

Electricity Specification 409

Issue 4 September 2023

Overhead Line Portable Earths (Including Application Tools)



Amendment Summary

ISSUE NO. DATE	DESCRIPTION
Issue 3 April 2022	Updated to the new document template. Updated reference to ENA TS 43-21. Prepared by: D.M. Talbot Approved by: Policy Approval Panel and signed on its behalf by Steve Cox, DSO Director
Issue 4 September 2023	Addition option added for alternative line end clamp in appendix A2.2 . Prepared by: D.M. Talbot Approved by: Policy Approval Panel and signed on its behalf by Steve Cox, DSO Director

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1 Introduction

This Specification comprises general, technical and performance requirements for overhead line portable earths – also referred to as additional earths or operational earths – for use on the overhead line network (Network) owned by Electricity North West Limited (Electricity North West), as Distribution Licensee.

The purpose of portable earths is to provide protection for linesmen when they are working on dead overhead circuits. Voltages and currents can be generated by different mechanisms. For example, induction from an adjacent circuit or atmospheric conditions.

Examples of earths and earthing kits for different line types and voltages are included in [Appendix A](#).

2 Scope

This Specification covers overhead line portable earths (including application tools) for voltages up to and including 132kV. This Specification covers all conductors carried overhead on any form of support.

Portable earths comprise:

- Flexible conductors (and associated clamps) for connection between overhead lines and earths.
- Mechanical plant earths.
- Running earth accessories.
- Operating rods (also referred to as poles).

3 Definitions

Approval	Sanction by the Electricity North West Overhead Line Circuits Policy Manager that specified criteria have been satisfied
Contract	The agreement between Electricity North West and the Contractor for the execution of the Works including therein all documents to which reference may properly be made in order to ascertain the rights and obligations of the parties under the said agreement.
Contractor	The person or person's firm or company, including personal representatives, successors and permitted assigns, who's Tender has been accepted by Electricity North West.
Specification	The Specifications and schedules (if any) agreed by the parties for the purpose of the Contract.
Sub-Contractor	Any person (other than the Contractor) named in the Contract for any part of the Works or any person to whom any part of the Contract has been sub-let with the consent in writing of the Electricity North West Overhead Line Circuits Policy Manager, and the legal representatives, successors and assigns of such person.

Supplier	Any person or person's firm or company who supplies goods to Electricity North West or to its Contractor.
Tender	An offer in writing to execute work or supply goods at a fixed price.
Tenderer	The person or person's firm or company, including personal representatives, successors and permitted assigns, invited by Electricity North West to submit a Tender.

4 General Requirements for Approvals and Testing

4.1 Product not to be Changed

No change in the product, packaging or labelling shall be made after Approval has been granted without prior notice to the Electricity North West Overhead Line Circuits Policy Manager, and receipt of a written agreement to the proposed change from the Electricity North West Overhead Line Circuits Policy Manager.

4.2 Electricity North West Technical Approval

The Tenderer shall submit, with this Tender, proposals for testing which will demonstrate, to the satisfaction of the Electricity North West Overhead Line Circuits Policy Manager, compliance with this Specification. Such tests shall be carried out without expense to Electricity North West.

Alternatively, technical reports and other data may be submitted that the Tenderer considers will demonstrate, to the satisfaction of the Electricity North West Overhead Line Circuits Policy Manager, compliance with this Specification. Acceptance of this evidence shall be at the discretion of the Electricity North West Overhead Line Circuits Policy Manager but will not be unreasonably withheld.

Approval shall be 'factory specific' and is not transferable to another factory without the written Approval of the Electricity North West Overhead Line Circuits Policy Manager.

The Supplier and product shall comply with all the relevant requirements of Electricity North West document CP311.

4.3 Quality Assurance

The Tenderer shall confirm whether or not Approval is held in accordance with a quality assurance scheme accredited under ISO 9000. If not, the Tenderer shall submit a statement of the quality assurance procedures employed to control the quality of the product, including the performance of Suppliers and Sub-Contractors.

The right is reserved for the repeat of such tests, from time to time, that the Electricity North West Overhead Line Circuits Policy Manager may deem to be reasonably necessary to demonstrate continued compliance with the Specification.

The Tenderer shall submit, with the Tender, a list of tests and inspections which are carried out on the product prior to despatch which shall demonstrate, to the satisfaction of the Electricity North West Overhead Line Circuits Policy Manager, fitness for installation and service.

The Tenderer shall provide free of charge to Electricity North West such samples as may, in the opinion of the Electricity North West Overhead Line Circuits Policy Manager, be reasonably required for inspection and/or retention as quality control samples. The Electricity North West Overhead Line Circuits Policy Manager will confirm the requirement for samples at the time of Tendering.

The right is reserved for inspections to be made of Tenderer's facilities, from time to time, as deemed reasonably necessary by the Electricity North West Overhead Line Circuits Policy Manager to ensure compliance with this Specification and any Contract of which it forms a part.

The Tenderer shall submit, with the Tender, such details of product packaging disposal, as will enable Electricity North West to comply with the requirements of BS EN ISO 14001 - Environmental Management Systems.

4.4 Formulation

The Tenderer shall submit, with the Tender, such details of the formulation and use of the product and associated substances as will enable Electricity North West to comply with the obligations of the Health and Safety at Work Act 1974 and the Control of Substances Hazardous to Health Regulations 2002, in the use, storage and disposal of the product. The Tenderer may stipulate, prior to submission of such information, that it is to remain confidential, and the Electricity North West Overhead Line Circuits Policy Manager will, if requested, confirm agreement to this prior to receipt of the information.

4.5 Identification Markings

The Tenderer shall submit, with the Tender, details of markings which it is proposed to apply to the product or packaging to identify manufacturing batches or items. The forms and content of such markings shall be subject to the Approval of the Electricity North West Overhead Line Circuits Policy Manager and shall in all cases include the Electricity North West approved description and commodity code number.

The Tenderer shall submit, with the Tender, such details of marking gross weight on components, assemblies and packages, as will enable Electricity North West to comply with the Health and Safety Manual Handling Operation Regulations 1992, for components, assemblies and packages supplied with a gross weight over 1kg. The forms and content of such markings shall be subject to the Approval of the Electricity North West Overhead Line Circuits Policy Manager.

4.6 Minimum Life Expectancy

The minimum life expectancy of all products covered by this Specification is 10 years.

4.7 Product Conformity

Preference will be given to those Suppliers who can provide suitable product conformity certification to a recognised or specified standard, or an equivalent certification.

