



Isolate Overhead Transformers - Maintenance and PCB Test

Standard
Operating
Procedure

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1.0 Purpose

This SOP provides:

- The information is intended to reinforce safe work procedures when performing the isolation of transformers for maintenance and/or PCB testing

2.0 Roles and Prerequisites

Role(s)	Quantity Required	Prerequisites
Power Line Technician	1 or more	<ol style="list-style-type: none"> Field care for live line tools Standard Protection Code distribution course Bonding and Grounding course
Issuing Authority	1	<ol style="list-style-type: none"> Successful completion of Standard Protection Code distribution course

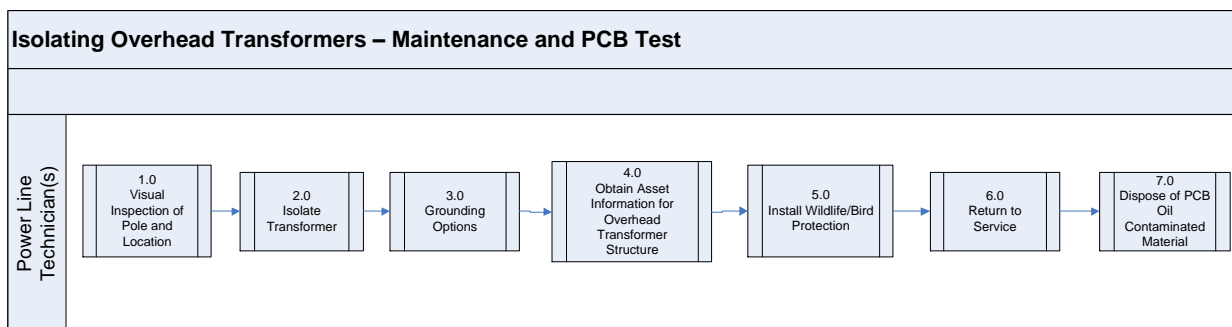
3.0 Tools and Equipment

Minimum Tools and Equipment Required:

- Gripall Hot stick
- Ground leads (2)
- Class 0 Rubber Gloves
- Safety Glasses
- Face Shield if removing a meter in the energized state
- Oil Spill Containment/Cleanup Supplies
- Wildlife/Bird Proofing Materials

4.0 Procedure

High Level Flowchart





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The Procedure

NOTE: Conduct a Hazard/Aspect and Risk Assessment prior to any work commencing.

- The Hazard/Aspect and Risk assessment must focus on all environmental and safety impacts considering the appropriate barriers and Emergency response guidelines.
- Job Plan and Standard Protection Code permits when required
- Follow Environmental Best Management Practices in regards to accessing the site and potential oil spills

REFER TO THE IDENTIFY OIL FILLED EQUIPMENT CONTAINING PCB'S SOP FOR OIL SAMPLING PROCEDURES IF SAMPLE IS REQUIRED

ISOLATING TRANSFORMERS

We isolate transformers for many reasons, but for the purposes of this isolation procedure it will be referring to installing Wildlife/Bird Protection and/or PCB Testing.

One of the main hazards associated with this process is the possibility of back feed, this can happen in many ways, but the main area of concern is from customer owned generators. Many of these generators are hooked up properly with the appropriate stand by switches provided by SaskPower or a qualified Electrician, however; **MANY ARE NOT!**

Generators may not be the only source of back feed. We have customers with wind generation, solar generation and co-gen power providers. These are legitimate customers connected by code, however; we cannot guarantee that their equipment is operating properly. We at SaskPower are no longer the only providers of electricity, and must take appropriate measures to protect ourselves from hazards.

Secondary cuts are to be checked prior to isolation to ensure that they are not jumpered.

While all of these situations may be unintentional mistakes in workmanship or construction, they do exist and are potentially lethal to the unsuspecting Power Line Technician.

DANGER - For all 480 volt metering applications you must follow the "Oilfield Metering - Self Contained Meter Exchange - Isolated State" SOP for proper isolation techniques for these situations

1.0 Visual Inspection of Pole and Location

1.1 Visually Inspect Pole and Location

1.1.1 The Power Line Technician shall ensure the following prior to perform the work:

- *Inspect conductor condition*
- *Visually inspect structure and adjacent structure*
- *Test pole (if climbing pole)*

2.0 Isolate Transformer

2.1 Remove the Fuse or Barrel

2.1.1 The Power Line Technician(s) shall remove the Fuse or open the Barrel.

- *Avoid Second point of contact if working from the pole*
- *The proper means of isolating a transformer on the primary H1 side is to open the cutout barrel or remove the fuse (grasshopper). The primary riser on top of the cutout SHALL be removed unless is impossible to do so, or it is crimped which may be the case in some situations*

