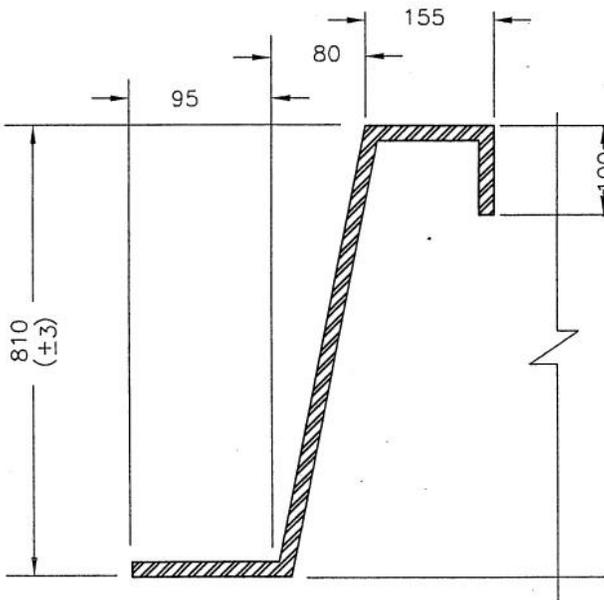
SaskPower INTERNAL USE ONLY

FARM POWER CENTER
C/W SPLITTER
5-03-30 & 5-03-32

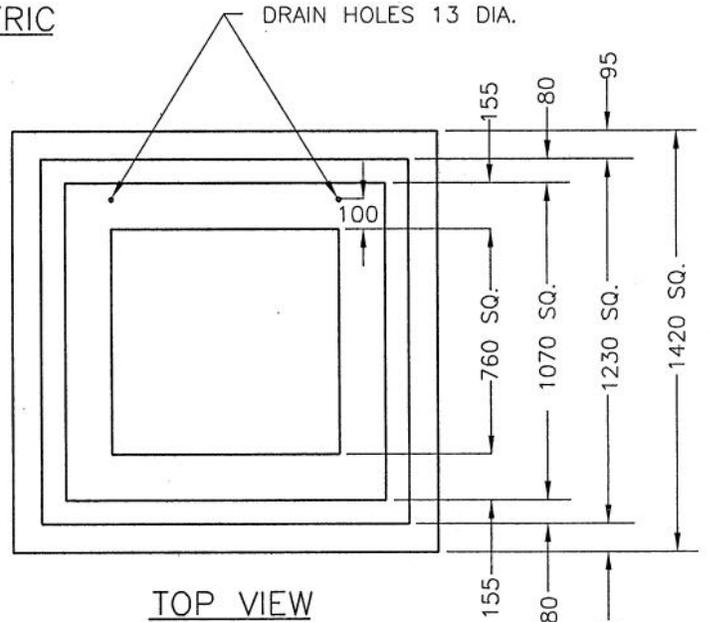
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 PLOT TIME: 1:17 PM
 PLOTTED BY: AGATZKE
 SCALE: AS SHOWN
 DRAWING No. E1
 SHEET 1 OF 1 REV. U



ISOMETRIC



DETAIL "A"
N.T.S.



TOP VIEW

NOTE: ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
ALL POINTS ON THE TOP SURFACE OF THE BOX MUST BE
LOCATED ON THE SAME PLANE WITH A TOLERANCE OF ± 1 mm.

ORIGINAL



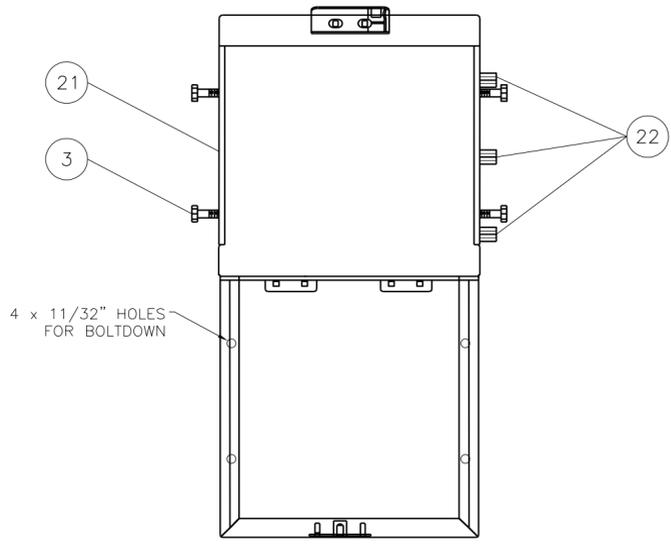
| | |
|---|--|
| C | AUTHOR'D BY J.JANSEN REV'D BY D.W. APPR'D BY 06/12/15 |
| | <i>M. Ereth</i> |
| B | AUTHOR'D BY REV'D BY A.JUTTLA APPR'D BY DATE 97/07/14 |

| | |
|-----------------|----------|
| DRAFTING DEPT. | |
| DRAWN BY | A.JUTTLA |
| CHECKED BY | |
| DATE (YR-MO-DY) | 97/07/14 |
| DESIGN DEPT. | |
| DESIGNED BY | |
| CHECKED BY | |
| APPROVED BY | |
| DATE APPROVED | |

