



High Voltage End Break Switch Operation Inspection

Standard
Operating
Procedure

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1.0 Purpose

This SOP provides:

- A standard to follow when inspecting the installation of a high voltage end break switch.

2.0 Roles and Prerequisites

Role(s)	Quantity Required	Prerequisites
Powerline Technician/ Contractor Inspector	1 or more	1. SaskPower Standard Protection Code Training 2. Qualified Electrical Worker

3.0 Tools and Equipment

Minimum Tools and Equipment Required:

- Binoculars or spotting scope
- PPE
- Line Switch Commissioning Form
- Camera

4.0 Procedure

The Procedure

NOTE: The following requirements shall be met prior to the start of the procedure:

- Complete Hazard/Aspect and Risk Assessment
- Applicable Personal Protective Equipment (PPE) is available and in good condition
- Obtain SaskPower Standard Protection Code and other related permits
- Reviewed work practices: limits of approach, testing for absence of potential and proper grounding procedures

NOTE: This procedure applies to all makes of end break high voltage switches with or without ground switches attached.

Refer to SOP "*High Voltage Ground Switch and Interlock Operation Inspection*".

This SOP is based on Southern State switches. Some brands of switches may operate and look different than what is illustrated in this SOP. However, the required end result is the same. For other makes of switches refer to the supplied setup manual for exact tolerances and requirements.



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1.0 Inspecting Operation of an End Break Switch

1.1 Inspection Operation of an End Break Switch

1.1.1 The Powerline Technician/Contractor Inspector, for end break switches shall ensure the following:

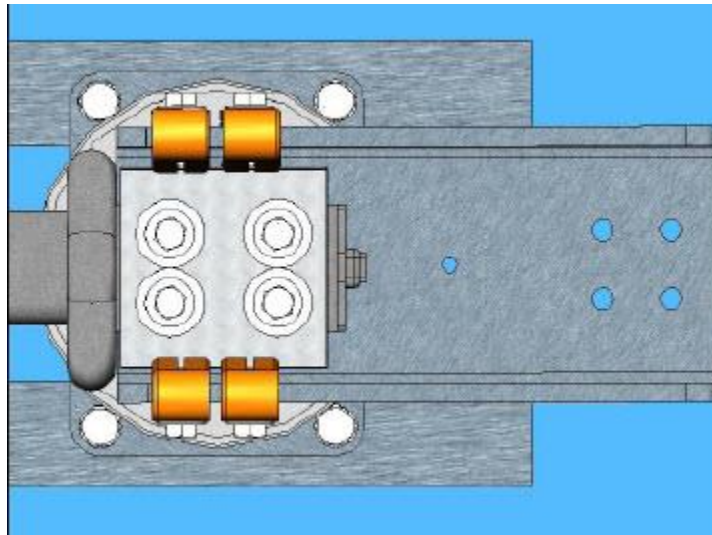
- *Confirm that the blades open to the correct direction as per engineering design*
- *The grounding mat(s) are in the correct location and are level as per engineering design*
- *Control handles are in the correct location as per the engineering design*
- *Confirm that the switch contacts have been thoroughly cleaned and lubricated with bar graphite.*
- **Note:** *The switch may not close properly if not lubricated*



Stock Coded Graphite Bar

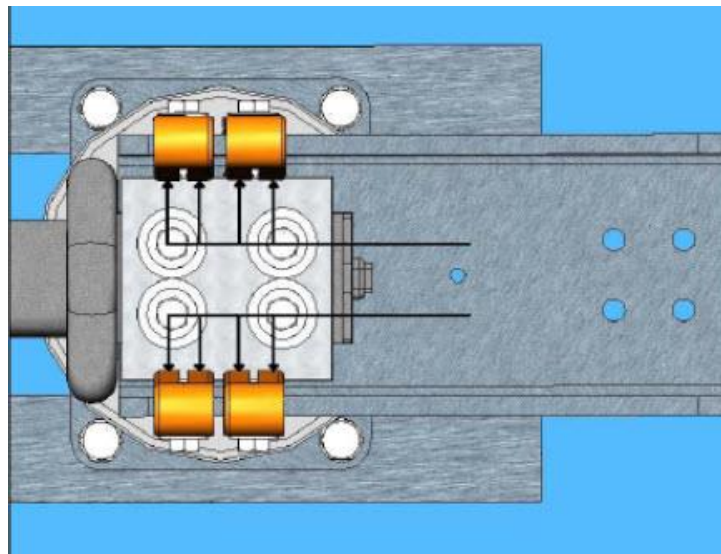
1.1.2 The Powerline Technician/Contractor Inspector shall ensure the following:

- *The jaw contact leaves (fingers) must be centered on the silver of the blade tip as shown in the figure below. If necessary, use the jack screws that support the jaw insulator to tilt the insulator for or aft, to align these parts.*



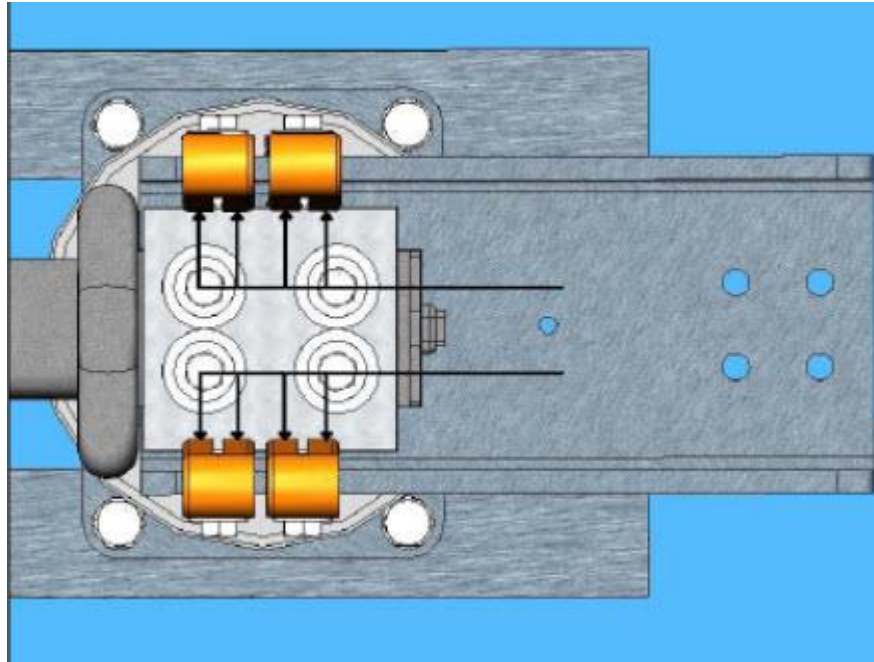
Female Contact Fingers Centered on the Male Blade Tip

- *All contact leaves (fingers) must be in contact with the silver of the blade tip as shown in the figure below. If necessary, shift the jaw against the bolt hole tolerances as required to achieve full contact distribution along the length of the blade tip.*



All Contact Fingers having Equal Pressure on the Blade Tip

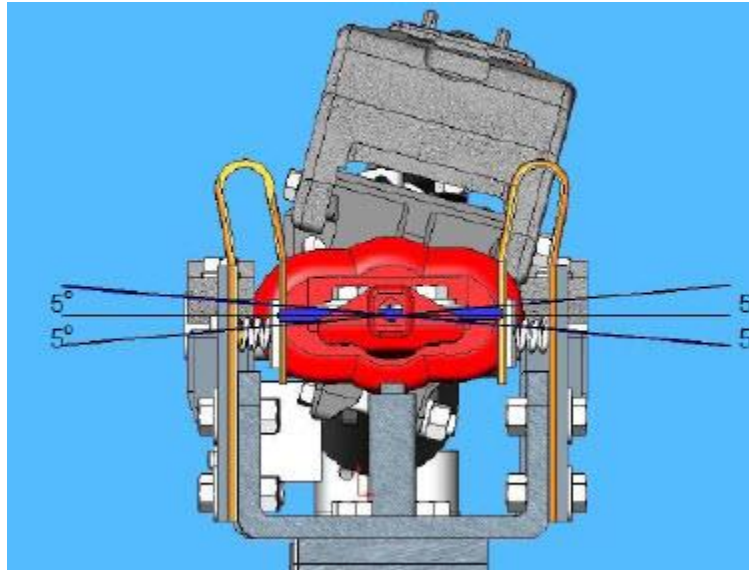
- *The blade tip must come down into the jaw in its center, without dragging on either side as shown in the figure below. Use the jack screw that support the jaw insulator sideways, if necessary to ensure this condition*