2.2 Check for Absence of Potential

2.2.1 The Power Line Technician(s) shall check for absence of potential

- *Use an approved potential tester on the primary riser*
- *Use a voltmeter or approved potential tester on the secondary side of the transformer*
- *If unable to remove the primary riser:*
 - *After checking for absence of potential, place a ground on the primary riser between the H1 primary bushing and cutout. In the case of back feed situation, there is no guarantee the ground on the primary riser would trip the generator quick enough to prevent injury to the line worker*

2.3 Isolate Secondary

2.3.1 The Power Line Technician(s) shall ensure the use one of the following options to protect from back feed:

- **NOTE:** *As back feed may occur at any time, it is NOT acceptable to assume that unexpected energization will not occur, and taking appropriate measures to protect yourself during the task is required*
- *If option available, isolate transformer secondary by removing the meter or opening the farm or main breakers, the Power Line Technician(s) shall first open the main customer breaker because of load*
- *Specifically, it is necessary to isolate the secondary while isolating oil field transformers that utilize the 480v/200 amp self-contained meters, this concern relates to past meter failures in this application. The approved method of operating the Customers breaker with proper PPE is required in these situations due to the potential ARC Flash Hazard. Refer to the Oilfield Metering - Self Contained Meter Exchange - Isolated State SOP for proper isolation techniques for these situations*
- *If the Power Line Technician(s) is unable to isolate the secondary using the above methods the Power Line Technician(s) shall remove the secondary risers on the transformer to prevent possibility of feedback*

2.4 Grounding Secondary Conductors

2.4.1 The Power Line Technician(s) shall consider grounding secondary conductors in some situations.

- *We at SaskPower do not employ the use of grounding chains on secondary conductors as they do in some areas in other utilities. However*



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grounding secondary to protect against back-feed may be an acceptable option in some situations in large commercial areas with multiple Customers, where it may be difficult and cumbersome to isolate the secondary on large three phase banks.

3.0 Grounding Options

3.1 System Ground

3.1.1 The Power Line Technician(s) shall use a system ground where it is available as it is the preferred method for grounding, and use equal potential zone grounding and bonding when required.

3.2 Transformer Grounding System (grid)

3.2.1 The Power Line Technician(s) shall use the transformer grounding system (grid) as a ground in areas where there is no system neutral and proper isolation of transformer primary is done.

- *Normally this is not permitted as an acceptable ground in our grounding & bonding procedures, however we are not placing grounds on the system, only the apparatus which is isolated from the system*

3.3 Temporary Ground Probe

3.3.1 The Power Line Technician(s) shall determine if the use of a temporary ground probe is required.

- *Pounding temporary ground probes in farm yards, industrial & and commercial areas or anywhere else with all the underground facilities buried in the ground, presents a potential hazard*

4.0 Obtain Asset Information for Overhead Transformer Structure

4.1 Data Collection

4.1.1 The following FieldSmart information as demonstrated below shall be filled out while on site:



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The 'Pole' software window displays inspection data for two line patrols. The 'Inspect - Line Patrol #1' tab is active. The form includes several sections of dropdown menus for recording maintenance and condition data:

- Structure Maintenance / Condition:** Insulators Maintenance, Insulators Condition, Pole in Water, Estimated Depth, Condition of Pole, Condition of Pole Reason, Pole Stubbed, Condition of Stub-Banding.
- Cut Out Condition:** Cutout Condition, Cutout Maintenance Performed, Cutout Maintenance Required.
- Guy Condition:** Guy Overall Condition, Guy Maintenance Performed, Guy Maintenance Required.
- Fault Indicator:** Fault Indicator Present, Fault Indicator Manufacturer, Fault Amp Rating, Battery Date, Fault Indicator Maintenance Performed, Fault Indicator Maintenance Required.
- Arrester Condition:** Surge Arrester Condition, Arrester Maintenance Performed, Arrester Maintenance Required.
- Grounding Condition:** Grounding and Bonding Condition, Grounding Maintenance Performed, Grounding Maintenance Required.

A 'Condition Legend' at the bottom left states: 0=Critical 1=Poor 2=Fair 3=Satisfactory 4=Excellent. The window has 'OK', 'Cancel', 'Set GPS Lat/Lon', and 'Attachments...' buttons.