4.8 Confirmation of Conformance

The Tenderer shall complete the conformance declaration sheets in [Appendix B](#). Failure to complete these declaration sheets may result in an unacceptable bid.

5 Requirements for Type and Routine Testing

The Electricity North West Overhead Line Circuits Policy Manager shall set out the requirement of the following tests to be carried out by the Supplier at the Supplier's cost.

5.1 Requirement for Type Tests at Suppliers Premises

These are a series of one-off type tests, which are carried out to ensure the satisfactory performance of the product design, under extremes of operating stresses, and of endurance, as may be appropriate, to be determined by the Electricity North West Overhead Line Circuits Policy Manager.

These may or may not be destructive tests.

5.2 Requirement for Routine Tests at the Supplier's Premises

These tests may be required to be carried out on every individual unit or component, as specified, or at some regular frequency to be determined by the Electricity North West Overhead Line Circuits Policy Manager.

The results of these tests may be required to be supplied to Electricity North West with each unit purchased or retained for inspection, at a period to be determined by the Electricity North West Overhead Line Circuits Policy Manager.

6 Technical and Performance Requirements

6.1 General

Earthing equipment is used outdoors in all weathers and shall be constructed of durable, impact resistant and corrosion resistant materials.

6.2 Compliance with Standards

The equipment to be supplied shall comply with the requirements of ENA TS 43-21 except where stated otherwise.

6.3 Insulating Materials

Insulated parts (in particular the operating rods) shall be constructed using synthetic materials resistant to the absorption of water, complying with the quality, constructional, mechanical and electrical requirements of:

- ENA TS 26-1 for "Insulating Foam Filled Tube and Solid Rod for Live Working".
- ENA TS 26-2 for "Insulated Tools for Live Working on High Voltage Overhead Lines".

All materials employed in the construction of earths and operating rods shall be resistant to degradation by exposure to ultraviolet light (from natural daylight).

Surfaces shall be glossy and resistant to the accumulation of dirt.

6.4 Metal Parts

All metal parts shall be constructed of steel, brass or high strength heat treated aluminium alloy. They shall be protected against corrosion either by their inherent composition, or by an appropriate treatment (refer to ENA TS 26-2 Section 2.3). Where different metals are in contact, regard shall be paid in the design of the tool to eliminate the possible effects of bimetallic corrosion. Aluminium alloy shall not be used for parts subjected to high stress or frictional loads. All conductors shall be flexible fine stranded types, terminated with compression fittings.

6.5 Equipment Bags

Individual sets of portable earthing equipment and operating rods are to be supplied in suitable carrying bags. The carrying bags shall be capable of withstanding rough handling, and shall prevent the ingress of dirt, etc.

They shall be clearly marked as follows:

- Electricity North West LV EARTH SET.
- Electricity North West WOOD POLE EARTH SET (1 to 33kV).
- Electricity North West RUNNING EARTH ACCESSORY SET (up to 33kV).
- Electricity North West RUNNING EARTH ACCESSORY SET (132kV).
- Electricity North West MECHANICAL PLANT EARTH.
- Electricity North West EARTH OPERATING ROD (up to 33kV).
- Electricity North West EARTH OPERATING ROD (132kV).

7 Equipment Schedule

7.1 General

Equipment sets shall comprise the items listed in this section. Additional items (spares, etc) or alternatives shall be identified in the Tender. (These additional items shall also meet the requirements of this Specification.)

Examples of portable earthing components and earthing arrangements are shown in [Appendix A](#).

NOTE: that alternative materials and/or arrangements to those specified in this section shall meet the rest of the requirements of this Specification for at least the minimum specified life expectancy ([Section 4.6](#)).

7.2 Portable Earthing Equipment for Wood Pole Overhead Lines (up to and including 33kV)

7.2.1 Portable Earths for LV Overhead Lines

The complete set shall comprise the following items:

- A set of five interconnected conductors each equipped with a screw closure 'Hook on and screw close' connector (or other clamping arrangement that will provide equivalent electrical connection), suitable for connection to LV conductors included in ES400C3.

The above conductors may be in the form of 50mm² aluminium flexible conductors or a five-way 25mm² copper bond lead tress, or suitable alternative that meets the same performance standard.

The lengths of conductor shall be sufficient to allow the earths to be applied to LV overhead lines with up to 305mm conductor spacing. Complete earths for LV use shall be tested to withstand 7.5kA for 1 second.

Refer to the examples included in [Appendix A, Section A1](#).

7.2.2 Portable Earths for HV Overhead Lines

7.2.2.1 General

Refer to [Appendix A, Sections A2.1](#) and [A2.2](#) for two basic arrangements.

A complete set comprises:

- A cable tress for connecting each phase to a common earth (provided by four interconnected earth rods). Each cable end shall be terminated by an appropriate clamp.
- A set of four interconnected earth rods (to provide the earth for the above cable tress).

Detailed requirements for the above components are given in the following sub-sections.

7.2.2.2 Cable Tress

The cable tress shall comprise two or three 120mm² fine stranded aluminium flexible conductors (phase leads), each 3m long, connected to a single 50mm² fine stranded aluminium flexible earth conductor (earth down lead), 15m long.

NOTE: that in the example shown in [Appendix A, Section A2.2](#), the centre phase parking bar provides interconnection for all three phases and the earth down lead, therefore, there is no need for the pole-mounted star point described below, nor a phase lead for the centre phase.

All the conductors shall be insulated with:

- Orange coloured PVC insulation to BS2751, Class Type B, or
- An equivalent insulating material that will meet the requirements of this Specification for the expected lifetime.

The pole-mounted star point connection ([Appendix A, Section A2.1](#) arrangement only) shall provide a common connection point for the above earth down lead and the three phase leads. It shall be capable of temporary attachment to a pole, for example by means of a belt and buckle, before application of the line end clamps.

Each of the phase leads shall be terminated by a line end clamp (refer to [Section 7.2.2.3](#) below), suitable for clamping to HV (1kV to 33kV) conductors included in ES400C3.

7.2.2.3 Line End Clamps

Phase connections between the above cable tress and the phase conductors shall made by three hook-on and screw-close line end clamps. Each clamp shall be:

- Suitable for clamping to HV (1kV to 33kV) conductors included in ES400C3 (refer to [Section 7.2.2.2](#) above).
- Fitted with standard 'ring' type closure devices as shown in [Appendix A, Section A2.1](#), allowing closure by the same tool as used for Electricity North West's live line taps (refer to [Section 7.2.5](#)).

