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Mains Maintenance Instruction

Underground transmission cables routine maintenance

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Mains Maintenance Instruction

PRIMARY SYSTEMS

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MMI 0006 UNDERGROUND TRANSMISSION CABLES ROUTINE MAINTENANCE

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1.0 PURPOSE

To specify the minimum standards for the routine maintenance of Endeavour Energy's underground pilot, sub-transmission and transmission cable system.

2.0 SCOPE

This Standard covers the routine maintenance of major underground pilot cables and underground power cables for voltages of 33kV and above, as well as the first section of high voltage distribution cable (11kV or 22kV) from a zone substation.

3.0 REFERENCES

Company Policy (Network) 9.9.1 – Network Asset Maintenance
Mains Maintenance Instruction MMI 0012 – Overhead transmission line routine inspection
Mains Maintenance Instruction MMI 0025 – Tests for transmission/sub-transmission underground cables
Substation Maintenance Instruction SMI 100 – Minimum requirements for maintenance of transmission and zone substation equipment.
Endeavour Energy Electrical Safety Rules
Network Management Plan December 2013 Review
Work Health and Safety Regulation 2011 (NSW)
Work Health and Safety Act 2011 (NSW)
ENA C(b)1 - 2006: Guidelines for design and maintenance of overhead distribution and transmission lines
ENA National Electricity Network Safety Code (Doc 01-2008)

4.0 DEFINITIONS AND ABBREVIATIONS

Critical cable

In the scope of this document, any wholly or partially underground section of a critical feeder. Guidance is provided in Annexure 1 – Critical 132, 66 and 33kV lines of MMI 0012 – Overhead transmission line routine inspection for overhead lines, many of which contain underground sections.

Critical feeder

A feeder that:

- is cyclically overloaded; or
- is a radial feeder for supply or backup of heavily loaded zone substations; or
- has a load over firm capacity for a group of ring feeders; or
- is a single feeder serving as backup and/or normal supply for multiple zone substations.

DBYD

Dial before you dig

Major pilot cable

Any underground pilot cable used for the protection of 132kV feeders.

5.0 ACTIONS

Routine maintenance shall be carried out on Endeavour Energy's underground pilot cables, sub-transmission cables, and transmission cables in accordance with this instruction.

5.1 Route patrols

Except for short lengths of underground feeders, that is, cables forming *tails* into substations less than approximately 200m in length, the routes of all underground 132kV feeders, 66kV/33kV oil and gas filled cables, critical 66kV/33kV cables and underground pilot cables, shall be patrolled at the frequencies shown below in Table 1.

Table 1: Patrol frequencies

Cable type	Patrol frequency
132kV cables	Weekly
66kV/33kV oil and gas filled cables	Every four (4) weeks
Critical 66kV/33kV cables	Every four (4) weeks
Major pilot cables (on-road)	Weekly
Major pilot cables (off-road)	Every four (4) weeks

The full underground route length of each feeder shall be patrolled and examined for activities, such as excavation works, which are being carried out in close proximity to the cables and that may result in damage to those cables. Before the route patrol has commenced, the patrolmen is required to check Dial Before You Dig (DBYD) notifications with Network Data & Performance. Any parties found to be carrying out such works and having not notified Endeavour Energy of works by way of DBYD notifications, shall be given written notice that:

- underground cables exist in close proximity to their work area;
- damaging any such cable is not only potentially dangerous, but also will render the party concerned liable to the full costs of repairs and for any losses resulting from the damage;
- copies of Endeavour Energy's underground cable records may be obtained from Endeavour Energy's Network Data & Performance Branch; and
- Arrangements can be made for suitable supervision to be provided while excavations proceed.

However, the patrolmen shall pass on by if it is known through the acquired DBYD notifications that correct procedures have been followed.

The patrol officer shall immediately report any activities that threaten the security of any of Endeavour Energy's underground cables (irrespective of voltage) to the Regional Transmission Manager or their delegate.

The supervisor shall take whatever steps are necessary, including obtaining a court order and summoning Police, to halt any activity that in their view may result in damage to any underground cable owned by Endeavour Energy.

