NPS/002/001 – Technical Specification for Earthing Materials

1. Purpose

The purpose of this document is to detail the requirements of Northern Powergrid (the Company) for earthing materials.

This document supersedes the following documents, all copies of which should be destroyed.

Document Reference	Document Title	Version	Published Date
NPS/002/001	Technical Specification for Earthing Materials	7.1	June 2020

2. Scope

This section of the tender document describes the requirements of the Company with respect to earthing materials, which shall comply with the requirements of ENATS – Energy Networks Association Technical Specification 43-94: Earth Rods and their Connectors for installation in accordance with the Company's Code of Practice (CoP) IMP/010/011 - Code of Practice for Earthing LV Networks and HV Distribution Substations.

- Earth Rods
- Earth Rod Couplings
- Steel Driving Stud's
- 'U' Bolt and 'G' Clamp Earth Rod Connectors
- Flat Copper Tape
- Flat Aluminium Tape
- Plain Copper Braid
- Square Tape Clamp
- Rod, Tape, Conductor Clamps
- Rebar Clamp (split bolt connector type)
- High Conductivity Copper Rod

The following appendices form part of this technical specification:

- Appendix 1: Requirements and Commodity Codes
- Appendix 2: Addendum to Supplier Requirements
- Appendix 3: Logistical Requirements
- Appendix 4: Self-Certification Conformance Declaration
- Appendix 5: Technical Information Check List

2.1. Table of Contents

3. Technical Requirements

3.1. Copper Bonded Steel Earth Rod

Copper bonded steel earth rods shall be used to provide effective permanent connection of the distribution network to the general mass of earth. They shall have a thread pitch of Unified National Coarse 2A (UNC – 2A). The steel rod shall meet the requirements of BS EN 10025-6: 2019 minimum grade S275 JR and coated with a copper bond including the threaded area.

A minimum coating of 250 microns should be applied. Copper bonded steel earth rods shall be manufactured to BS EN 62561-2.

3.2. Earth Rod Couplings

Couplings shall be used for the series connection of earth rods as detailed in 3.1. The coupling shall have a threaded bore to allow them to be applied over the threaded end of the rod. They shall have the same mechanical characteristics as the rod and provide an adequate electrical conductance that is the equivalent of the rod its self. Couplings shall be manufactured to BS EN 62561-1.

3.3. Steel Driving Stud

Steel driving studs shall be used to provide a durable impact point for a hammer when installing earth rods. The driving head shall be capable of being used multiple times without deformation that would affect its performance. Driving studs shall be manufactured to BS EN 62561-1.

3.4. Earth Rod Connector

Double Plate 'U' bolt clamps (bulldog grip type) and 'G' clamp type connectors manufactured to cater for conductors in the range 25mm^2 to 70mm^2 in size are required. Connectors shall be compatible with the earth rod and the conductor so as to give a mechanically robust and a good electrical connection. Earth rod connectors shall be manufactured to BS EN 62561-1.

3.5. High Conductivity Plain Copper Tape

Copper tape shall be used to provide earthing interconnection between items of substation plant and also to connect substation plant to earth arrangements. It shall be manufactured to BS EN 13601 and be embossed every 300mm with the wording "PROPERTY OF NORTHERN POWERGRID". Copper tape shall also be available with a tinned surface coating as required.

3.6. Flat Aluminium Tape

Aluminium tape shall be used to provide earthing interconnection between items of substation plant and also to connect substation plant to earth arrangements. It shall be manufactured to BS EN 755-5 and be embossed every 300mm with the wording "PROPERTY OF NORTHERN POWERGRID".

3.7. Plain Copper Braid

Copper braid shall be used to provide earthing interconnection between items of substation plant and also to connect substation plant to earth arrangements. It shall be manufactured in accordance with BS EN 13602.

3.8. Square Tape Clamp

Suitable for jointing 25mm x 4mm high conductivity plain copper tape (3.5 above Northern Powergrid catalogue number; 331300).

3.9. Rod / Tape Clamp

Suitable for jointing copper bonded steel earth rods to 25mm x 4mm high conductivity plain copper tape (3.1 and 3.5 above, Northern Powergrid catalogue numbers 354249 and 331214 respectively).