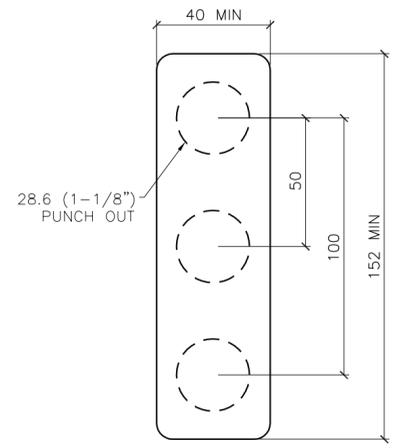
SaskPower

FIBREGLASS BOX PAD
FOR URD USE
SPC CODE 5-06-04

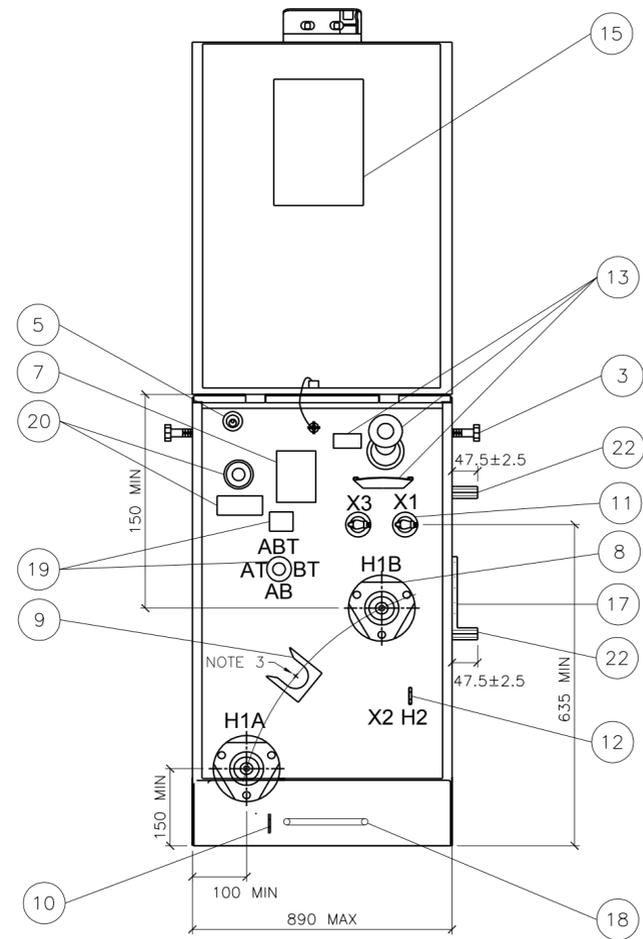
| |
|--|
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| DRAWING No. E1-562 |
| SHEET 1 OF 1 REV. C |