Network Data & Performance shall be notified if correct DBYD procedures have **not** been followed, so that it may be included in the monthly reporting to the Department of Energy.

5.2 Electrical tests on cables

5.2.1 Power cables

Tests on power cables shall be carried out in accordance with Mains Maintenance Instruction MMI 0025 – Tests for transmission/sub-transmission underground cables, clause 5.5.

5.2.2 Pilot cables

Tests on pilot cables shall be carried out in accordance with Mains Maintenance Instruction MMI 0025 – Tests for transmission/sub-transmission underground cables, clause 5.6.

5.3 Thermal scan of cable terminations

Thermal scans of cable terminations in substations shall be carried out in accordance with Substation Maintenance Instruction SMI 100 -- Minimum requirements for maintenance of transmission and zone substation equipment. Thermal scans of cable terminations on overhead line shall be carried out in accordance with Mains Maintenance Instruction MMI 0012 – Overhead transmission line routine inspection.

5.4 Oil and gas pressure readings

For all oil and gas insulated cables, pressure readings shall be taken at all monitoring points at the frequencies shown in Table 2 below.

Records of oil and gas pressure readings shall be stored electronically on the network and kept for a minimum of two (2) years.

Table 2: Frequency of oil and gas pressure readings

Cable type	Pressure readings
Oil-filled, with single-level alarms	Every two (2) weeks
Oil-filled, with three-level alarms	Every four (4) weeks
Gas-filled, with single-level alarms	Every two (2) weeks
Gas-filled, with three-level alarms	Every four (4) weeks

5.4.1 Oil pressure tanks and oil leaks

Oil pressure tanks shall be refilled to maintain permitted pressure within each cable under any operating conditions. The permitted pressure will vary between each stop joint and will depend upon the cable route profile.

The oil leak rate can be estimated during refilling. If the oil leak rate is greater than five (5) litres per day, and depending on operational constraints, the feeder shall be taken out of service as soon as practically possible. The leak location shall be commenced within 24 hours after the feeder has been taken out of service. If any of these conditions cannot be met the Chief Engineer shall be consulted.

5.4.2 Gas cylinders changes

For gas insulated cables, gas cylinders shall be changed as required to maintain an acceptable pressure of gas within each cable. If gas cylinders are changed due to low pressure within a period of four (4) weeks, investigations shall be made to locate and repair the source of the leak.

5.4.3 Oil and gas pressure alarms system check

Oil pressure alarms system shall be checked every six (6) months for correct operation and accuracy, and re-calibrated/adjusted or repaired if necessary.

Gas pressure alarms system (including the condition of gas bottle) and gas regulator pressures shall be checked for good condition, correct operation and accuracy, and re-calibrated/adjusted or repaired if necessary every 12 months.

When low-level pressure alarm signals are received, an investigation shall be carried out and the problem associated with the alarms shall be rectified immediately. Details of the alarms shall also be recorded and kept for a minimum of five (5) years.

5.5 Cable route labelling

Cable route labelling shall be inspected, repaired and cleared of vegetation, as necessary, once every 12 months.

6.0 AUTHORITIES AND RESPONSIBILITIES

Chief Engineer has the authority and responsibility for approving this instruction.

Manager Primary Systems has the authority and responsibility for making recommendations to the Chief Engineer in respect to this instruction.

Network Maintenance Manager has the authority and responsibility for keeping the content of this instruction up to date.

Endeavour Energy employees and/or contractors have the authority and responsibility for:

- meeting the requirements of this instruction;
- working in accordance with local and statutory requirements;
- maintaining a high level of public safety;
- working in accordance with Endeavour Energy's Electrical Safety Rules;
- updating Endeavour Energy's databases as required; and
- reporting abnormalities found in the transmission lines to the Regional Transmission Manager.

Regional Transmission Manager has the authority and responsibility for:

- verifying that Endeavour Energy employees and/or contractors engaged to perform the work have appropriate qualifications and are competent to carry out the work;
- meeting the requirements of this instruction when carrying out maintenance work on the cable system;
- providing appropriate equipment and training; and
- taking actions to stop activities that threaten Endeavour Energy's assets.

7.0 DOCUMENT CONTROL

Documentation Content Coordinator: Network Maintenance Manager

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