Correct Blade Tip Travel

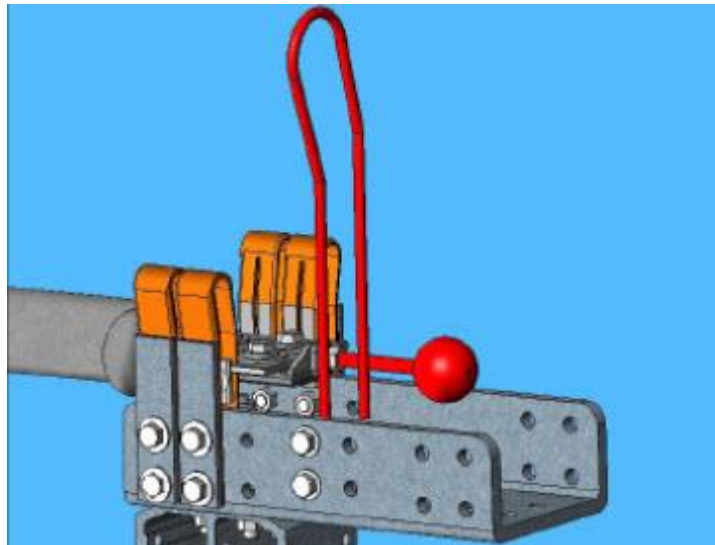
NOTE: The blade tip must come down firmly on the stop in the jaw. If necessary, use the jack screws that support the jaw insulator to elevate it as required. By adjusting all jackscrews equally (count the flats), previous adjustment will not be disturbed.

- *These switches will have adequate contact pressure if the blade has rotated to within plus or minus 5° of perpendicular in the contacts as shown in the figure below. Adjustment of the bearing stop may be required.*
- **NOTE:** Refer to Switch Installation Manual for exact tolerances.



Correct Blade Rotation

- *Confirm that the arcing horns (if the switch is equipped) are making full contact before the current carrying contacts touch.*



Arcing Horn Attachment

NOTE: All of these conditions must be rechecked after conductor attachments to both ends of the switch pole have been made.

- Confirm when the end break switch is fully open, the blade leans back 2° - 5° . **NOTE:** Confirm this requirement with the specific switch manufacturer installation instructions



End Break Switch in Fully Open Position

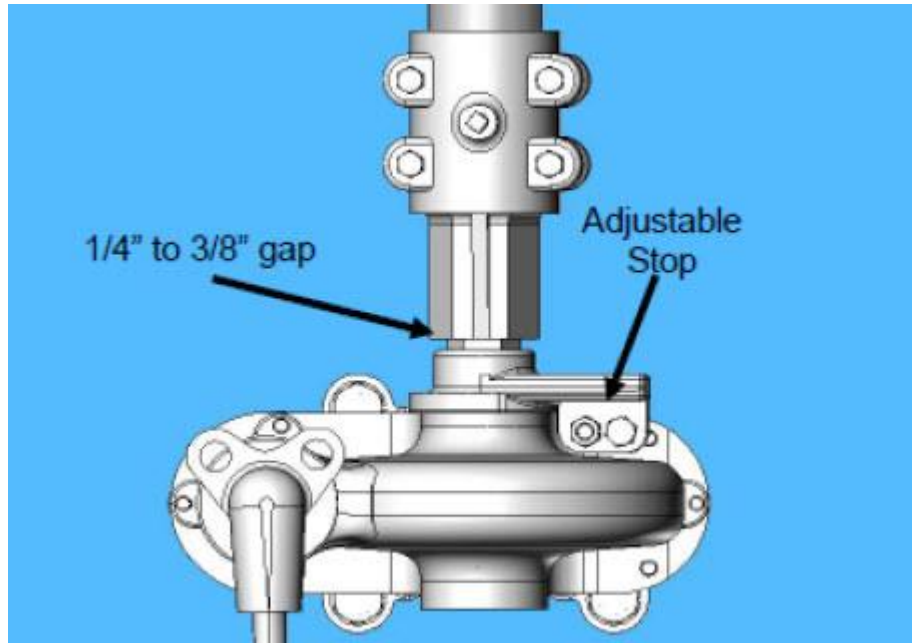
- Confirm all poles of the fully adjusted disconnect operate together, although a slight variance between poles is acceptable. The primary objective is for all poles to fully open and fully close. Minor adjustments of the interphase pipe clevises may be necessary for pole coordination.
- **NOTE:** See Component "SOP End Break Switch - Full Operation Video".
- Confirm that there is a positive toggle in the control handle in the fully closed position
- **NOTE:** Check with specific switch manufacturer installation instructions for toggle requirement



