Substation Design Instruction

ABB NXB Sectos
12kV/24kV load break switch

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SUBSTATION DESIGN INSTRUCTION

SDI 223 ABB NXB Sectos 12kV/24kV load break switch

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1.0 PURPOSE
To provide technical and reference information to assist with the safe design, installation, commissioning, operation and decommissioning of ABB NXB Sectos 12/24kV manual load break switch.

2.0 SCOPE
This instruction provides information and reference documentation to assist in the safe design, installation, commissioning, operation and decommissioning of ABB Sectos 12/24kV LBS. This instruction provides details of the standard units approved for use in Endeavour Energy’s network as detailed in 5.1.2 (Approved products). The scope of this document provides reference to the various lifecycle stages of the LBS and therefore should be read in conjunction with Section 3.0 and the following documents:

- Location of isolation points on the network: MDI 0026 - Location of isolation points on the high voltage distribution network.
- Earthing design, construction and testing: EDI 100 - Distribution earthing design, construct and test.
- Specification for new equipment: ETS 0067 - 11kV and 22kV enclosed load break switches.
- General details and minimum design requirements: SDI101- - Distribution substation general details and minimum requirements and MDI 0028 - Underground distribution network design.
- Ongoing maintenance requirements: SMI 101 - Minimum requirements for maintenance of distribution equipment.
- Standard drawing requirements: SAD 0001 – Project drawing standards.
- Disposal: GSU 0012 - Selection and Approval of a Disposal Method.

This document should be read in conjunction with the following ABB documents:

- ABB Installation, operation and maintenance instruction – Sectos pole mounted load break switch
- ABB drawing no.: 7508260-IOM – Installation instruction of Sectos down rod assembly kit and automatic locking mid pole operator
- ABB drawing no. 7508260 and 750860 Ext – NXB 24KV c/w e-stp b/cap sa/brkt mpo kit

3.0 REFERENCE
- Company Policy 9.1.7 - Commissioning Network Electrical Assets
- Company Policy 9.2.2 - Network Protection
- Company Policy 9.2.5 - Network Asset Design
4.0 DEFINITIONS AND ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASP</td>
<td>Accredited Service Provider</td>
</tr>
<tr>
<td>BIL</td>
<td>Basic Impulse Level – Insulation level designed to withstand surge voltage</td>
</tr>
<tr>
<td>CCT</td>
<td>covered conductor thick – Insulated overhead conductor</td>
</tr>
<tr>
<td>LBS</td>
<td>load break switch</td>
</tr>
<tr>
<td>RMS</td>
<td>root mean square</td>
</tr>
<tr>
<td>SF₆</td>
<td>sulphur hexafluoride</td>
</tr>
</tbody>
</table>
5.0 ACTIONS

5.1 General

5.1.1 Introduction
The ABB NXB Sectos load break switches (LBSs) are used in the distribution network to meet the network isolation policy, cost effectively and to improve power supply reliability. They are designed for use on overhead distribution lines operated at 11kV or 22kV. The LBS can only be used as a manual operated switch.

5.1.2 Product approval number and stock code
ABB NXB Sectos LBS has been approved for use on Endeavour Energy’s 11kV and 22kV network as shown in Table 1.

<table>
<thead>
<tr>
<th>Endeavour Energy stock code</th>
<th>ABB part number</th>
<th>Description</th>
<th>Approval no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1564384</td>
<td>7508260</td>
<td>12 kV manual load break switch*</td>
<td>530261</td>
</tr>
<tr>
<td>1564509</td>
<td>7508260-Ext</td>
<td>24kV manual load break switch*</td>
<td>530277</td>
</tr>
</tbody>
</table>

* The only difference is the size of the bushing.

Note: Currently automatic Sectos LBS is not approved.

5.1.3 Technical features
A summary of the main technical features of the ABB enclosed switch are:

- Tank made from 304 grade stainless steel.
- SF₆ gas used as insulation and interruption medium.
- SF₆ gas tank is sealed for life.
- Operated manually by a hook stick for manual LBS.
- Mechanical locking of LBS using manual lock which can be padlocked.
- Open and closed position is indicated by reflective green and red indicators, respectively.
- Low gas below safe working pressure locks the switch and prevents further operation.
- Low gas pressure warning flag is visible from the ground.
- Bushing boots are made from silicon.

