

Transmission & Distribution
Material & Installation Specification

Three Phase Padmount Transformer – Standard Connections
6 Primary Bushings

I. Scope and classification

Scope: This document is to govern the product and installation of Three Phase Padmount transformers commonly used by the City of Columbus, Division of Power.

Classification: The contractor shall supply three phase padmount transformers, of various ratings and connections. The three phase padmount transformers specified herein shall be for connection at 14.4KV Delta. The contractor shall be required to submit preliminary drawings for approval prior to the manufacturer of the transformers. The contractor shall perform a contamination testing prior to delivery. Final drawings, operating manuals and certified test results must be provided. Transformers shall be shipped complete with oil.

Transformers manufactured under this specification shall meet the efficiency requirements as directed by the Department of Energy (DOE) per its Energy Conservation Program: Energy Conservation Standards for Distribution Transformers, Final Rule. – 10 CFR Part 431.196(b) (2013).

II. Applicable publications and standards

All items characteristic, definitions, and terminology, except as specifically covered in this specification, shall be in accordance with the latest revisions of the following ANSI, IEEE, Department of Energy and NEMA standards, including US Department of Energy National Efficiency Standard 78 FR 2335.

III. Requirements

GENERAL REQUIREMENTS

A. Term: This document is to govern the product and installation of three phase padmount transformers commonly used by the City of Columbus, Division of Power.

- B. Quantity: The quantities are specified for each item on the bid document.
- C. Quality standards: Transformers are to be new and unused. All insulating components, oil, paper, and wire enamel, shall be made of thermally upgraded materials, which are all compatible at today's industry standard 65 degrees Celsius temperature rise.
- D. Automatic pressure relief valve: Shall be provided per IEEE C57.12.20, Section 7.2.5.1 with the following clarification.
 - Indicator shall include an orange or red indicator that becomes visible only after the valve has vented.
 - Cap and pull ring shall cover the valve that separates from the assembly during venting, revealing the orange or red indicator and hanging down from the valve via a chain or strap.
 - Sealant: Valve threads shall be sealed with a liquid pipe thread compound such as Rectorseal, liquid Teflon, or similar, not Teflon tape.
- E. All supplied equipment is to be complete with oil (NON-PCB), and all accessories, mounting hardware, lifting provisions, suitable and ready for their intended use upon delivery.
- F. The primary voltage ratings of the transformers specified herein are designated as per IEEE standard C57.12.00.
- G. The exterior of each transformer must be permanently marked with a "NON-PCB" decal.
- H. The awarded supplier shall be required to submit preliminary drawings in one Adobe Acrobat PDF file for approval prior to the manufacturer of the transformers. The drawings will promptly be reviewed by the city and returned approved or with corrections as required.
- I. Final drawings, operating manuals, maintenance manuals, and certified test results shall be provided at time of delivery.

CITY OF COLUMBUS DEPT. OF PUBLIC UTILITIES – DIVISION OF POWER THREE PHASE PADMOUNT TRANSFORMER STANDARD CONNECTION 6 PRIMARY BUSHINGS		
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CONTRACTOR REQUIREMENTS

- A. Approval drawings for transformers: All documentation shall be in English and use customary inch-pound units. The successful bidder shall submit in a single Adobe Acrobat PDF file the following:
 - An outline drawing showing the principle view and dimensions and including a descriptive table of the accessories.
 - A nameplate drawing including wiring diagram.
 - No-load (core) loss, load (winding) loss at 25%, 50%, 75% and 100% rated current, and delivery days after order.
 - Instructional materials demonstrating the proper installation, operation, and maintenance of the equipment.
 - Certified test data for each transformer type bid and for every category listed in IEEE C57.12.00 Section 8.7. Format test data using numbering system shown in IEEE C57.12.00 Section 8.7.
- B. The successful bidder(s) shall test each transformer and provide factory certified test results to prove its compliance with the efficiency requirements as directed by the Department of Energy (DOE) per its Energy Conservation Program: Energy Conservation Standards for Distribution Transformers, Final Rule. – 10 CFR Part 431.196(b) (2013).