Complete connection sufficient to achieve the short circuit capability of 120mm² aluminium conductor, shall be achieved at a torque of 22Nm and the clamp shall be capable of resisting a torque of 45Nm without damage to itself or the conductor.

The method of coupling the operating rod to the clamp shall allow application at angles between 45 and 90° to the axis of the conductor. One clamp shall be provided with a parking bar, capable of accepting the other two clamps

7.2.2.4 Earth End Clamp

The earth down lead from the above cable tress (refer to [Section 7.2.2.2](#) above) shall be terminated by an earth end clamp.

The earth end clamp shall be:

- Capable of connection to round earth conductors in the range 4mm to 20mm diameter and rectangular earth conductors in the range 3mm to 17mm, ie the earth down lead specified in [Section 7.2.2.2](#) above.
- Suitable for clamping to the four interconnected earth rods specified in [Section 7.2.2.5](#) below.
- Capable of operation by hand or using the same tool as supplied for the line end clamps.

Complete connection shall be achieved at a torque of 22Nm, even if the conductor is painted. The clamp shall be capable of resisting a torque of 45Nm without damage to itself or the conductor.

7.2.2.5 Set of Four Interconnected Earth Rods

The four earth rods shall be:

- Permanently connected to a central aluminium bar, or other suitable star point connection by four 1m lengths of 50mm² aluminium fine stranded conductor.
- Copper clad steel, 850mm in length, or other material that will meet the requirements of this Specification. The bar shall be capable of accepting the earth clamp defined above. This device is intended to be used as a temporary earth.

Complete portable arrangements for HV use shall be tested to withstand 17.5kA for 1 second in accordance with ENA TS 43-21. Refer to [Appendix A, Section A2.2](#) for an example of a complete portable HV earthing arrangement.

7.2.3 Running Earth Accessory

An example running earth accessory is shown in [Appendix A, Section A2.3](#).

This set of three identical devices is intended to earth HV conductors which are being run out. Each accessory shall be of robust construction, generally of aluminium with the exception of stressed parts or those parts subjected to friction, which shall be of steel. The plate body shall be fitted with two outer fixed wheels and one inner sprung jockey wheel, the latter capable of spring force adjustment.

All the wheels are to be grooved to fit HV (1kV to 33kV) conductors included in ES400C3. A bar shall be fitted, capable of accepting 'Hook on and screw close' clamps and a hole 35mm in diameter shall be provided to accept a stabilising rope. The centre of gravity of the complete accessory is to be such that it is stable in the vertical position when fitted to the conductor.

7.2.4 Mechanical Plant Earth

An example of earthed plant is shown in [Appendix A, Section A2.4](#).

This comprises a 50mm² fine stranded aluminium flexible earth conductor, 4m long, insulated with durable, clear PVC tubing or opaque ethylene propylene rubber of minimum thickness 2.0mm or an equivalent insulating material that will meet the requirements of this Specification. One end is to be fitted with a clamp capable of connection to round earth conductors in the range 4mm to 20mm diameter and rectangular earth conductors in the range 3mm to 17mm. This clamp shall be capable of operation by hand or using the same tool as supplied for the HV earth clamps. Complete connection shall be achieved at a torque of 22Nm, even if the conductor is painted, and the clamp shall be capable of resisting a torque of 45Nm without damage to itself or the conductor. The other end shall be connected to a replaceable earth rod.

Alternatively, this may be supplied as a complete kit (refer to the example in [Appendix A, Section A2.4](#)).

7.2.5 Operating Rods for use with HV Overhead Line Earths

Application of HV earthing kit using an operating rod (earthing pole) is shown in the drawing in [Appendix A, Section A2.1](#).

The operating rod set shall comprise the following:

- Glass reinforced plastic insulated operating rod with high gloss finish, having a length of 2.4m, to allow a minimum clearance of 1.1m between the operator's body and any high voltage conductors or insulators supporting them (ENA TS 43-81 Section 3.6). It is permissible for the operating rod to comprise two shorter lengths, but if so, it shall not be possible to operate with a rod less than:

1.5m in length (HV up to and including 33kV), or
1.7m in length (132kV).

Operating rods must be so designed that it is possible to add extra sections of rod, if required.

- Interchangeable heads for both 'Bayonet 12mm diameter rod/5mm cross pin' and 'Ring' operated clamps (as sketched above). Alternatively, two separate upper rods with fixed heads for the required purposes may be supplied.

7.3 Portable Earthing Equipment for Wood Pole Overhead Lines (132kV)

7.3.1 Portable Earths for 132kV Overhead Lines

The design is the same as that for the HV portable set specified in [Section 7.2.2](#), but with the following differences:

- Longer phase lead (4m).
- Longer earth down lead (20m).

Suitable for connection to 132kV conductors included in ES400C3

7.3.2 Running Earth Accessory

The running earth shall be similar to the running earth specified in [Section 7.2.3](#) and shown in [Appendix A, Section A2.3](#), but shall be suitable for use on 132kV conductors included in ES400C3.

7.3.3 Mechanical Plant Earth

Refer to [Section 7.2.4](#).

7.3.4 Operating Rods for use with 132kV Overhead Line Earths

Refer to [Section 7.2.5](#).

7.4 Portable Earthing Equipment for Steel Tower Overhead Lines (33kV and 132kV)

7.4.1 General

Examples of portable earthing components for steel tower earths are shown in [Appendix A, Section A3](#).

Additional earthing equipment shall generally be to National Grid Safety Rules, NSI 4.

7.4.2 Additional Earth Leads

An additional earth lead is used to connect each phase conductor to the tower steelwork. (Refer to "Normal and trailing earth" in [Appendix A, Section A3](#).)

Each additional earth lead shall:

- Comprise 50mm² fine stranded aluminium flexible conductor covered by transparent plastic covering to give added protection to the earth lead whilst permitting visual inspection of the condition of the aluminium alloy strands.
- Be terminated at one end by a conductor clamp (refer to [Section 7.4.3](#)) – for connection to the phase conductor.

Be terminated at the other end by an earth end clamp (refer to [Section 7.4.4](#)) – for connection to the tower steelwork.

7.4.3 Conductor Clamps

Conductor clamps shall:

- Be suitable for attachment to all line conductors specified in ES400C4.
- Have bolted type connections for the additional earth lead to facilitate inspection and site repair.

