



Disconnectors, links and air break switches

SMI 204

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Revision History

This standard replaces amendment no 5. All changes are highlighted in this document with grey colouring.

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1 Documentation Scope

This standard sets out in detail the broad requirements for routine maintenance of disconnectors, links and air break switches in Endeavour Energy's networks.

This instruction specifies the following requirements for disconnectors, links and air break switches:

- The required routine inspection and maintenance requirements;
- Redundant and specific ABS model replacements; and,
- Refurbishment kits for ABS replacements.

This document does not cover the frequency of inspection and maintenance activities. These are covered in:

- SMI 100 for transmission and zone substation equipment; and,
- SMI 101 for switches in the distribution network.

2 References

External Regulations

Electricity Supply Act 1995 (NSW)

Electricity Supply (Safety and Network Management) Regulation 2014

Work Health and Safety Act 2011

Work Health and Safety Regulation 2017

External Standards

ENA National Electricity Network Safety Code (Doc 01-2008)

Company Policies and Procedures

Company Policy (Network) 9.9.1 – Network Asset Maintenance

Company Standards

Mains Design Instruction MDI 0026 – Location of isolation points on the high voltage network

Substation Maintenance Instruction SMI 100 – Minimum requirements for maintenance of transmission and zone substation equipment

SMI 101 – Minimum requirements for maintenance of distribution equipment

SMI 124 – Maintenance data entry and defect prioritisation

3 Definitions and Abbreviations

Abbreviation	Meaning
ABS	Air break switch
AKPS	AK Power Systems (Formerly known as Haycolec)
LBS	Load break switch
USL	Under slung link

Term	Definition
Ellipse	Endeavour Energy's asset management database

A full list of definitions is contained in SMI 100 and SMI 101

4 General Requirements

4.1 General Inspection and Maintenance Approach

The routine maintenance required for disconnectors, links, and air break switches, as detailed in Section 5, comprises of an inspection and a major overhaul.

During the inspection and maintenance work carried out, the nameplate data that has been recorded in Ellipse must be confirmed. Where any nameplate information that has yet not been recorded in Ellipse, this must be captured and entered into Ellipse.

Distinct types or brands of equipment may not contain some of the components listed in the following sections for routine maintenance, in which case that particular component is to be disregarded.

4.2 Defect Requirements

Inspections are to include the repair of simple defects and abnormalities that can be easily and safely rectified during the inspection.

All defects and abnormalities found during maintenance are to be recorded in Ellipse, in accordance with SMI 124.

5 Routine Maintenance Requirements

Routine maintenance must always be carried out in accordance with manufacturer's recommendations as a minimum.

Where applicable, the set of maintenance requirements for disconnectors, links and air break switch equipment outlined in the maintenance schedule given below must be met.

Table 1 – Routine maintenance requirements

Routine maintenance	Transmission / zone substations and switching stations			Distribution	
	Links	Disconnectors	Air break switch	Links	Air break switch / disconnectors
1.0 IN-SERVICE INSPECTION					
General					
Inspect the equipment and note any defects.	X	X	X	X	X
Structure/steelwork					
Inspect unit for cracks and distortion.	X	X	X	X	X
Inspect for rust, corrosion or other defects.	X	X	X	X	X
Connections - fixed and flexible					
Inspect for discolouration, damage or other defects.	X	X	X	X	X
Contacts - main and earthing					
Inspect for discolouration, damage, burns or other defects.	X	X	X	X	X
Insulators					
Inspect for cracks, chips, burns or other defects Defective insulators should be replaced as a phase set – if two (2) sets are defective replace all sets.	X	X	X	X	X
Arcing (flicker) horns					
Inspect for discolouration or damage, burns or other defects.		X	X		X
Check alignment and correct operation.					X
Labels					
Check labels/signs are legible and correctly fitted.	X	X	X	X	X
Operating mechanism					

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Routine maintenance	Transmission / zone substations and switching stations			Distribution	
	Links	Disconnectors	Air break switch	Links	Air break switch / disconnectors
Check flexible earthing bond to moving handle is not damaged.		X	X		X
Check connecting-rod(s) for damage, decay, tracking and twisting.		X	X		X
Check pivot points move freely.					
Check handle for damage, sharp objects, rust.		X	X		X
Check down-rod for damage, decay, tracking and twisting.		X	X		X
Check down-rods supports for damage.		X	X		X
<i>Ellipse data validation</i>					
Confirm the nameplate data that has been recorded in Ellipse.	X	X	X	X	X
Capture the nameplate data that has not been recorded or incorrectly entered in Ellipse and update accordingly.	X	X	X	X	X
2.0 MAJOR OVERHAUL					
<i>2.1 As found checks</i>					
Take photos of any defects found during overhaul	X	X	X	X	X
<i>Measurements</i>					
Record primary circuit resistance. The injected current during the measurement must have a minimum of any convenient value between 50 A and the rated normal current	X	X	X		
<i>Insulators</i>					
Replace defective insulators with cracks, chips, flashovers, burns, or other defects as a phase set – if two (2) sets defective replace all sets.	X	X	X	X	X
<i>Connections - fixed and flexible</i>					
Inspect for discolouration, damage or other defects.	X	X	X	X	X
All terminations to be lugged, that is, hammer lug.					X
<i>Contacts - main and earthing</i>					

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Routine maintenance	Transmission / zone substations and switching stations			Distribution	
	Links	Disconnectors	Air break switch	Links	Air break switch / disconnectors
Rectify/replace discoloured, damaged or other defects.	X	X	X	X	X
Arcing (flicker) horns					
Rectify/replace discoloured, damage or other defects.		X	X		X
Check alignment and operation.		X	X		X
2.2 Overhaul					
Insulators					
Clean with recommended solvent.	X	X	X		X
Contacts - main and earthing					
Clean with recommended solvent.	X	X	X		X
Dress if necessary.	X	X	X		X
Adjust spring tension if necessary.	X	X	X		X
Polish contact surfaces	X	X	X		X
Lubricate contact surfaces with recommended lubricant (indoor units only).	X	X	X		X
Connections					
Clean with recommended solvent.	X	X	X		X
Check tightness.	X	X	X		X
Modify all terminations to lug type, that is, hammer lug.				X	X
Hinges					
Adjust movement if necessary.	X	X	X		X
Clean with recommended solvent.	X	X	X		X
Arcing (flicker) horns - blades					
Clean with recommended solvent.		X	X		X
Check alignment and operation, dress/replace and adjust if necessary.		X	X		X
Arcing (flicker) horns - springs					
Check condition and replace if necessary.		X	X		X
Operating mechanism					

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Routine maintenance	Transmission / zone substations and switching stations			Distribution	
	Links	Disconnectors	Air break switch	Links	Air break switch / disconnectors
Check tightness, adjust if necessary		X	X		X
Lubricate with recommended lubricant.		X	X		X
Replace flexible earthing bond to moving handle if damaged.		X	X		X
Replace connecting-rod(s) if damaged, decayed, or if tracking and/or twisting.		X	X		X
Check pivot points move freely – lubricate as required.		X	X		X
Replace handle if damaged, rusted or other defect.		X	X		X
Replace down-rod if damaged, decayed, or if tracking and/or twisting.		X	X		X
Replace damaged down-rods supports and check alignment.		X	X		X
Check operation at least three times, adjust as necessary.		X	X		X
Motor drive (where applicable)					
Check condition.		X			
Check motor protection automatic switch (MCB to protect motor)		X			
Correct operation of interlocking device		X			
Clean with recommended solvent.		X			
Lubricate with recommended lubricant.		X			
Earthing connections					
Check condition - repair as required.	X	X	X		X
Check earth mat connections – repair as required.	X	X	X		
2.3 FINAL CHECKS					
Operation					
Check alignment and operation. Perform five (5) manual operations and check that the opening and closing movements are correct.	X	X	X	X	X
Measurements					

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	Transmission / zone substations and switching stations			Distribution	
	Links	Disconnectors	Air break switch	Links	Air break switch / disconnectors
Routine maintenance					
Record primary circuit resistance. The injected current during the measurement must have a minimum of any convenient value between 50A and the rated normal current.	X	X	X		
<i>Ellipse data validation</i>					
Confirm the nameplate data that has been recorded in Ellipse.	X	X	X	X	X
Capture the nameplate data that has not been recorded or incorrectly entered in Ellipse and update accordingly.	X	X	X	X	X

6 Special ABS Replacement Requirements

6.1 Redundant ABS Replacement

Where HV air-break switches and underslung links in residential and rural areas are in-operable, opportunities must be sought to assess whether or not they are redundant in the system in accordance with MDI 0026.

Where a connection/bond on an ABS or USL is repaired or replaced, all connections/bonds associated with the ABS or USL must be checked, and replaced if their conditions are not acceptable or they are U-bolt connection.

6.2 Specific Model Replacement

Three ABS models have been identified for proactive replacement, being:

- Essante model HS641
- Taplin model D571
- AK Power (Formerly Haycolec) A24 – installed without insulator caps only. Refer to Table 2 below for full details of applicable models.

Table 2 – AK Power ABS models

AK Power ABS Type	Insulator Type	Insulator End Caps (Y/N/Unknown)	Date of Manufacture
0130 or 0140	Porcelain	N	Prior to January 2004
Gen 1	Porcelain	N or Unknown	Prior to February 2004 or Unknown
Other & Unknown	Porcelain	N	Prior to February 2004 or Unknown
	Unknown	Unknown	

Until such time these are replaced, maintenance must still be performed on these models. However, replacement may be a more cost effective solution and must be considered instead of a major overhaul.

During the replacement of an ABS, a pole top assessment must be carried out.

6.3 Copper Hammer-head Lugs

Copper hammer-head lugs are not to be used on any part of the network. Where an existing copper hammer-head lug needs replacement, or when copper hammer head lugs are identified during maintenance, every effort must be made to replace them with a lug complying with the current standard.

7 Authorities and Responsibilities

General Manager Asset Management has the authority and responsibility for approving this instruction.

Manager Asset Standards & Design has the delegated authority and responsibility for approving this instruction for minor changes and making recommendations to **General Manager Asset Management** for major changes in respect to this instruction.

Substation Assets Manager has the authority and responsibility for keeping the contents of this instruction up to date.

Regional Transmission and Distribution Managers have the authority and responsibility for:

- engaging Endeavour Energy employees and/or contractors who have appropriate qualifications and are competent to carry out the work;
- entering the maintenance details into Endeavour Energy's Ellipse database;
- meeting the requirements of this instruction, SMI 100 and SMI 101;
- working in accordance with local and statutory requirements;
- upholding a high level of public safety; and
- encouraging employees to be conversant with and work in accordance with the principles of the Electrical Safety rules.

Maintenance employees have the authority and responsibility for:

- meeting the requirements of this instruction, SMI 100 and SMI 101;
- working in accordance with local and statutory requirements;
- upholding a high level of public safety;
- working in accordance with Endeavour Energy's Electrical Safety Rules; and
- communicating abnormalities found in the equipment to Regional Transmission/Distribution Managers and **Substation Assets Manager**.

8 Annexure 1 - Replacement Kits for Air Break Switches

Table 3 below list items available for the refurbishment of various models of ABS in the event of a failure. Not all these kits can be used in every situation, and the restrictions around each kit or part is detailed.

Table 3 - Spare parts for air break switches

Item	Description	Supplier	Stock code	When to be used
1	Phase refurbishment kit (includes current carrying parts and post insulators)	ABB	1544949	This kit is used for all repairs/replacements for air break switches other than the AKPS type. This kit DOES NOT suit the polymer type ABB switches.
2	Complete centre phase assembly, including mounting channel, for AKPS switch	AKPS	1545052	This assembly is used to replace defective centre phase units on the AKPS switches. Complete phase assemblies must be changed, do not break this item down into individual components.
3	Complete outer phase assembly, including mounting channel, for AKPS switch	AKPS	1545060	This assembly is used to replace defective outer phase units on the AKPS switches. Complete phase assemblies must be changed;- do not break this item down into individual components.
4	Operating handle for AKPS switch including connecting pipe for down rod	AKPS	1545078	This is a complete operating handle assembly for the AKPS switch. It may be suitable for replacement of defective handles on other brands of switches. It will be necessary when fitting this handle to use two stand-off insulators to isolate the handle from the pole. Suitable insulators are items 8 or 9, depending on pole type.
5	Fibreglass down rods (3) for AKPS switch	AKPS	1545086	This is a set of operating rods (fibreglass) for the AKPS switch. They may be suitable for use with other brands of ABS that use 50x50mm down rods.

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Item	Description	Supplier	Stock code	When to be used
6	Fibreglass down rod (1) for AKPS switch plus 1 down rod guide and coach screws	AKPS	1117456	This is an additional down rod (3.3m long) and guide bracket for the AKPS switch. It is for use when the switch is mounted on a 14m pole where an additional down rod will be required.
7	Post insulator for ABB type D571 switch	ABB	SY10379	This is a post insulator for replacement of insulators on older ABB switches. It may be suitable for use with other brands of switches that use similar styles of post insulator. These insulators must be installed in pairs, that is, if one post insulator on a phase needs changing then the other post insulator on the SAME phase must be changed as well.
8	Insulator for ABS handle mounting (for 11/22kV switch) on concrete poles	AKPS	SY10204	This post insulator is used to isolate the operating handles of 11/22kV switches from concrete poles where mounting holes are present in the pole.
9	Insulator for ABS handle mounting (for 11/22kV switch) on wood poles	AKPS	SY10190	This post insulator is used to isolate the operating handles of 11/22kV switches from wooden poles. This insulator incorporates a coach screw insert for attaching to wooden poles.
10	Flicker arm	AKPS	1503481	This is a replacement flicker arm for the AKPS switch. It should be suitable for use on other brands of switches. Some shortening of the arm may be required on other brands of switches.
11	Arcing contact	AKPS	1503499	This is a replacement arcing contact for the AKPS switch. It may be suitable for use on other brands of switches.
12	Top downrod section for polymer ABB ABS	ABB	1552793	This item is for the polymer type ABB air break switch.
13	Bottom downrod section for polymer ABB ABS	ABB	1552819	This item is for the polymer type ABB air break switch.

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Item	Description	Supplier	Stock code	When to be used
14	Hinged intermediate support for polymer ABB ABS	ABB	1552827	This item is for the polymer type ABB air break switch.
15	Phase assembly complete for polymer ABB ABS	ABB	1552868	This item is for the polymer type ABB air break switch. It consists of a complete phase assembly with all insulators, current carrying components and mounting channel. It is suitable for all phase positions. It should be used as a complete assembly, DO NOT break down into component parts.

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