View of the Outboard (Fifth) Bearing where Toggle will be Present

NOTE: See Component "*SOP End Break Switch - Bearing Toggle Video*"

- *Confirm that the pipe collar supports the entire weight of the vertical pipe.*
- **NOTE:** *The pipe collar above the Vertical Bearing must support the entire weight of the Vertical Operating Pipe. DO NOT ALLOW THE MANUAL OR ELECTRICAL OPERATOR HOUSING TO BEAR ANY WEIGHT*



Small Space Between Manual Controller and Vertical Operating Pipe

- *Confirm all adjustment bolts and interphase pipe turnbuckles are tight*



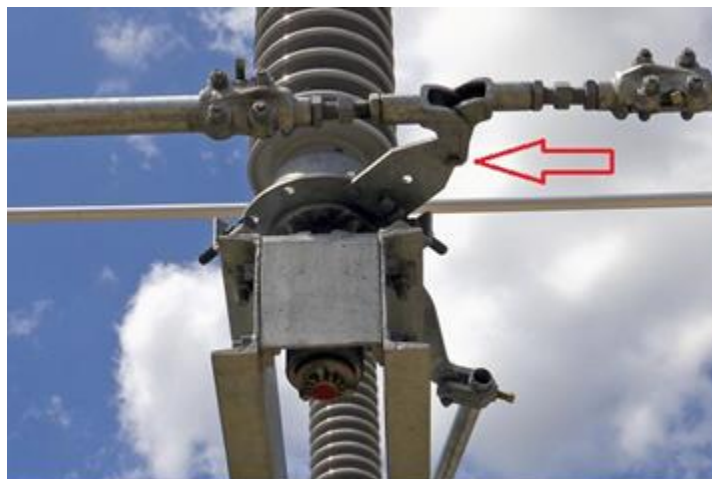
View of Turnbuckle Jam

- *Confirm all setscrews are pierced through the pipe walls. These piercing screws are located at several locations.*



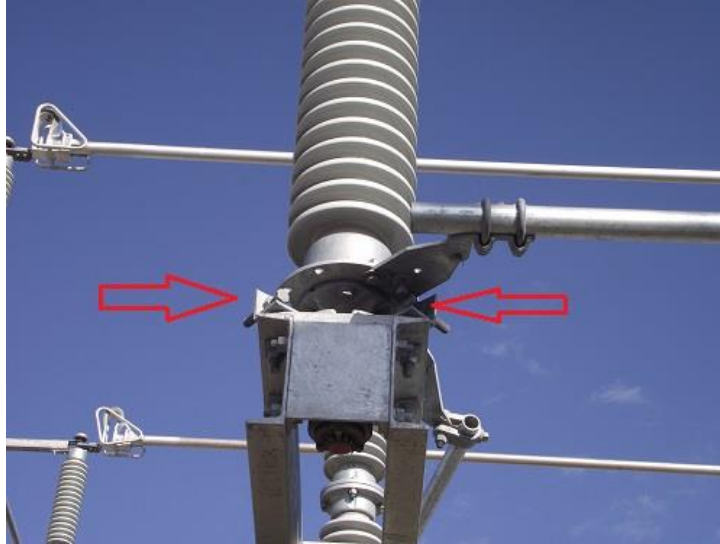
View of some of the Piercing Screws

- *Confirm all cotter keys are installed and bent between 15 and 20 degrees. These cotter keys are located at several locations.*



View of a Cotter Key Location

- *Confirm all bearing stops are lightly touching or have a small gap in both open and closed positions*