Be capable of being applied by the operating rod specified below

7.4.4 Earth End Clamps

Earth end clamps shall:

- Incorporate a steel tip on the clamping screw to penetrate paint films.
- Have bolted type connections for the additional earth lead to facilitate inspection and site repair.
- Be capable of being applied by the operating rod specified below.

7.4.5 Bridging Earth Leads

A bridging earth lead is only used to bridge across an insulator string.

The specification for bridging earth leads is the same as that for additional earth leads above ([Section 7.4.2](#)) with the following exceptions:

- The covering shall green translucent plastic.
- Each bridging earth lead shall be terminated at one end by an earth end lug. The lug shall incorporate a 5/8" bolt for attachment to 11/16" hole in ball-ended eye-link.
- Each bridging earth lead shall be terminated at the other end by the conductor clamp specified in [Section 7.4.3](#).

7.4.6 CME for Tower Earth

The specification for CME (Circuit Main Earth) leads is the same as that for additional earth leads above ([Section 7.4.2](#)) with the following exception:

- Diameter shall be 120mm².

7.4.7 Earthing Spike

The earthing spike shall be made from 50mm x 50mm x 6mm MS angle section 1m long, tapered to a point at one end and with a striking plate welded to the other end.

7.4.8 Earthing Bridle

The earthing bridle shall comprise a bolted tee connector fitted mid-way along a length (approximately 6m) of earth lead with earthing conductor clamps at each end. The tee connector shall accommodate a bridging earth end lug fitted to a length (approximately 3m) of earth lead, the other end of which shall be fitted with an earth end clamp for attachment to tower steelwork or to an earthing spike.

7.4.9 Running Earth Accessory

The running earth shall be similar to the running earth specified in [Section 7.2.3](#) and shown in [Appendix A, Section A3](#).

The running earth shall be capable of being used on conductors of diameter up to and including Rubus.

7.4.10 Mechanical Plant Earth

Refer to [Section 7.2.4](#).

7.4.11 Operating Rods for use with Steel Tower Overhead Line Earths

Glass fibre operating poles for placing and removing the conductor clamps shall generally comply [Section 7.2.5](#).

8 Variations

In Appendix A, the Tenderer shall provide details of variations from the above Specification.

9 Documents Referenced

DOCUMENTS REFERENCED	
Health and Safety at Work Act 1974	
Control of Substances Hazardous to Health Regulations 2002	
Manual Handling Operations Regulations 1992	
BS EN ISO 9000	Quality management systems
BS EN ISO 14001	Environmental management systems. Requirements with guidance for use
ENA TS 26-1	Insulating Foam Filled Tube and Solid Rod for Live Working.
ENA TS 26-2	Insulated Tools for Live Working on High Voltage Overhead Lines.
ENA TS 43-21	Portable Earthing Equipment for Overhead Lines & Substations

National Grid Safety Rules, NSI 4	
CP311	Equipment Approval Policy and Process
ES400C3	Wood Pole Overhead Line Conductors (up to and including 132kV)
ES400C4	Steel Tower Overhead Line Conductors (33kV and 132kV)

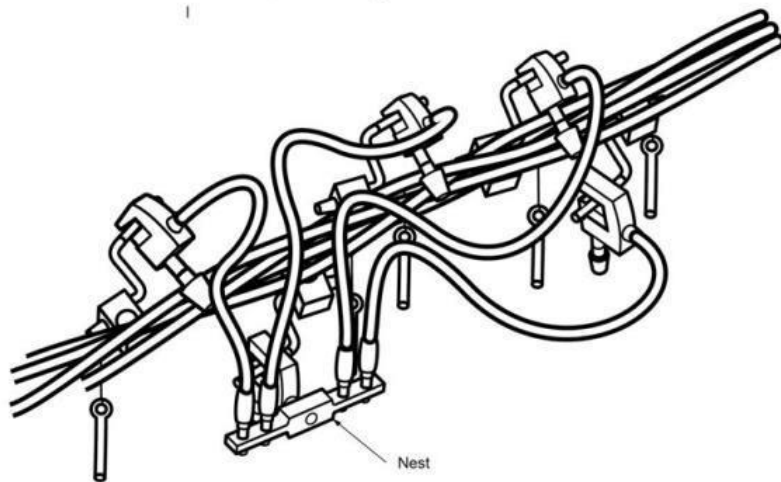
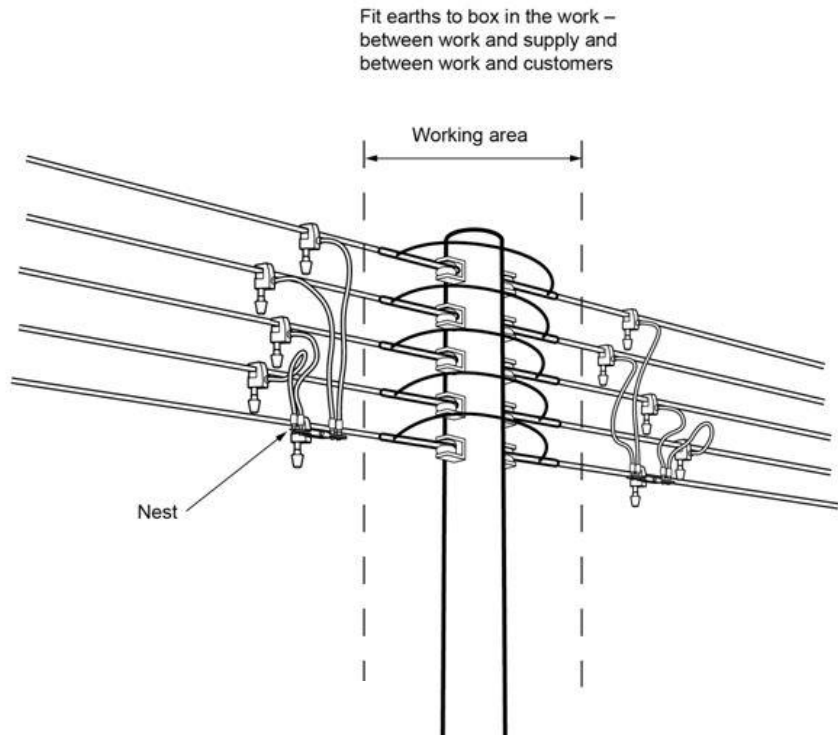
10 Keywords

Earthing; portable.

