

Substation Defect Handbook

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Revision History

This is the first revision of the standard.

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Contents

1 Documentation Scope	5
2 References	5
3 Definitions and Abbreviations	6
4 Technical Requirements	6
4.1 Failure modes	7
4.2 Fault and Emergency Defects	7
4.3 Defect Priority	7
5 Circuit Breakers	9
5.1 Circuit Breaker Defect Index	9
5.2 Circuit Breaker Defects	10
6 Transformers	24
6.1 Transformers Defect Index	24
6.2 Transformers Defects	25
7 Tap Changers	38
7.1 Tap Changers Defect Index	38
7.2 Tap Changers Defects	39
8 Instrument Transformers	46
8.1 Instrument Transformers Defect Index	46
8.2 Instrument Transformers Defects	47
9 Isolators and Earth Switches	54
9.1 Isolators and Earth Switches Defect Index	54
9.2 Isolators and Earth Switches Defects	55
10 Batteries and DC System	63
10.1 Batteries and DC System Defect Index	63
10.2 Batteries and DC System Defects	64
11 Capacitor Banks	70
11.1 Capacitor Banks Defect Index	70
11.2 Capacitor Banks Defects	71
12 Earthing	77
12.1 Earthing Defect Index	77
12.2 Earthing Defects	78

13	Civil	82
13.1	Civil Defect Index	82
13.2	Civil Defects	83
14	Miscellaneous	101
14.1	Miscellaneous Defect Index	101
14.2	Miscellaneous Defects	102
15	Roles and Responsibilities	107

1 Documentation Scope

To set out the requirements for defects which are found within Endeavour Energy's network to establish a uniformed approach to defect identification and prioritisation.

This document provides guidance on whether abnormalities found within the system are to be considered defects, the priorities in which these typical defects shall be treated, the data to be recorded and the replacement decision for these defects.

This document covers the typical defects found during the substation visual inspections.

The philosophy around defects, their priorities are given in SMI 124.

2 References

External Regulations

Electricity Supply Act 1995 (NSW)

Electricity Supply (Safety and Network Management) Regulation 2014
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Work Health and Safety Act 2011 (NSW)

Work Health and Safety Regulation 2017 (NSW)
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Company Policies and Procedures

Company Policy 9.2.5 – Network Asset Design

Company Policy 9.9.1 – Network Asset Maintenance
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Endeavour Energy Electrical Safety Rules
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Company Standards

SMI 104	Major substation earthing system test
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SMI 122	Use and handling of sulphur hexafluoride (SF6)
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SMI 124	Maintenance data entry and defect prioritisation
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SMI 140	Thermovision of zone and transmission substations
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EDI 516	Major substation earthing design, construct and commissioning
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EMS 0008	Environmental incident response and management
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3 Definitions and Abbreviations

Abbreviation	Meaning
CB	Circuit Breaker
E/S	Earth Switch
EDI	Earthing Design Instruction
EMS	Environmental Management Standard
F&E	Fault and Emergency
HV	High Voltage
Mech	Mechanism
RCM	Reliability Centred Maintenance
SAP	Systems Applications and Products
SCADA	Supervisory Control and Data Acquisition
SF6	Sulphur Hexafluoride Gas
SMI	Substation Maintenance Instruction
TRF	Transformer

Term	Definition
Failure Mode	The way a failure is observed on a failed item.
Fault and emergency (F&E)	Maintenance activities to rectify any emergency, unpredicted or impending failure, incident or event, impacting on safety, the environment, loss of supply to customers or imposing unacceptable operational constraints on the network.
Major Defect	Defects that have already resulted in failure or are expected to fail soon if left untouched.
Minor Defect	Defects that are not imminent for failure but if left for a prolonged period has the possibility to turn into a failure.
Network	The Endeavour Energy electrical network of poles, wires, substations and other assets through which electrical power is transmitted/distributed to customers.

4 Technical Requirements

This document has been developed in conjunction with RCM principles, regional experience and risk analysis.

This document is to be referenced when raising defects, to ensure consistency between defect failure modes, condition, and rectification periods, while also detailing information required when raising a defect.

4.1 Failure modes

For the failure modes listed in the following sections, the listed 'Object Part', 'Damage Code' and 'Cause' are to be used. However, it is not practical to capture every possible failure type, cause or mode. As such, an 'Other' option will be made available, for free text input to be used to describe any anomalies. However, this is to be used sparingly, and its usage will be monitored to continue to update the document and Endeavour Energy's asset management systems.

Where the 'Other' option is selected, detailed information about the failure mode must be included in the Work Order Description.

4.2 Fault and Emergency Defects

'Fault and Emergency (F&E)' defects differ from the 'Immediate' defects detailed in the rest of this standard. F&E defects have already reached a failed state, while immediate defects pose a risk of an imminent failure. Immediate defects present an imminent risk of failure, that has a potential to impact on:

- The safety of staff or customers
- The environment
- Loss of supply to customers
- Imposes an unacceptable operational constraint on the network

Due to the nature of F&E work, not all information may be known, however, as much information needs to be recorded where it can be gathered, in line with the requirements of the following sections.

4.3 Defect Priority

Endeavour Energy uses a risk-based defect prioritisation system to classify and plan defect rectification works. The following sections detail the standard priorities which should be used when raising the applicable defects that are in line with the system detailed in SMI 124.

In general, assigned priorities are to be considerate of the condition of the defect at the time of identification and guidance is provided within the tables where specific risk cases may require additional action or consideration.

In addition, if there is local evidence which suggests that a higher priority defect must be raised, then it is the responsibility of the person doing the inspection to do so. The following situations will require a higher priority than those listed in the following sections:

- A defect that causes clearances to be compromised;
- A defect that could cause a fire;
- A defect that could cause a safety issue.

SAP Priority Selection	Priority Explanation	
	Expected Timeframes to Failure	Defect Examples
2 – Urgent – High	< 1 Week	Defects have already resulted in failure or representing immediate hazards and safety risks. Conditional defects are expected to failure within days resulting in imminent risks/hazards.
6 – General – High	<3 Months	Conditional defects will likely result in increased risk/hazards within the timeframes shown, due to continued degradation or functional failure.
7 – General – Medium	>3 Months & <12 Months	
8 – General – Low	>12 Months	
9 – General – Observation	N/A	Observation 'defects' are to be left open until remediated and packaged with other localised works.

5 Circuit Breakers

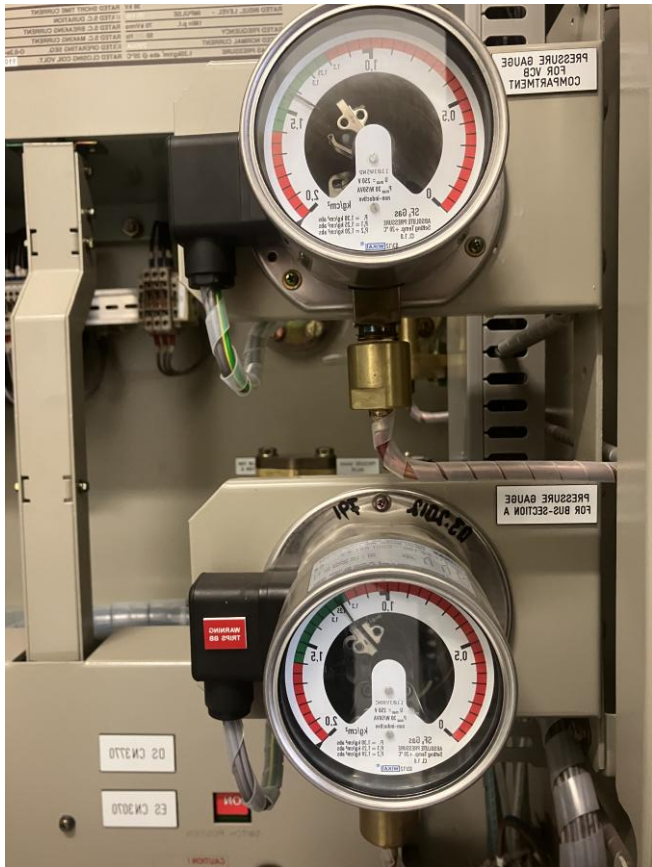
5.1 Circuit Breaker Defect Index

Circuit Break Defect Index	
Defect Type	Page No.
Min & Bulk Oil CB – Low Oil	<u>10</u>
Min & Bulk Oil CB – Oil Leak / Spill	<u>11</u>
SF6 CB – SF6 Gas Leak	<u>12</u>
SF6 CB – SF6 Level Low	<u>13</u>
CB Gauge – Broken, Cracked or Damaged	<u>14</u>
CB Bushings – Major Damage	<u>15</u>
CB Bushings – Minor Damage	<u>16</u>
SF6 & Vac CB – CT Covers Cracked/ Damaged	<u>17</u>
CB – Presence of Rust	<u>18</u>
CB HV Termination – Rusted/ Corroded/ Overheating	<u>19</u>
CB Mech – Trip/Close Coil Faulty	<u>20</u>
CB Mech – Spring Charge Motor Faulty	<u>21</u>
CB Mech – Mech or Rollers Faulty	<u>22</u>
CB Secondaries – Cabling/Equipment Faulty	<u>23</u>

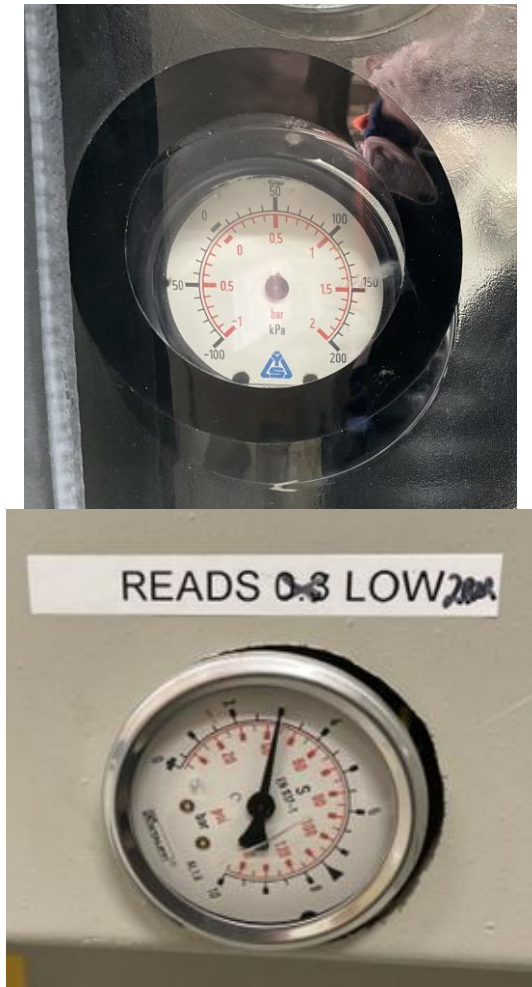
5.2 Circuit Breaker Defects

Defect Description	Defect Photo	Task Details
Min & Bulk Oil CB – Low Oil		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: Priority 7		<u>Standard Job</u> - 1OILCB: Oil low Top Up CB
<u>Indicators</u> - Oil level low on the indicator - Alarms present on SCADA - Visible oil on the equipment or ground Major defects: When oil level is below or likely to be below the minimum oil level before the next inspection interval		<u>Object Part</u> 1353: Chamber
<u>Damage Code</u> - 1019: Loss of Insulation - 1041: Damaged		
<u>Cause Code</u> - 1059: Mechanical Failure - 1149: Corrosion - 1153: Fatigue - 1164: Unknown		
<u>Scope of Rectification Works</u> Top up the oil and clean up the site of any oil stains.		

Defect Description		Defect Photo	Task Details	
Min & Bulk Oil CB – Oil Leak / Spill			<u>Bushfire Defect</u>	- No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 8			<u>Standard Job</u>	- 1OILLE: Oil Leak
<u>Indicators</u> - Visible oil stains or pooling of oil on the equipment or ground - Oil level low on the indicator - Oil top up frequency higher than other similar equipment Major defects: When top ups are required less than 6-month intervals			<u>Object Part</u>	- 1003: Bushing - 1353: Chamber - 1450: Housing
			<u>Damage Code</u>	- 1041: Damaged - 1059: Mechanical Failure - 1019: Loss of Insulation
			<u>Cause Code</u>	- 1059: Mechanical Failure - 1149: Corrosion - 1153: Fatigue 1164: Unknown
<u>Scope of Rectification Works</u> Identify the location and the cause of the leak and rectify as required. Ensure oil level is topped up to the necessary level. For any oil spills follow company standard EMS 0008 - Environmental Incident Response and Management				

Defect Description	Defect Photo	Task Details
SF6 CB – SF6 Gas Leak		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 9		<u>Standard Job</u> - SF6LEA: SF6 leak – Repair
<u>Indicators</u> - Pressure gauge reading is out of limits - Alarms present on SCADA - CB has entered “Low Gas Lockout” Major defects: When top ups are required less than 3-month intervals		<u>Object Part</u> - 1353: Chamber - 1261: Gauge - 1085: Piping
<u>Damage Code</u> - 1596: Low Gas - 1019: Loss of Insulation - 1041: Damaged		
<u>Cause Code</u> - 1059: Mechanical Failure - 1149: Corrosion - 1153: Fatigue - 1164: Unknown		
<u>Scope of Rectification Works</u> Identify the location and the cause of the leak and rectify as required. Ensure SF6 level is topped up to the necessary level. If CB had entered "Low Gas Lock Out", ensure alarms have cleared and the CB is operational prior to leaving site. For any SF6 leaks follow company standard SMI 122 - Use and handling of sulphur hexafluoride (SF6)		

Defect Description	Defect Photo	Task Details
SF6 CB – SF6 Level Low		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7		<u>Standard Job</u> - SF6LOW: SF6 Low - Top Up
<u>Indicators</u> - Pressure gauge reading is out of limits - Alarms present on SCADA - CB has entered "Low Gas Lockout" Major defects: When CB has entered or is close to locking out from low SF6 Gas		<u>Object Part</u> - 1353: Chamber - 1261: Gauge
		<u>Damage Code</u> - 1596: Low Gas - 1019: Loss of Insulation - 1041: Damaged
		<u>Cause Code</u> - 1059: Mechanical Failure - 1149: Corrosion - 1153: Fatigue - 1164: Unknown
<u>Scope of Rectification Works</u> Top up SF6 to required levels and ensure all alarms have cleared. If CB had entered "Low Gas Lock Out", ensure alarms have cleared and the CB is operational prior to leaving site.		

Defect Description	Defect Photo	Task Details
CB Gauge – Broken, Cracked or Damaged		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 8		<u>Standard Job</u> - 1DCB: Rectify CB Defect
<u>Indicators</u> - Illegible pressure reading - Gauge indicator not operating - Pressure, temp or oil out of limit from other devices reading correctly Major defects: When the CB gauge is not operating or a reading is unable to be obtained		<u>Object Part</u> - 1261: Gauge
<u>Damage Code</u> - 1041: Damaged - 1054: Inoperable		
<u>Cause Code</u> - 1059: Mechanical Failure - 1149: Corrosion - 1153: Fatigue - 1164: Unknown		
<u>Scope of Rectification Works</u> Repair or replace the gauge as required and ensure correct operation prior to returning to service		

Defect Description	Defect Photo	Task Details
CB Bushings – Major Damage		<u>Bushfire Defect</u> - No
<u>Priority</u> SAP Priority 6		<u>Standard Job</u> - 1TRBSH: Transmission bushing
<u>Indicators</u> Poly: - All sheds display cracks or holes - Major treeing/ tracking - More than half of the sheds display major deformation or warping Porcelain/Ceramic: - Major cracking present - Large chunks of insulator missing - Major treeing/tracking		<u>Object Part</u> - 1003: Bushing
		<u>Damage Code</u> - 1019: Loss of insulation - 1020: Tracking/PD - 1041: Damaged
		<u>Cause Code</u> - 1059: Mechanical Failure - 1153: Fatigue - 1156: Fault Operations - 1164: Unknown
<u>Scope of Rectification Works</u> Inspect surrounding bushings for signs of similar damage and replace all defective bushings as required.		

Defect Description	Defect Photo	Task Details
CB Bushings – Minor Damage		<u>Bushfire Defect</u> - No
<u>Priority</u> SAP Priority 9		<u>Standard Job</u> - 1TRBSH: Transmission bushing
<u>Indicators</u> Poly: - Damage to 3 or more sheds. - Cracking on 3 or more sheds. - Insulators have lost their hydrophobic properties. - Minor tracking or corona. Porcelain/Ceramic: - Minor cracking present - Small chips or flakes of insulator missing - Minor tracking or corona		<u>Object Part</u> - 1003: Bushing
		<u>Damage Code</u> - 1019: Loss of insulation - 1020: Tracking/PD - 1041: Damaged
		<u>Cause Code</u> - 1059: Mechanical Failure - 1153: Fatigue - 1156: Fault Operations - 1164: Unknown
<u>Scope of Rectification Works</u> Poly: Inspect surrounding bushings for signs of similar damage. Record the defect in SAP to monitor further deterioration. Ceramic: Inspect surrounding bushings for signs of similar damage. If appropriate coat exposed porcelain with Glyptal to seal the bushing. Record the defect in SAP to monitor for further deterioration		

Defect Description	Defect Photo	Task Details
SF6 & Vac CB – CT Covers Cracked/ Damaged		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 7 Minor: SAP Priority 9		<u>Standard Job</u> - 1TRBSH: Transmission bushing
<u>Indicators</u> - CT cover boot had lost its hydrophobic properties. - Significant cracking/damage on CT cover Major defects: When the CT covers are completely deformed or showing severe signs of failure		<u>Object Part</u> - 1003: Bushing
		<u>Damage Code</u> - 1019: Loss of insulation - 1020: Tracking/PD - 1041: Damaged
		<u>Cause Code</u> - 1059: Mechanical Failure - 1153: Fatigue - 1156: Fault Operations - 1164: Unknown
<u>Scope of Rectification Works</u> Inspect surrounding CT covers for signs of similar damage. Record the defect in SAP to monitor further deterioration.		

Defect Description	Defect Photo	Task Details
CB – Presence of Rust		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 7 Minor: SAP Priority 9		<u>Standard Job</u> - 1DCB: Rectify CB Defect
<u>Indicators</u> - Rust, corrosion or discolouration present on the surface of the CB Major defects: When rust is more severe than surface rust and is starting to damage the CB		<u>Object Part</u> - 1450: Housing
		<u>Damage Code</u> - 1041: Damaged
		<u>Cause Code</u> - 1059: Mechanical Failure - 1149: Corrosion - 1164: Unknown
<u>Scope of Rectification Works</u> Minor: Where possible, remove rust and seal the surface of the affected area to prevent further corrosion. Monitor for any further deterioration Major: Replace the rusted component		

Defect Description	Defect Photo	Task Details
CB HV Termination – Rusted/ Corroded/ Overheating		<u>Bushfire Defect</u> - No
<u>Priority</u> SAP Priority determined by SMI 104 – Thermovision of zone and transmission substations		<u>Standard Job</u> - 2HOTJT: Repair High Resistance Joint
<u>Indicators</u> - Visible signs of burning - Hot joints - Major corrosion/ rust - High contact resistance		<u>Object Part</u> - 1355: Terminal - 1354: Palm - 1352: Contacts
		<u>Damage Code</u> - 1036: Burnt - 1058: Loose - 1041: Damaged
		<u>Cause Code</u> - 1059: Mechanical Failure - 1149: Corrosion - 1347: Hot connection - 1348: Contact Wear - 1164: Unknown
<u>Scope of Rectification Works</u> Conduct a thermal imaging scan of termination and surrounding equipment if required. Identify the cause of the fault and clean or re-terminate as required. Test connections prior to re-energisation.		

Defect Description		Defect Photo	Task Details	
CB Mech – Trip/Close Coil Faulty			<u>Bushfire Defect</u>	- No
<u>Priority</u> SAP Priority 2			<u>Standard Job</u>	- 1DCB: Rectify CB Defect
<u>Indicators</u> - CB won't open/close - Coil looks or smells burnt - Coil measuring as short/open circuit			<u>Object Part</u>	- 1277: Mechanism
			<u>Damage Code</u>	- 1054: Inoperable - 1041: Damaged - 1032: Blown
			<u>Cause Code</u>	- 1059: Mechanical Failure - 1153: Fatigue - 1156: Fault Operations - 1348: Contact Wear - 1164: Unknown
<u>Scope of Rectification Works</u>				
Replace the Trip and/or Close coil as required and ensure CB is operational prior to leaving site.				

Defect Description		Defect Photo	Task Details	
CB Mech – Spring Charge Motor Faulty			<u>Bushfire Defect</u>	- No
<u>Priority</u> SAP Priority 2			<u>Standard Job</u>	- 1DCB: Rectify CB Defect
<u>Indicators</u> - CB won't open/close - Motor looks or smells burnt - Coil measuring as short/open circuit - CB will operate but will not charge spring			<u>Object Part</u>	- 1277: Mechanism
			<u>Damage Code</u>	- 1054: Inoperable - 1041: Damaged - 1032: Blown
			<u>Cause Code</u>	- 1059: Mechanical Failure - 1153: Fatigue - 1156: Fault Operations - 1348: Contact Wear - 1164: Unknown
<u>Scope of Rectification Works</u> Replace the Spring Charge Motor as required and ensure CB is operational prior to leaving site.				

Defect Description	Defect Photo	Task Details
CB Mech – Mech or Rollers Faulty		<u>Bushfire Defect</u> - No
<u>Priority</u> SAP Priority 2		<u>Standard Job</u> - 1DCB: Rectify CB Defect
<u>Indicators</u> - CB is slow to operate - CB won't open/close - Roller bearings are stiff to rotate by hand		<u>Object Part</u> - 1277: Mechanism
		<u>Damage Code</u> - 1054: Inoperable - 1041: Damaged
		<u>Cause Code</u> - 1059: Mechanical Failure - 1149: Corrosion - 1153: Fatigue - 1348: Contact Wear - 1164: Unknown
<u>Scope of Rectification Works</u> - Remove, clean and re-lubricate roller bearings and mechanism using approved lubricant - Replace roller bearings or mechanism as required and ensure CB is operational prior to leaving site.		

Defect Description	Defect Photo	Task Details
CB Secondaries – Cabling/Equipment Faulty		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7		<u>Standard Job</u> - 1DFSW: Rectify Secondary Wiring
<u>Indicators</u> - Secondary wiring looks/smells burnt - Secondary systems not working as expected - CB won't operate/communicate with SCADA or remote panels - System alarms relating to CB that don't match up		<u>Object Part</u> - N/A: Secondary Wiring
Major defects: When the CB is unable to be operated as required		<u>Damage Code</u> - 1019: Loss of insulation - 1041: Damaged - 1054: Inoperable
		<u>Cause Code</u> - 1059: Mechanical Failure - 1149: Corrosion - 1156: Fault Operations - 1347: Hot Connection - 1164: Unknown
<u>Scope of Rectification Works</u> - Repair/replace any secondary wiring that is defective - Repair/replace any defective secondary components as required (Links, Terminals, Fuses, etc.) and ensure CB is operational prior to leaving site.		

6 Transformers

6.1 Transformers Defect Index

Transformers Defect Index	
Defect Type	Page No.
TRF – Major Oil Leak	<u>25</u>
TRF – Minor Oil Leak	<u>26</u>
TRF – Oil Low	<u>27</u>
TRF – Oil Level Gauge Defective	<u>28</u>
TRF Tank – Rusted / Damaged	<u>29</u>
TRF Bushings – Major Damage	<u>30</u>
TRF Bushings – Minor Damage	<u>31</u>
TRF HV Termination – Rusted/ Corroded/ Overheating	<u>32</u>
TRF Earthing – Faulty or Poor Condition	<u>33</u>
TRF – Silica Gel Deteriorated	<u>34</u>
TRF Secondaries – Temperature Indicator Faulty	<u>35</u>
TRF Secondaries – Cooling System Faulty	<u>36</u>
TRF Secondaries – Cabling/Equipment Faulty	<u>37</u>

6.2 Transformers Defects

Defect Description	Defect Photo	Task Details
TRF – Major Oil Leak		<u>Bushfire Defect</u> - No
<u>Priority</u> SAP Priority 7		<u>Standard Job</u> - 1OILLE: Oil leak
<u>Indicators</u> - Frequently having to top up oil - Oil level indicator low - Major oil leaking from joints, gaskets, bolts, etc. - Pooling of oil on equipment or in bund - Frequent OWS cleaning required		<u>Object Part</u> - 1002: Tank - 1078: Gasket - 1085: Piping - N/A: Conservator
<u>Damage Code</u> - 1004: Low oil - 1041: Damaged		
<u>Cause Code</u> - 1059: Mechanical Failure - 1149: Corrosion - 1164: Unknown		
<u>Scope of Rectification Works</u> Identify the location and the cause of the leak and rectify as required. Ensure oil level is topped up to the necessary level. For any oil spills follow company standard EMS 0008 - Environmental Incident Response and Management		

Defect Description	Defect Photo	Task Details
TRF – Minor Oil Leak		<u>Bushfire Defect</u> - No
<u>Priority</u> SAP Priority 9		<u>Standard Job</u> - 1OILLE: Oil Leak
<u>Indicators</u> - Oil level indicator low - Minor oil leaking from joints, gaskets, bolts, etc. - Pooling of oil on equipment or in bund - Semi regular OWS cleaning required		<u>Object Part</u> - 1002: Tank - 1078: Gasket - 1085: Piping - N/A: Conservator
		<u>Damage Code</u> - 1004: Low oil - 1041: Damaged
		<u>Cause Code</u> - 1059: Mechanical Failure - 1149: Corrosion - 1164: Unknown
<u>Scope of Rectification Works</u> For mild leaks, record the defect in SAP to monitor if not existing already For any oil spills follow company standard EMS 0008 - Environmental Incident Response and Management		

Defect Description	Defect Photo	Task Details
TRF – Oil Low		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7		<u>Standard Job</u> - 1OILTX: Oil Low - Top Up Transformer
<u>Indicators</u> - Low oil in Main Tank conservator site glass - Low oil alarm on SCADA Major defects: When oil level is below or likely to be below the minimum oil level before the next inspection interval		<u>Object Part</u> - 1002: Tank - N/A: Conservator
		<u>Damage Code</u> - 1004: Low Oil
		<u>Cause Code</u> - 1059: Mechanical Failure - 1149: Corrosion - 1164: Unknown
<u>Scope of Rectification Works</u> Top up the oil in the Transformer Main Tank to the required level		

Defect Description	Defect Photo	Task Details
TRF – Oil Level Gauge Defective		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 7		<u>Standard Job</u> - 2TXMCR - Transformer Miscellaneous Repairs
<u>Indicators</u> - Sight glass dirty and can't be read - Sight glass cracked and leaking oil - Gauge full of water and sending false “Low Oil” alarms to SCADA Major defects: When the oil gauge is not operating or a reading is unable to be obtained		<u>Object Part</u> - 1261: Gauge
		<u>Damage Code</u> - 1041: Damaged - 1054: Inoperable
		<u>Cause Code</u> - 1059: Mechanical Failure - 1058: Loose - 1149: Corrosion - 1164: Unknown
<u>Scope of Rectification Works</u> - Clean or replace the sight glass as required and ensure oil level can be accurately observed from ground level - Dry out and re-seal, or replace oil level gauge as required and ensure alarms to SCADA are working as intended		

Defect Description	Defect Photo	Task Details
TRF Tank – Rusted / Damaged		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 7 Minor: SAP Priority 9		<u>Standard Job</u> - 2TXMCR – Transformer Miscellaneous Repairs
<u>Indicators</u> - Signs of damage like cracks or rust causing the transformer to leak - Other major TRF tank damage Major defects: When rust is more severe than surface rust and is starting to damage the TRF		<u>Object Part</u> - 1002: Tank
		<u>Damage Code</u> - 1041: Damaged - 1058: Loose
		<u>Cause Code</u> - 1149: Corrosion - 1170: Surface rust - 1170: Unknown
<u>Scope of Rectification Works</u> - Repair of the leak/ rust should be attempted (replacing gaskets, welding, bushing replacements). - For major issues, submit notification and raise a DRA for assessment.		

Defect Description	Defect Photo	Task Details
TRF Bushings – Major Damage		<u>Bushfire Defect</u> - No
<u>Priority</u> SAP Priority 6		<u>Standard Job</u> - 1TRBSH: Transmission bushing
<u>Indicators</u> - Major cracking present - Large chunks of insulator missing - Major treeing/tracking		<u>Object Part</u> - 1003: Bushing
		<u>Damage Code</u> - 1019: Loss of insulation - 1020: Tracking/PD - 1041: Damaged
		<u>Cause Code</u> - 1059: Mechanical Failure - 1164: Unknown - 1156: Fault Operations
<u>Scope of Rectification Works</u> Inspect surrounding bushings for signs of similar damage and replace all defective bushings as required.		

Defect Description	Defect Photo	Task Details
TRF Bushings – Minor Damage		<u>Bushfire Defect</u> - No
<u>Priority</u> SAP Priority 9		<u>Standard Job</u> - 1TRBSH: Transmission bushing
<u>Indicators</u> - Small chips or flakes of insulator missing - Minor cracking present - Some signs of tracking or corona		<u>Object Part</u> - 1003: Bushing
		<u>Damage Code</u> - 1019: Loss of insulation - 1020: Tracking/PD - 1041: Damaged
		<u>Cause Code</u> - 1059: Mechanical Failure - 1164: Unknown - 1156: Fault Operations
<u>Scope of Rectification Works</u> Inspect surrounding bushings for signs of similar damage. If appropriate coat exposed porcelain with Glyptal to seal the bushing. Record the defect in SAP to monitor for further deterioration		

Defect Description	Defect Photo	Task Details
TRF HV Termination – Rusted/ Corroded/ Overheating		<u>Bushfire Defect</u> - No
<u>Priority</u> SAP Priority determined by SMI 104 – Thermovision of zone and transmission substations		<u>Standard Job</u> - 2HOTJT: Repair High Resistance Joint
<u>Indicators</u> - Visible signs of burning - Hot joints - Major corrosion/ rust - High contact resistance		<u>Object Part</u> - 1003: Bushing - 1112: Conductor
		<u>Damage Code</u> - 1036: Burnt - 1041: Damaged - 1058: Loose
		<u>Cause Code</u> - 1051: High Resistance - 1149: Corrosion - 1164: Unknown - 1156: Fault Operations - 1347: Hot Connections
<u>Scope of Rectification Works</u> Conduct a thermal imaging scan of termination and surrounding equipment if required. Identify the cause of the fault and clean or re-terminate as required. Test connections prior to re-energisation.		

Defect Description	Defect Photo	Task Details
TRF Earthing – Faulty or Poor Condition		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7		<u>Standard Job</u> - 1EARTH: Earthing
<u>Indicators</u> - Damaged or loose terminations - Damaged Earthing conductor - Incorrect TRF Earthing arrangement Major defects: When the earthing poses a hazard to the safety of staff or the network		<u>Object Part</u> - N/A: Equipment Earthing
		<u>Damage Code</u> - 1041: Damaged - 1019: Loss of Insulation - 1054: Inoperable
		<u>Cause Code</u> - 1058: Loose - 1051: High Resistance - 1059: Mechanical Failure
<u>Scope of Rectification Works</u> Repair or replace the damaged earthing conductor or terminations and ensure that earthing complies to EDI 516 – Major substation earthing design, construct, and commissioning		

Defect Description	Defect Photo	Task Details
TRF – Silica Gel Deteriorated		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 7		<u>Standard Job</u> - SILICA: Silica Breather/Gel Repair/Replacement
<u>Indicators</u> - Silica Gel has faded to a white/pink colour - Silica Gel holder has cracks/signs of failure Major defects: When the silica gel holder has major cracks or damage or the silica gel has completely deteriorated		<u>Object Part</u> - N/A: Silica Gel Breather
		<u>Damage Code</u> - 1054: Inoperable - 1041: Damaged
		<u>Cause Code</u> - 1359: Age - 1059: Mechanical Failure - 1149: Corrosion - 1164: Unknown
<u>Scope of Rectification Works</u> - Top up Silica Gel as required - Replace Silica Gel holder if required		

Defect Description	Defect Photo	Task Details
TRF Secondaries – Temperature Indicator Faulty		<u>Bushfire Defect</u> - No
<u>Priority</u> SAP Priority 6		<u>Standard Job</u> - 2TXMCR - Transformer Miscellaneous Repairs
<u>Indicators</u> - OTI or WTI indicator broken or reading illegible - Sending false OTI and WTI readings to SCADA		<u>Object Part</u> - 1261: Gauge
<u>Damage Code</u> - 1041: Damaged - 1054: Inoperable		
<u>Cause Code</u> - 1058: Loose - 1059: Mechanical Failure - 1164: Unknown		
<u>Scope of Rectification Works</u> Repair or replace the OTI or WTI gauge as required. Ensure OTI and WTI gauges are commissioned and read accurately on SCADA		

Defect Description		Defect Photo	Task Details	
TRF Secondaries – Cooling System Faulty			<u>Bushfire Defect</u>	- No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 7			<u>Standard Job</u>	- 2TXMCR - Transformer Miscellaneous Repairs
<u>Indicators</u> - Cooling Fans or Pumps won't run as expected - Cooling Fans are rusted and won't spin - Cooling System CB's and Fuses keep tripping Major defects: When the TRF cooling system is unable to be operated as required			<u>Object Part</u>	- 1077: Radiator Fins - 1081: Pump - 1082: Fan
			<u>Damage Code</u>	- 1032: Blown - 1041: Damaged - 1054: Inoperable
			<u>Cause Code</u>	- 1058: Loose - 1059: Mechanical Failure - 1149: Corrosion - 1164: Unknown
<u>Scope of Rectification Works</u> Repair or replace any Cooling Fans or Oil Pumps as required and ensure that all cooling systems are operating as required				

Defect Description		Defect Photo	Task Details	
TRF Secondaries – Cabling/Equipment Faulty			<u>Bushfire Defect</u>	
			- No	
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7			<u>Standard Job</u>	
			- 1DFSW: Rectify Secondary Wiring	
<u>Indicators</u> - Secondary wiring looks/smells burnt - Secondary systems not working as expected - TRF won't operate/communicate with SCADA or remote panels - System alarms relating to TRF that don't match up Major defects: When the TRF is unable to be operated as required			<u>Object Part</u> - 1083: Pressure Relief Device - 1084: Bucholtz Relay - N/A: Secondary Wiring	
		<u>Damage Code</u> - 1019: Loss of Insulation - 1032: Blown - 1036: Burnt - 1041: Damaged		
		<u>Cause Code</u> - 1051: High Resistance - 1058: Loose - 1059: Mechanical Failure - 1164: Unknown - 1156: Fault Operations		
<u>Scope of Rectification Works</u> - Repair/replace any secondary wiring that is defective - Repair/replace any defective secondary components as required (Links, Terminals, Fuses, etc.) and ensure TRF is operational prior to leaving site.				

7 Tap Changers

7.1 Tap Changers Defect Index

Tap Changers Defect Index	
Defect Type	Page No.
Tap Changer – Oil Leak	<u>39</u>
Tap Changer – Oil Low	<u>40</u>
Tap Changer – Oil Level Gauge Defective	<u>41</u>
Tap Changer – Rusted / Damaged	<u>42</u>
Tap Changer – Silica Gel Deteriorated	<u>43</u>
Tap Changer Secondaries – Motor Faulty	<u>44</u>
Tap Changer Secondaries – Cabling/Equipment Faulty	<u>45</u>

7.2 Tap Changers Defects

Defect Description	Defect Photo	Task Details	
Tap Changer – Oil Leak		<u>Bushfire Defect</u> - No	
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 9		<u>Standard Job</u> - 1OILLE: Oil leak	
<u>Indicators</u> - Frequently having to top up oil - Oil level indicator low - Oil leaking from joints, gaskets, bolts, etc. - Pooling of oil on equipment or in bund Major defects: When top ups are required less than 6-month intervals		<u>Object Part</u> - 1002: Tank - 1078: Gasket - 1085: Piping - N/A: Conservator	
		<u>Damage Code</u> - 1004: Low oil - 1041: Damaged	
		<u>Cause Code</u> - 1059: Mechanical Failure - 1149: Corrosion - 1164: Unknown	
<u>Scope of Rectification Works</u> For major leaks, repair of leak should be attempted (replacing gaskets, bushing replacements, epoxy sealing) For minor leaks, record the defect in SAP to monitor if not existing already. For any oil spills follow company standard EMS 0008 - Environmental Incident Response and Management			

Defect Description	Defect Photo	Task Details
Tap Changer – Oil Low		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7		<u>Standard Job</u> - 1OILTX: Oil Low - Top Up Transformer
<u>Indicators</u> - Low oil in Tap Changer conservator sight glass - Low oil alarm on SCADA Major defects: When oil level is below or likely to be below the minimum oil level before the next inspection interval		<u>Object Part</u> - 1002: Tank - N/A: Conservator
		<u>Damage Code</u> - 1004: Low Oil
		<u>Cause Code</u> - 1059: Mechanical Failure - 1149: Corrosion - 1164: Unknown
<u>Scope of Rectification Works</u> Top up the oil in the Transformer Tap Changer Tank to the required level		

Defect Description	Defect Photo	Task Details
Tap Changer – Oil Level Gauge Defective		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 7		<u>Standard Job</u> - 2TCMIN: Tap changer/motor box repair Minor
<u>Indicators</u> - Sight glass dirty and can't be read - Sight glass cracked and leaking oil - Gauge full of water and sending false “Low Oil” alarms to SCADA Major defects: When the oil gauge is not operating or a reading is unable to be obtained		<u>Object Part</u> - 1261: Gauge
		<u>Damage Code</u> - 1041: Damaged - 1054: Inoperable
		<u>Cause Code</u> - 1059: Mechanical Failure - 1058: Loose - 1149: Corrosion - 1164: Unknown
<u>Scope of Rectification Works</u> - Clean or replace the sight glass as required and ensure oil level can be accurately observed from ground level - Dry out and re-seal, or replace oil level gauge as required and ensure alarms to SCADA are working as intended		

Defect Description		Defect Photo	Task Details	
Tap Changer – Rusted / Damaged			<u>Bushfire Defect</u>	- No
<u>Priority</u> Major: SAP Priority 7 Minor: SAP Priority 9			<u>Standard Job</u>	- 2TCMAJ: Tap changer/motor box repair Major
<u>Indicators</u> - Signs of damage like cracks or rust causing the Tap Changer to leak - Other major Tap Changer damage Major defects: When rust is more severe than surface rust and is starting to damage the Tap Changer			<u>Object Part</u>	- 1613: Control Box - 1002: Tank
			<u>Damage Code</u>	- 1041: Damaged - 1058: Loose
			<u>Cause Code</u>	- 1149: Corrosion - 1170: Surface rust - 1170: Unknown
<u>Scope of Rectification Works</u> - Repair of the leak/ rust should be attempted (replacing gaskets, welding, bushing replacements). - For major issues, submit notification and raise a DRA for assessment.				

Defect Description		Defect Photo	Task Details	
Tap Changer – Silica Gel Deteriorated			<u>Bushfire Defect</u>	- No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 7			<u>Standard Job</u>	- SILICA: Silica Breather/Gel Repair/Replacement
<u>Indicators</u> - Silica Gel has faded to a white/pink colour - Silica Gel holder has cracks/signs of failure Major defects: When the silica gel holder has major cracks or damage or the silica gel has completely deteriorated			<u>Object Part</u>	- N/A: Silica Gel Breather
			<u>Damage Code</u>	- 1054: Inoperable - 1041: Damaged
			<u>Cause Code</u>	- 1359: Age - 1059: Mechanical Failure - 1149: Corrosion - 1164: Unknown
<u>Scope of Rectification Works</u> - Top up Silica Gel as required - Replace Silica Gel holder if required				

Defect Description		Defect Photo	Task Details	
Tap Changer Secondaries – Motor Faulty			<u>Bushfire Defect</u>	- No
<u>Priority</u> SAP Priority 2			<u>Standard Job</u>	- 2TCMAJ: Tap changer/motor box repair Major
<u>Indicators</u> - TRF won't change taps - Motor looks or smells burnt - Motor measuring as short/open circuit - Tap Changer will operate manually			<u>Object Part</u>	- 1613: Control Box - 1423: Motor
			<u>Damage Code</u>	- 1032: Blown - 1041: Damaged - 1054: Inoperable
			<u>Cause Code</u>	- 1051: High Resistance - 1058: Loose - 1059: Mechanical Failure - 1149: Corrosion - 1164: Unknown
<u>Scope of Rectification Works</u> Repair or replace the Tap Change Motor as required and ensure Tap Changer is operational prior to leaving site.				

Defect Description	Defect Photo	Task Details
Tap Changer Secondaries – Cabling/Equipment Faulty		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7		<u>Standard Job</u> - 1DFSW: Rectify Secondary Wiring
<u>Indicators</u> - Secondary wiring looks/smells burnt - Secondary systems not working as expected - Tap Changer won't operate/communicate with SCADA or remote panels - System alarms relating to Tap Changer that don't match up Major defects: When the Tap Changer is unable to be operated as required		<u>Object Part</u> - 1084: Bucholtz Relay - 1613: Control Box - N/A: Secondary Wiring
		<u>Damage Code</u> - 1019: Loss of Insulation - 1032: Blown - 1036: Burnt - 1041: Damaged
		<u>Cause Code</u> - 1051: High Resistance - 1058: Loose - 1059: Mechanical Failure - 1164: Unknown - 1156: Fault Operations
<u>Scope of Rectification Works</u> - Repair/replace any secondary wiring that is defective - Repair/replace any defective secondary components as required (Links, Terminals, Fuses, etc.) and ensure Tap Changer is operational prior to leaving site.		

8 Instrument Transformers

8.1 Instrument Transformers Defect Index

Instrument Transformers Defect Index	
Defect Type	Page No.
Instrument TRF – Oil Leak	<u>47</u>
Instrument TRF – Rusted / Damaged	<u>48</u>
Instrument TRF Bushings – Major Damage	<u>49</u>
Instrument TRF Bushings – Minor Damage	<u>50</u>
Instrument TRF HV Termination – Rusted/ Corroded/ Overheating	<u>51</u>
Instrument TRF – Silica Gel Deteriorated	<u>52</u>
Instrument TRF Secondaries – Cabling/Equipment Faulty	<u>53</u>

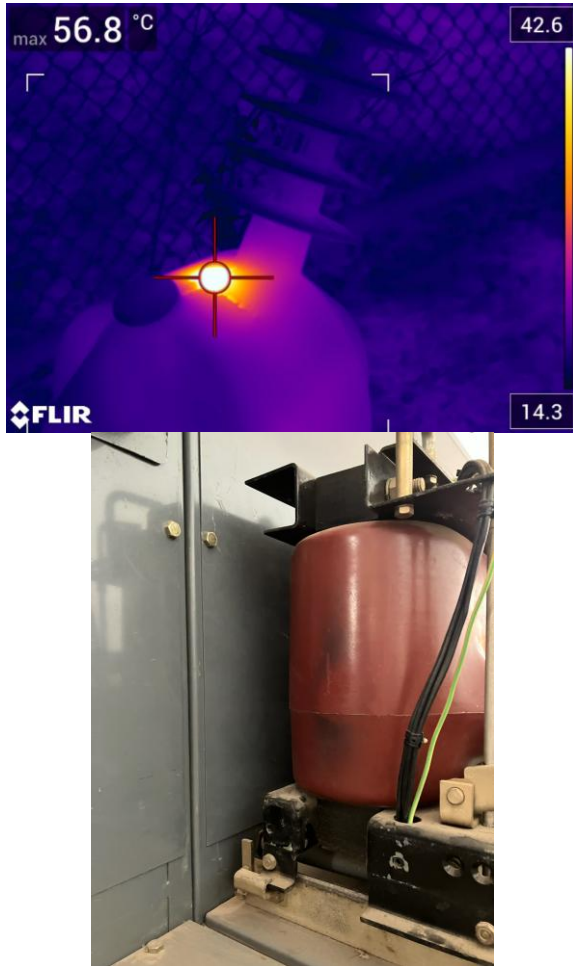
8.2 Instrument Transformers Defects

Defect Description	Defect Photo	Task Details	
Instrument TRF – Oil Leak		<u>Bushfire Defect</u> - No	
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 8		<u>Standard Job</u> - 1OILLE: Oil leak	
<u>Indicators</u> - Frequently having to top up oil - Oil level indicator low - Oil leaking from joints, gaskets, bolts, etc. - Pooling of oil on equipment or on the ground Major defects: When top ups are required less than 6-month intervals		<u>Object Part</u> - 1002: Tank - N/A: Conservator	
		<u>Damage Code</u> - 1004: Low Oil - 1041: Damaged	
		<u>Cause Code</u> - 1059: Mechanical Failure - 1149: Corrosion - 1164: Unknown	
<u>Scope of Rectification Works</u> For major leaks, repair of leak should be attempted (replacing gaskets, bushing replacements, epoxy sealing) For minor leaks, record the defect in SAP to monitor if not existing already. For any oil spills follow company standard EMS 0008 - Environmental Incident Response and Management			

Defect Description		Defect Photo	Task Details	
Instrument TRF – Rusted / Damaged			<u>Bushfire Defect</u>	- No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 9			<u>Standard Job</u> CT - 1CTF: Rectify CT Defect VT - 1VTF: Rectify VT Defect	
<u>Indicators</u> - Rust, corrosion or discolouration present on the surface of the Instrument TRF - Major cracking or deformation present Major defects: When rust is more severe than surface rust and is starting to damage the Instrument TRF			<u>Object Part</u> - 1002: Tank	
			<u>Damage Code</u> - 1041: Damaged - 1058: Loose	
			<u>Cause Code</u> - 1149: Corrosion - 1170: Surface rust - 1170: Unknown	
<u>Scope of Rectification Works</u> Minor: Where possible, remove rust and seal the surface of the affected area to prevent further corrosion. Monitor for any further deterioration Major: Submit notification and raise a DRA for assessment				

Defect Description		Defect Photo	Task Details	
Instrument TRF Bushings – Major Damage			<u>Bushfire Defect</u>	
			- No	
<u>Priority</u> SAP Priority 6			<u>Standard Job</u>	
			- 1TRBSH: Transmission bushing	
<u>Indicators</u>			<u>Object Part</u>	
- Major cracking present - Large chunks of insulator missing - Major treeing/tracking		- 1003: Bushing		
		<u>Damage Code</u>		
		- 1019: Loss of insulation - 1020: Tracking/PD - 1041: Damaged		
		<u>Cause Code</u>		
		- 1059: Mechanical Failure - 1164: Unknown - 1156: Fault Operations		
<u>Scope of Rectification Works</u>				
Inspect surrounding bushings for signs of similar damage and replace all defective bushings as required.				

Defect Description	Defect Photo	Task Details
Instrument TRF Bushings – Minor Damage		<u>Bushfire Defect</u> - No
<u>Priority</u> SAP Priority 9		<u>Standard Job</u> - 1TRBSH: Transmission bushing
<u>Indicators</u> - Small chips or flakes of insulator missing - Minor cracking present - Some signs of tracking or corona		<u>Object Part</u> - 1003: Bushing
		<u>Damage Code</u> - 1019: Loss of insulation - 1020: Tracking/PD - 1041: Damaged
		<u>Cause Code</u> - 1059: Mechanical Failure - 1164: Unknown - 1156: Fault Operations
<u>Scope of Rectification Works</u> Inspect surrounding bushings for signs of similar damage. If appropriate coat exposed porcelain with Glyptal to seal the bushing. Record the defect in SAP to monitor for further deterioration		

Defect Description	Defect Photo	Task Details
Instrument TRF HV Termination – Rusted/ Corroded/ Overheating		<u>Bushfire Defect</u> - No
<u>Priority</u> SAP Priority determined by SMI 104 – Thermovision of zone and transmission substations		<u>Standard Job</u> - 2HOTJT: Repair High Resistance Joint
<u>Indicators</u> - Visible signs of burning - Hot joints - Major corrosion/ rust - High contact resistance		<u>Object Part</u> - 1003: Bushing - 1112: Conductor
		<u>Damage Code</u> - 1036: Burnt - 1041: Damaged - 1058: Loose
		<u>Cause Code</u> - 1051: High Resistance - 1149: Corrosion - 1164: Unknown - 1156: Fault Operations - 1347: Hot Connections
<u>Scope of Rectification Works</u> Conduct a thermal imaging scan of termination and surrounding equipment if required. Identify the cause of the fault and clean or re-terminate as required. Test connections prior to re-energisation.		

Defect Description	Defect Photo	Task Details
Instrument TRF – Silica Gel Deteriorated		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 7		<u>Standard Job</u> - SILICA: Silica Breather/Gel Repair/Replacement
<u>Indicators</u> - Silica Gel has faded to a white/pink colour - Silica Gel holder has cracks/signs of failure Major defects: When the silica gel holder has major cracks or damage or the silica gel has completely deteriorated		<u>Object Part</u> - N/A: Silica Gel Breather
		<u>Damage Code</u> - 1054: Inoperable - 1041: Damaged
		<u>Cause Code</u> - 1359: Age - 1059: Mechanical Failure - 1149: Corrosion - 1164: Unknown
<u>Scope of Rectification Works</u> - Top up Silica Gel as required - Replace Silica Gel holder if required		

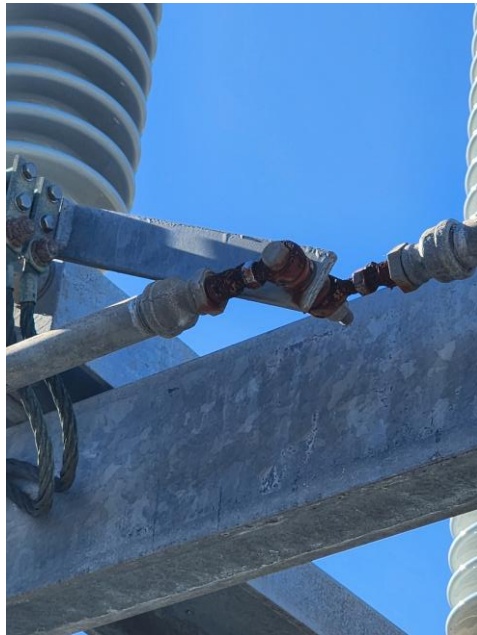
Defect Description	Defect Photo	Task Details
Instrument TRF Secondaries – Cabling/Equipment Faulty		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7		<u>Standard Job</u> - 1DFSW: Rectify Secondary Wiring
<u>Indicators</u> - Secondary wiring looks/smells burnt - Secondary systems not working as expected - Instrument TRF won't operate/communicate with SCADA or remote panels - System alarms relating to Instrument TRF that don't match up Major defects: When the Tap Changer is unable to be operated as required		<u>Object Part</u> - N/A: Secondary Wiring
<u>Damage Code</u> - 1019: Loss of Insulation - 1032: Blown - 1036: Burnt - 1041: Damaged		
<u>Cause Code</u> - 1051: High Resistance - 1058: Loose - 1059: Mechanical Failure - 1164: Unknown - 1156: Fault Operations		
<u>Scope of Rectification Works</u> - Repair/replace any secondary wiring that is defective - Repair/replace any defective secondary components as required (Links, Terminals, Fuses, etc.) and ensure Instrument TRF is operational prior to leaving site.		

9 Isolators and Earth Switches

9.1 Isolators and Earth Switches Defect Index

Isolators and Earth Switches Defect Index	
Defect Type	Page No.
Isolators & E/S – Stiff / Stuck	<u>55</u>
Isolators & E/S – Damaged Operating Handle	<u>56</u>
Isolators & E/S Bushings – Major Damage	<u>57</u>
Isolators & E/S Bushings – Minor Damage	<u>58</u>
Isolators & E/S – Damaged Arcing Horns	<u>59</u>
Isolators & E/S – Rusted / Damaged	<u>60</u>
Isolator & E/S HV Termination – Rusted/ Corroded/ Overheating	<u>61</u>
Isolators & E/S – Damaged or Defective Earthing	<u>62</u>

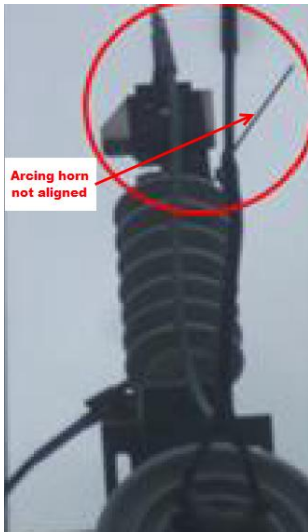
9.2 Isolators and Earth Switches Defects

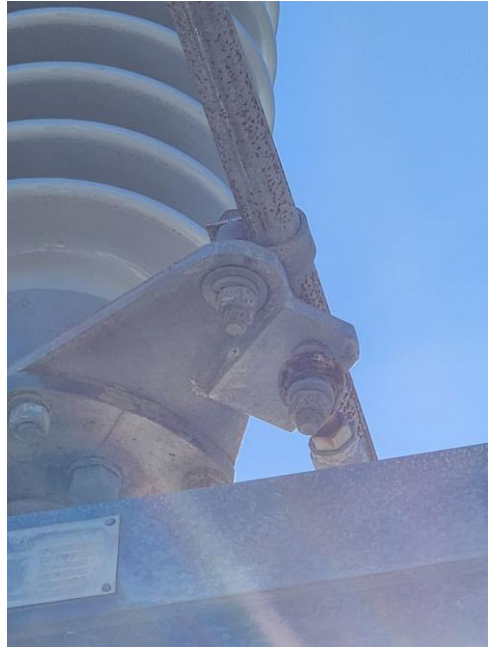
Defect Description	Defect Photo	Task Details
Isolators & E/S – Stiff / Stuck		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7		<u>Standard Job</u> - 2ISOLR: Isolator Repair - 2ESWRP: Earth Switch Repair
<u>Indicators</u> - Isolator or E/S is unable to be operated normally - Greater force is required to operate the equipment - Contacts can't make complete and even contact on all phases Major defects: When the Isolator or E/S is unable to be operated		<u>Object Part</u> - 1415: Handle - 1352: Contacts
		<u>Damage Code</u> - 1398: Broken/Damaged - 1418: Jammed - 1054: Inoperable
		<u>Cause Code</u> - 1058: Loose - 1149: Corrosion - 1059: Mechanical Failure
<u>Scope of Rectification Works</u> - Conduct an overhaul of the defective equipment and ensure all linkages and pivot points are set correctly and rotate as expected - For major issues, submit notification and raise a DRA for assessment.		

Defect Description	Defect Photo	Task Details
Isolators & E/S – Damaged Operating Handle		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7		<u>Standard Job</u> - 2ISOLR: Isolator Repair - 2ESWRP: Earth Switch Repair
<u>Indicators</u> - Operating handle does not operate as expected - Operating handle is loose - Operation of the handle could cause injury to operator Major defects: When the Isolator or E/S is unable to be operated		<u>Object Part</u> - 1415: Handle
		<u>Damage Code</u> - 1398: Broken/Damaged - 1418: Jammed - 1054: Inoperable
		<u>Cause Code</u> - 1042: Deterioration - 1058: Loose - 1059: Mechanical Failure
<u>Scope of Rectification Works</u> - Repair/replace the operating handle as required and ensure that it allows for smooth and complete operation of the equipment - For major issues, submit notification and raise a DRA for assessment.		

Defect Description		Defect Photo	Task Details	
Isolators & E/S Bushings – Major Damage			<u>Bushfire Defect</u>	- No
<u>Priority</u> SAP Priority 6			<u>Standard Job</u>	- 1TRBSH: Transmission bushing
<u>Indicators</u> - Major cracking present - Large chunks of insulator missing - Major treeing/tracking			<u>Object Part</u>	- 1265: Insulator
			<u>Damage Code</u>	- 1398: Broken/Damaged - 1020: Tracking/PD
			<u>Cause Code</u>	- 1164: Unknown - 1059: Mechanical Failure - 1156: Fault Operations
<u>Scope of Rectification Works</u> Inspect surrounding bushings for signs of similar damage and replace all defective bushings as required.				

Defect Description	Defect Photo	Task Details
Isolators & E/S Bushings – Minor Damage		<u>Bushfire Defect</u> - No
<u>Priority</u> SAP Priority 9		<u>Standard Job</u> - 1TRBSH: Transmission bushing
<u>Indicators</u> - Small chips or flakes of insulator missing - Minor cracking present - Some signs of tracking or corona		<u>Object Part</u> - 1265: Insulator
		<u>Damage Code</u> - 1398: Broken/Damaged - 1020: Tracking/PD
		<u>Cause Code</u> - 1164: Unknown - 1059: Mechanical Failure - 1156: Fault Operations
<u>Scope of Rectification Works</u> Inspect surrounding bushings for signs of similar damage. If appropriate coat exposed porcelain with Glyptal to seal the bushing. Record the defect in SAP to monitor for further deterioration		

Defect Description	Defect Photo	Task Details
Isolators – Damaged Arcing Horns		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 7 Minor: SAP Priority 9		<u>Standard Job</u> - 2ISOLR: Isolator Repair
<u>Indicators</u> - Arcing horns are misaligned - Arcing horns are damaged or show signs of deterioration Major defects: When the arcing horns are severely damaged or are not making contact as required		<u>Object Part</u> - 1091: Arcing horn
		<u>Damage Code</u> - 1398: Broken/damaged
		<u>Cause Code</u> - 1042: Deterioration - 1164: Unknown - 1059: Mechanical Failure
<u>Scope of Rectification Works</u> Repair/ replace the arcing horns are required and ensure they are aligned as per manufacturer specifications		

Defect Description	Defect Photo	Task Details
Isolators & E/S – Rusted / Damaged		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 9		<u>Standard Job</u> - 2ISOLR: Isolator Repair - 2ESWRP: Earth Switch Repair
<u>Indicators</u> - Rust/corrosion is present especially around linkages - Support structure is damaged or showing signs of deterioration Major defects: When rust is more severe than surface rust and is starting to damage the Isolator or E/S		<u>Object Part</u> - N/A: Supporting Structure
		<u>Damage Code</u> - 1398: Broken/ damaged
		<u>Cause Code</u> - 1149: Corrosion
<u>Scope of Rectification Works</u> - Replace any rusted/damaged linkages and components. - For minor structure corrosion, remove rust and seal the surface of the affected area to prevent further corrosion. Monitor for any further deterioration. - For major issues, submit notification and raise a DRA for assessment.		

Defect Description		Defect Photo	Task Details	
Isolators & E/S HV Termination – Rusted/ Corroded/ Overheating			<u>Bushfire Defect</u>	- No
<u>Priority</u> SAP Priority determined by SMI 104 – Thermovision of zone and transmission substations			<u>Standard Job</u>	- 2HOTJT: Repair High Resistance Joint
<u>Indicators</u> - Visible signs of burning - Hot joints - Major corrosion/ rust - High contact resistance			<u>Object Part</u>	- 1112: Conductor - 1352: Contacts
			<u>Damage Code</u>	- 1398: Broken/damaged - 1417: High Contact Resistance - 1418: Jammed
			<u>Cause Code</u>	- 1149: Corrosion - 1164: Unknown - 1156: Fault Operations - 1347: Hot Connection
<u>Scope of Rectification Works</u> Conduct a thermal imaging scan of termination and surrounding equipment if required. Identify the cause of the fault and clean or re-terminate as required. Test connections prior to re-energisation.				

Defect Description	Defect Photo	Task Details
Isolators & E/S – Damaged or Defective Earthing		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 6		<u>Standard Job</u> - 1EARTH: Earthing
<u>Indicators</u> - Earthing braids are frayed or damaged - Earthing is not as per technical specifications - Earthing is showing signs of deterioration Major defects: When the earthing poses a hazard to the safety of staff or the network		<u>Object Part</u> - N/A: Equipment Earthing
<u>Damage Code</u> - 1398: Broken/ damaged - 1417: High Contact Resistance		
<u>Cause Code</u> - 1042: Deterioration - 1058: Loose - 1059: Mechanical Failure - 1156: Fault Operations		
<u>Scope of Rectification Works</u> - Repair/replace any defective earthing connections or conductors and ensure they are rated for the required fault current. - Ensure all earthing complies with Manufacturer Recommendations, Earthing Design Reports and EDI 516 – Major substation earthing design, construct and commissioning		

10 Batteries and DC System

10.1 Batteries and DC System Defect Index

Batteries and DC System Defect Index	
Defect Type	Page No.
Batteries – Failed Maintenance	<u>64</u>
Batteries – Out of Date	<u>65</u>
Battery Charger – Defective / Faulty	<u>66</u>
Battery Charger – Rectifier Faulty	<u>67</u>
Battery DC Isolation Switch – Damaged / Poor Condition	<u>68</u>
DC System – Earth Fault Present	<u>69</u>

10.2 Batteries and DC System Defects

Defect Description		Defect Photo	Task Details	
Batteries – Failed Maintenance			<u>Bushfire Defect</u>	
			- No	
<u>Priority</u> SAP Priority 6			<u>Standard Job</u>	
			- 2BATCL: Battery Cell/s Replacement	
<u>Indicators</u>			<u>Object Part</u>	
- Batteries failed to maintain required voltage and discharge limits as per SMI 102			- N/A: Cell - 1112: Conductor	
			<u>Damage Code</u>	
			- 1411: No Voltage - 1412: Reduced Discharge Capacity - 1041: Damaged	
			<u>Cause Code</u>	
			- 1042: Deterioration - 1058: Loose - 1059: Mechanical Failure - 1347: Hot Connection - 1164: Unknown	
<u>Scope of Rectification Works</u>				
Individual cells – Replace faulty cell as required Whole bank – Submit notification and raise DRA. Escalate to Asset Engineering for immediate assessment.				

Defect Description		Defect Photo	Task Details	
Batteries – Out of Date			<u>Bushfire Defect</u>	
			- No	
<u>Priority</u> SAP Priority 6			<u>Standard Job</u>	
			- 2BATCL: Battery Cell/s Replacement	
<u>Indicators</u>			<u>Object Part</u>	
- Batteries are expired from date of installation as per SMI 102			- N/A: Cell	
			<u>Damage Code</u>	
			- 1376: Redundant	
			<u>Cause Code</u>	
			- 1359: Age	
<u>Scope of Rectification Works</u>				
Replace batteries as required and record new installation date for future replacement.				

Defect Description	Defect Photo	Task Details
Battery Charger – Defective / Faulty		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7		<u>Standard Job</u> - 2BTCHR: Battery Charger Repair - 2BCHRC: Battery Charger Replacement
<u>Indicators</u> - Battery Charger does not charge battery bank to required voltage - Float or Boost charge does not operate as expected - Charger voltage and current readings are not displaying - Charger output does not match measured readings Major defects: When the battery charger is not charging the batteries as required		<u>Object Part</u> - 1413: Charger Card - N/A: LV Fuses/CB/RCD
<u>Damage Code</u> - 1149: Corrosion - 1398: Broken/Damaged - 1032: Blown - 1054: Inoperable		
<u>Cause Code</u> - 1042: Deterioration - 1058: Loose - 1059: Mechanical Failure - 1117: Foreign Object/Vermin - 1164: Unknown		
<u>Scope of Rectification Works</u> Repair or replace the battery charger as required and ensure correct operation prior to leaving site		

Defect Description		Defect Photo	Task Details	
Battery Charger – Rectifier Faulty			<u>Bushfire Defect</u>	- No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7			<u>Standard Job</u>	- 2BTCHR: Battery Charger Repair
<u>Indicators</u> - Battery Charger rectifier unit has failed - Alarms present on Battery Charger screen			<u>Object Part</u>	- N/A: Rectifier
Major defects: When the rectifier not allowing the battery charger to charge the batteries as required			<u>Damage Code</u>	- 1398: Broken/Damaged - 1032: Blown - 1054: Inoperable
			<u>Cause Code</u>	- 1042: Deterioration - 1359: Age - 1059: Mechanical Failure
<u>Scope of Rectification Works</u> Remove the defective rectifier card, replace with a new unit, and ensure correct operation. Old rectifier cards should be sent away for repair/ replacement as required.				

Defect Description	Defect Photo	Task Details
Battery DC Isolation Switch – Damaged / Poor Condition		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7		<u>Standard Job</u> - 1DBATT: Rectify Battery / DC Defect
<u>Indicators</u> - DC Isolation Switch is stiff to operate - Handles and fuse/link holders are cracked or poor condition Major defects: When the DC Isolation Switch is unable to be operated safely		<u>Object Part</u> - N/A: Isolation Switch
		<u>Damage Code</u> - 1032: Blown - 1041: Damaged - 1054: Inoperable - 1364: Failed to Operate
		<u>Cause Code</u> - 1058: Loose - 1059: Mechanical Failure - 1149: Corrosion - 1164: Unknown
		<u>Scope of Rectification Works</u> Repair or replace the Battery DC Isolation Switch as required and ensure correct operation prior to leaving site

Defect Description		Defect Photo	Task Details	
DC System – Earth Fault Present			<u>Bushfire Defect</u>	- No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7			<u>Standard Job</u>	- 1DBATT: Rectify Battery/ DC Defect
<u>Indicators</u> - DC Earth Fault lamps indicate a DC Earth Fault is present - Battery / DC Supply Failed alarms present on SCADA - DC alarms failing / restoring intermittently - Signs of rodent presence within pits/ trenches/ panels Major defects: When the earth fault is causing issues with protection or control circuits			<u>Object Part</u>	- 1355: Terminal - 1405: Cable - N/A: Stand
			<u>Damage Code</u>	- 1149: Corrosion - 1368: Insulation Damaged - 1032: Blown - 1036: Burnt - 1059: Mechanical Failure
			<u>Cause Code</u>	- 1042: Deterioration - 1058: Loose - 1059: Mechanical Failure - 1117 Foreign Object/Vermin - 1164: Unknown
<u>Scope of Rectification Works</u> Use a DC Earth Fault Locator to identify which circuit the fault is present on. Locate the source of the fault and rectify / replace any defective equipment or cabling as required.				

11 Capacitor Banks

11.1 Capacitor Banks Defect Index

Capacitor Banks Defect Index	
Defect Type	Page No.
Capacitor Bank – Capacitor Major Damage	<u>71</u>
Capacitor Bank – Capacitor Minor Damage	<u>72</u>
Capacitor Bank – Step Contactors Faulty	<u>73</u>
Capacitor Bank HV Terminations – Rusted/ Corroded/ Overheating	<u>74</u>
Capacitor Bank Secondaries – Cabling/Equipment Faulty	<u>75</u>
Capacitor Bank Enclosure – Damaged / Poor Condition	<u>76</u>

11.2 Capacitor Banks Defects

Defect Description		Defect Photo	Task Details	
Capacitor Banks – Capacitor Major Damage			<u>Bushfire Defect</u>	- No
<u>Priority</u> SAP Priority 6			<u>Standard Job</u>	- 2CAPRP: Capacitor Bank Repair
<u>Indicators</u> - Major damage to the Capacitor Can present - Capacitor is leaking liquid - Capacitor is bulging or showing other signs of imminent failure - Capacitor does not measure the same as the name plate			<u>Object Part</u>	- 1420: Capacitor
			<u>Damage Code</u>	- 1368: Insulation Damaged - 1398: Broken/Damaged - 1032: Blown - 1054: Inoperable - 1020: Tracking/PD
			<u>Cause Code</u>	- 1042: Deterioration - 1149: Corrosion - 1164: Unknown - 1074: Vegetation - 1117: Foreign Object/Vermin - 1156: Fault Operations
<u>Scope of Rectification Works</u> Remove defective capacitor cans from service and replace with new units as required.				

Defect Description		Defect Photo	Task Details
Capacitor Banks – Capacitor Minor Damage			<u>Bushfire Defect</u> - No
<u>Priority</u> SAP Priority 9		<u>Standard Job</u> - 2CAPRP: Capacitor Bank Repair	
<u>Indicators</u> - Minor damage to the Capacitor Can present - Capacitor is showing minor signs of fatigue		<u>Object Part</u> - 1420: Capacitor	
		<u>Damage Code</u> - 1368: Insulation Damaged - 1398: Broken/Damaged - 1032: Blown - 1054: Inoperable - 1020: Tracking/PD	
		<u>Cause Code</u> - 1042: Deterioration - 1149: Corrosion - 1164: Unknown - 1074: Vegetation - 1117: Foreign Object/Vermin - 1156: Fault Operations	
<u>Scope of Rectification Works</u> Raise a notification in SAP and monitor for further deterioration			

Defect Description		Defect Photo	Task Details	
Capacitor Banks – Step Contactors Faulty			<u>Bushfire Defect</u>	- No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7			<u>Standard Job</u>	- 2CAPRP: Capacitor Bank Repair
<u>Indicators</u> - Step Contactor does not operate as required - Step Contactor fails testing as per SMI 209 Major defects: When the step contactor is unable to be operated limiting the use of the capacitor bank			<u>Object Part</u>	- 1002: Tank - 1355: Terminal - 1003: Bushing
			<u>Damage Code</u>	- 1398: Broken/Damaged - 1417: High Contact Resistance - 1054: Inoperable - 1020: Tracking/PD
			<u>Cause Code</u>	- 1042: Deterioration - 1149: Corrosion - 1164: Unknown - 1117: Foreign Object/Vermin - 1156: Fault Operations
<u>Scope of Rectification Works</u> Repair or replace the Step Contactor as required and ensure correct operation				

Defect Description		Defect Photo	Task Details	
Capacitor Bank HV Termination – Rusted/ Corroded/ Overheating			<u>Bushfire Defect</u>	- No
<u>Priority</u> SAP Priority determined by SMI 104 – Thermovision of zone and transmission substations			<u>Standard Job</u>	- 2HOTJT: Repair High Resistance Joint
<u>Indicators</u> - Visible signs of burning - Hot joints - Major corrosion/ rust - High contact resistance			<u>Object Part</u>	- 1355: Terminal - 1003: Bushing
			<u>Damage Code</u>	- 1398: Broken/Damaged - 1036: Burnt - 1054: Inoperable - 1059: Mechanical Failure
			<u>Cause Code</u>	- 1042: Deterioration - 1149: Corrosion - 1164: Unknown - 1117: Foreign Object/Vermin - 1347: Hot Connection
<u>Scope of Rectification Works</u> Conduct a thermal imaging scan of termination and surrounding equipment if required. Identify the cause of the fault and clean or re-terminate as required. Test connections prior to re-energisation.				

Defect Description	Defect Photo	Task Details
Capacitor Bank Secondaries – Cabling / Equipment Faulty		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 7		<u>Standard Job</u> - 1DFSW: Rectify Secondary Wiring
<u>Indicators</u> - Secondary wiring looks/smells burnt - Secondary systems not working as expected - Cap Bank won't operate/communicate with SCADA or remote panels - System alarms relating to Cap Bank that don't match up Major defects: When the Cap Bank is unable to be operated as required		<u>Object Part</u> - 1405: Cable - 1355: Terminal
		<u>Damage Code</u> - 1368: Insulation Damaged - 1398: Broken/Damaged - 1032: Blown - 1054: Inoperable - 1059: Mechanical Failure
		<u>Cause Code</u> - 1042: Deterioration - 1164: Unknown - 1359: Age - 1117: Foreign Object/Vermin
<u>Scope of Rectification Works</u> - Repair/replace any secondary wiring that is defective - Repair/replace any defective secondary components as required (Links, Terminals, Fuses, etc.) and ensure Capacitor Bank is operational prior to leaving site.		

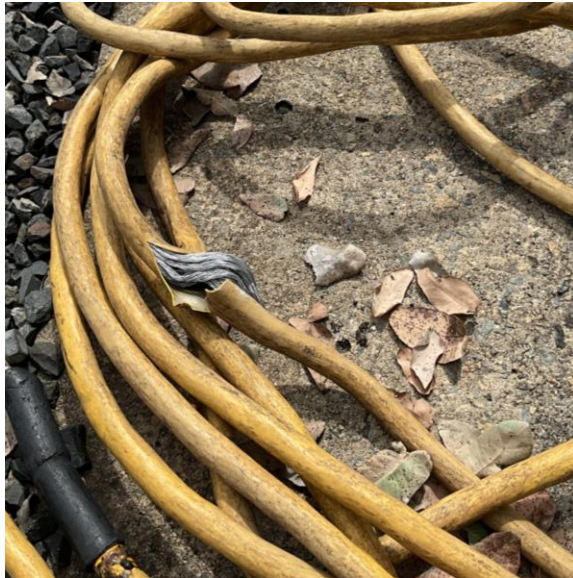
Defect Description		Defect Photo	Task Details	
Capacitor Bank Enclosure – Damaged / Poor Condition			<u>Bushfire Defect</u>	
			- No	
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7			<u>Standard Job</u>	
			- YARDRE: Yard Maintenance - Reactive	
<u>Indicators</u> - Enclosure is damaged - Enclosure doors/ gates are in poor condition or difficult to operate - Enclosure is dirty/ overgrown with vegetation Major defects: When the damage poses a hazard to the safety of staff or the network			<u>Object Part</u> - 1043: Door - 1469: Gate - 1471: Fence	
		<u>Damage Code</u> - 1041: Damaged - 1054: Inoperable - 1058: Mechanical Failure - 1479: Broken		
		<u>Cause Code</u> - 1059: Mechanical Failure - 1164: Unknown - 1359: Age - 1074: Vegetation - 1117: Foreign Object/Vermin		
<u>Scope of Rectification Works</u> Arrange an outage to clean, repair or replace any required equipment and ensure enclosure can effectively operate to maintain the safety requirements for capacitor banks				

12 Earthing

12.1 Earthing Defect Index

Earthing Defect Index	
Defect Type	Page No.
Portable Earth – Damaged / Faulty	78
Earthing Conductor – Missing / Damaged	79
Earth Grid – Missing / Damaged	80
Structure Earthing – Missing / Damaged	81

12.2 Earthing Defects

Defect Description	Defect Photo	Task Details
Portable Earth – Damaged / Faulty		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 7		<u>Standard Job</u> - 1EARTH: Earthing
<u>Indicators</u> - Insulation is damaged - Missing or Broken Strands - Earthing Clamps are in poor condition or unusable Major defects: When the damage could be potentially unsafe to staff or derate the portable earth		<u>Object Part</u> - 1405: Cable - 1355: Terminal
<u>Damage Code</u> - 1051: High Resistance - 1116: Strands Broken/Damaged - 1368: Insulation Damaged - 1398: Broken/Damaged		
<u>Cause Code</u> - 1042: Deterioration - 1059: Mechanical Failure - 1117: Foreign Object/Vermin - 1164: Unknown		
<u>Scope of Rectification Works</u> Repair or replace Portable Earthing as required		

Defect Description	Defect Photo	Task Details
Earthing Conductor – Missing / Damaged		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7		<u>Standard Job</u> - 1EARTH: Earthing
<u>Indicators</u> - Earthing conductor has missing or broken strands - Earthing connections are loose or deteriorating - Earthing does not comply with Earthing Design Report or EDI 516 Major defects: When the earthing poses a hazard to the safety of staff or the network		<u>Object Part</u> - 1405: Cable - N/A: Equipment Earthing
		<u>Damage Code</u> - 1041: Damaged - 1019: Loss of Insulation - 1054: Inoperable
		<u>Cause Code</u> - 1042: Deterioration - 1059: Mechanical Failure - 1117: Foreign Object/Vermin - 1164: Unknown
<u>Scope of Rectification Works</u> Repair or replace the damaged earthing conductor or terminations and ensure that earthing complies to EDI 516 – Major substation earthing design, construct and commissioning		

Defect Description		Defect Photo	Task Details	
Earth Grid – Missing / Damaged			<u>Bushfire Defect</u>	- No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7			<u>Standard Job</u>	- 1EARTH: Earthing
<u>Indicators</u> - Earth Grid has missing or broken strands - Earth Grid connections are deteriorating - Altered ground level has exposed areas of the bare earth grid - Earthing does not comply with Earthing Design Report or EDI 516 Major defects: When the earthing poses a hazard to the safety of staff or the network			<u>Object Part</u>	- N/A: Equipment Earthing
			<u>Damage Code</u>	- 1041: Damaged - 1054: Inoperable
			<u>Cause Code</u>	- 1059: Mechanical Failure - 1114: Altered Ground Level - 1073: Vandalism - 1042: Deterioration
<u>Scope of Rectification Works</u> Repair or replace the damaged earthing conductor or terminations. Rectify the ground level so that the earth grid is buried to the correct depth and ensure that earthing complies to EDI 516 – Major substation earthing design, construct and commissioning				

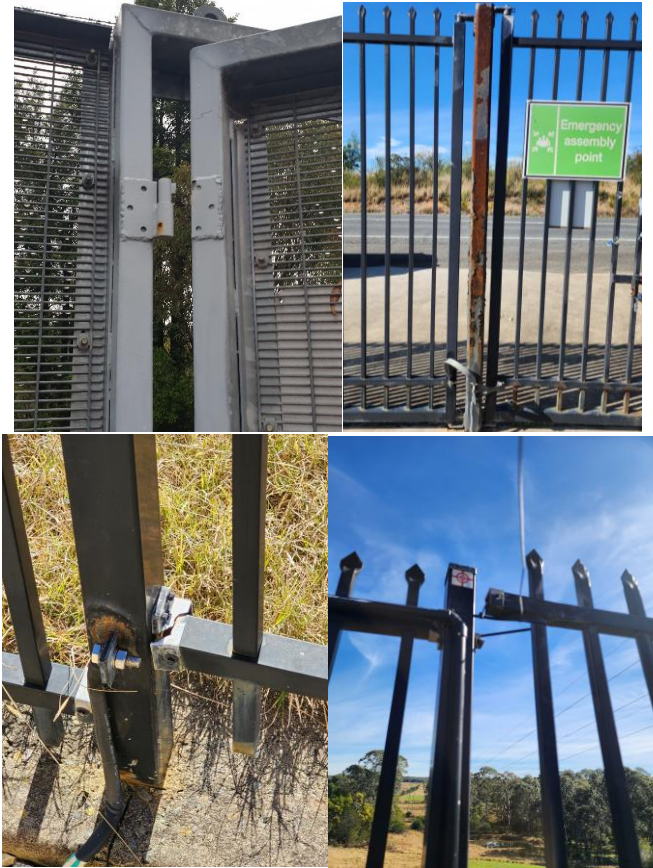
Defect Description		Defect Photo	Task Details	
Structure Earthing – Missing / Damaged			<u>Bushfire Defect</u>	- No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7			<u>Standard Job</u>	- 1EARTH: Earthing
<u>Indicators</u> - Earthing conductor has missing or broken strands - Earthing connections are loose or deteriorating - Structure does not have the required earthing arrangement - Earthing does not comply with Earthing Design Report or EDI 516 Major defects: When the earthing poses a hazard to the safety of staff or the network			<u>Object Part</u>	- 1405: Cable - N/A: Equipment Earthing
			<u>Damage Code</u>	- 1041: Damaged - 1019: Loss of Insulation - 1054: Inoperable
			<u>Cause Code</u>	- 1042: Deterioration - 1059: Mechanical Failure - 1117: Foreign Object/Vermin - 1164: Unknown
<u>Scope of Rectification Works</u> Repair or replace the damaged earthing conductor or terminations. Confirm structure earthing arrangement is correct and ensure that earthing complies to EDI 516 – Major substation earthing design, construct and commissioning				

13 Civil

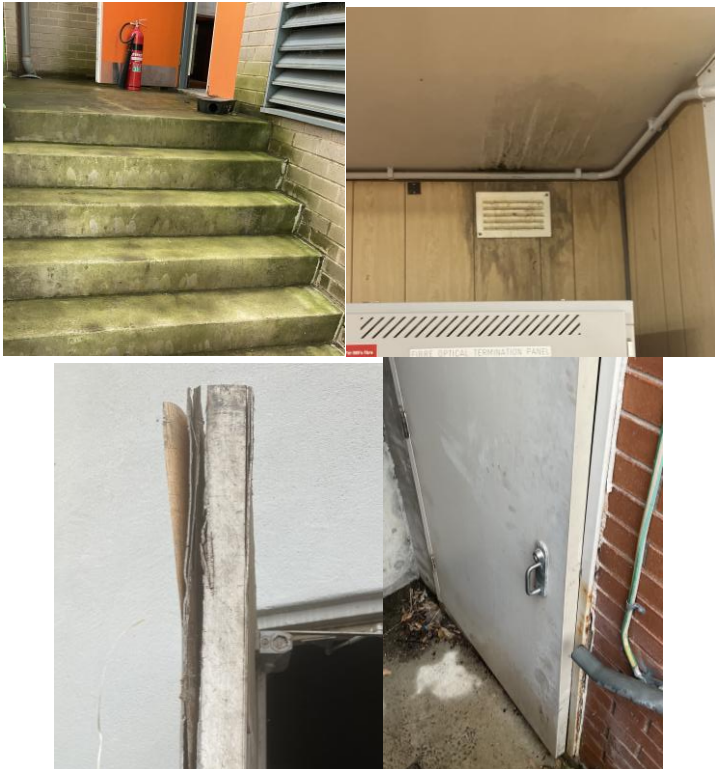
13.1 Civil Defect Index

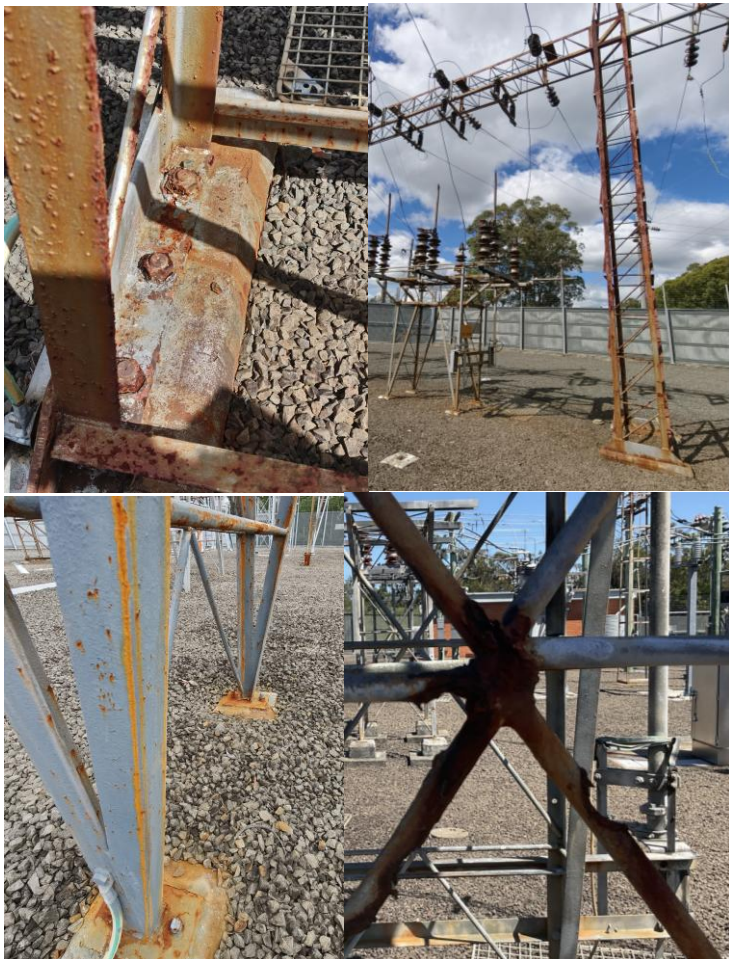
Civil Defect Index	
Defect Type	Page No.
Security Gates, Fences and Locks – Damaged or Inoperable	<u>83</u>
Sub Security Systems – Damaged or Inoperable	<u>84</u>
Site Buildings – Damaged / Poor Condition	<u>85</u>
Yard Structures – Damaged / Poor Condition	<u>86</u>
Lighting – Damaged or Poor Condition	<u>87</u>
Switch Yard Blue Metal – Missing or Poor Condition	<u>88</u>
Switch Yard – Overgrown Weeds	<u>89</u>
Switch Yard – AA Stands / Bollards Damaged	<u>90</u>
Substation Signage – Missing / Poor Condition	<u>91</u>
Deluge Showers – Damaged / Poor Condition	<u>92</u>
Stormwater System – Damaged / Poor Condition	<u>93</u>
Fire System Assets – Faulty / Poor Condition	<u>94</u>
Emergency Lighting – Fault / Poor Condition	<u>95</u>
Oil Water Separator – Motor / Pump Faulty	<u>96</u>
Oil Water Separator – Storage Tank Damaged / Rusted	<u>97</u>
Bund – Damaged / Poor Condition	<u>98</u>
Trenches, Pits and Cable Ducts – Damaged / Poor Condition	<u>99</u>
Driveways / Access Tracks – Damaged / Poor Condition	<u>100</u>

13.2 Civil Defects

Defect Description	Defect Photo	Task Details
Security Gates, Fences and Locks – Damaged or Inoperable		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7		<u>Standard Job</u> - 1FENCE: Fence repair - 2GATE: Gate Repair
<u>Indicators</u> - Site Security has been compromised - Security fencing is unable to prevent inadvertent site access - Gates or locks are hard to operate - Gates or Fencing showing signs of deterioration		<u>Object Part</u> - 1471: Fence - 1057: Lock - 1469: Gate
Major defects: When the damage poses a hazard to the safety of staff or the network		<u>Damage Code</u> - 1041: Damaged - 1479: Broken - 1054: Inoperable
<u>Scope of Rectification Works</u> - Report any security breaches or site access issues to the Control Room - Contact Security / Locking as required to ensure sites remain secure - Repair / Replace defective equipment as required to ensure site security		<u>Cause Code</u> - 1059: Mechanical Failure - 1117: Foreign Objects/Vermin - 1073: Vandalism

Defect Description	Defect Photo	Task Details
Sub Security Systems – Damaged or Inoperable		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7		<u>Standard Job</u> - 1DACM: Rectify Accommodation Defect
<u>Indicators</u> - Security Cameras are damaged - Security devices are not operating as intended e.g. Reed Switches - Site alarm unable to be disabled/active as required		<u>Object Part</u> - 1494: Control Panel - N/A: Security Devices
Major defects: When the damage poses a hazard to the safety of staff or the network		<u>Damage Code</u> - 1041: Damaged - 1054: Inoperable - 1479: Broken
		<u>Cause Code</u> - 1059: Mechanical Failure - 1149: Corrosion - 1154: Electrical Failure - 1117: Foreign Object/Vermin - 1060: Moisture Ingress
<u>Scope of Rectification Works</u> - Report any site security or site access issues to the Control Room - Contact Security / Locking as required to ensure sites remain secure - Repair / Replace defective equipment as required to ensure site security		

Defect Description	Defect Photo	Task Details
Site Buildings – Damaged / Poor Condition		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 9		<u>Standard Job</u> - CIVIL: Civil works
<u>Indicators</u> - Broken building locks or doors - Leaking roofs - Building structure in poor condition - Paint work issues - Plumbing issues - Any damaged furniture Major defects: When the damage poses a hazard to the safety of staff or the network		<u>Object Part</u> - 1043: Door - 1469: Gate - 1473: Wall
		<u>Damage Code</u> - 1041: Damaged - 1054: Inoperable - 1479: Broken
		<u>Cause Code</u> - 1006: Cracked - 1059: Mechanical Failure - 1359: Age - 1164: Unknown - 1074: Vegetation - 1117: Foreign Object/Vermin
<u>Scope of Rectification Works</u> - Repair / Replace damaged equipment as required - For major structure damage, submit notification and raise a DRA.		

Defect Description	Defect Photo	Task Details
Yard Structures – Damaged / Poor Condition		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 9		<u>Standard Job</u> - 2YARDR: Yard Structure Repair
<u>Indicators</u> - Hardware broken or missing - Structures are damaged or in poor condition - Structures showing signs of rust - Structures are showing signs of damage to foundation Major defects: When the damage poses a hazard to the safety of staff or the network		<u>Object Part</u> - N/A: Supporting Structure
		<u>Damage Code</u> - 1041: Damaged
		<u>Cause Code</u> - 1149: Corrosion - 1059: Mechanical failure - 1153: Fatigue
		<u>Scope of Rectification Works</u> - Repair / Replace damaged equipment as required - For major structure damage, submit notification and raise a DRA.

Defect Description	Defect Photo	Task Details
Lighting – Damaged or Poor Condition		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 7		<u>Standard Job</u> - 2LGTRC: Sub light fitting replacement
<u>Indicators</u> - Lighting is inoperable - Lighting is inadequate for required area - Light fittings are cracked/damaged - Light fittings are not properly secured Major defects: When the lighting is inoperable or poses a hazard to the safety of staff or the network		<u>Object Part</u> - 1405: Cable - N/A: Light - N/A: LV Fuses/CB/RCD
<u>Damage Code</u> - 1041: Damaged - 1054: Inoperable - 1032: Blown		
<u>Cause Code</u> - 1006: Cracked - 1059: Mechanical Failure - 1359: Age - 1164: Unknown - 1117: Foreign Object/Vermin - 1060: Moisture Ingress		
<u>Scope of Rectification Works</u> Repair / Replace lighting as required to ensure adequate site lighting		

Defect Description	Defect Photo	Task Details
Switch Yard Blue Metal – Missing or Poor Condition		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 7 Minor: SAP Priority 9		<u>Standard Job</u> - YARDRE: Yard Maintenance - Reactive
<u>Indicators</u> - Blue Metal coverage is not adequate - Large areas of dirt visible in yard - Sink holes are forming Major defects: When the damage poses a hazard to the safety of staff or the network		<u>Object Part</u> - 1553: Concrete Stones
<u>Damage Code</u> - 1059: Mechanical Failure - 1403: Clearance Compromised		
<u>Cause Code</u> - 1059: Mechanical Failure - 1359: Age - 1164: Unknown - 1074: Vegetation - 1114: Altered Ground Level		
<u>Scope of Rectification Works</u> - For minor issues, replenish the blue metal as required - For major issues, submit notification and raise a DRA.		

Defect Description	Defect Photo	Task Details	
Switch Yard – Overgrown Weeds		<u>Bushfire Defect</u> - No	
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 7		<u>Standard Job</u> - 2VMITL: Veg Management	
<u>Indicators</u> - Vegetation growing in switch yard - Vegetation encroaching on clearances Major defects: When weeds are starting to encroach on equipment or is becoming a trip hazard to staff		<u>Object Part</u> - 1553: Concrete Stones	
		<u>Damage Code</u> - 1403: Clearance Compromised	
		<u>Cause Code</u> - 1074: Vegetation	
<u>Scope of Rectification Works</u> - Spray the vegetation as required and remove any excess weeds from the switch yard - For any compromised clearances – Contact control room and organise an outage to remove vegetation			

Defect Description	Defect Photo	Task Details
Switch Yard – AA Stands / Bollards Damaged		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 7		<u>Standard Job</u> - 1DACM: Rectify Accommodation Defect
<u>Indicators</u> - Stands and Bollards are damaged - Stands are faded and are no longer yellow - Bollards are UV damaged		<u>Object Part</u> - N/A: AA Stands/Bollards
Major defects: When Stands or Bollards are unable to be used as required		<u>Damage Code</u> - 1041: Damaged - 1479: Broken
<u>Scope of Rectification Works</u> Repair / Replace all defective AA stands and Bollards as required. Ensure that there is an adequate amount on site and that they are stored out of the weather.		<u>Cause Code</u> - 1006: Cracked - 1059: Mechanical Failure - 1359: Age - 1164: Unknown

Defect Description	Defect Photo	Task Details
Substation Signage – Missing / Poor Condition		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 7		<u>Standard Job</u> - 2SGNZS: Install/Replace Signage
<u>Indicators</u> - Signs are illegible - Signs are missing - Signs are not secured appropriately		<u>Object Part</u> - N/A: Sign
Major defects: When the missing or damaged sign poses a hazard to the safety of staff, public or the network		<u>Damage Code</u> - 1041: Damaged - 1054: Inoperable
		<u>Cause Code</u> - 1059: Mechanical Failure - 1359: Age - 1164: Unknown - 1117: Foreign Objects/Vermin - 1073: Vandalism
<u>Scope of Rectification Works</u> Repair / Replace the defective signage as required		

Defect Description	Defect Photo	Task Details
Deluge Showers – Damaged / Poor Condition		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 7		<u>Standard Job</u> - 2PLMBR: Plumbing Repair
<u>Indicators</u> - Deluge Shower is inoperable - Leaking is present - Valves / Taps are damaged Major defects: When the deluge shower is unable to be operated as required		<u>Object Part</u> - 1002: Tank - 1080: Valve - 1490: Shower Head - 1085: Piping
<u>Damage Code</u> - 1054: Inoperable - 1041: Damaged		
<u>Cause Code</u> - 1006: Cracked - 1059: Mechanical Failure - 1359: Age - 1164: Unknown - 1117: Foreign Object/Vermin		
<u>Scope of Rectification Works</u> Repair / Replace the defective equipment as required and ensure correct operation prior to leaving site.		

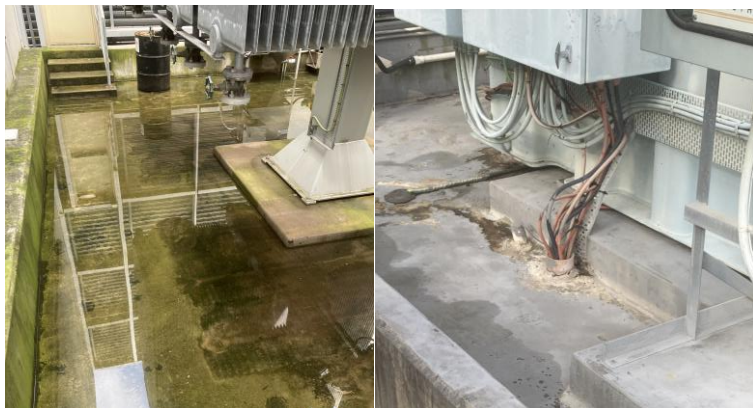
Defect Description	Defect Photo	Task Details
Stormwater System – Damaged / Poor Condition		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 7		<u>Standard Job</u> - 2PLMBR: Plumbing Repair
<u>Indicators</u> - Damaged or blocked stormwater pits - Stormwater not adequately draining away - Basements / Pits have excessive water pooling		<u>Object Part</u> - N/A: Stormwater System
Major defects: When the stormwater system is unable to take away water as required during storm events		<u>Damage Code</u> - 1041: Damaged - 1054: Inoperable - 1479: Broken
<u>Scope of Rectification Works</u> Submit notification and raise DRA. For major or critical damage, call and advise design group for immediate assessment.		<u>Cause Code</u> - 1059: Mechanical Failure - 1117: Foreign Object/Vermin - 1459: Rain - 1164: Unknown

Defect Description	Defect Photo	Task Details
Fire System Assets – Faulty / Poor Condition		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7		<u>Standard Job</u> - 2FIPMC: Fire Equipment Miscellaneous Repair
<u>Indicators</u> - Alarms are present - Fire Detection System not operating as expected - Equipment out of inspection date - Fire Assets are missing - Fire Assets have signs of tampering Major defects: When the fire system assets are not working as required		<u>Object Part</u> - 1498: Fire extinguisher - 1496: Fire Blanket - 1493: Fire Alarm Detector - 1494: Control Panel
<u>Damage Code</u> - 1041: Damaged - 1054: Inoperable - 1479: Broken		
<u>Cause Code</u> - 1059: Mechanical Failure - 1359: Age - 1164: Unknown - 1117: Foreign Objects/Vermin - 1042: Deterioration		
<u>Scope of Rectification Works</u> Repair / Replace damaged equipment as required. Ensure that all Fire System assets are working as intended prior to leaving site.		

Defect Description	Defect Photo	Task Details
Emergency Lighting – Fault / Poor Condition		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7		<u>Standard Job</u> - EXLTRP: Rectify Emergency Exit Lighting Defect
<u>Indicators</u> - Emergency lighting is inoperable - Fails 90-minute testing - Exit Lighting is illegible - Lighting is cracked / damaged Major defects: When Emergency Lighting is inoperable across the whole room/site		<u>Object Part</u> - 1405: Cable - N/A: Light - N/A: LV Fuses/CB/RCD
		<u>Damage Code</u> - 1398: Broken/Damaged - 1054: Inoperable - 1032: Blown
		<u>Cause Code</u> - 1042: Deterioration - 1059: Mechanical Failure - 1117: Foreign Object/Vermin - 1164: Unknown
<u>Scope of Rectification Works</u> Repair / Replace emergency lighting as required and conduct a 90-minute test to ensure correct operation.		

Defect Description	Defect Photo	Task Details
Oil Water Separator – Motor / Pump Faulty		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 7		<u>Standard Job</u> - 2OWSRP: OWS Repair
<u>Indicators</u> - OWS is pumping but bund water is not draining - OWS is not running when bund is full - Motor is very loud when running Major defects: When the OWS motor or pump is inoperable and require replacement		<u>Object Part</u> - 1081: Pump - 1423: Motor
		<u>Damage Code</u> - 1041: Damaged - 1054: Inoperable
		<u>Cause Code</u> - 1059: Mechanical Failure - 1359: Age - 1164: Unknown - 1117: Foreign Objects/Vermin
<u>Scope of Rectification Works</u> Repair / Replace equipment as required and ensure bund is drained of any water prior to leaving site.		

Defect Description		Defect Photo	Task Details	
Oil Water Separator – Storage Tank Damaged / Rusted			<u>Bushfire Defect</u>	- No
<u>Priority</u> Major: SAP Priority 7 Minor: SAP Priority 9			<u>Standard Job</u>	- 2OWSRP: OWS Repair
<u>Indicators</u> - Any cracks or corrosion - Visible oil traces in discharged water - Loose or missing parts - Damaged valves Major defects: When the OWS tank is showing signs of major damage that could result in failure			<u>Object Part</u>	- 1002: Tank
			<u>Damage Code</u>	- 1041: Damaged - 1054: Inoperable
			<u>Cause Code</u>	- 1059: Mechanical Failure - 1359: Age - 1164: Unknown - 1117: Foreign Objects/Vermin
<u>Scope of Rectification Works</u>				
Repair / Replace equipment as required and ensure bund is drained of any water prior to leaving site.				

Defect Description	Defect Photo	Task Details
Bund – Damaged / Poor Condition		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 9		<u>Standard Job</u> - 2YARDR: Yard Structure Repair
<u>Indicators</u> - Cracks or damage to bund walls - Leaking from the bund is present - Oil stains / Moss present Major damage: When the structural integrity of the bund could be compromised or oil leaking is present		<u>Object Part</u> - 1473: Wall - 1046: Enclosure
		<u>Damage Code</u> - 1041: Damaged - 1054: Inoperable
		<u>Cause Code</u> - 1006: Cracked - 1059: Mechanical Failure - 1359: Age - 1164: Unknown
<u>Scope of Rectification Works</u> - For minor issues, repair and clean the bund as required - For major issues, submit notification and raise a DRA for assessment		

Defect Description	Defect Photo	Task Details
Trenches, Pits and Cable Ducts – Damaged / Poor Condition		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 9		<u>Standard Job</u> - 2YARDR: Yard Structure Repair
<u>Indicators</u> - Are blocked or obstructed and unable to be used - Cracking or other signs of deterioration present that could cause failure - Lids are not secure or showing signs of failure - Vermin and/or vegetation present Major defects: When the damage poses a hazard to the safety of staff or the network		<u>Object Part</u> - N/A: Cable Ducts/Pits/Trenches
		<u>Damage Code</u> - 1041: Damaged - 1054: Inoperable - 1479: Broken
		<u>Cause Code</u> - 1059: Mechanical Failure - 1074: Vegetation - 1117: Foreign Object/Vermin - 1164: Unknown
<u>Scope of Rectification Works</u> - For minor issues, repair the damage as required - For major issues, submit notification and raise a DRA for assessment		

Defect Description		Defect Photo	Task Details	
Driveways / Access Tracks – Damaged / Poor Condition			<u>Bushfire Defect</u>	- No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 9			<u>Standard Job</u>	- 1ACCTR: Access Track
<u>Indicators</u> - Damaged driveways or access tracks - Blocked access - Road/access plates are damaged or not fit for purpose - Heavy pooling of storm water Major defects: When the damage poses a hazard to the safety of staff or the network			<u>Object Part</u>	- N/A: Driveway - 1628: Access Track
			<u>Damage Code</u>	- 1041: Damaged - 1464: No Access
			<u>Cause Code</u>	- 1459: Rain - 1042: Deterioration - 1114: Altered Ground Level - 1073: Vandalism
<u>Scope of Rectification Works</u> - For minor issues, repair the damage as required - For major issues, submit notification and raise a DRA for assessment				

14 Miscellaneous

14.1 Miscellaneous Defect Index

Miscellaneous Defect Index	
Defect Type	Page No.
Surge Divertors – Damaged / Poor Condition	<u>102</u>
Conductors / Busbars – Damaged / Poor Condition	<u>103</u>
Bushings / Insulators – Major Damage	<u>104</u>
Bushings / Insulators – Minor Damage	<u>105</u>
Secondary / Control Systems – Faulty / Poor Condition	<u>106</u>

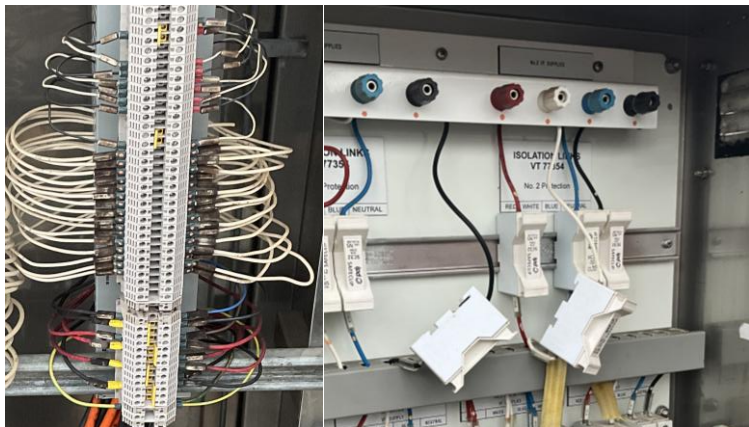
14.2 Miscellaneous Defects

Defect Description	Defect Photo	Task Details
Surge Divertors – Damaged / Poor Condition		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 7		<u>Standard Job</u> - SI108A: Replace Surge Diverter
<u>Indicators</u> - Visible cracks or damage - Surge Diverter has operated during fault operations - Signs of thermal heating around the base/earth connection of surge diverter Major defects: When the damage poses a hazard to the safety of staff or the network		<u>Object Part</u> - 1265: Insulator - 1031: Base
<u>Damage Code</u> - 1368: Insulation Damaged - 1398: Broken/Damaged - 1019: Tracking/PD		
<u>Cause Code</u> - 1042: Deterioration - 1149: Corrosion - 1164: Unknown - 1059: Mechanical Failure - 1156: Fault Operations		
<u>Scope of Rectification Works</u> Replace any surge divertors that are damaged or that have operated during fault operations.		

Defect Description		Defect Photo	Task Details	
Conductors / Busbars – Damaged / Poor Condition			<u>Bushfire Defect</u>	- No
<u>Priority</u> Major: SAP Priority 6 Minor: SAP Priority 7			<u>Standard Job</u>	- 1TRCDR: Transmission conductor
<u>Indicators</u> - Visible signs of rust/corrosion - Damaged connections - Signs of overheating - Lugs are not terminated correctly Major defects: When the damage poses a hazard to the safety of staff or the network			<u>Object Part</u>	- 1112: Conductor
			<u>Damage Code</u>	- 1398: Broken/damaged - 1149: Corrosion - 1368: Insulation Damaged
			<u>Cause Code</u>	- 1359: Age - 1042: Deterioration - 1059: Mechanical Failure
<u>Scope of Rectification Works</u> - Repair/replace conductors and busbars as required and ensure that they are rated for the required load. - For major issues, submit notification and raise a DRA for assessment.				

Defect Description	Defect Photo	Task Details
Bushings / Insulators – Major Damage		<u>Bushfire Defect</u> - No
<u>Priority</u> SAP Priority 6		<u>Standard Job</u> - 1TRBSH: Transmission Bushings
<u>Indicators</u> - Major cracking present - Large chunks of insulator missing - Major treeing/tracking		<u>Object Part</u> - 1003: Bushing - 1265: Insulator
		<u>Damage Code</u> - 1019: Loss of insulation - 1020: Tracking/PD - 1041: Damaged
		<u>Cause Code</u> - 1059: Mechanical Failure - 1156: Fault Operations - 1164: Unknown
<u>Scope of Rectification Works</u> Inspect surrounding bushings for signs of similar damage and replace all defective bushings as required.		

Defect Description		Defect Photo	Task Details	
Bushings / Insulators – Minor Damage			<u>Bushfire Defect</u>	- No
<u>Priority</u> SAP Priority 9			<u>Standard Job</u>	- 1TRBSH: Transmission Bushings
<u>Indicators</u> - Small chips or flakes of insulator missing - Minor cracking present - Some signs of tracking or corona			<u>Object Part</u>	- 1003: Bushing - 1265: Insulator
			<u>Damage Code</u>	- 1019: Loss of insulation - 1020: Tracking/PD - 1041: Damaged
			<u>Cause Code</u>	- 1059: Mechanical Failure - 1156: Fault Operations - 1164: Unknown
<u>Scope of Rectification Works</u> Inspect surrounding bushings for signs of similar damage. If appropriate coat exposed porcelain with Glyptal to seal the bushing. Record the defect in SAP to monitor for further deterioration				

Defect Description	Defect Photo	Task Details
Secondary / Control Systems – Faulty / Poor Condition		<u>Bushfire Defect</u> - No
<u>Priority</u> Major: SAP Priority 2 Minor: SAP Priority 7		<u>Standard Job</u> - 1DFSW: Rectify Secondary Wiring
<u>Indicators</u> - Secondary wiring looks/smells burnt - Secondary systems not working as expected - Equipment won't operate/communicate with SCADA or remote panels - System alarms relating to equipment that don't match up Major defects: When equipment is unable to be operated as required		<u>Object Part</u> - 1494: Control Pane - 1405: Cable - N/A: LV Fuses/CB/RCD
<u>Damage Code</u> - 1041: Damaged - 1032: Blown - 1368: Insulation Damaged		
<u>Cause Code</u> - 1059: Mechanical Failure - 1164: Unknown - 1117: Foreign Object/Vermin - 1156: Fault Operations		
<u>Scope of Rectification Works</u> - Repair/replace any secondary wiring that is defective - Repair/replace any defective secondary components as required (Links, Terminals, Fuses, etc.) and ensure equipment is operational prior to leaving site.		

15 Roles and Responsibilities

Listed below are the positions or groups of positions that have specific authorities and responsibilities associated with this policy/procedure. [List groups and positions in organisational hierarchical order].

General Manager Future Grid & Asset Management has the authority and responsibility for:

- approving this instruction;
- delegating any of these authorities and responsibilities to the Head of Asset Planning & Performance.

Head of Asset Planning & Performance has the authority and responsibility for:

- approving this instruction for minor changes and making recommendations to General Manager Operations for major changes in respect to this instruction.

Asset Risk & Performance Manager has the authority and responsibility for:

- keeping the contents of this instruction up to date.

Regional Transmission Managers have the authority and responsibility for:

- confirming that the inspectors are aware of their responsibilities under this instruction;
- verifying that all inspectors have been suitably trained;
- implementing this instruction;
- keeping the Asset Performance Manager informed of any factors that may prevent the acceptance of responsibility for its full implementation;
- verifying the data is being entered in SAP.

Transmission Technicians have the authority and responsibility for:

- carrying out all the procedures of this instruction, appropriate to each asset being examined;
- seeking clarification of this instruction, as required, from the Asset Performance Manager;
- entering the defect data in SAP and raising any concerns to the Asset Performance Manager.