3.10. Rod / Tape / Conductor Clamp

Suitable for jointing 25mm x 4mm high conductivity plain copper tape to copper bonded steel earth rods and up to 95mm² copper conductor (3.1, 3.5 and 3.9 above, Northern Powergrid catalogue numbers 354345).

3.11. Rebar Clamp

Suitable for jointing 50-95mm² stranded copper conductor to 10mm nominal diameter reinforcing bar.

3.12. High Conductivity Solid Copper Rod

3/8” (9.53mm) diameter solid copper rod to BS EN 12163.

4. References

The products described within this specification shall comply with all current versions of the relevant International Standards, British Standard Specifications and all relevant Energy Networks Association Technical Specifications (ENA TS) current at the time of supply in this respect the following documents are particularly relevant.

4.1. External Documentation

Reference	Title
BS EN 10025-6: 2019 +A1: 2022	Hot rolled products of structural steels. Part 6: Technical delivery conditions for flat products of high yield strength structural steels in the quenched and tempered condition
BS EN 12163: 2024	Copper and copper alloys. Rod for general purposes
BS EN 13599: 2014	Copper and copper alloys. Copper plate, sheet and strip for electrical purposes
BS EN 13601: 2021	Copper and copper alloys. Copper rod, bar and wire for general electrical purposes
BS EN 13602: 2013	Copper and copper alloys. Drawn, round copper wire for the manufacture of electrical conductors
BS EN 62561-1: 2023	Lightning Protection System Components (LPSC). Requirements for connection components
BS EN 755-5: 2008	Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Rectangular bars, tolerances on dimensions and form
BS EN IEC 62561-2: 2018	Lightning Protection System Components (LPSC). Part 2: Requirements for conductors and earth electrodes (IEC 62561-2:2018)
ENA TS 43-94: 2022, Issue 7	Earth Rods and their Connectors

4.2. Internal documentation

Reference	Title
IMP/010/011	Code of Practice for Earthing LV Networks and HV Distribution Substations

4.3. Amendments from Previous Version

Reference	Description
4.1 External Documentation	Section updated to reference latest external document versions
6.0 Authority for Issue	Section updated to reflect current structure

5. Definitions

Term	Definition
The Company	Northern Powergrid

6. Authority for issue

6.1. CDS Assurance

I sign to confirm that I have completed and checked this document and I am satisfied with its content and submit it for approval and authorisation.

		Date
Eve Fawcett	Governance Administrator	25/03/2025

6.2. Author

I sign to confirm that I have completed and checked this document and I am satisfied with its content and submit it for approval and authorisation.

Review Period - This document should be reviewed within the following time period;

Standard CDS review of 3 years?	Non Standard Review Period & Reason	
No	**Period:** 5 Years	**Reason:** Update will be dictated by contact renewal date or any significant changes in the specification or documents referenced
Should this document be displayed on the Northern Powergrid external website?		Yes

		Date
Steven Salkeld	Policy and Standards Engineer	25/03/2025

6.3. Technical Assurance

I sign to confirm that I am satisfied with all aspects of the content and preparation of this document and submit it for approval and authorisation.

		Date
Paul Hanrahan	Engineer - Asset Management	26/03/2025

6.4. Authorisation

Authorisation is granted for publication of this document.