Appendix A – Kits, Application Equipment and Items Required

A1 LV

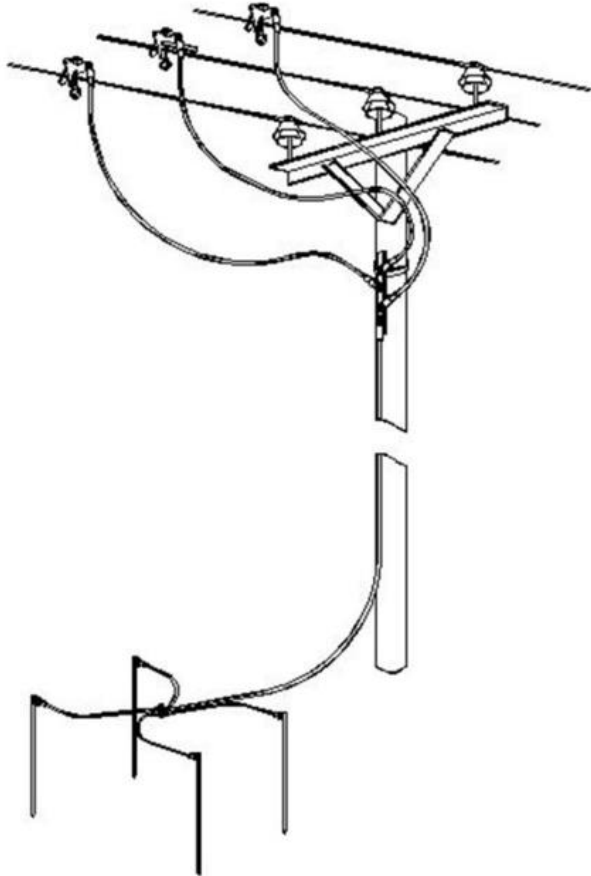
Examples of different types of portable LV earthing kit are shown below. Note that the bottom arrangement shows an earthing kit connected to LV ABC.



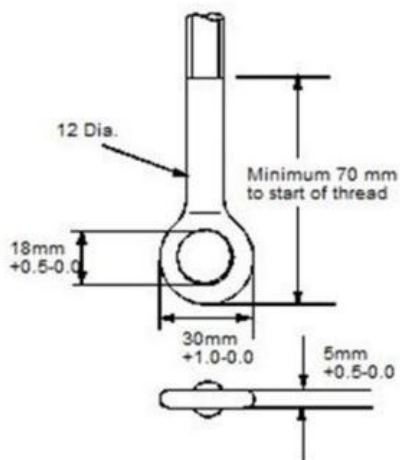
A2 Wood Pole Lines – 1kV up to and Including 33kV

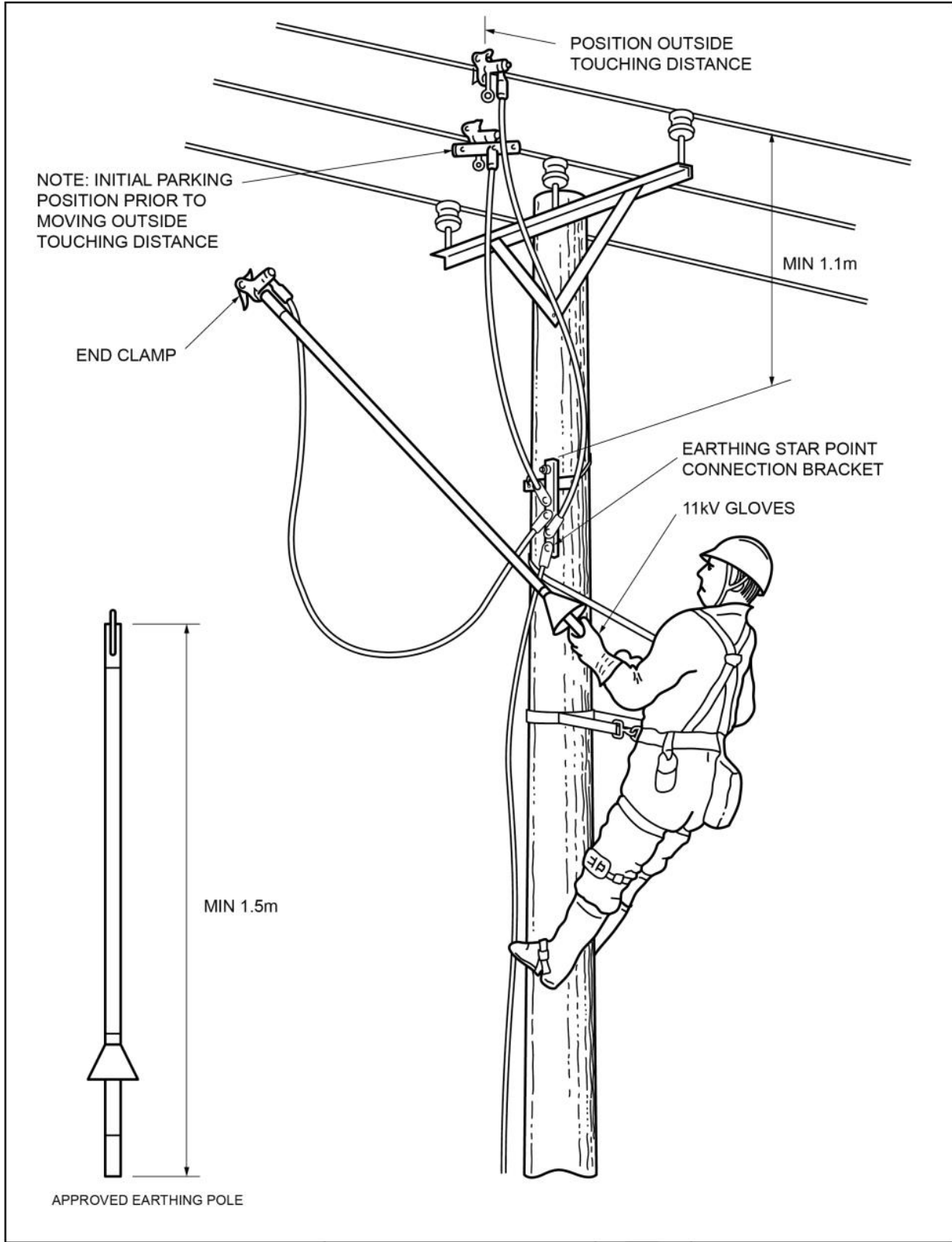
A2.1 Example of Traditional Portable Earth for HV Overhead Line