View of Switch Open/Close Switch Stops

- *Confirm that the open & closed indicator signs are installed correctly*



View of Closed Indicator Sign, Open is on Opposite Side of Pipe

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- *Confirm the grounding mat and switch are grounded properly according to the **SaskPower specs**, and that the grounding mat is level and at the correct height*



View of Grounding Mat



View of Main Drive Pipe Ground

- *Confirm the switch designation signs are correct and mounted in the correct location*

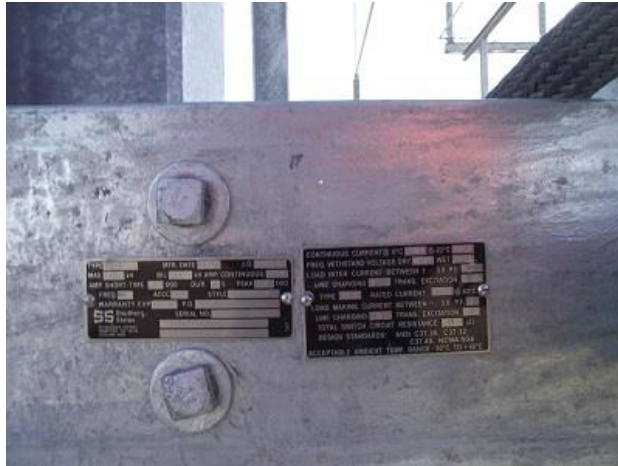


View of Switching Station Designation Sign



View of a Line Switch Designation Sign and other required signage

- 1.1.3 The Powerline Technician/Contractor Inspector shall complete the switch commissioning form and document the switch name plate data
- Refer to the " Line Switch Commissioning Form"



View of the Switch Name Plates



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Line Switch Commissioning Form

Switch Designation:	Commissioned By:	Date:
Switch Manufacturer:	Serial Number(s)	Manufacturer Ref or Style #
Year of Manufacture:	Voltage Rating (kV)	Basic Insulation Level (BIL) (kV)
Continuous Current Rating (A)	Momentary Current Rating (A)	Vacuum Interrupter Rating (if equipped)

Items	Checked	Comments
Grounding – Measured Resistance less than 1GΩ. Provide measured resistance.		
Switch is installed as per job specification with no visible damage. Insulators have been cleaned.		
Correct operation of main contacts, arcing horns, whips and vac-rupters (if equipped)		
Contacts have been cleaned and properly lubricated with graphite bar.		
Alignment and timing as per manufacturer's instructions.		
All phases lean back at 91° in open position. All phases are synchronized and touch the open stop at the same time.		
All phases are synchronized and touch the closed stop at the same time in the closed position.		
All hardware double checked for proper torque.		
All pins installed head up with cotter pin installed. All piercing bolts installed.		
Switch Designation Placard and all other required signage installed.		
Switch Name plate data tag(s) installed near operating handle.		
Damage to coating has been repaired. Uncoated steel (ie screw pile caps) have been coated.		
Photographs of installation have been sent of AM&S.		
One copy of the manufacturer supplied drawings & manual have been sent to AM&S.		

Switch is installed as per the job specification and manufacturer's installation manual.
The switch operates correctly and is ready for service: Yes No

Comments: _____

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View of the Line Switch Commissioning Form

NOTE: Refer to the "Line Switch Commissioning Form" found in this SOP Bundle

- Take pictures of the Apparatus in the fully open and fully close positions, and all three phase current carrying contacts in the fully closed position.
- Send the pictures, along with the Line Switch Commissioning Form electronically to the Construction Department for input into SAP.



- Apparatus in the fully open and fully close positions, and all three phase current carrying contacts in the fully closed position.



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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
Line Switch Commissioning Form	Form	A form that is required for this procedure	SOP Online - SOP Bundle: High Voltage End Break Switch Operation
SOP End Break Switch - Full Operation Video	Video	A video job aid required for this procedure	SOP Online - SOP Bundle: High Voltage End Break Switch Operation

6.0 Acronyms, Definitions and Symbols

Acronyms and Abbreviations

N/A

Definitions

N/A

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)

- N/A

Policies

- Job Hazard Assessment Policy
- Personal Protective Equipment Policy



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Standards

- N/A

Other

- SaskPower Standard Protection Code
- SaskPower Safety and Environment Rulebook

8.0 References

References

N/A