		Date
Paul Black	Head of System Engineering	25/03/2025

Appendix 1 – Requirements and Commodity Codes

DESCRIPTION	Northern Powergrid Commodity Code
Earth Rod: Extensible, Copper Bonded, 1.2M Long and 16mm Nominal Diameter (Typical Arrangement – Drawing 1.09.119.3143 Sheet 1)	354249
Earth Rod Coupling: Threaded, for Use With Extensible Earth Rods (cc 354249) (Typical Arrangement – Drawing 1.09.119.3143 Sheet 1)	354361
Driving Stud, Steel: Threaded, for Use With Extensible Earth Rods (cc 354249) (Typical Arrangement – Drawing 1.09.119.3143 Sheet 1)	354408
Earth Rod Connector: 'G' Clamp Type Suitable For 25–70mm^2 Conductor (Typical arrangement – Drawing 1.09.119.3143 Sheet 2)	354338
Earth Rod Connector: 'U' Bolt Clamp (Bulldog Grip, Double Plate Type) Suitable For 25-70mm^2 Conductor to Earth Rod (16mm Nominal Dia) (Typical Arrangement – Drawing 1.09.101.0383 Sheet 1)	222398
Square Earth Tape Clamp: Suitable for Connecting 25mm x 4mm High Conductivity Copper Tape	354337
Rod / Tape Clamp: 'U' Bolt Clamp (Double Plate Type) Suitable for Connecting 25mm x 4mm High Conductivity Plain Copper Tape to Earth Rod (16mm Nominal Dia)	354336
Rebar Clamp: Split Bolt Type Suitable for Connecting 50–95mm^2 Stranded Copper Conductor to Reinforcing Bar (10mm Nominal Dia)	354335
Multi-Connection Clamp: Suitable for Connecting 16mm (Nominal Dia) Earth Rod, up to 95mm^2 Copper Conductor and 25mm x 4mm Tape	354345
Copper Tape: High Conductivity, Plain, Size 25 x 4mm and Marked "PROPERTY OF NORTHERN POWERGRID". Supplied in 25 Metre Rolls.	331214
Copper Tape: High Conductivity, Plain, Size 40 x 4mm and Marked "PROPERTY OF NORTHERN POWERGRID". Supplied in 15 Metre Rolls.	281832
Copper Tape: High Conductivity, Tinned, Size 25 x 3mm and Marked "PROPERTY OF NORTHERN POWERGRID". Supplied in 25 Metre Rolls.	331300
Aluminium Tape: Size 40mm x 6mm and Marked "PROPERTY OF NORTHERN POWERGRID". Supplied in 25 Metre Rolls	331303
Copper Flexible Braid: Plain, 120 Amp, 19mm x 2.5mm, CSA 16mm^2 (Nominal Size)	330672
Copper Flexible Braid: Plain, 160 Amp, 23mm x 2.0mm, CSA 25mm^2 (Nominal Size)	330704
Copper Rod: High Conductivity, Solid Copper, Plain, 9.53mm (Nominal Diameter). Supplied in 4.0 Metre Lengths.	333717

Appendix 2 – Addendum to Supplier Requirements

The supplier shall provide with the tender full technical details of the equipment offered and shall indicate any variation from these standards or specifications.

No specialist tooling shall be required for the application/installation of earthing materials.

Appendix 3 – Logistical Requirements

To enable the Company to store the product(s) in accordance with the manufacturer's recommendations the Tenderer should provide details of the recommended storage environment with respect to each tendered product.

Details should be provided where relevant in respect to the minimum and maximum exposure levels, frequency of exposure and duration of exposure of the packaged item with respect to;

- Ambient temperature
- Humidity
- Water
- Dust
- Atmospheric corrosion
- Impact
- Vibration
- Solar radiation

The Tenderer shall ensure that each item is suitably packaged and protection to maintain the product and packaging as "fit for service" prior to installation taking account of the potential for an outdoor storage environment. All packaging shall be sufficiently durable giving regard to the function, reasonable use and contents of the packaging. Where product packages tendered are made up of sub packages all the sub packages shall unless varied by this specification, be supplied securely packaged together. Where items are provided in bagged/boxed form the material from which the bags are manufactured shall be capable of sustaining the package weight and resisting puncture by the materials within. Tenderer shall submit at the time of tendering the details of the proposed packaging (i.e. materials composition and structure) to be used for each product. Where the Tenderer is unable to provide packaging suitable for outdoor storage then this should be stated at the time of tender.

Palletised goods shall be supplied on standard 1200mm x 1000mm pallets.

Clearly legible, easily identifiable, durable and unambiguous labelling shall be applied to each individual and where relevant multiple packages of like products. Where product packages tendered are made up of sub packages each sub packages shall be marked. As a minimum requirement the following shall be included;

- Manufacturer's trademark or name
- Supplier's trademark or name
- Description of item
- Date of packaging and/or batch number
- Northern Powergrid product code
- Weight

Tenderer shall submit at the time of tendering a sample of the proposed labelling for each product package type.

Appendix 4 – SELF CERTIFICATION CONFORMANCE DECLARATION

The Technical Specification for Earthing Materials shall comply with the latest issues of the relevant national and international standards, including ENA TS 43-94. Additionally this technical specification is intended to amplify and/or clarify requirements relating to these Standards.

