

# Control and prevention of television and radio interference in 11kV-132kV overhead power lines

MMI 0005

Amendment No 5  
19 September 2019

## Revision History

This standard replaces amendment no 4. All changes are highlighted in this document with grey colouring.

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For any enquiries relating to the content of this document please contact the Standards Coordinator on 13 10 81.

## Document Control

Documentation content coordinator: Mains Assets Manager

Documentation process coordinator: Standards Process Coordinator

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## 1 Documentation Scope

To provide guidance on methods to control radio frequency and television interference from overhead power lines of between 11kV and 132kV inclusive.

This procedure applies to all overhead lines controlled by Endeavour Energy that carry voltages of 11kV or greater.

RFI and TVI complaints are detailed and managed according to Branch Workplace Instruction WAE 2003.

## 2 References

### External Regulations

Electricity Supply Act 1995 (NSW)

Electricity Supply (Safety and Network Management) Regulation 2014

Work Health and Safety Act 2011 (NSW)

Work Health and Safety Regulation 2017 (NSW)

Radiocommunications Act 1992

### External Standards

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

AS/NZS 7000:2016 - Overhead line design

AS/NZS 2344:2016 - Limits of electromagnetic interference from overhead a.c. powerlines and high voltage equipment installations in the frequency range 0.15 to 3000 MHz

### Company Policies and Procedures

Company Policy 9.2.5 - Network Asset Design

Company Policy 9.7.1 - Network Asset Construction

Company Policy 9.9.1 - Network Asset Maintenance

Company Procedure GAM 0089 – Authorisations Governance and Management

Branch Workplace Instruction WAE 2003 – Electric and magnetic fields (EMF) and radio frequency (RF) inquiry service

### Company Standards

Mains Construction Instruction MCI 0005 – Overhead construction standards manual

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- **MMI 0005 – Control and Prevention of RFI/TVI in**
- **overhead power lines**

### 3 Definitions and Abbreviations

| Abbreviation | Meaning                      |
|--------------|------------------------------|
| RFI          | Radio Frequency Interference |
| SWER         | Single Wire Earth Return     |
| TVI          | Television Interference      |

## 4 General Requirements

The construction methods and procedures detailed in this instruction are methods found to reduce the occurrence and production of interference caused by some overhead power lines. Where excessive inference is identified, the construction methods detailed in the following sections must be applied.

### 4.1 For 11/22kV and SWER construction

#### 4.1.1 General

Where excessive RFI / TVI is found on 11/22kV and SWER constructions, the following procedures must be applied to reduce or eliminate the interference. This applies to:

- All types of 11/22kV mains construction;
- Underslung links, air break switches and drop-out fuses;
- Pole substations; and
- Open points of HV ABC construction.

#### 4.1.2 Bolted connections

The appropriate sized square washer, volute coil spring washer and round washer must be installed on **all** bolted connections onto poles and crossarms, for example, each bolt, coach screw, pin insulator and, in the case of double cross arms, on the spreader bolts as shown in Figure 1.

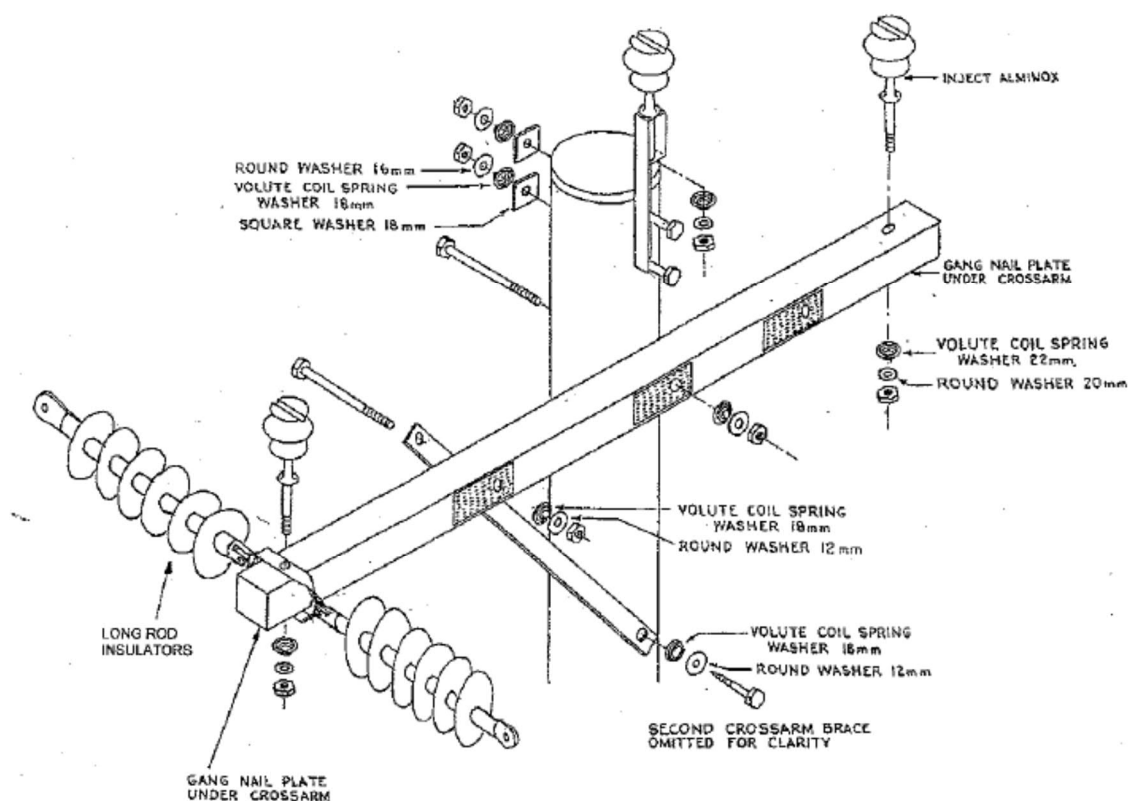


Figure 1 – Bolted connection details

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Where gang nails have been applied to crossarm penetrations, square washers are not required. Annexure 1 details the applicable stockcodes and parts.

### 4.1.3 Pin insulators

The cavity of pin insulators must be filled to 1/3 of the depth of the cavity with an electrical jointing compound prior to fitting the pin (Stockcode: 1033566). This will remove any air gap in the insulator, eliminating any possible source of corona discharge due to dags or burrs on the insulator pin.

No more than three (3) threads of the insulator pin are to be exposed once the pin is fully screwed into the insulator.

### 4.1.4 Tie wire

It is essential that the tie wire used to secure the conductor to the insulator be finished off correctly. The ties must be rounded off smoothly, leaving no sharp points. Similarly, the armour tape must be rounded under the tie wire leaving no sharp points.

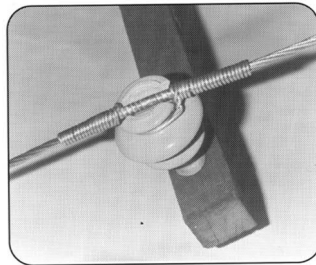


Figure 2 – Correctly fitted tie-wire

### 4.1.5 Clevis tongue disc insulators

If TVI is found on distribution clevis tongue disc insulators, they should be replaced with polymer long rod insulators.

### 4.1.6 Air break switches and underslung links

Existing air break switches and underslung links with U-bolt connections have been known to cause RFI/TVI due to the connector becoming loose and allowing dirt accumulation in the joint. If this occurs, the U-bolt connections should be replaced with lug connections.

### 4.1.7 Copper joints

McIntyre sleeves have also been known to cause RFI/TVI. The sleeves are of twisted copper and are found only on copper conductors. When identified as causing interference, these sleeves must be replaced with copper compression sleeves.

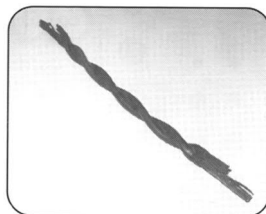


Figure 3: McIntyre sleeves

## **4.2 For 33/66/132kV construction**

Where excessive RFI / TVI is found on 33/66/132kV constructions, the following procedures must be applied to reduce or eliminate the interference.

All new subtransmission and transmission construction must use polymer long rod or post insulators. These insulators, by their inherent design, prevent corona discharge, and are also more advantageous to live line work.

The use of round washers, volute coil springs and square washers will be required for all bolted connections on poles and crossarms.

### **4.2.1 Clevis-tongue disc insulators**

A clevis shunt must be inserted using the shunt applicator tool on either side of the tongue of one insulator and the clevis of the other insulator. On some insulators, depending upon the size of the gap between the tongue and clevis, one (1) shunt only may be required.

Hexagonal pins must be used, instead of the standard round pins, to secure the bow shackle to the eye bolt on the crossarm, and the insulator onto the bow shackle.

