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PROJECT

NE1 - 700MW CSP + 250MW PV Hybrid Project

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DOCUMENT NAME

Earthing Grid and Lightning
Protection Material Technical
Specification

	Document No. NE1-00-EM-EAI-TSP-BXE(E)-20820	EAI Document No. 476-00-I-E-20820	
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CLASSIFICATION

<p>Contains information for the design of structures, systems or components: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p> <p>Design verification : Not applicable <input type="checkbox"/> Head of OU/Supervisor <input checked="" type="checkbox"/> Verifier Level 1 <input type="checkbox"/> Level 2 <input type="checkbox"/></p>
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1. PURPOSE

The purpose of this document is to establish the technical requirements for the earthing materials to be supplied for Noor Energy 1-700 MW CSP + 250 MW PV Hybrid Project. Said materials are described in the List of Materials indicated in Section 9.

This specification outlines the minimum requirements for the design, manufacturing, factory testing, supply, transport, commissioning and testing of the materials for the plant grounding and lightning protection system.

2. DESCRIPTION OF THE PLANT

Noor Energy 1-700MW CSP + 250MW PV Hybrid Project comprises 250 MW of photovoltaic power units and four (4) concentrated solar power units: one (1) based on CT configuration using molten salt central receiver technology with a maximum net capacity of 100 MW and three (3) based on PT collector technology (200 MW each).

For further details, see document No. NE1-00-EM-EAI-PLN-OOO(G)-00400, General Project Requirements.

3. REQUIREMENTS. LOCATION OF THE PLANT


The Plant is located in a greenfield site within the Mohammed Bin Rashid Al Maktoum Solar Park plot. The Solar Park is located at the Saih al Dahal Area, which is about 50 km south of Dubai, or 20 km southeast of the small town of Al Lisaili.

For further details, see document No. NE1-00-EM-EAI-PLN-OOO(G)-00400, General Project Requirements.

4. SCOPE OF SUPPLY

In accordance with this Specification, the scope of supply will comprise the following.

- The materials included in the Lists of Materials referenced in Section 9.
- One set of special tools which the supplier deems necessary to carry out the work.
- Packaging and preparation for shipment in accordance with the General Project Requirements, document No. NE1-00-EM-EAI-PLN-OOO(G)-00400.
- Type tests.
- The drawings and documents associated with each of the materials indicated.

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The following services are not included in the scope of this specification:

- Assembly of the earthing grid and field tests.

5. APPLICABLE STANDARDS


The Supplier shall comply with local or national Regulations, Codes and Standards in accordance with the country in which the Plant is erected as well as with all Purchaser requirements.

Unless otherwise indicated in the corresponding paragraphs, the equipment and components to be supplied must be designed, manufactured and tested in accordance with the following standards:

- IEC 60028 International standard of resistance for copper
- IEC 60502-1 Power Cables with Extruded Insulation and their Accessories for Ateed Voltages from 1kV (Um=1.2kV) up to 30 kV (Um=36kV). Part 1: Cables for Rated Voltages of 1 KV (Um=1.2kV) and 3kV (Um=3,6kV)
- IEEE 837 Qualifying Permanent Connections In Substation Grounding
- DIN 13601 Copper and cooper alloys – Copper rod, bar and wire for general electrical purposes
- IEC 62305 Protection Against Lightning. Part 1: General Principles
- IEC 62561-1 Lightning Protection System Components (LPSC) – Requirements for connection components
- BS 50164 Lightning Protection Components (LPC)
- NFC 17-102 Protection contre la foudre-systèmes de protection contre la foudre à dispositif d'amorçage.

The applicable issues of these standards shall be the latest published, including the corresponding modifications, at the time of award of the order.

In the event of conflict between the requirements of different standards, the mos stringent shall apply.

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6. MATERIAL TO BE USED

6.1 CONDUCTORS

The underground earthing grid shall be tinned stranded soft copper conductor of the following cross section:

- 120mm² cross section for areas where 400 kV equipment (main transformers in the Power Block, in the substations of 400/33 kV for the PV full dispatch and in the area where 400 kV cabinets are located).
- 70mm² cross section for Power Block areas excluding main transformers area.
- 50mm² cross section for solar field and common facilities.

The conductors used in the indoor and outdoor earthing grid shall be made of copper cable as per standard IEC 60028 with a 16, 50, 70 and 120 mm² cross section.

For the indoor earthing system, the conductors that form the perimeter ring inside the buildings on the walls of each building floor shall be made of bare copper strips, as per DIN 13601 with 240 mm² cross section (60x4).

The conductors for the indoor earthing grid shall in general be made of bare copper. However, copper cable with yellow and green XLPE insulation shall be used for the applications that so require it as an example, for outdoor earthing applications. The cable shall be of 0.6/1 kV as per IEC 60502-1.

In addition, galvanized steel conductors shall be used for the buried earthing ring around the tanks supported on slabs.

6.2 WELDS


An exothermic process shall be used for welds (cadweld, thermoweld, apliweld or similar) as per IEEE 837.

As an option, exothermic process with electronic starter shall be quoted. The welding process shall be initiated through receiving current from the electronic ignition device.

In addition, insulated welds shall be provided for the connections between the insulated copper conductors and the metal tanks.

The electrical conductivity of the connection shall be equal to or greater than that of the smallest conductor connected.

The heat lost during the oxide scavenging process shall not generate the fusion of any of the elements.

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The welding process shall guarantee the absence of pores inside the welding once the connection is solidified.

Based on the types and quantities of different welds included in the Lists of Materials, the bidder shall indicate in his proposal the number of moulds, caps and accessories required to make them. The bidder shall also indicate the maximum number of welds that can be made with each mould.

6.3 SCREWS, NUTS AND BOLTS

The screws, nuts, bolts, rings and anti-vibration washers shall be made of stainless steel of the type indicated in the Lists of Materials referenced in Section 9.

6.4 TERMINALS

Compression type terminals used for connecting cables shall be of tin-coated copper. The size, the material and the type shall be included in the Lists of Materials referenced in Section 9.

6.5 TEST TERMINALS

The test or disconnection terminals shall be made of tin-coated copper, and both ends shall be prepared for connection of the associated conductor.

The test terminals shall be placed in stainless steel grounding boxes installed in the walls for easy disconnection to carry out. The size, the material and the type shall be included in the Lists of Materials referenced in Section 9.

6.6 EARTH RODS


The ground rods shall be 30 mm diameter and 1.5 m long and made of copper.

If the Supplier considers it necessary, two rivets will be supplied for each ground rod.

6.7 LIGHTNING AIR RODS

Lightning rods shall comprise a double hot dipped galvanized steel rod 18 mm in diameter and 2 or 3 m long (as indicated in the Lists of Materials). They shall be supplied with their associated fixing clamps, mast (with anchors and supports as required) and connections for down conductors.

In addition, lightning rods made of special steel alloy suitable for withstand the maximum allowable high temperature (over 1000°C) near the central tower receiver shall be provided.

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As an option, lightning rods with electronic streaming and the associated auxiliary materials suitable for external lightning protection of the highest part of the central tower receiver structure shall be quoted in case this concept to minimize the lightning protection system design is finally considered. The coverage radius by protection level I is calculated as a difference in height between the tip of the lightning rods and the considered horizontal plane 20 m.

6.8 STRIP HOLDERS, STAPLES AND CLAMPS

The strip holders used to fasten the strips on the surface facing or metal building support structure as well as the staples used to fasten cables to the metal structure, steel pipe, etc, shall be made of galvanized steel. In addition, these materials made of copper or bronze shall be quoted as an optional in case client request this optional to minimize the corrosion of the materials.

The spacer clamps for fastening the cables on to the surface facing or metal support structure shall be made of galvanized steel. In addition, clamps made of copper or bronze shall be quoted as an optional in case client request this optional to minimize the corrosion of the materials.

7. TEST


Type sizing test certificates shall be issued for the materials to be supplied, in accordance with the applicable standards listed in Section 5.

8. DOCUMENTATION

8.1 DOCUMENTATION TO BE SUPPLIED WITH THE TENDER

The bidder shall include the following information with his proposal.

- A detailed list of all material to be supplied and any special accessories or tools that are necessary.
- Leaflets describing each of the connecting parts, cables, metal strips, welds, etc., included in the proposal.
- Completely filled in Project Technical Data sheet (attached, see Appendix A to this specification) without which the bid will not be taken into consideration.

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8.2 DOCUMENTATION TO BE PROVIDED BY THE SUPPLIER AFTER AWARD OF CONTRACT


After award of contract, the material Supplier shall provide the following documentation.

- A detailed list of all the materials, indicating the name of the manufacturer, the type and characteristics.
- A sketch of each of the connecting parts, cables and welds included in the proposal
- Site storage conditions.
- Manufacturer's quality manual.
- Completely filled in Project Technical Data sheet (see Appendix A to this specification) with guaranteed data.
- Weight and dimensions for transport.
- Type test certificates, as appropriate.

9. REFERENCE DOCUMENTS


The referenced documents indicated as follows are an integral part of this specification:

DOCUMENT	NUMBER
Typical Erection Details of Earthing Network	NE1-00-EM-EAI-DRW-BXE(E)-40100
Physical Layout Underground General Earthing Network CF CT/PT1	NE1-00-EM-EAI-DRW-BXE(E)-40130
Physical Layout. Power Block Aerial Earthing Grid (TES & SGS area)	NE1-0-EM-EAI-DRW-BXE(E)-40132
Physical Layout Underground General Earthing Network-PT Plant	NE1-03-EM-EAI-DRW-BXE(E)-40130
General Layout Lightning Protection-PT Plant	NE1-10-EM-EAI-DRW-BXE(E)-40133
General Layout Lightning Protection-Common Facilities	NE1-00-EM-EAI-DRW-BXE(E)-40133
List of Materials for Underground General Earthing	NE1-00-EM-EAI-LIS-BXE(E)-60100
List of Materials for Power Block Aerial Earthing Grid	NE1-00-EM-EAI-LIS-BXE(E)-60102
List of Materials for Lightning Protection	NE1-00-EM-EAI-LIS-BXE(E)-60103


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APPENDIX A


BID TECHNICAL DATA

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BIDDER:	REQUIRED	OFFERED
1. CABLES (for each type and section)		
Manufacturer		
Manufacturing standards	IEC 60028 IEC 60502-1	
Type	Bare copper cable (indoor applications) Bare copper cable with XLPE insulation (outdoor applications) Tinned stranded soft copper cable (buried earthing grid) Galvanized steel cable (as required)	
Composition <ul style="list-style-type: none"> Number of wires Diameter of each one 		
Section	As per Typical Erection Details of Earthing Network NE1-00-EM-EAI-DRW-BXE(E)-40100 (sheet 002)	
External cover (when applicable) type and thickness	XLPE Insulation	
External diameter		
Ohmic resistance at 20°C, according to IEC 60228		
Máximum curvature radius		
2. EARTH STRIPS		
Manufacturer		
Manufacturing standards	DIN 13601	
Type	Bare copper	
Section	As per Typical Erection Details of Earthing Network NE1-00-EM-EAI-DRW-BXE(E)-40100 (sheet 008)	
Dimensions	60 x 4 mm	
Width		
Thickness		
Ohmic resistance at 20°C		
3. WELDS		
Manufacturer		
Manufacturing standards	IEE 837	
Type	Cadwell, thermoweld, apliweld or similar	

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BIDDER:	REQUIRED	OFFERED
Type of mould	As per welds indicated in the applicable Lists of Materials for Underground General Earthing NE1-00-EM-EAI-LIS-BXE(E)-60100	
Maximum number of welds for each one of the moulds		
Types of accessories required		
Electronic ignition device (when applicable)		
4. TERMINALS		
Manufacturer		
Manufacturing standards	International standards	
Type	Compression	
Material	Tin-coated copper	
Dimensions		
Cable sections	As per Typical Erection Details of Earthing Network NE1-00-EM-EAI-DRW-BXE(E)-40100 (sheet 007)	
5. EARTH RODS (As per Typical Erection Details of Earthing Network NE1-00-EM-EAI-DRW-BXE(E)-40100 (sheet 005))		
Manufacturer		
Manufacturing standards	International standards	
Type		
Material	Copper	
Dimensions	30 mm Ø	
Length	1.5 m	
6. LIGHTNING AIR RODS (As per Typical Erection Details of Earthing Grid Network NE1-00-EM-EAI-DRW-BXE(E)-40100 (sheet 045))		
6.1 LIGHTNING AIR RODS FOR GENERAL PURPOSES		
Manufacturer		
Manufacturing standards	IEC 62305 IEC 62561-1	
Type		
Material	Double hot dipped galvanized steel	
Dimensions	18 mm Ø	
Length	2 or 3 m	
6.2 LIGHTNING AIR RODS FOR CENTRAL TOWER RECEIVER AREA		
Manufacturer		
Manufacturing standards	IEC 62305 IEC 62561-1	
Type		

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BIDDER:	REQUIRED	OFFERED
Material	Steel alloy suitable to withstand high temperatures (over 1000°C)	
Dimensions		
Length	5 m	
6.3 LIGHTNING AIR RODS WITH ELECTRONIC STREAMING		
Manufacturer		
Manufacturing standards	NFC 17-102	
Type		
Material	Stainless steel	
Dimensions	16 mm Ø	
Length	2 or 3 m	
Δt	60 μs	
Coverage radius by protection level I	80 m	
7. SCREWS		
Manufacturer		
Manufacturing standards	International standards	
Type		
Material	Stainless steel	
Dimensions		
8. NUTS AND BOLTS		
Manufacturer		
Manufacturing standards	International standards	
Material	Stainless steel	
Dimensions		
9. STRIP-HOLDERS		
Manufacturer		
Manufacturing standards	International standards	
Material	Galvanized steel ⁽¹⁾	
Dimensions		
10. CLAMPS		
Manufacturer		
Manufacturing standards	International standards	
Material	Galvanized steel ⁽¹⁾	
Dimensions		
11. CLIPS		
Manufacturer		
Manufacturing standards	International standards	
Material	Galvanized steel ⁽¹⁾	

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BIDDER:	REQUIRED	OFFERED
Dimensions		
12. TEST LINKS		
Manufacturer		
Manufacturing standards	International standards	
Composition of the material of each one of the parts offered		
Type		
Material	Tin-coated copper	
Dimensions	As per Typical Erection Details of Earthing Network NE1-00-EM-EAI-DRW- BXE(E)-40100 (sheet 008)	
13. GROUNDING BOXES		
Manufacturer		
Manufacturing standards	International standards	
Composition of the material of each one of the parts offered		
Type		
Material	Stainless steel	
Dimensions	As per Typical Erection Details of Earthing Network NE1-00-EM-EAI-DRW- BXE(E)-40100	

⁽¹⁾ Copper or bronze shall be quoted as an optional