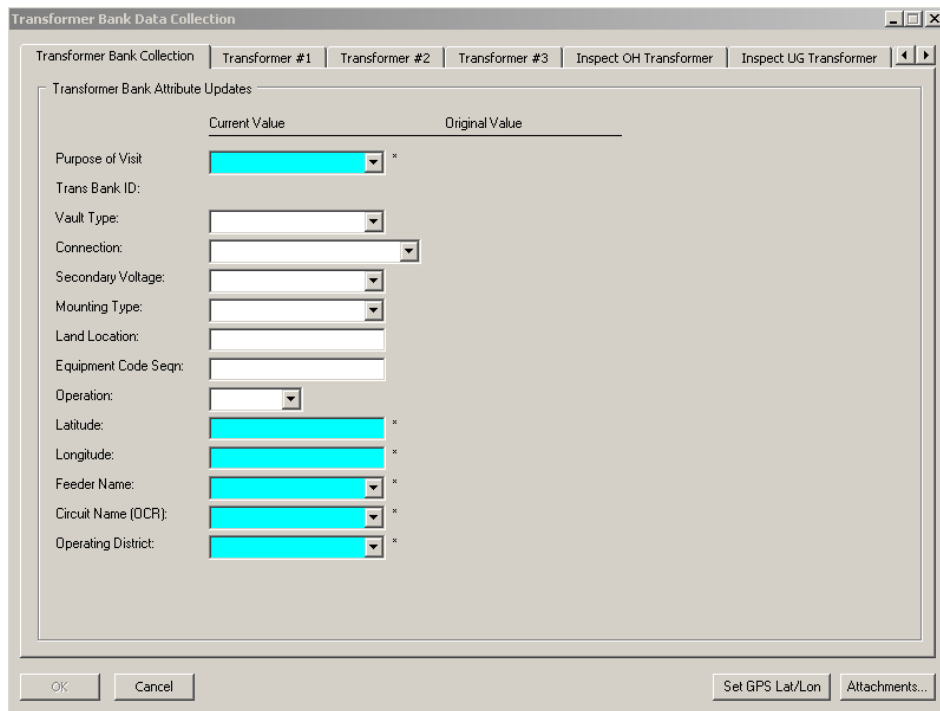
The 'Pole' software window displays overall inspection data and maintenance requirements. The 'Inspect - Line Patrol #1' tab is active. The form includes several sections of dropdown menus and text input fields:

- Conductor and Sleeve:** Conductor Condition, Sleeve Condition.
- Clearance:** Acceptable Clearance, Clearance Measurement (Meters), Ambient Temperature (C), Clearance Type.
- Vegetation Control:** Vegetation Control, Action Performed, Vegetation Control Action Required, Vegetation Proximity Control As Left.
- Customer Metering:** Customer Meter Number, Existing Meter Type, Meter Maintenance Required.
- Overall:** Overall Need Crew, Maintenance Required (highlighted in red), Maintenance Priority, Equipment Needed, Estimated Time To Complete Maintenance, Partial Inspection Reason, Inspect Date, Comments, SAP Work Order # (highlighted in red).

A 'Condition Legend' at the bottom left states: 0=Critical 1=Poor 2=Fair 3=Satisfactory 4=Excellent. The window has 'OK', 'Cancel', 'Set GPS Lat/Lon', and 'Attachments...' buttons.

4.2 Record the name plate data of the transformer(s).

4.2.1 The Power Line Technician(s) shall select the appropriate tab(s) to record the name plate data of the transformer(s):



The screenshot shows a software window titled "Transformer Bank Data Collection". It has a menu bar with "Transformer Bank Collection", "Transformer #1", "Transformer #2", "Transformer #3", "Inspect OH Transformer", and "Inspect UG Transformer". Below the menu bar is a section titled "Transformer Bank Attribute Updates" with a table-like structure. The table has two columns: "Current Value" and "Original Value". The rows include: Purpose of Visit (dropdown), Trans Bank ID (text), Vault Type (dropdown), Connection (dropdown), Secondary Voltage (dropdown), Mounting Type (dropdown), Land Location (text), Equipment Code Seqn (text), Operation (dropdown), Latitude (text), Longitude (text), Feeder Name (dropdown), Circuit Name (DCR) (dropdown), and Operating District (dropdown). At the bottom of the window are buttons for "OK", "Cancel", "Set GPS Lat/Lon", and "Attachments...".

5.0 Install Wildlife/Bird Protection

5.1 Install Appropriate Protective Device

5.1.1 Single Bushing Transformer

- *Wildlife Guard below the top skirt of the bushing*

Wildlife Guard Flexible fingers type, 16" dia.



UOM: ea	Package:	Spec No:
Item ID	Wt(lbs)	
13402	.66	

5.1.2 Double Bushing transformer

- *Install Bushing Covers on Each Bushing*

Bushing Cover Used on transformer bushings, prevents outages due to **wildlife**. Insulates energized bushing parts.