Example of a Portable HV Earthing Arrangement



Standard Ring Type Closure Device



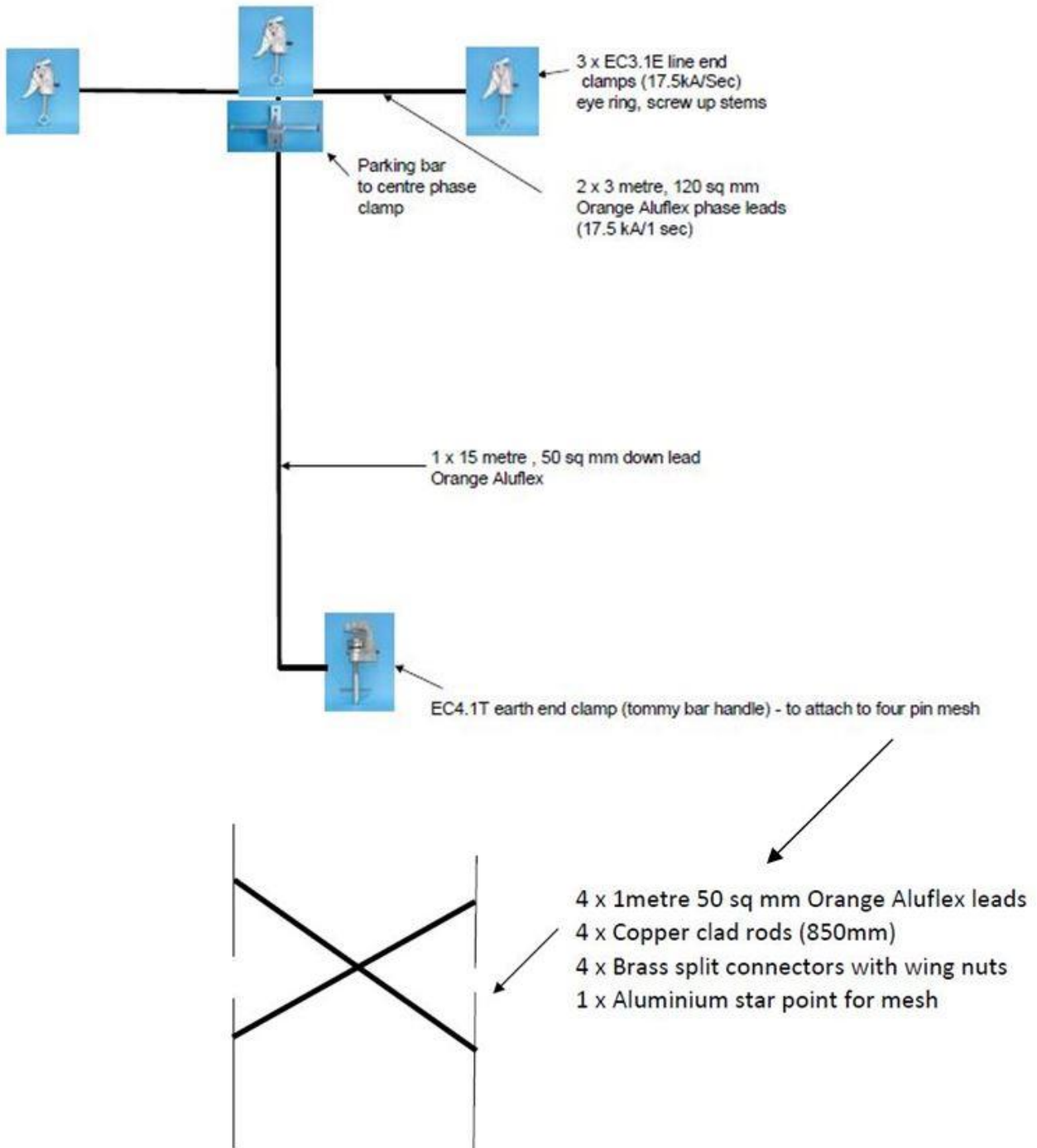


<p>OPERATIONAL EARTHING OF AN OVERHEAD LINE</p>	<p>Change information for this issue Climbing equipment updated</p>	<p>Appears in CP430 Pt 1</p>	<p>electricity north west</p> <p>I-430P1-M151-001 Iss 3 sht 1 of 1 Scale: nts Auth: DMT Date: 24/7/2014</p>
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A2.2 Example of Alternative Portable Earth for HV Overhead Line

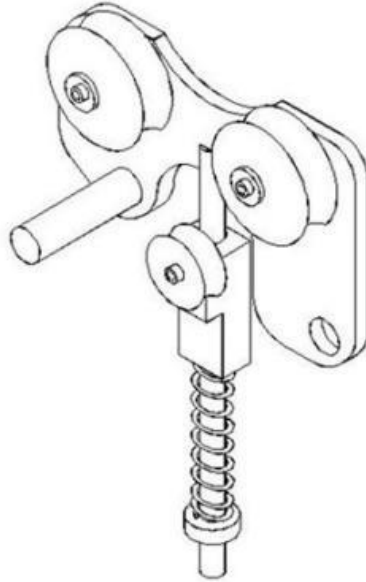
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NOTE: that this arrangement does not use a star point. Can be either EC3.1E or EC3.2E line end clamps.



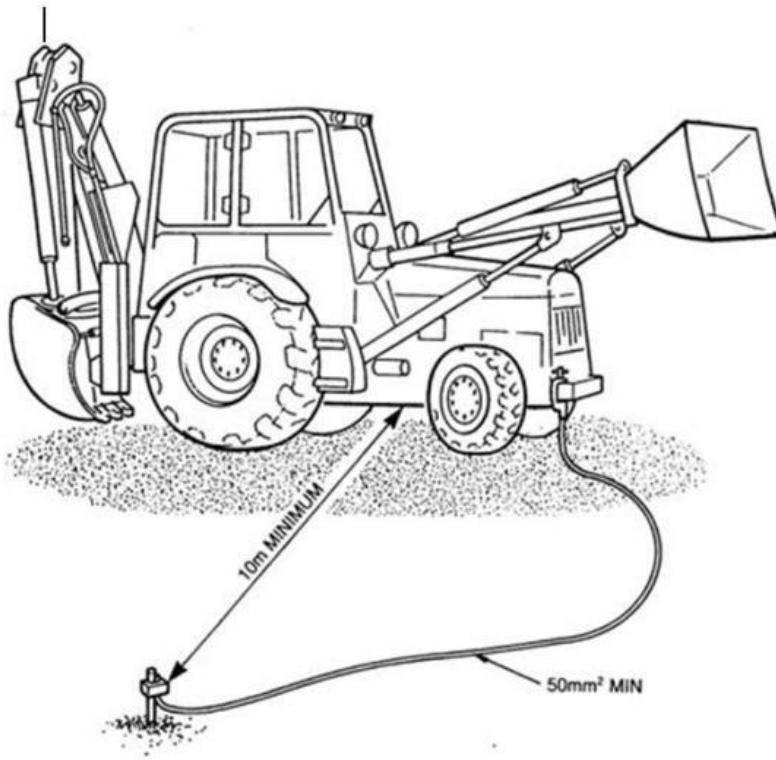
A2.3 Example of Running Earth for HV Overhead Line