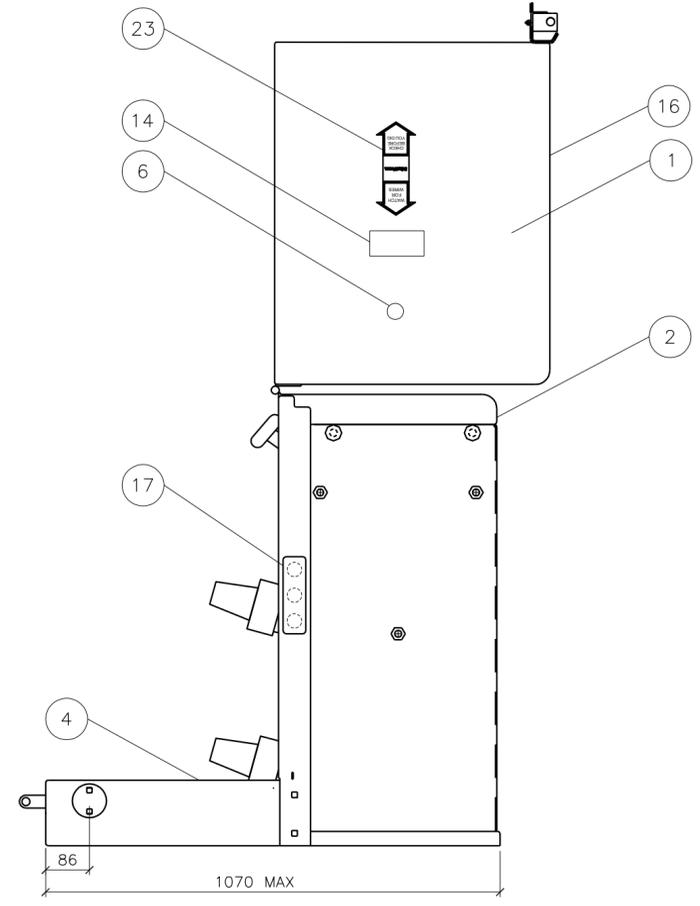
78 SERIES TOP VIEW



LOCKING PLATE DETAIL

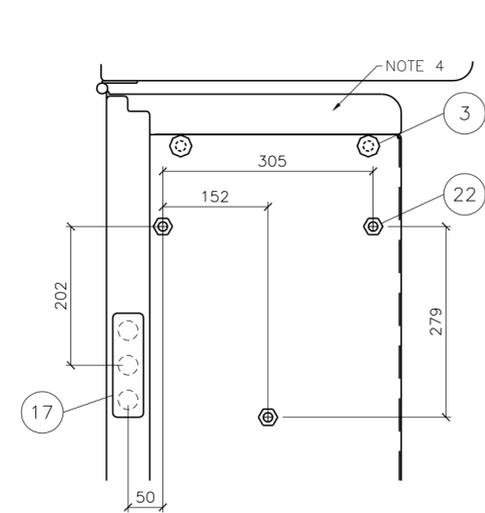


78 SERIES FRONT VIEW

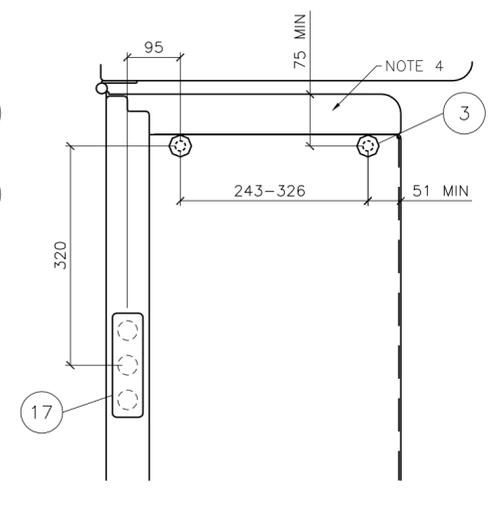


78 SERIES RIGHT VIEW

| PARTS LIST | |
|------------|---|
| # | DESCRIPTION |
| 1 | REMOVABLE ENCLOSURE HOOD c/w #2 GROUND STRAP, 1/2" PENTAHEAD BOLT w/ PROVISION FOR PADLOCKING & FIXED CUPWASHER |
| 2 | BOLTED TANK COVER c/w REMOVABLE TAMPER RESISTANT HOOD |
| 3 | LIFTING BOSSES - 5/8" - 11 UNC BLIND BOSS c/w BOLT |
| 4 | REMOVABLE ENCLOSURE SILL c/w EMERGENCY CABLE ENTRANCE - 50mm Ø c/w TAMPERPROOF COVER |
| 5 | PRESSURE RELIEF DEVICE - OPERATES AT 5 ± 2 PSI - HEARTLAND HPV - 1005 OR EQUIVILANT |
| 6 | EXTERNAL SELF-ADHESIVE NON-PCB DECAL |
| 7 | NAMEPLATE AND CONNECTION DIAGRAM |
| 8 | HV BUSHING WELL w/ REMOVABLE STUD AND BUSHING INSERT |
| 9 | PARKING STAND |
| 10 | HV GROUNDING BRACKET |
| 11 | LV BUSHING |
| 12 | X2-H2 SPADE |
| 13 | RTE BAYONET c/w WELDED DRIP TRAY & WARNING DECAL. LOCATION SHALL BE DETERMINED BY MANUFACTURER. |
| 14 | EXTERNAL SELF-ADHESIVE FOIL IDENTIFICATION NAMEPLATE. |
| 15 | EEMAC WARNING SIGN - INTERNAL SELF-ADHESIVE (MANUFACTURER SUPPLIES) |
| 16 | EEMAC WARNING SIGN - EXTERNAL SELF-ADHESIVE (SASKPOWER SUPPLIES) |
| 17 | LOCKING PLATE c/w THREE - 28.6mm (1-1/8") PUNCH OUTS |
| 18 | GROUNDING BRACKET |
| 19 | EXTERNALLY OPERATED 4 POSITION LOADBREAK SWITCH c/w WARNING DECAL. SWITCH LOCATION SHALL BE DETERMINED BY MANUFACTURER. |
| 20 | 1" Ø SIGHT GLASS c/w WARNING DECAL REGARDING LOADBREAK SWITCHING. SIGHT GLASS LOCATION SHALL BE DETERMINED BY MANUFACTURER. |
| 21 | SASKPOWER SUPPLIED ASSET TAG SHALL BE INSTALLED BY MANUFACTURER ON LEFT SIDE OF THE TRANSFORMER |
| 22 | COUPLING NUTS FOR METER CABINET MOUNTING |
| 23 | "WATCH FOR WIRES" DECAL - EXTERNAL SELF ADHESIVE (SASKPOWER SUPPLIES) |



78 SERIES RIGHT SIDE METER ATTACHMENT PROVISION DETAIL



72 SERIES RIGHT SIDE METER ATTACHMENT PROVISION DETAIL

- NOTES:
1. COMMON ARRANGEMENT SHOWN. MANUFACTURER MAY DETERMINE LOCATION OF DEVICES AND FEATURES EXCEPT WHERE DIMENSIONS ARE SHOWN.
 2. ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED. TOLERANCES ARE ±2mm UNLESS NOTED OTHERWISE AND ARE NOT CUMULATIVE.
 3. REFER TO CSA C227.3-06 FIGURE 2 FOR MINIMUM DIMENSIONAL REQUIREMENTS.
 4. SIDE TANK AND TRANSFORMER LID SHALL BE FLUSH TO ACCOMMODATE METER ATTACHMENT.