PRODUCT REQUIREMENTS

Additional requirements specific to this type:

- A. The padmount transformers shall be 60 Hz, 65 degrees Celsius rise, oil immersed and self-cooled. The high voltage side shall be equipped with taps for de-energized operation. The high voltage winding shall be rated at 95KV BIL and the low voltage winding shall be rated at 30 KV BIL.
- B. The transformer shall be furnished complete with oil (NON-PCB), lifting provisions, an automatic pressure relief device, and all accessories suitable and ready for its intended use upon delivery.
- C. The transformer shall be painted on all sides (top, sides, and bottom) olive green, Munsell type 7GY3.29/1.5 to blend in with surrounding landscapes and the tank coating shall meet all requirements in IEEE Std. C57.12.28 Section 5. When

measured with a magnetic thickness gauge, the paint thickness shall be the following:

- Cover 8 mils thick, minimum
 - Tank 3 mils thick, minimum
- D. The enclosure shall meet or exceed the requirements for tamper resistance set forth in ANSI C57.12.28 including the pry test, pull test, and wire probe test.
 - E. The enclosure hood and/or doors shall be secured by a recessed, penta head bolt and suitable for padlocking. To facilitate the making of the connections and to permit cable pulling, the terminal section hood and/or doors and roof shall be removable. The sill shall also be removable to permit sliding of the transformer unit on or off the pad without disturbing the cables or conduits.
 - F. A one inch filling plug shall be located at the top of the front panel.
 - G. A one inch drain valve with sampler and one inch plug shall be provided on all three phase units.
 - H. Nameplate shall be per the requirements of IEEE C57.12.24, Section 7.4 and IEEE C57.12.00-2010 standard with stainless steel fasteners on inside and outside door, with the following clarifications:
 - Nameplate shall be 300-series stainless steel and affixed to the transformer with 300-series stainless steel or silicon bronze fasteners and readable with cables in place
 - Lettering to be etched or engraved
 - Include: Fuse amperage, switches, total weight in pounds, total gallons, the statement "CONTAINS LESS THAN 1 PPM PCB AT TIME OF MANUFACTURE", voltages high and low, taps four at 2 ½% listed below 14.4 kV, kVA rating, and fuse size.
 - I. A liquid level indication gauge shall be provided on all three phase transformers.
 - J. Grounding pads with ½" x 13 threaded boss shall be provided in both the low voltage and high voltage sections for tank grounding.
 - K. An automatic pressure relief device shall be provided.

CITY OF COLUMBUS DEPT. OF PUBLIC UTILITIES – DIVISION OF POWER THREE PHASE PADMOUNT TRANSFORMER STANDARD CONNECTION 6 PRIMARY BUSHINGS		
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- L. The high voltage section shall be equipped with a tap changer for de-energized operation only, and must be externally operable with a hot-stick and must require at least two (2) operator actions to change taps. Taps shall be all four- 2-1/2% below rated voltage.
- M. Three (3) internal oil immersed, gang operated, two position load break switches (3 total) for loop feed operation with a continuous current rating of 200 amps on 500 KVA and below or 300 amps on 750 KVA and above shall be provided. The switches must be capable of switching the continuous rated current to permit sectionalizing of the primary loop. Make-and-latch and momentary ratings shall be 10,000 amps symmetrical. The switches (3) controls shall be located in the primary compartment, convenient for hot stick operation. Switch positions shall be permanently marked for identification, such as welded, engraved or stamped. The switches shall provide for:
 - Feed right
 - Feed left
 - Feed through with coil on / Feed through with coil off
- N. The high voltage bushing shall maintain a minimum distance of 15" between the center of the lowest bushing and the bottom of the enclosure. The parking stands shall be provided close to the bushings.
- O. The incoming line section shall be on the left-hand side, with enclosed high voltage bushings and shall provide for incoming cable from below. Equipment enclosed in the incoming line compartment shall include six (6) 200 amp bushing wells "Elastimold" type for loop feed transformers in accordance with ANSI Standard C119.2.
- P. The outgoing line compartment shall be arranged for cabling from below. The compartment door shall be hinged, have 3 point latching and be suitable for padlocking. Low voltage terminations shall be NEMA spade type per ANSI Standards.
- Q. KVA Size / Number of holes on secondary
 - 75 - 300 KVA 8 holes
 - 500 - 2500 KVA 12 holes
- R. Insulated support required for all secondary bushings.