Fig. 1 ABB Sectos LBS
5.1.4 Technical specifications

Table 2: ABB Sectos LBS specifications

<table>
<thead>
<tr>
<th>Rated voltage of use</th>
<th>12kV</th>
<th>24kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage (rms)</td>
<td></td>
<td>24kV</td>
</tr>
<tr>
<td>Rated continuous current (rms)</td>
<td></td>
<td>630A</td>
</tr>
<tr>
<td>Fault make capacity, (rms)</td>
<td></td>
<td>35kA</td>
</tr>
<tr>
<td>Fault make capacity (peak)</td>
<td></td>
<td>50kA</td>
</tr>
<tr>
<td>Mainly active load breaking capacity (rms)</td>
<td></td>
<td>630A</td>
</tr>
<tr>
<td>No load mechanical operations – main switch</td>
<td></td>
<td>5000</td>
</tr>
<tr>
<td>Rated full load operations</td>
<td></td>
<td>400</td>
</tr>
<tr>
<td>Short time current withstand (rms)</td>
<td></td>
<td>20kA / 4 sec</td>
</tr>
<tr>
<td>Rated no load transformer breaking current</td>
<td></td>
<td>6.3A</td>
</tr>
<tr>
<td>Cable charging breaking current</td>
<td></td>
<td>50A</td>
</tr>
<tr>
<td>Line charging breaking current</td>
<td></td>
<td>50A</td>
</tr>
<tr>
<td>Power frequency withstand voltage (rms) – to earth and between phases</td>
<td></td>
<td>50kV</td>
</tr>
<tr>
<td>Power frequency withstand voltage (rms) - across open contacts</td>
<td></td>
<td>60kV</td>
</tr>
<tr>
<td>Impulse withstand phase to earth and phase to phase</td>
<td></td>
<td>125kV</td>
</tr>
<tr>
<td>Impulse withstand across open contacts</td>
<td></td>
<td>145kV</td>
</tr>
<tr>
<td>Insulation medium</td>
<td></td>
<td>SF₆ gas</td>
</tr>
<tr>
<td>SF6 quantity</td>
<td></td>
<td>0.6 kg</td>
</tr>
<tr>
<td>SF6 nominal operating gas pressure @ 20 deg. C</td>
<td></td>
<td>1.5 bar abs</td>
</tr>
<tr>
<td>Bushings</td>
<td></td>
<td>Silicone</td>
</tr>
<tr>
<td>Creepage distance</td>
<td>620 mm.</td>
<td>960 mm.</td>
</tr>
<tr>
<td>Ambient temperature limits</td>
<td>-10°C - 60°C</td>
<td></td>
</tr>
<tr>
<td>Humidity</td>
<td></td>
<td>0-100%</td>
</tr>
<tr>
<td>Altitude</td>
<td></td>
<td>&lt; 1000m</td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td>82kg</td>
</tr>
</tbody>
</table>

5.1.5 Gas density gauge

A gas density gauge is fitted to the bottom of the tank. The normal gas filling pressure is 1.5 bar abs @20°C.
5.1.6 Gas leak indication

Low gas pressure (< 1.1 bar abs @20° C) in the switch tank will automatically inhibit operation of the switch. Low gas pressure is indicated by a mechanical indicator. The reflective “GAS LOW” indicator will be visible from ground level.

![Figure 3- Gas Low lock out indicator](image)

5.1.7 Internal arc venting

The stainless steel tank is designed specifically to guarantee the safety of operation employees in the event of an internal arc fault at the maximum fault capacity. Due to high internal arc containment capacity of the tank, the LBS will withstand an internal fault without venting hot gases. An arc vent is provided that will operate if the internal tank pressure exceeds 20 bar abs in a controlled manner to the side of the LBS tank.

If the LBS has failed and all the SF₆ gas has been depleted, and is beyond repair, the LBS can be disposed through the normal disposal methods. Where the SF₆ gas is still present, the SF₆ gas shall be removed prior to disposal. Refer to Branch Workplace Instruction WRG 0526 - Handling of SF6 (Sulphur Hexafluoride), when handling SF6 gas.

5.2 Installation

The installation of LBS shall comply with the following standards:

- MCI 0005 - Overhead distribution construction standards manual, for construction and mounting arrangements.
- EDI 100 - Distribution earthing design, construct and test, for earthing requirement.
- MDI 0026 - Location of isolation points on the high voltage distribution network, for location of load break switches.