APPROVED FOR CONSTRUCTION

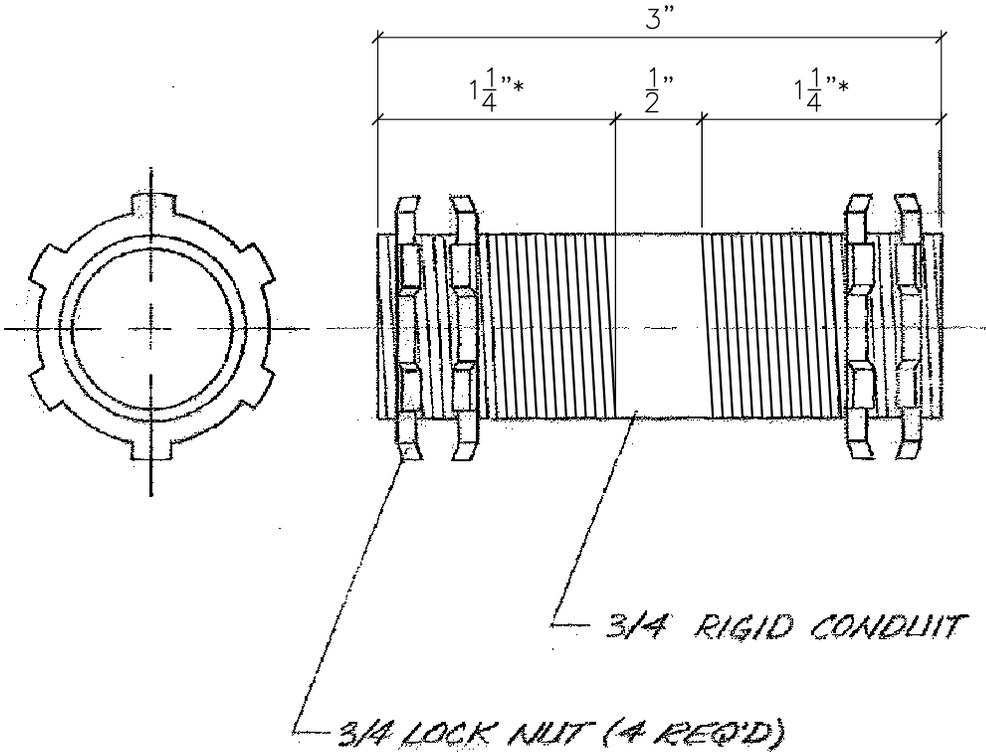
AutoCAD

| | | | | | | | | | |
|---|--|---|---|---|--|---|--|-------------------|---|
| D | DESIGNED BY D.DONAIS DRAWN BY A.GATZKE APPR'D BY M.ERETH SEALED BY DATE (Y-M-D) 2014-03-25 | C | DESIGNED BY L. MOEN DRAWN BY TrmBIRAM APPR'D BY M. ERETH SEALED BY DATE (Y-M-D) | B | DESIGNED BY SINGH DRAWN BY APPR'D BY SEALED BY DATE (Y-M-D) 2008-01-29 | E | DESIGNED BY D.DONAIS DRAWN BY D.REDEKOPP APPR'D BY L.MOEN SEALED BY DATE (Y-M-D) 2017-11-02 | ENGINEERING SEAL. | DRAFTING DEPT. DRAWN BY DAN PRICE CHECKED BY DATE (Y-M-D) 1988-10-05 |
| | -ADDED PARTS 19 & 20. -CLEANED UP DIMENSIONS. | | -GENERAL DRAWING UPDATE. | | -CONVERTED TO ACAD. | | -UPDATED NOTES AND DIMENSIONS. -ADDED 72 SERIES METER ATTACHMENT DETAIL. -CHANGED LAYOUT TO MATCH COMMON DESIGNS. -CLAIRIFIED METER CABINET PROVISION DIMENSIONS. | | |

SaskPower INTERNAL USE ONLY

TYPICAL RUD
PADMOUNT TRANSFORMER
AND METER ATTACHMENT
PROVISIONS

| |
|--|
| AUTOCAD SOURCE FILENAME: E1_609.DWG |
| PLOT DATE: 2017-11-16 PAPER: C |
| PLOT TIME: 1:21 PM |
| PLOTTED BY: DREDEKOPP |
| SCALE: NTS |
| DRAWING No. |
| E1 609 |
| SHEET 1 OF 1 REV. E |

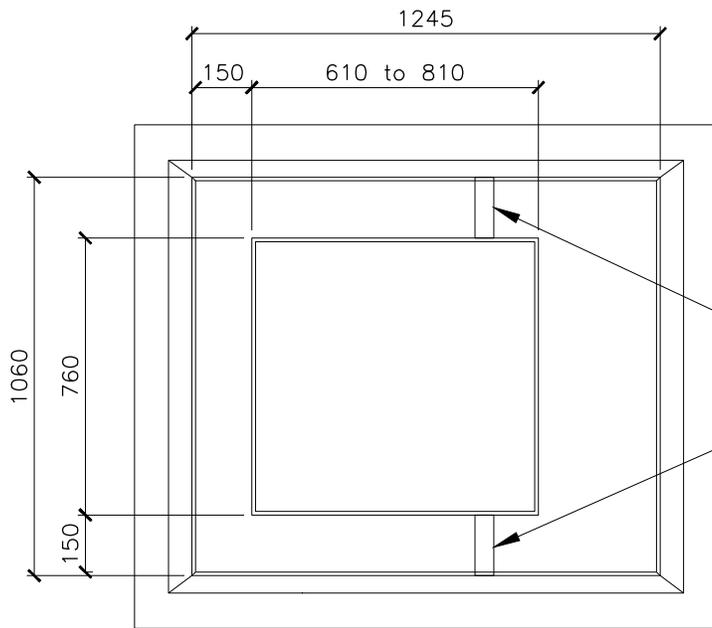


NOTE:
 * - EFFECTIVE LENGTH (MINIMUM) - STRAIGHT THREAD = 1-1/4"

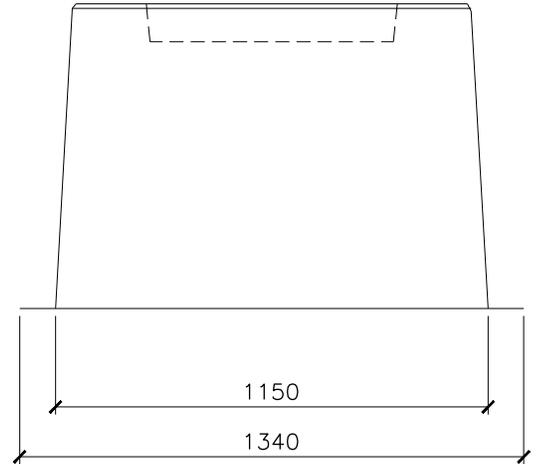
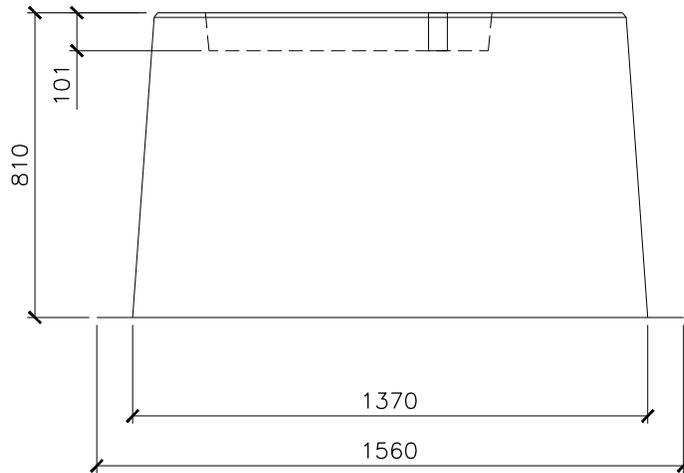
DIMENSIONS

| 3/4" RIGID CONDUIT | 3/4" LOCK NUT |
|---------------------------|----------------------------|
| INSIDE DIAMETER = 0.824" | MINIMUM THICKNESS - 0.140" |
| OUTSIDE DIAMETER = 1.050" | MAXIMUM DIMENSION - 1.42" |
| WALL THICKNESS = 0.113" | CORNERS |

