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Substation Maintenance Instruction

Breathers

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Substation Maintenance Instruction

ASSET STANDARDS & DESIGN

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SMI 156 BREATHERS

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1.0 PURPOSE

To set the standard for maintenance of desiccant breathers fitted on transformers, tap changers and circuit breakers.

2.0 SCOPE

This instruction is to be read in conjunction with SMI 100, SMI 101, SMI 155, SMI 151, SMI 150, SMI 159, SMI 158, SMI154, SMI 153, SMI152 and SMI 200.

This instruction provides the minimum requirements for maintenance of breathers installed on transformers. The generic term transformers includes power transformers, auto-transformers, auxiliary transformers, isolating transformers, regulating transformers, voltage transformers and distribution transformers in the network.

In addition, this instruction covers maintenance of breathers fitted on tap changers that are an integral part of some transformers and some of oil-filled circuit breakers on transmission and distribution networks.

All work is to be carried out in accordance with the manufacturers' recommendations.

3.0 REFERENCES

Internal

Company Policy 9.9.1 - Network Asset Maintenance

Company Procedure GSY 0003 - Manual Handling

Company Procedure GSY0067 – Personal Protective Equipment

Company Procedure GSY 1066 - Worksite Hazard And Risk Assessment

Network Management Plan, 2011-2013

Electrical Safety Rules

Environmental Management Standard EMS 0007 – Waste management

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

Substation Maintenance Standard SMI 101 – Minimum requirements for maintenance of distribution equipment

Substation Maintenance Standard SMI 151 – On load tap changers and tap changer motor boxes

Substation Maintenance Standard SMI 155 – Power, auto and regulating transformers

Substation Maintenance Standard SMI 159 – Distribution transformers

Substation Maintenance Standard SMI 152 – Auxiliary transformers

Substation Maintenance Standard SMI 153 – Voltage transformers and capacitor voltage transformers

Substation Maintenance Standard SMI 154 – Reactors

Substation Maintenance Standard SMI 158 – Current transformers

Substation Maintenance Standard SMI 150 – Isolation transformers

Substation Maintenance Standard SMI 200 – HV circuit breakers

External

Electricity Supply (Safety and Network Management) Regulation 2008

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

Work Health & Safety Act 2011

Work Health & Safety Regulations 2011

Australian Standard AS 2467:2008 - Maintenance of electrical switchgear

4.0 DEFINITIONS AND ABBREVIATIONS

Desiccant

An absorbent that attracts water vapour molecules. For example; silica gel.

Ellipse

Endeavour Energy's asset database

MSDS

Material safety and data sheet

PPE

Personal Protective Equipment

SMI

Substation Maintenance Instruction

5.0 ACTIONS

All work is to be carried out in accordance with the breather manufacturer's recommendations. Breather inspection and major overhaul **must** be carried in conjunction with the transformer, tap changer and circuit breaker inspection and major overhaul.

All defects and abnormalities found during routine maintenance are to be recorded in Ellipse.

Due to the age of some equipment on the network, it is required that, for the particular item on which the maintenance work is being carried out, the nameplate data that has been recorded in Ellipse **must** be confirmed, and the nameplate data that has not yet been recorded in Ellipse **must** be captured and entered into Ellipse.

5.1 Standardising the desiccant type

Cobalt chloride impregnated silica gel (blue) **must** be the only desiccant used in breathers of electrical equipment during maintenance work. If a breather filled with a different type/colour desiccant is found, the desiccant **will** be replaced with cobalt chloride impregnated silica gel.

5.2 Replacing the desiccant

The condition of the desiccant **will** be reviewed for replacement by considering the time interval to the next inspection. Since substations inspections are carried out at six (6) monthly intervals, the desiccant **must** be replaced when 50% or more has changed colour.

Desiccant contaminated with oil **must** be replaced as its moisture adsorbing capability is reduced.

PPE recommended by the desiccant manufacturer **must** be worn when handling the desiccant. Instructions provided in the desiccant MSDS **must** be followed in full when handling desiccants.

Replacement of desiccant in a breather **must** be recorded in Ellipse under the maintenance of the relevant equipment (transformer, tap changer or circuit breaker).