This self-declaration sheet identifies the clauses of the aforementioned standards relevant to Earthing Materials for use on the Company's distribution network. The manufacturer shall declare conformance or otherwise, clause by clause, using the following levels of conformance declaration codes.

Conformance declaration codes
N/A = Clause is not applicable/ appropriate to the product
Cs1 = The product conforms fully with the requirements of this clause
Cs2 = The product conforms partially with the requirements of this clause
Cs3 = The product does not conform to the requirements of this clause
Cs4 = The product does not currently conform to the requirements of this clause, but the manufacturer proposes to modify and test the product in order to conform.

Instructions for completion
- When Cs1 code is entered the supplier shall provide evidence of conformance
- When any other code is entered the reason and supporting evidence for non-Conformance shall be entered
- Prefix each remark with the relevant 'BS EN' or 'ENATS' as appropriate
- Provide technical data sheets and associated drawings for each product.

Manufacturer / Supplier:

Manufacturer / Supplier Product Reference:

Northern Powergrid Product Reference (Commodity Code):

Details of the Product Type (Voltage, Type and Size)

Name:

Signature:

Date:

NOTE: One sheet shall be completed for each item or variant submitted.

ENA TS 43-94: Earth Rods and their Connectors				
Clause/Sub-clause	**Requirement**	**Conformance Code**	**Evidence Reference**	**Remarks / Comments**
4.1	Fabrication and Marking			
5	Components			
5.1	Earth Rods			
5.2	Driving Heads			
5.4	Couplers			
5.4.1	General			
5.4.3	Requirements for Dowels for Copper Bonded Rod			
5.4.4	Couplers of Alternate Design			
5.5	Connectors			
6	Testing			
6.1	General			

ENA TS 43-94: Earth Rods and their Connectors				
Clause/Sub-clause	**Requirement**	**Conformance Code**	**Evidence Reference**	**Remarks / Comments**
6.2	Type Tests			
6.2.1	Sample Size			
6.2.2	Visual Examination			
6.2.2.1	Requirements for Copper Bonded Rods			
6.2.2.3	Requirements for Galvanised Couplers and Driving Tips			
6.2.2.4	Requirements for Sherardized Couplers			
6.2.3	Rod Bend Test			
6.2.4	Adhesion Test (Copper Bonded Earth Rod)			
6.3	Sample Tests			
6.3.1	Sample Size			
6.3.1	Sample Tests			

NPS / 002 / 001: Technical Specification for Earthing Materials				
Clause/Sub-clause	**Requirement**	**Conformance Code**	**Evidence Reference**	**Remarks / Comments**
3.4 - Connectors	Double plated 'U' Bolt (Bull Dog Grip) and 'G' Clamp Type, suitable and compatible with stranded copper conductor 25mm^2 - 70mm^2 and the earth rod to BS EN 62561-1			
3.5 - High Conductivity Plain Copper Tape	BS EN 13601 (Embossed every 300mm with the wording "Property of Northern Powergrid").			
3.6 - Flat Aluminium Tape.	BS EN 755-5 Embossed every 300mm with the wording "Property of Northern Powergrid".			
3.7 - Plain Copper Braid.	BS EN 13602.			
3.8 - Square Tape Clamp	Suitable for connecting 4mm x 25mm High Conductivity Plain Copper Tape			
3.9 - Rod / Tape Clamp	Suitable for connecting 4mm x 25mm High Conductivity Plain Copper Tape to Earth Rod (16mm nominal dia)			
3.10 – Rod / Tape / Conductor Clamp	Suitable for connecting 4mm x 25mm High Conductivity Plain Copper Tape to Earth Rod (16mm nominal dia) and a conductor up to 95mm²			
3.11 - Rebar Clamp (Split Bolt Connector Type)	Suitable for connecting 50 – 95mm^2 stranded copper conductor to reinforcing bar (10mm nominal dia)			
3.12 - High Conductivity Plain Copper Rod	3/8" (9.53mm dia) to BS EN 12163 (Condition H)			

Appendix 5 - Technical Information Check List

The Following information shall be provided by the supplier for technical review by the company. (Additional information shall be provided if required):

Requirements	Provided (Yes / No)
Drawings and product data sheets for each item offered	
Full product descriptions part/reference numbers	
Appendix 4 – Completed self-certification conformance declaration	
Type test evidence	
Packaging/delivery information	
Product quality plan	