| | | | | |
|---|---|---|--|--|
| A | AUTHOR'D BY S. NOE REV'D BY D. ROSOM APPR'D BY DATE 2002/10/10 | DRAFTING DEPT. DRAWN BY _____ M.T.S. CHECKED BY _____ W.S. DATE (YR-MO-DY) 1988/11/03 | 3/4 x 3 GALVANIZED CONDUIT NIPPLE | AUTOCAD SOURCE FILENAME: E1_614B PLOT DATE: 2010-11-10 PLOT TIME: 14:05 |
| | B | AUTHOR'D BY T. ABADIANO REV'D BY J. KERR APPR'D BY DATE 2010/11/10 -EXTENDED THREAD LENGTH. | | DESIGN DEPT. DESIGNED BY _____ L.N.M. CHECKED BY _____ APPROVED BY _____ J. SIMPSON DATE APPROVED 1988/11/18 |
| | | | SHEET 1 OF 1 | REV. B |



2 - MOLDED IN WOOD 2x4
 (ALTERNATE LOCATION MAY BE
 CONSIDERED PROVIDED LOADING
 REQUIREMENTS ARE STILL MET)

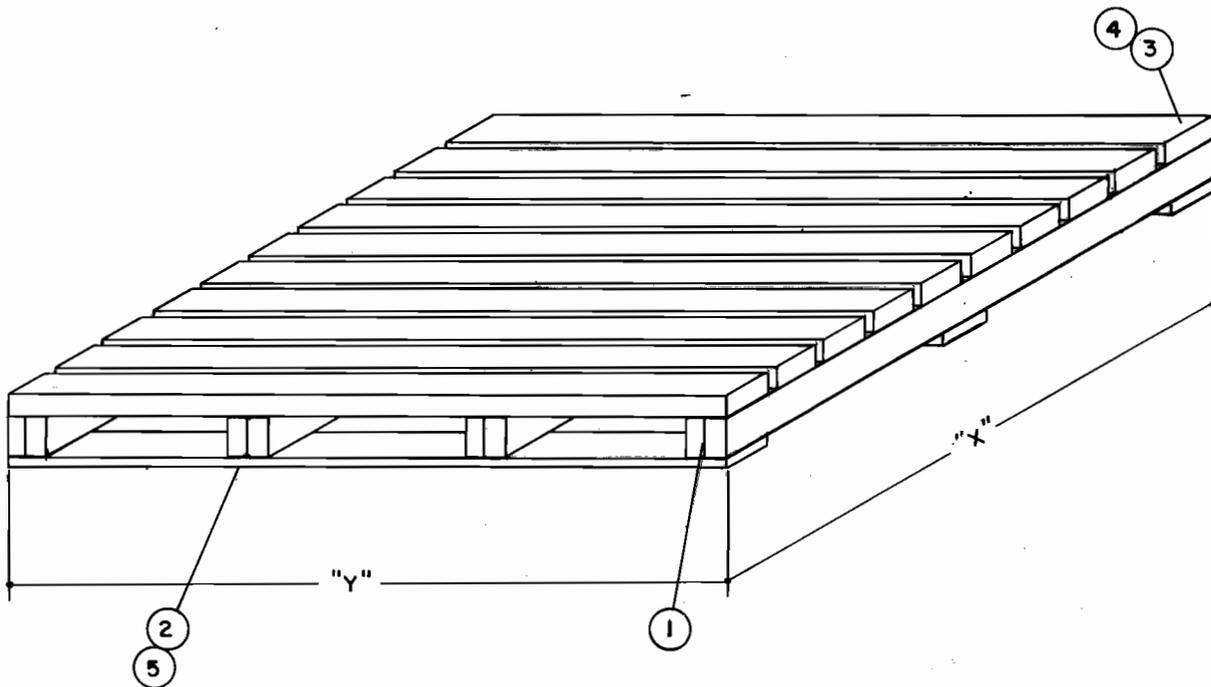


NOTE:

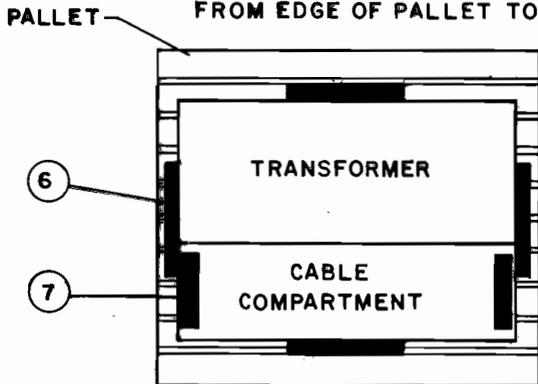
1. DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED
2. ALL POINTS ON THE TOP OF THE BOX MUST BE LOCATED ON THE SAME PLANE WITH A TOLERANCE OF ± 1 mm.
3. BOX PAD MUST BE RATED FOR TRANSFORMER WEIGHING 1500kg.

AutoCAD

| | | | | |
|---|---|---|---|--|
| A | DESIGNED BY A.UHREN DRAWN BY A.GATZKE APPR'D BY M.ERETH SEALED BY M.ERETH DATE 2014-08-14 -REVISED DIMENSIONS. | DRAFTING DEPT. DRAWN BY <u> A.GATZKE </u> CHECKED BY <u> </u> DATE (Y-M-D) <u> 2014-08-13 </u> |  FIBREGLASS BOX PAD FOR URD USE (167kVA) CODE 5 05 97 | AUTOCAD SOURCE FILENAME: E1_768.DWG PLOT DATE: 2014-08-14 PLOT TIME: 9:09 AM PLOTTED BY: AGATZKE |
| | ENGINEERING SEAL. | DESIGN DEPT. DESIGNED BY <u> A.UHREN </u> CHECKED BY <u> A.UHREN </u> APPROVED BY <u> M.ERETH </u> SEALED BY <u> M.ERETH </u> DATE (Y-M-D) <u> </u> | | SCALE: 1:20 DRAWING No. |
| | | | | E1 <hr/> 768 |
| | | | | SHEET 1 OF 1 REV. A |