This also applies to 66kV and 132kV clevis-tongue disc insulator construction.

When audible corona discharge is causing concern to residents, these construction types must be replaced either with ball and socket, synthetic, or post insulators.

Hexagonal pins are not required on tension insulator assemblies.

### **4.2.2 Ball and socket disc insulators**

On suspension constructions using ball and socket disc insulators, a hexagonal pin must be used to secure the ball shackle to the eyebolt on the crossarm, instead of the standard round pin.

If pre-formed end fittings are to be used with ball and socket disc insulators for 66kV and 132kV construction, a circular split pin must be used to secure the thimble to the socket tongue.

Unlike the conventional humpback split pin, the circular split pin prevents corona discharge from this end fitting.

In addition, it should be noted that a clevis shunt is also required between the socket tongue and thimble.

### **4.2.3 Synthetic insulators**

Unlike a string of disc insulators, synthetic insulators are essentially made from non-metallic material, therefore gap-arcing phenomena does not occur. Corona discharge phenomena, however, may still occur at the end fittings for 66kV and 132kV construction. Therefore, procedures should be used similar to those for the end fittings on ball and socket disc insulators.

## 5 Authorities and Responsibilities

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

**Manager Asset Standards and Design** has the delegated authority and responsibility for approving this Standard and keeping it up to date.

**Mains Assets Manager** has the authority and responsibility for keeping the content of this instruction up to date.

All **Endeavour Energy employees** and contractors have the authority and responsibility for:

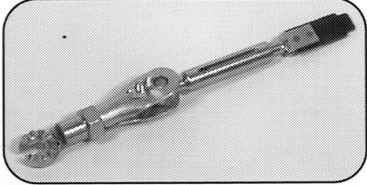
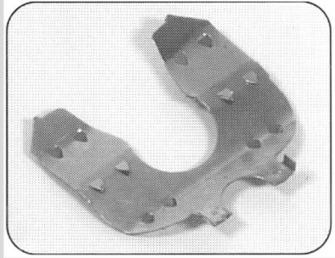
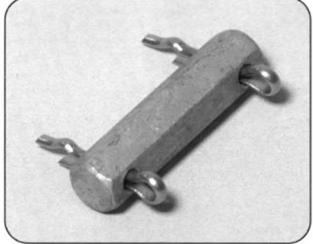
- meeting the requirements of this instruction;
- working in accordance with local and statutory requirements;
- managing public safety;
- working in accordance with Endeavour Energy's Electrical Safety Rules;
- confirming that employees and contractors who carry out these instructions have been authorised in accordance with GAM 0089.

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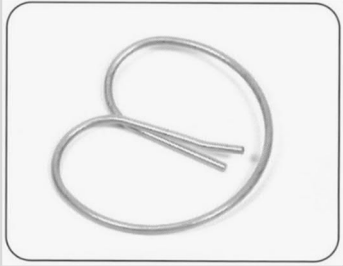
### 6 Annexures

#### 6.1 Annexure 1 – TVI and RFI Prevention Equipment

The following equipment will be required to control and prevent RFI and TVI in overhead power lines.

| Part description                                             | Stockcode | Drawing Number | Picture                                                                               |
|--------------------------------------------------------------|-----------|----------------|---------------------------------------------------------------------------------------|
| Shunt Applicator tool                                        | TS10014   | N/A            |    |
| Clevis Shunt                                                 | SS18569   | N/A            |    |
| Volute coil spring washer 18mm<br>(To suit M12 to M16 bolts) | SW11988   | 059556         |  |
| Volute coil spring washer 22mm<br>(To suit M20 to M24 bolts) | SW11961   | 059556         |  |
| Hexagonal pin                                                | SP10064   | 060885         |  |

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| Part description             | Stockcode | Drawing Number | Picture                                                                             |
|------------------------------|-----------|----------------|-------------------------------------------------------------------------------------|
| Circular split pin           | SP10056   | 241283         |  |
| Electrical jointing compound | 1033566   | N/A            |  |

## 6.2 Annexure 2 – Additional/ Supplementary Drawings

| Drawing no. | Amendment no. | Subject                                       |
|-------------|---------------|-----------------------------------------------|
| 059556      | C             | Volute coil spring washer fabrication details |
| 060885      | C             | Hexagonal clevis pin detail                   |
| 241283      | A             | Split pin circular anti-corona type detail    |

**Produced by Asset Standards and Design Branch**

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