Example of a Running Earth Accessory

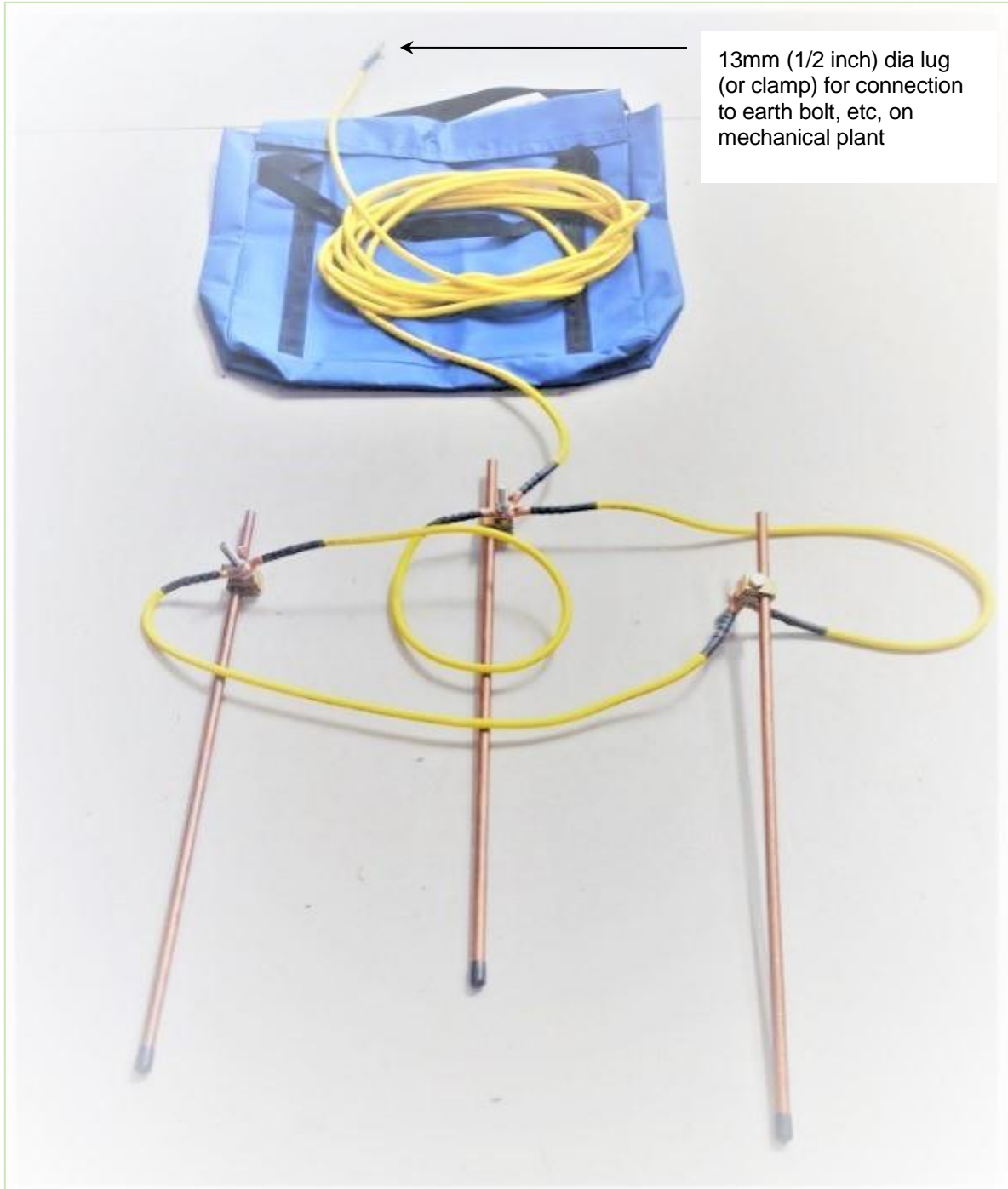


A2.4 Example of Mechanical Plant Earth

Example of a Mechanical Plant Earth

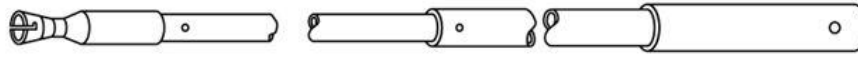


Example of Earth Kit for Mechanical Plant

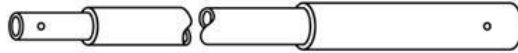


A3 Steel Tower Lines – 33kV and 132kV

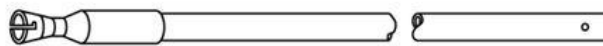
Examples of earthing equipment are illustrated below. The photograph illustrates the requirement for a shorter operating rod (pole) in certain situations.