DIMENSIONS "X" & "Y" TO BE DETERMINED TO SUIT SIZE OF INDIVIDUAL TRANSFORMER; 4" CLEARANCE TO BE MAINTAINED FROM EDGE OF PALLET TO ANY PART OF THE TRANSFORMER



LOCATION OF TRANS. STABILIZER BLOCKS

| MATERIAL LIST | | |
|---|------|---------------------|
| ITEM | QTY. | DESCRIPTION |
| 1 | 4 | 2-2" x 6" x "X" |
| 2 | 3 | 1" x 6" x "Y" |
| 3 | 10 | 2" x 6" x "Y" |
| 4 | 60 | #10 x 4" SCREWS |
| 5 | 18 | 2 1/2" COATED NAILS |
| | | |
| TRANSFORMER STABILIZER BLOCKS | | |
| 6 | 4 | 2" x 4" x 24" |
| 7 | 2 | 2" x 6" x 16" |
| | | |
| MATERIAL TO BE ROUGH SAWN UTILITY GRADE LUMBER. | | |

SASKATCHEWAN POWER CORPORATION

| | | |
|----------|------------------------------|------------------------|
| A | REVISED BY <u>G.H.</u> | DES'D BY <u>M.H.D.</u> |
| | DATE <u>JAN. 4/77</u> | DRAWN BY <u>G.G.T.</u> |
| | SAFETY DEPT. _____ | DATE <u>APR 13/76</u> |
| B | APP'D. BY _____ | SCALE <u>N.T.S.</u> |
| | REVISED BY <u>A.LAZURKO</u> | DRAFTING <u>JK</u> |
| | DATE <u>03-11-14</u> | SAFETY DEPT. _____ |
| C | APP'D. BY <u>M.ERETH</u> | ENGINEERING _____ |
| | REVISED BY <u>C.ZUROWSKI</u> | SUB'D BY _____ |
| | DATE <u>2005/04/13</u> | APP'D. BY _____ |
| | SAFETY DEPT. _____ | DATE <u>MAY 5/76</u> |
| | APP'D. BY <u>M.ERETH</u> | |

**PALLET
FOR
TRANSFORMER SPEC.
D.E. 302**

| | |
|----------|----------------|
| DWG. No. | MI-175 |
| | C |
| SHEET | _____ of _____ |

***Distribution Transformers Single Phase,
Double Bushing***

SASKPOWER CODE
See Section 1.3.1

LS-101

2017 July 26

PREPARED BY
D. Donais

APPROVED BY
*Original Signed by
Lonn Moen*

*Original Sealed by
Lonn Moen*

SUPERSEDES

LS-101

2016 August 17

1. Scope

This specification describes Distribution Transformers Single Phase, Double Bushing (the “Specification”) outlines various specifications (including, without limitation, technical specifications, physical characteristics, performance characteristics, manufacturing and assembly requirements, finishing requirements and marking requirements) for Distribution Transformers Single Phase, Double Bushing (referred to in this Specification as the “Transformers” and each as a “Transformer”) to be supplied to SaskPower. All of the Transformers are to be built in accordance with the requirements of this Specification and the Reference Publications outlined in section 2 of this Specification. Where the specific requirements of this Specification vary from the requirements of the Reference Publications, the specific requirements of this Specification shall take precedence.

1.1 Deviation

Any deviation of design of any Transformer from any requirement outlined in this Specification shall have prior written approval from SaskPower.

1.2 Information Relating to Transformers

1.2.1 High and low voltage rating

The following chart outlines the high and low voltage rating, insulation classes and BIL for each of the Transformers (listed by the first four digits of the SaskPower stock code for the Transformers):

| Stock Code | High Voltage (V) | Low Voltage (V) | Insulation Class | | BIL | |
|------------|----------------------------|-----------------|------------------|----------|-----------|----------|
| | | | High (kV) | Low (kV) | High (kV) | Low (kV) |
| 16 18 XX | 4160/7200Y | 120/240 | 8.7 | 1.2 | 75 | 30 |
| 16 19 XX | 480 | 120/240 | 1.2 | 1.2 | 30 | 30 |
| 16 26 XX | 2400/4160Y | 600 | 5.0 | 1.2 | 60 | 30 |
| 16 27 XX | 2400/4160Y | 240/480 | 5.0 | 1.2 | 60 | 30 |
| 16 28 XX | 2400/4160Y | 277/480Y | 5.0 | 1.2 | 60 | 30 |
| 16 29 XX | 2400/4160Y | 120/240 | 5.0 | 1.2 | 60 | 30 |
| 16 31 XX | 4800/8320Y | 120/240 | 8.7 | 1.2 | 75 | 30 |
| 16 32 XX | 2400/4160Y x 4800/8320Y | 120/240 | 5.0/8.7 | 1.2 | 60/75 | 30 |

| Stock Code | High Voltage (V) | Low Voltage (V) | Insulation Class | | BIL | |
|------------|------------------|-----------------|------------------|----------|-----------|----------|
| | | | High (kV) | Low (kV) | High (kV) | Low (kV) |
| 16 35 XX | 14400/24940Y | 347/600Y | 18 | 1.2 | 125 | 30 |
| 16 36 XX | 14400/24940Y | 240/480 | 18 | 1.2 | 125 | 30 |
| 16 37 XX | 14400/24940Y | 120/240 | 18 | 1.2 | 125 | 30 |
| 16 39 XX | 14400/24940Y | 120/240/480 | 18 | 1.2 | 125 | 30 |
| 16 42 XX | 14400/24940Y | 600 | 18 | 1.2 | 125 | 30 |
| 16 43 XX | 25000 | 120/240 | 25 | 1.2 | 150 | 30 |
| 16 44 XX | 25000 | 347/600Y | 25 | 1.2 | 150 | 30 |
| 16 55 XX | 2400/4160Y | 347/600Y | 5.0 | 1.2 | 60 | 30 |