- S. The transformer high voltage windings shall have three bayonet type fuses, each provided in series with a current limiting fuse. The current limiting fuse shall be internal to the transformer tank and shall isolate the faulted windings from the distribution system. The current limiting fuses shall have an interrupting rating of at least 25,000 amps symmetrical and 40,000 amps asymmetrical. The bayonet type fuses shall protect the transformer from overload conditions and shall be oil immersed assembly with a flapper valve to minimize oil spillage, the draw out type.

IV. Method of measurement

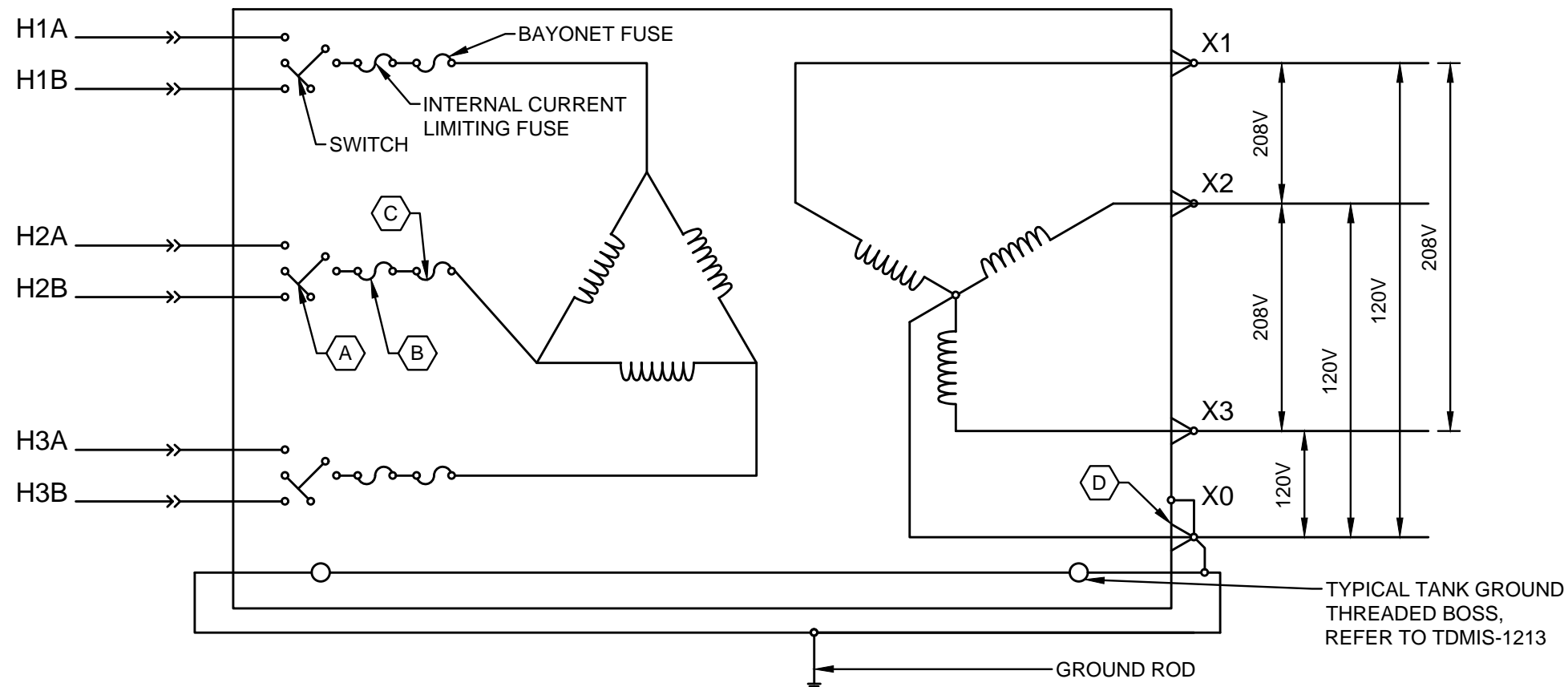
Shall be per each completed and operational three phase padmount transformer including transformer, accessories, grounding lugs for tank bosses, #1/0 copper ground loop, ground rod, ground connections for shields and secondary XO bushing, bushing inserts, feed through bushing inserts, arresters, labor material, delivery and placement and attachment to / on pad, equipment, tools supervision and miscellaneous required for a complete and operational module.

The associated apparatus and hardware shall include, but not limited by items described in TDMIS-1100, 1101, 1102, 1105, 1106, 1202, 1211 and 1212 shall be included within this completed module.

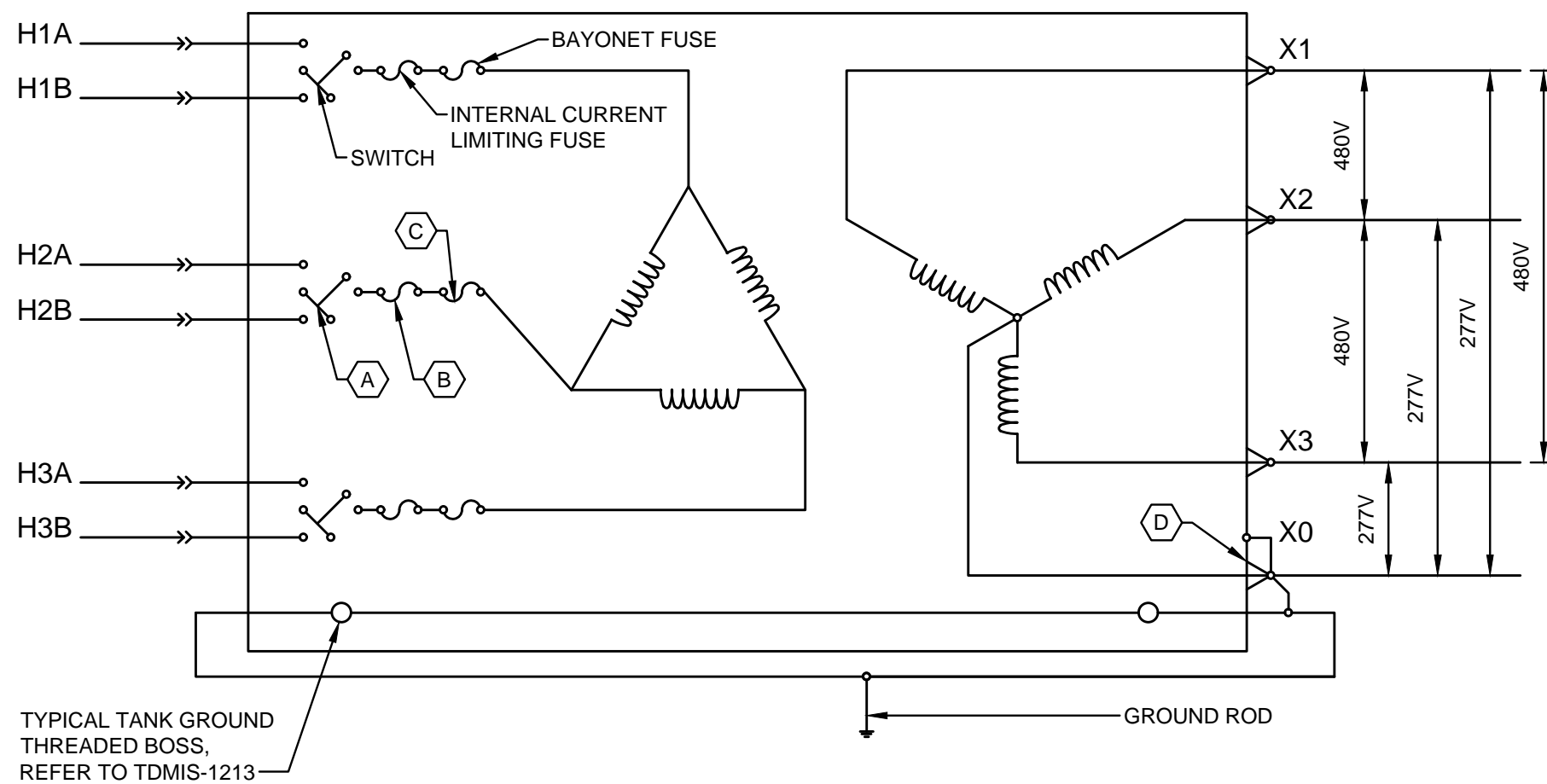
V. Basis of payment

Items	Unit	Description
TDMIS-1202	Each	__ kVA loop feed three phase padmount transformer, 14.4 kV, Delta/208/120
TDMIS-1202	Each	__ kVA loop feed three phase padmount transformer, 14.4 kV, Delta/480/227
TDMIS-1202	Each	__ kVA loop feed three phase padmount transformer, 14.4 kV, Delta/480V 3W

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DETAIL 1
120/208 VOLT 4 WIRE SERVICE



DETAIL 2
277/480 VOLT 4 WIRE SERVICE

CODED NOTES:

- (A) "T" BLADE SWITCH, TYP., SEE TABLE 1.
- (B) NOT REPLACEABLE BY FIELD PERSONNEL.
- (C) BAYONET TYPE, LOAD-BREAK FUSEHOLDER.
- (D) GROUND STRAP IS NOT REQUIRED IF THE X0 TERMINAL IS A SPADE WELDED DIRECTLY TO THE TANK.

LEGEND

↘	BUSHING
→	ELBOW
[INSULATING CAP
⋈	PARKING BUSHING
⋈ ⋈ ⋈	FEED THRU CAN BE 2, 3, OR 4 OUTLETS
EA →	ELBOW ARRESTER
SA	OVERHEAD ARRESTER