The supplied mounting bracket is suitable for both pole top and mid pole mounting. Refer to standard drawing no. 332021 and ABB drawing no.: 7508260 and 7508260-Ext.

Commissioning of the LBS shall be performed in accordance with Division Procedure GNV 1044 - Commissioning Network Electrical Assets, and SDI 120 - Testing and commissioning for distribution systems.
5.2.1 Supplied manufacturer items:

Table 3: Items included with the LBS

<table>
<thead>
<tr>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABB NXB Sectos LBS in a stainless steel tank with six (6) terminals</td>
<td>1</td>
</tr>
<tr>
<td>Pole mounting bracket for load break switch</td>
<td>1</td>
</tr>
<tr>
<td>Surge arrester bracket</td>
<td>2</td>
</tr>
<tr>
<td>3m Fibreglass down rod</td>
<td>1</td>
</tr>
<tr>
<td>2.3m of 32NB and 25NB galvanised pipe</td>
<td>1</td>
</tr>
<tr>
<td>Down rod support kit</td>
<td>1</td>
</tr>
<tr>
<td>Mid pole operator</td>
<td>1</td>
</tr>
<tr>
<td>Earthing stirrups connected to palm of each bushing</td>
<td>6</td>
</tr>
<tr>
<td>Silicon rubber bushing cover</td>
<td>6</td>
</tr>
</tbody>
</table>

Figure 4 Installed ABB Sectos LBS

Reference shall be made to MCI 0005 - Overhead distribution construction standards manual, for complete list of materials required for construction of pole mounted LBS. Refer to drawing no. 332021 for termination to the LBS.
Additional items not included in the stock item but required for construction of pole mounted LBS are:

- Surge arresters with earth lead disconnect device, including HV connections and hardware.
- Earthing conductor from surge arresters to tank and to earth rods.

5.3 Operation

5.3.1 Manual operation (using the mid pole operator)

The enclosed switch is manually operated from ground level using an extended insulated hook stick. To open or close the switch, two operations must be carried out.

(i) First operation:
Unlock the locking mechanism which allows the switch to be opened or closed. This operation is performed by pushing the locking key into the funnel entry using the insulated hook stick from ground level.

(ii) Second operation:
Operation performed on the main arm (manual operating arm) of the switch to open or close function using the insulated hook stick from ground level. Facilities are provided to padlock the mechanism in the open position or closed position.

A manual locking device using a hook stick is available close to the operating arm of the LBS.

For detailed instructions on the operation of the LBS, refer to ABB document no.: 1VXA00041-en, 201001.

The stock code for hook stick operating key is 1560721.

5.3.2 Switching operations

Switching operations must be carried out by authorised personnel only. Refer to Division Procedure GNV 1061 - Transmission and High Voltage Distribution Network Switching.
5.3.3 Position indicators

The enclosed switch provides a reflective indication:
(a) ‘ON’ indication – red in colour with “I” (closed).
(b) ‘OFF’ indication – green in colour with “O” (open).

The indication is directly linked to the operating mechanism. The indication is visible from the ground to provide a clear indication of the position of the enclosed switch.

5.4 Maintenance

All routine maintenance must be carried out in accordance with SMI 101 – Minimum requirements for maintenance of distribution equipment.

5.5 Decommissioning

Disposal of equipment must be registered onto the equipment register (refer to GNV 1026 - Equipment Register) and disposed with an approved method (refer to GSU 0012 - Selection and Approval of a Disposal Method).

6.0 AUTHORITIES AND RESPONSIBILITIES

Chief Engineer has the authority and responsibility for approving this instruction and approving variations to the requirements of this instruction.

Manager Primary Systems has the authority and responsibility for endorsing and recommending changes and revisions to this instruction.

Network Substations Manager has the authority and responsibility for revising and updating this instruction in accordance with Company Policy and Procedures.

Regional Managers have the authority and responsibility for determining all designs carried out by Regional employees conform to the requirements of this instruction.

Manager Network Connections has the authority and responsibility for determining all designs carried out by Level 3 ASPs conform to the requirements of this instruction.

It will be the ASP’s responsibility to establish the latest issue of any instruction or drawing relevant to or listed in this manual is available and used during the design of any project.

7.0 DOCUMENT CONTROL

Documentation content coordinator: Network Substations Manager

Documentation process coordinator: Standards Process Coordinator