UOM: EA	Package:	Spec No:
Item ID	Install Type	
13540	New	Silicone Rubber
13541	Hotstick	Polypropylene copolymer

- *Cut the required length of Conductor Cover and install on riser between bushing and cutout*

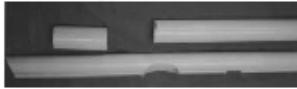
Conductor Cover #4 AWG to 4/0 Inner diameter to fit #4AWT to 4/0, made of silicone **rubber**

UOM:Feet	Package:	Spec No:
Item ID	WT	
13538	?	

5.1.3 FUD Structures

- *Install the proper RUD Bracket Insulating guards on the T-bracket*

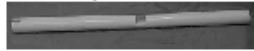
Guard, RUD Bracket Insulating 1½" I.D. yellow polyethylene for code 1-35-33



UOM:kit	Package:single	Spec No:DE-913
Item ID	Weight	
13535	1.5 lbs	

-

Guard, 30" RUD Bracket Insulating 1½" I.D. yellow polyethylene for code 1-35-36



UOM:each	Package:single	Spec No:Dwg. E1-415
Item ID	Weight	
13537	2 lbs	

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6.0 Return to Service

6.1 Return to Service

6.1.1 The Power Line Technician(s) shall, where applicable, ensure the following:

- *Remove all grounds installed on the primary and secondary using proper live line tools and PPE. Install secondary risers on the transformer using Class 0 gloves*
- *Install the primary riser*
- *Install the fuse (grasshopper or barrel)*
- *Where applicable, install the meter and reset the customer's main breaker*

7.0 Dispose of PCB Oil Contaminated Material

7.1 Dispose of PCB Oil Contaminated Material

7.1.1 The Power Line Technician(s) shall ensure the following

- ***NOTE: ALL PCB OIL CONTAMINATED MATERIAL (PIPETTES, GLOVES, RAGS, ABSORBENT MATERIAL) MUST BE DISPOSED OF IN THE APPROPRIATE PCB SOLID WASTE BARREL AT THE END OF THE DAY.***



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5.0 Components

The following is a list of components for this SOP which can be accessed through the SOP System:

Component Name	Component Type	Component Description	Location of Component
Isolating Overhead Transformers - Maintenance and PCB Test Flowchart	Flowchart	A high level and mid-level flowchart for this procedure	SOP Online - SOP Bundle: Isolating Overhead Transformers - Maintenance and PCB Test
PCB Transformer Data Collection Form	Job Aid	A form required for this procedure	SOP Online - SOP Bundle: Isolating Overhead Transformers - Maintenance and PCB Test
Hazard Aspect and Risk Assessment Form	Job Aid	A form to be completed prior to performing this task	SOP Online - SOP Bundle: Isolating Overhead Transformers - Maintenance and PCB Test

6.0 Acronyms, Definitions and Symbols

Acronyms and Abbreviations

- PCB** - Polychlorinated biphenyls
- TDG** - Transportation of Dangerous Goods
- FUD** - Farm Underground Distribution
- RUD** - Rural Underground

Definitions

Personal Protective Equipment - PLT shall ensure the following **Mandatory PPE** is used and in good condition

- **Head Protection** - CSA approved head protection shall be worn by all personnel at the job site, work areas and in posted areas on site
- **Eye Protection** - Approved safety glasses with side shields shall be worn by all personnel at the job site
- **Clothing** - Minimum Class 2 FR/Class 2 High Visibility Clothing shall be worn by all personnel at the job site
- **Footwear** - CSA approved, electric shock resistant footwear with minimum six inch (6") leather uppers for ankle support and a steel or composite toe

Additional PPE Requirements - To be determined according to the requirements of the task being performed. (Face Shield, rubber gloves, additional FR as determined using the SaskPower Arc Flash Tables) Review the procedure above for additional PPE requirements



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Symbols

N/A

7.0 Policies and Regulatory Requirements

This SOP is a result of the following regulations, policies, industry standards, and corporate directives and standards:

Regulatory Requirement(s)

Federal

- PCB Regulations
- The PCB Waste Storage Regulations
- Environmental Spill Control Regulations
- Canadian Environmental Protection Act

Provincial

- Saskatchewan Occupational Health and Safety Act and Regulations
 - *Part XXI, Sections 306 and 311, and Table 20*
 - *Part XXX, Additional Protection for Electrical Workers*

Policies

- Hazard/Aspect and Risk Assessment Policy
- Personal Protective Equipment Policy

Standards

- Electric Safe Work Standard
- Hazard/Aspect and Risk Assessment Standard

Other

- Standard Protection Code
- Safety and Environment Rulebook
- SaskPower Environmental Best Management Practices
- Testing for Absence of Potential SOP
- Deviation from Safe Work Procedure Standard

8.0 References

References

SOP - Identify Oil Filled Equipment Containing PCB's

SOP - 480 Volt Metering Operation

SOP - Field Care for Live Line Tools