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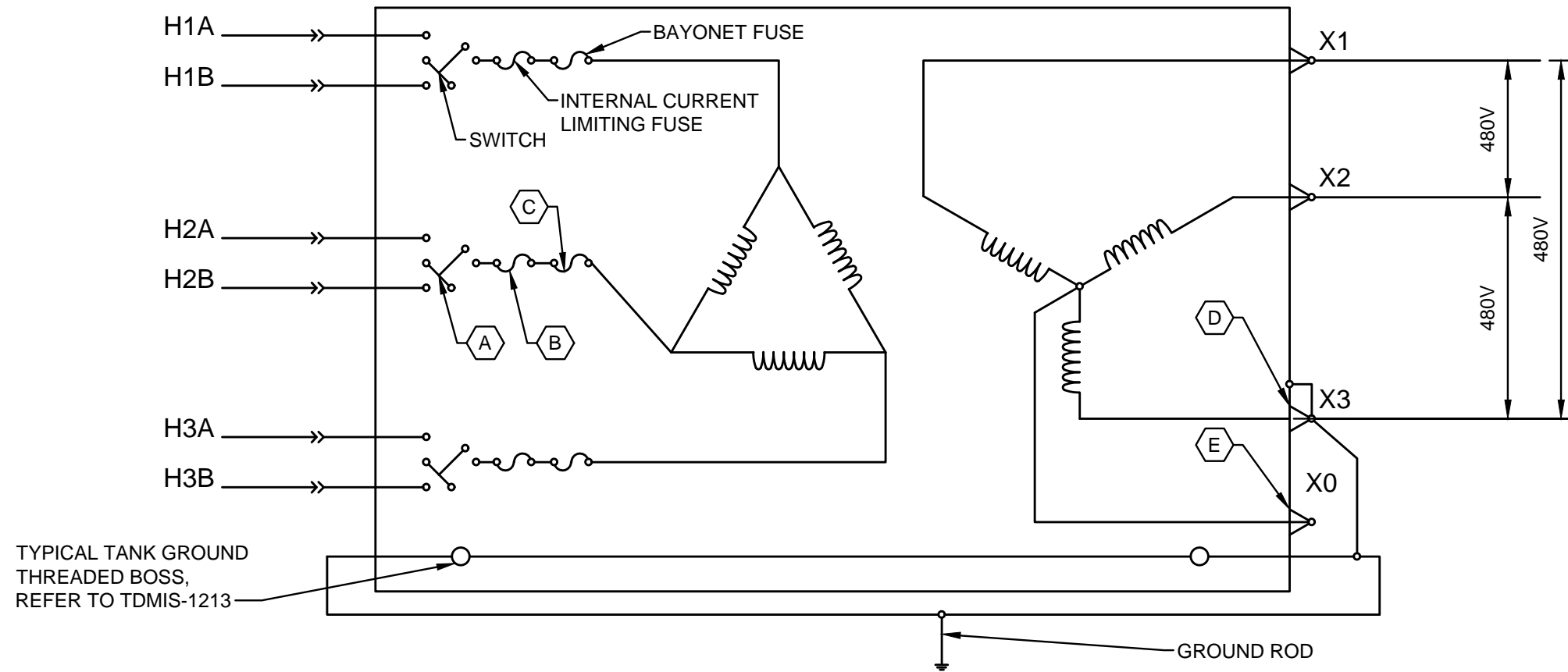
**THREE PHASE PADMOUNT TRANSFORMER
STANDARD CONNECTION, 6 PRI BUSHINGS**

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SCALE: NTS SHEET: 4 OF 6

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CODED NOTES:

- (A) "T" BLADE SWITCH, TYP., SEE TABLE 1.
- (B) NOT REPLACEABLE BY FIELD PERSONNEL.
- (C) BAYONET TYPE, LOAD-BREAK FUSEHOLDER.
- (D) THIS CONNECTION REQUIRED BY POWER COMPANY. VERIFY THAT CUSTOMER GROUNDS THE SAME PHASE.
- (E) INSULATE THIS BUSHING AND PUT A TAG INDICATING THAT IT IS ENERGIZED.

DETAIL 3
480 VOLT 3 WIRE SERVICE

T-BLADE SWITCH POSITION				
	POINTER DIRECTION			
	LEFT	RIGHT	UP	DOWN
SOURCE OF POWER FOR TRANSFORMER	LINE A	LINE B	LINE A AND LINE B	TRANSFORMER OPEN LINE A AND LINE B CONNECTED
CIRCUIT CONNECTION				

TABLE 1
T-BLADE SWITCH POSITION

LEGEND	
	BUSHING
	ELBOW
	INSULATING CAP
	PARKING BUSHING
	FEED THRU CAN BE 2, 3, OR 4 OUTLETS
	ELBOW ARRESTER
	OVERHEAD ARRESTER

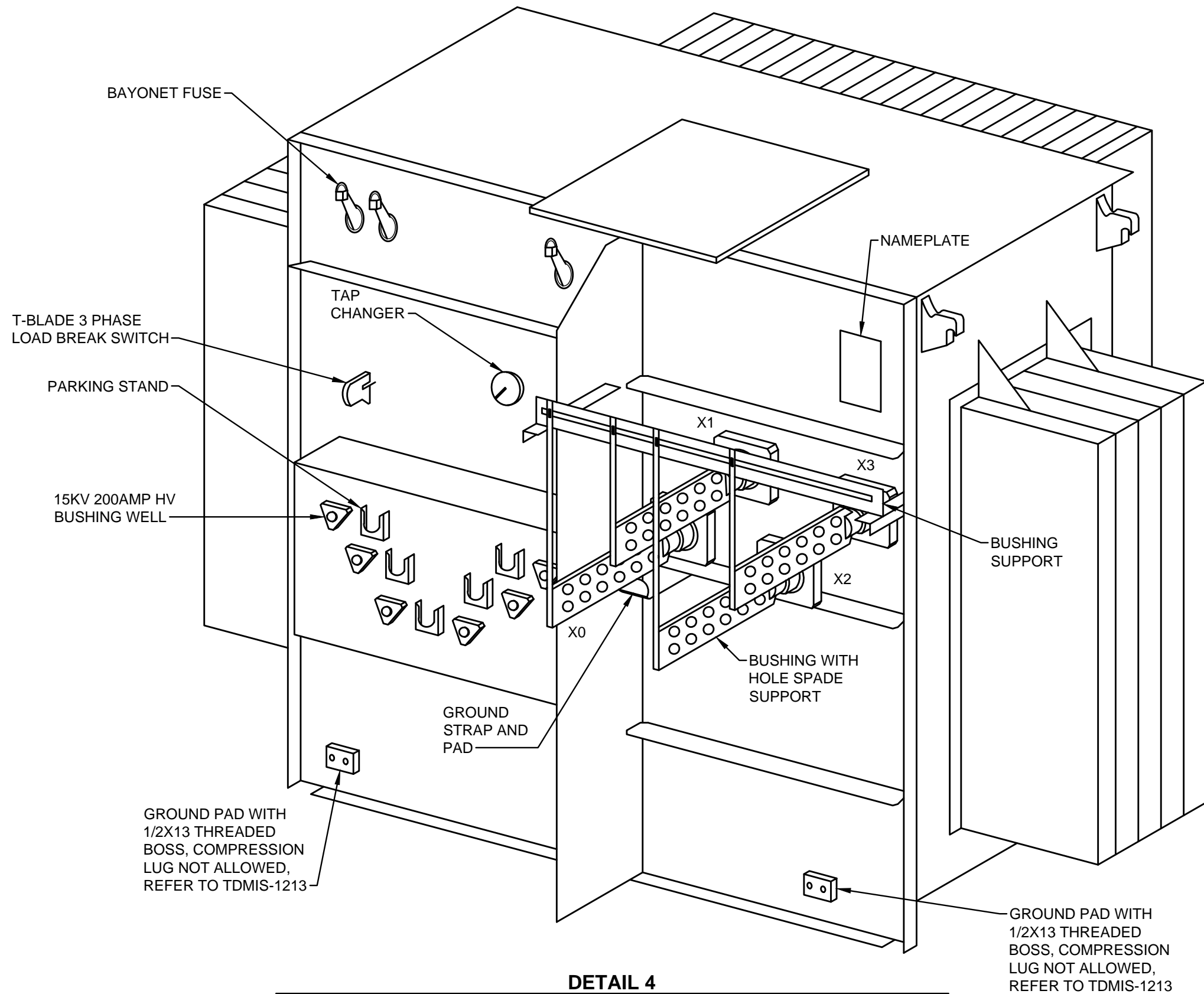
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THREE PHASE PADMOUNT TRANSFORMER
STANDARD CONNECTION, 6 PRI BUSHING

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DETAIL 4
TYPICAL THREE PHASE TRANSFORMER-6 PRIMARY BUSHING

REFERENCE LIST	
TDMIS	DESCRIPTION
1005	CONCRETE PAD FOR THREE PHASE TRANSFORMERS 75 KVA THRU 500 KVA
1006	CONCRETE PAD FOR THREE PHASE TRANSFORMERS 750 KVA THRU 2500 KVA
1200	PADMOUNT TRANSFORMER PART NUMBERS
1213	CIRCLE GROUND ASSEMBLY

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 STANDARD CONNECTION, 6 PRI BUSHING**

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