5.3 Colours of the desiccant

Desiccant	Initial colour	Colour after moisture absorption
Cobalt chloride impregnated silica gel	Blue	Pink

5.4 Disposing of used desiccant

Care **must** be taken to prevent used desiccant being released into the environment as it is extremely harmful to aquatic organisms and may cause long-term adverse effects in the aquatic environment.

An appropriate container **will** be used to store used desiccant. The container **must** be structurally sound, sealed to prevent water ingress, and clearly labelled.

Used desiccant and its packaging **must** be disposed of at an approved licensed waste site.

Disposal of desiccant and its containers **must** be in accordance with the appropriate MSDS, Endeavour Energy's waste disposal policies and procedures, and EMS 0007.

5.5 Routine maintenance

As a minimum, routine maintenance must always be carried out in accordance with manufacturer's recommendations.

Where applicable, the set for maintenance requirements of breathers outlined in the maintenance schedule given below **must** be met.

The routine maintenance requirement for breathers comprises an inspection and a major overhaul.

Details are set out in the following table:

Routine maintenance	Transformers, circuit breakers and tap changers
1.0 IN-SERVICE INSPECTION	
General	
Inspect the breather equipment and report any defects.	x
Replacement of desiccant	
Visually inspect the condition of the desiccant, operation and any general defects, such as leaking seals or rust. Replace the desiccant if 50% or greater has changed colour.	x
Connections	
Check condition of pipes, flanges and joints and the like for rust, evidence of leaking seals or other defects. Clean rust.	x
Ellipse data validation:	
Confirm the nameplate data that has been recorded in Ellipse.	x
Capture the nameplate data that has not been recorded or incorrectly entered in Ellipse and update accordingly.	x
2.0 MAJOR OVERHAUL	
Carefully remove complete breather assembly, according to the manufacturer's recommendations. This is to carry out a complete breather inspection and overhaul. <i>Note: Small amounts of explosive gases may come out of breather devices. Make sure that no open fire, hot surfaces</i>	x

Routine maintenance	Transformers, circuit breakers and tap changers
<i>or sparks occur in the immediate surroundings of the breathing devices.</i>	
Containers	
Inspect container for abnormalities, such as cracks, chips or other defects.	X
Remove dust, and clean in accordance with the manufacturer's instructions.	X
Breathing passages	
Inspect for dirt and blockages. Clean and clear accordingly.	X
Oil bath	
Clean with recommended solvent and wash down with clean oil.	X
Fill with clean, dry transformer oil.	X
Connections	
Check condition of pipes, flanges, joints and the like for clogging, rust and evidence of leaking seals or other defects. Clean rust.	X
Gaskets	
Replace all gaskets.	X
Re-connection	
Reconnect the breather assembly. Where leaks are through threaded connections, clean rust and apply paint. Apply thread seal tape in all cases.	X
Ellipse data validation:	
Confirm the nameplate data that has been recorded in Ellipse.	X
Capture the nameplate data that has not been recorded or incorrectly entered in Ellipse and update accordingly.	X

6.0 AUTHORITIES AND RESPONSIBILITIES

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

Manager Asset Standards & Design has the authority and responsibility for making recommendations to Chief Engineer in respect to this instruction.

Network Maintenance Manager, Asset Standards & Design is responsible for ensuring that the content of this instruction is kept up to date.

The **Regional Transmission Managers** is responsible for:

- **Overseeing** that Endeavour Energy employees engaged to perform the work have appropriate qualifications and are competent to carry out the work.
- Providing appropriate equipment and training.
- **Overseeing** that the requirements of this standard are met when maintaining breathers of oil filled equipment.

All **Maintenance Workers** are responsible for:

- **Overseeing** that the requirements of this instruction, SMI 100 and SMI 101, are met.
- Working in accordance with local and statutory requirements.
- **Maintaining** that public safety is not compromised.
- Working in accordance with Endeavour Energy's Electrical Safety Rules.
- Communicating abnormalities found in the equipment to Regional Transmission/Distribution Managers and **Network** Maintenance Manager, **Asset Standards & Design**.

7.0 DOCUMENT CONTROL

Documentation Content Coordinator: **Network** Maintenance Manager

Documentation Distribution Coordinator: Branch Process Coordinator