1.2.2 kVA ratings

The following chart outlines the kVA rating for each of the Transformers (listed by the last two digits of the SaskPower stock code for the Transformers):

| Last two digits of Stock Code | kVA |
|-------------------------------|------|
| 05 | 5 |
| 15 | 15 |
| 25 | 25 |
| 37 | 37.5 |
| 50 | 50 |
| 75 | 75 |

| Last two digits of Stock Code | kVA |
|-------------------------------|-----|
| 76 | 100 |
| 78 | 150 |
| 79 | 167 |
| 80 | 200 |
| 85 | 250 |
| 88 | 333 |

1.2.3 Minimum Impedance

The following chart outlines the minimum impedance required for each of the Transformers according to the kVA rating of each of the Transformers:

| Size in kVA | Minimum %IZ |
|---------------|-------------|
| Up to 50 | 1.5% |
| 75 | 2% |
| 100 and above | 2.5% |

2. Reference Publications

Reference is made in this specification to the following standards, the latest issues, amendments, and supplements of which shall apply:

2.1 CSA Standards

C2.1-06 (R2017) – Single-Phase and Three-Phase Liquid-Filled Distribution Transformers

C2.2-06 (R2017) – Pole-mounted, Single-Phase Distribution Transformers for Electric Utilities

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2.2 Other Standards

CEA DTWG-01 (07/99) – Pole Mounted Single Phase Distribution Transformers

IEEE C57.12.28-2014 – IEEE Standard for Pad-Mounted Equipment - Enclosure Integrity

3. Electrical Characteristics

3.1 Rating

Ratings shall be based on a maximum temperature rise of 65°C. The Transformer shall be oil-immersed, self-cooled (ONAN) type.

3.2 High Voltage Taps

High voltage taps are required on 16 35 75 and Transformer sizes 100 kVA and above. Ratios shall be in accordance with CSA C2.1.

3.3 Internal Fault Detector

An internal fault detector (referred to in this Specification as an “IFD”) manufactured by Internal Fault Detector Corp. or a SaskPower approved equivalent shall be installed.

The IFD shall be situated in the airspace above the maximum operating oil level and shall have no impact on the normal operation of the Transformer. It shall activate with a minimum pressure rise of 3.5 kPa (0.5 psi) in 5-7 ms over a temperature range of -40°C to 105°C.

The activated IFD shall be clearly visible from at least 20 m during day or night.

The IFD shall only activate during an internal fault in the Transformer. It shall not activate during normal Transformer transport, handling and operating conditions, or external faults.

The IFD shall be fitted with a 35 kPa (5 psi) pressure relief device. The IFD shall have at least a 30-year service life and require no maintenance during its service life.

The IFD shall have a Locking Key installed for shipping to prevent nuisance activation.

4. Mechanical Characteristics

4.1 Insulating Fluids

All insulating fluids shall contain not more than two (2) parts per million of PCB (Polychlorinated Biphenyl) by weight as per Section 8.10.2 of CSA C2.1.

4.2 Lifting Provisions

Adequate provision shall be made for lifting the Transformer. There shall be no permanent deformation of the tank or cover when lifted. Lifting lugs shall be constructed so that the slings will not be damaged.

4.3 Tap Changer Switch

When installed, the location of the tap changer switch shall be on the right side of the low voltage terminals when viewed from the low voltage side.

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4.4 Pole Mounting

The maximum mass of Transformers for pole mounting shall be as per Section 8.5 of CSA C2.2 with the exception that all 15 kVA Transformers with a low voltage rating of 120/240V shall have a maximum mass of 136 kg (300 lb).

4.5 Cover

The Transformer cover shall be held in place with bolt-down toggles or a stainless steel cover band.

5. Bushings, Terminals and Grounding**5.1 Bushings****5.1.1 High Voltage Bushings**

Two bushings are to be mounted in accordance with CSA C2.1.

5.1.2 Low Voltage Bushings

The bushings shall be supplied and mounted in accordance with Section 6.2, 6.3.2 and 6.5 of CSA C2.1. Terminals to be of the spade type in accordance with Table 8 of CSA C2.1.

All Transformers with LV 120/240V shall be equipped with four secondary bushings. This requirement takes precedence over CSA C2.1 Section 6.3.2.2 (a).

A low voltage grounding strap shall be provided as per Section 5.2.2.1 of CSA C2.2.

5.2 Bushing Hardware

The following hardware is to be fitted to each low voltage bushing:

Comprise one assembly:

Qty. 1 – bolt, galvanized, 1 1/2” x 1/2” N.C., complete with nut

Qty. 2 – washer, flat, galvanized steel, 9/16”

Qty. 1 – washer, Belleville, stainless steel, 17/32”

Number of Assemblies per bushing (by voltage):

| kVA Size | 120/240 | 240/480 | 347/600Y | 480 | 277/480Y |
|----------|---------|---------|----------|-----|----------|
| 15 | 1 | 1 | - | - | - |
| 25 | 1 | 1 | - | - | - |
| 50 | 2 | 2 | 2 | 2 | 2 |
| 75 | 2 | 2 | 2 | 2 | 2 |
| 100 | 2 | 2 | 2 | 2 | 2 |
| 150 | 2 | 2 | 2 | 2 | 2 |
| 167 | 2 | 2 | 2 | 2 | 2 |
| 200* | 2 | 2 | 2 | 2 | 2 |
| 250* | 2 | 2 | 2 | 2 | 2 |

* Not suitable for pole mounting

5.3 Grounding

The tank ground shall consist of a connector; Bayco M4C, H-J Enterprises AS1358-002, or SaskPower approved connector, which shall be attached to the center of or near to the left side of the lower pole-mounting bracket, as viewed from the low voltage side.

5.4 Lightning Arrester Bosses

Lightning arrester bosses shall be provided in accordance with CSA C2.2 Section 8.12. Bosses shall be situated at both locations as shown in Figure 1 of Appendix A. One mounting bracket shall be installed adjacent to the H1 bushing, with galvanized or stainless steel hardware. A galvanized or stainless steel 2" x 1/2" UNC bolt, flat washer, lock washer and nut shall also be provided for the installation of the lightning arrester.

6. Workmanship and Finish**6.1 Finish Performance**

The exterior finish shall conform to IEEE C57.12.28, except the salt spray test acceptance criteria shall be 1000 hours.

6.2 Color

The color of the tank and all bushings shall be Light Grey number 70, Munsell notation 5BG 7.0/0.4.

6.3 Hardware

All the exposed threaded parts and hold-down clamps shall be corrosion resistant.

7. Markings**7.1 Combination Nameplate**

The combined nameplate and connection diagram shall be installed on the right side of the top pole-mounting bracket, as viewed from the low voltage side. All information, as detailed in Section 10 of CSA C2.1, shall be included on the nameplate. In addition to the CSA Standard number as specified in CSA C2.1 Section 10.2.3 (n), the SaskPower specification number and revision date shall be included on the nameplate.

All possible connections (parallel/series) shall be included on the nameplate.

7.2 Stencilling

The primary voltage rating shall be stencilled on the Transformer tank as per CSA C2.1 using 63 mm white numbers.

The secondary voltage rating shall be stencilled on the Transformer tank directly below the primary voltage marking using 63 mm white numbers. Stencilling of 120/240 volts is not required.

SaskPower's stock code shall be stencilled on the tank wall above the kVA rating using 63 mm white numbers.

Decals may be considered instead of stencils. Supplier to provide specifications and samples of labels to SaskPower for approval, if not previously approved.

7.3 Non-PCB Decal Sign

A non-PCB decal shall be installed on the Transformer, and located to the right of the kVA stencilling. The decal shall be as per Figure 11 of CSA C2.1.

7.4 Amorphous Core

Amorphous core Transformers shall be stencilled or labelled on the Transformer tank, just below the non-PCB decal. The stencil or label shall be of an “A”, in 38 mm (1.5”) Helvetica font lettering, in fluorescent green graphic film (3M Scotchcal 7725SE-406 or a SaskPower approved equivalent).

7.5 Barcode/QR Code Asset Tags

SaskPower will supply assets tags measuring 102mm wide by 32mm high to the manufacturer to be attached adjacent to the exterior nameplate or information tag using two stainless steel screws or rivets by the manufacturer. The manufacturer shall be responsible for providing the following information in an electronic spreadsheet (Excel) format for each transformer supplied to SaskPower;

- High Voltage Level in kV;
- Low Voltage Level in kV;
- Phase;
- Front Type (Live or Dead);
- SaskPower Stock Code;
- Transformer Capacity in kVA;
- Number of Bushings;
- Type of Installation (Pole or Padmount);
- Manufacturer’s Serial Number;
- Total Mass in Kilograms;
- Oil Volume in Litres;
- Core Type;
- Impedance at 85 Degrees Celsius in percent;
- Date of Manufacture;
- Purchase Order Number;
- Manufacturer;
- Dimensions of the Transformer;
- R.T.E. Bay-o-net Fuse Size and Catalogue Number;
- E.L.S.P Fused Link Fuse Size and Catalogue Number; and

- Associated Barcode Alphanumeric Designation (as shown on the Asset Tag).

This information shall be supplied with every shipment.

8. Packaging

Each Transformer shall be shipped with one Transformer per wooden pallet, steel banded, suitable for forklift handling. Nylon banding shall also be acceptable if a suitable number of nylon bands are employed. Transformers shall be placed upon the pallets such that the stock code labelling on the Transformer is clearly visible to the forklift driver as it is being lifted.

Transformers are to be shipped on open flatdeck trailers in a manner suitable for offloading from the sides.

Alternate packaging requires prior approval from SaskPower before shipping.

9. Design Documents

An initial preliminary design document including a drawing of the Transformer must be provided to SaskPower for the purpose of review of conformance of the preliminary design of the Transformer to the requirements of this Specification prior to any manufacture or supply of the Transformer, which design document must include at a minimum the following information:

- Six digit SaskPower Stock Code number for the Transformer;
- Dimensions of the Transformer;
- High voltage level and low voltage level of the Transformer in volts;
- High and low insulation class of the Transformer in kV;
- BIL (basic insulation level) of the Transformer;
- Calculated percent regulation of the Transformer at 1.0 PF and 0.8 PF;
- Estimated total weight of the Transformer in kilograms; and
- Location of all bushings, terminals, applicable HV tap changers and accessories.

Prior to the supply of each Transformer, a final design drawing of each Transformer must be provided to SaskPower for approval, which design drawing must include all information required for SaskPower to confirm that the Transformer will comply with the requirements of this Specification.

All design drawings shall be forwarded to the Asset Management & Field Services Department within SaskPower to the attention of the Manager, Standards.

Appendix A

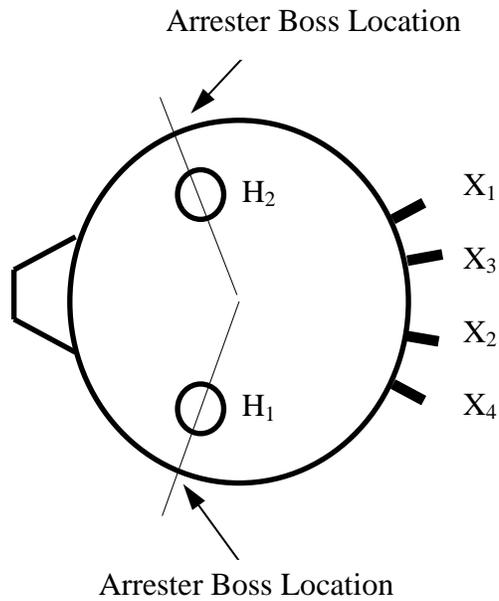


Figure 1 - Transformer Arrester Boss Location (Section 5.4)