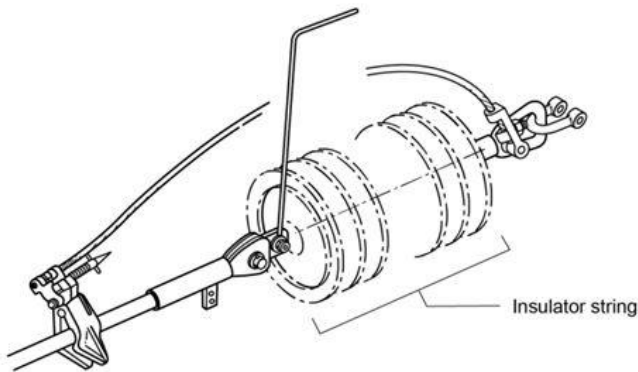
2.4m to 4.8m telescopic pole



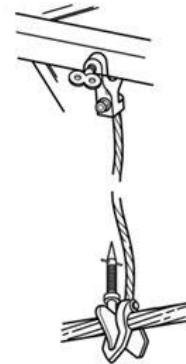
1.8m extension for telescopic pole



2.4m standard pole

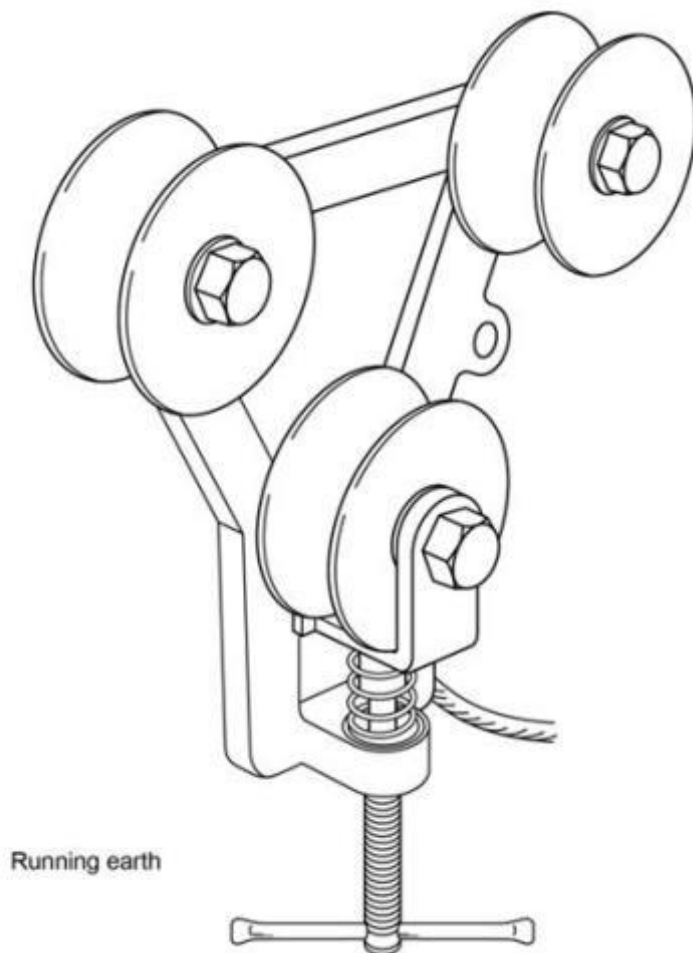
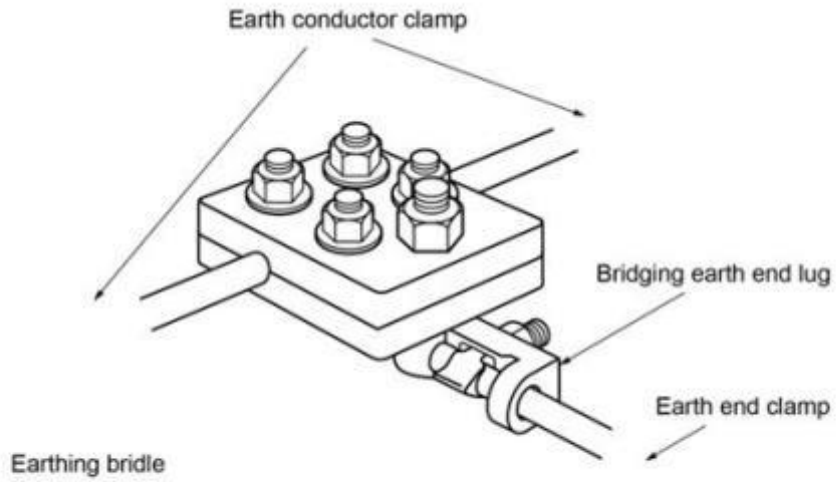


Bridging earth for insulators
(with angle type conductor clamp)
(also used with normal type
conductor clamp)



Normal and trailing earth





Appendix B – Conformance Declaration

SECTION-BY-SECTION CONFORMANCE WITH SPECIFICATION

The Tenderer shall declare conformance or otherwise for each product/service or range of products/services, section-by-section, using the following Conformance Declaration Codes.

Conformance Declaration Codes:

N/A =	Clause is not applicable/appropriate to the product/service.
C1 =	The product/service conforms fully with the requirements of this clause.
C2 =	The product/service conforms partially with the requirements of this clause.
C3 =	The product/service does not conform to the requirements of this clause.
C4 =	The product/service does not currently conform to the requirements of this clause, but the manufacturer proposes to modify and test the product in order to conform.

Manufacturer:

Product/Service Description:

Product/Service Reference:

Name:

Company:

Signature:

SECTION-BY-SECTION CONFORMANCE

Section	Section Topic	Conformance Declaration Code	Remarks * (must be completed if code is not C1)
4.1	Product not to be Changed		
4.2	Electricity North West Technical Approval		
4.3	Quality Assurance		
4.4	Formulation		
4.5	Identification Markings		
4.6	Minimum Life Expectancy		
4.7	Product Conformity		
4.8	Confirmation of Conformance		
5.1	Requirement for Type Tests at the Supplier's Premises		
5.2	Requirement for Routine Tests at the Supplier's Premises		
6.1	General		
6.2	Compliance with Standards		
6.3	Insulating Materials		
6.4	Metal Parts		
6.5	Equipment Bags		

7.1	General		
7.2.1	Portable Earths for LV Overhead Line Use		
7.2.2	Portable Earths for HV Overhead Line Use		
7.2.2.1	General		
7.2.2.2	Cable Tress		
7.2.2.3	Line End Clamps		
7.2.2.4	Earth End Clamp		
7.2.2.5	Set of Four Interconnected Earth Rods		
7.2.3	Running Earth Accessory		
7.2.4	Mechanical Plant Earth		
7.2.5	Operating Rods for use with HV Overhead Line Earths		
7.3.1	Portable Earths for 132kV Overhead Lines		
7.3.2	Running Earth Accessory		
7.3.3	Mechanical Plant Earth		
7.3.4	Operating Rods for use with 132kV Overhead Line Earths		
7.4.1	General		
7.4.2	Additional Earth Leads		
7.4.3	Conductor Clamps		

7.4.4	Earth End Clamps		
7.4.5	Bridging Earth Leads		
7.4.6	Earthing Spike		
7.4.7	Earthing Bridle		
7.4.8	Running Earth Accessory		
7.4.9	Mechanical Plant Earth		
7.4.10	Operating Rods for use with Steel Tower Overhead Line Earths		
8.	Variations		

Additional Notes: