

NEUTRAL GROUNDING RESISTOR- RATE CONTRACT

TECHNICAL SPECIFICATION FOR NEUTRAL GROUNDING RESISTOR (RATE CONTRACT)

SPECIFICATION NO: *PE-RC-999-506-E001*
REVISION: 00



BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, UP (INDIA) – 201301



DOCUMENT TITLE

**TECHNICAL SPECIFICATION FOR
NEUTRAL GROUNDING RESISTOR**

SPECIFICATION NO. PE-RC- 999-506-E001

VOLUME II

CONTENT SHEET

REVISION 0

DATE: 21.03.2025

SHEET

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COMPLIANCE CERTIFICATE

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COMPLIANCE CERTIFICATE

The bidder shall confirm compliance to the following by signing/ stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same.
2. There are no deviation with respect to specification other than those furnished in the 'schedule of deviations'.
3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.
4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.
5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in 'BOQ-Cum-Price schedule' of the specification shall not be considered (i.e., technical description & quantities as per the specification shall prevail).

BIDDER'S STAMP & SIGNATURE



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SECTION –I

SPECIFIC TECHNICAL REQUIREMENTS



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1.0 SCOPE OF ENQUIRY

- 1.1 Design, Manufacture, Inspection and Testing at Manufacturer's works, proper packing and delivery to site of NEUTRAL GROUNDING RESISTOR conforming to this specification.
- 1.2 General technical requirements of the NEUTRAL GROUNDING RESISTOR are indicated in Section-II. Project specific technical/ quality requirements / changes are listed in Section-I.
- 1.3 **The requirements of Section-I shall prevail and govern in case of conflict between the corresponding requirements of Section-I and Section-II.**
- 1.4 The documents shall be in English Language and MKS system of units.

2.0 BILL OF QUANTITIES:

- 2.1 Quantity requirements shall be as per 'BOQ-cum-price schedule' as part of NIT.
- 2.2 Supplier to give following undertaking in BOM: " The BOM provided here completes the scope (in content and intent) of material supply under PO no. ---- dtd ---- Any additional material which may become necessary for the intended application of supplied item(s)/package will be supplied free of cost in most reasonable time."

3.0 SPECIFIC TECHNICAL REQUIREMENTS

3.1

<u>S.No.</u>	<u>Reference Clause No. of Section- II</u>	<u>Specific Requirement/ Change</u>
1.	5.1.1	Clause 5.1.1 shall be read as follows: "Each Neutral Grounding Resistor shall be formed of non-aging (grade ASTM-A240/AISI-304 or better) corrosion resistant punched stainless-steel elements for high values 600A of earth fault current. Resistance material mentioned above shall have high electrical resistivity and low temperature coefficient of resistance".
2.	5.1.10	Clause 5.1.10 shall be read as follows: "The connection between neutral terminal of transformer and NGR is through a tinned copper strip of 50 X 8mm. The copper strip shall be supplied by bidder. The required hardware for the termination of copper flat at both ends shall be supplied by the bidder. This item is included in BOQ-cum-Price Schedule in NIT".
3.	5.1.11	Clause 5.1.11 shall be added as follows: "All resistance Bank to Bank interconnection shall be done by solid stainless steel/copper.".
4.	5.1.12	Clause 5.1.12 shall be added as follows: "The resistor element shall be insulated from supporting bars by mica tubes. Supporting bar shall be insulated by porcelain insulator".
5.	5.2.1	Clause 5.2.1 shall be read as follows: "Each neutral grounding resistor shall be housed in weather-proof enclosure having Degree of Protection as specified in Data Sheet-A. Enclosure shall be cold rolled sheet steel having a minimum thickness of 2.5 mm. Suitable ventilating louvers shall be provided on sides to ensure proper ventilation. The louvers shall be provided with fine wire mesh to make vermin proof.".



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6.	5.2.7	Clause 5.2.7 shall be read as follows: "All cubicle door hinges shall be concealed type. Each cubicle shall be complete with suitably mounted cable box fitted with removable gland plate of Aluminium of suitable thickness for fixing cable gland. Cable gland shall be heavy duty Double compression type of Brass machine finished and nickel chrome plated. Thickness of plating shall not be less than 10 microns. All the washers and hardware shall also be made of brass with nickel chrome plating for cable glands. Testing requirement of cable glands shall conform to BS: 6121. Rubber components shall be of neoprene or better synthetic material and of tested quality. Cable lug for power cable shall be tinned copper solderless crimping type suitable for aluminium compacted conductor cables. Cable lugs for control cables shall be provided with insulating sleeve and shall suit the type of terminals provided on the equipment. Cable lugs & ferrule shall conform to relevant standard.
7.	5.2.11	Clause 5.2.11 shall be read as follows: "For connection of other end of NGR to ground, Tinned copper flat (of size 50X8) mm with Fork connector up to 100mm above ground with 2 nos. earthing terminal/pad, tapped holes and bolts suitable for connection of GS Flat shall be supplied by bidder. The tinned copper flat shall be insulated from mounting structure through porcelain insulators. GS flat (size to be informed during detail engineering) for connection of fork connector of NGR to ground shall be in BHEL scope. The length of copper flat shall be suitably decided by bidder."
8.	6.0	In addition to clause 6.0: Following tests shall be conducted on NGR Cubicle 1. Routine Tests: DOP test on enclosure (routine test) as follows: It shall not be possible to insert a 2.5mm dia. steel wire into the enclosure from any direction without using force
9.	6.2	Clause 6.2 shall be read as follows: Bidder shall furnish Type test certificates (Short time current test along with temperature rise test & Degree of protection test i.e. IP33 for enclosure and IP55 for Terminal box). The type test should have been conducted within 10 yrs from 09.12.2024. Following valid type test report (within last ten years as on 09.12.2024) shall be furnished by the bidder and in absence of type tests reports or in case reports are not found to be meeting the specification/standards requirements, vendor shall conduct all such type tests without any commercial/delivery implication to BHEL according to the relevant standards and reports shall be submitted to the owner for approval: 1. Short time current test along with temperature rise test. 2. Degree of protection test for IP33 on enclosure. 3. Degree of protection test for IP55 on Terminal Box.
10.	6.5	Clause 6.5 shall be read as follows: All materials & components shall be procured, manufactured, inspected, and tested by vendor/sub-vendor as per applicable clauses of NTPC endorsed quality plan and Annexure to quality plan
11.	7.0	In addition to clause 7.0: 1. External surface of NGR shall be Chemical resistant epoxy zinc phosphate primer, MIO (Micaceous iron oxide) as intermediate paint followed by polyurethane finish paint of blue colour corresponding to RAL 5012. No. of coats shall be one coats each & total DFT shall not less than 100 microns. 2. Internal surface of NGR shall be Chemical resistant epoxy zinc phosphate primer followed by chemical and heat resistant epoxy enamel white paint. No. of coats shall be one coats each & total DFT shall not less than 100 microns. Colour code shall be subjected to customer approval at contract stage without any commercial implication to BHEL.



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- 3.2 All internal wiring between equipment and terminal block shall be carried out by fire resistance PVC insulated 1100V grade 2.5 Sq.mm Stranded copper conductor wires.
- 3.3 All devices and terminal blocks within the terminal box shall be clearly identified by symbol corresponding to those used on applicable schematic/wiring diagram. 20% spare terminals shall be provided in terminal block.
- 3.4 Each cubicle shall be provided with 5A, 5 pin plug socket and door-switch controlled cubicle illumination lamp. Two pole switch fuse unit shall be provided for receiving 240 V single phase AC supply for cubicle lamp and illumination circuit.
- 3.5 Bidder shall confirm compliance with the NTPC's standard Quality plan (0000-999-QOE-S-045 REV-0) as attached with the specification, without any deviations. At contract stage, the successful bidder shall submit the Quality Plan for BHEL/ ultimate customer's approval. In case bidder has reference, Quality Plan agreed with ultimate customer, same can be submitted for specific project after award of contract for BHEL/ ultimate customer's approval. There shall be no commercial implication to BHEL on account of Quality plan approval.
- 3.6 Packing shall be as per Annexure-II to QP (Packing Specification).
- 3.7 Suitable lifting arrangement shall be provided for NGR.
- 4.0 DOCUMENTATION**
- 4.1 Documents required along with technical offer shall be as per attachment-I.
- 4.2 Documents required after award of LOI shall be as per attachment-II.

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ATTACHMENT – I

DOCUMENTS REQUIRED ALONG WITH TECHNICAL OFFER.

Sign & stamped copy of following documents:

- a] A copy of sheet "Compliance Sheet" with bidder's signature & company stamp.
- b] Unpriced copy of "Annexure-I (BOQ-Cum-Price Schedule for Neutral Grounding Resistor)" with bidder's signature & company stamp indicating "quoted" against each line item.
- c] A copy of the sheet "No deviation Sheet" with bidder's signature and company stamp.
- d] Supporting documents of PQR.

ATTACHMENT – II

DOCUMENTS REQUIRED AFTER AWARD OF LOI.

Following documents/drawings shall be submitted after placement of order for BHEL & customer's approval: -

<i>Drawing Title</i>	<i>Vendor Sub (Days) *</i>	<i>BHEL comment (Days)</i>	<i>Vendor Sub (Days)#</i>	<i>BHEL and Customer comment/ approval (Days)</i>
<i>Primary Documents</i>				
QP OF 11 & 3.3 KV NGR	7	8	7	18
DATA SHEET OF NGR	7	8	7	18
GA OF NGR	7	8	7	18
TYPE TEST CERTIFICATES OF NGR	7/60 **	8	7	18
<i>Secondary Documents</i>				
TYPE TEST PROCEDURE OF NGR	NA/15 **	8	7	18
O & M MANUAL FOR NGR	60	8	7	18
NOTES:				
a) * 1st submission within indicated days from date of purchase order				
b) # Submission (within indicated days) after incorporating all BHEL comments				
c) Primary documents shall be considered for Delay analysis				
d) ** 1. If Type Test Report is available and Type test conduction is not required as per Technical Specification, days specified before '/' shall be followed. 2. If Type Test Report is not available as per technical Specification, days specified after '/' shall be followed after approval of all other primary documents. Document type shall be secondary.				



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DATA SHEET-A**1.0 SYSTEM DESIGN DATA**

- 1.1 Design Ambient : ☒ 50°C ☐ 40°C
- 1.2 Reference Standard : IEEE – 32
- 1.3 Rated Voltage : 11 KV \pm 6% & 3.3 KV \pm 6%
- 1.4 Location of NGR : Outdoor

2.0 RESISTOR

- 2.1 Rated Voltage : 11.5 KV & 3.45 KV
- 2.2 Rated short time current and time : 600A for 10sec
- 2.3 Net resistance of resistor unit : 11.066 Ω for 11.5KV & 3.32 Ω for 3.45KV
- 2.4 Tolerance limit on resistance at 50 Deg. C (%) : \pm 10%
- 2.5 Material of resistor element
- i) For high value of current : ☒ AISI-304 ☒ ASTM-A240 ☐ AISI-406
(Say 300/400/500/600A)
- 2.6 No. of parallel Path : 2 parallel paths
- 2.7 Max. allowable temp. rise (over ambient)
of resistor element : ☐ 300° C ☒ 350° C
☐ 500° C ☐ 790° C
- 2.8 Electrical Resistivity (Micro Ohm-cm) : 72
- 2.9 Temperature Co-efficient of resistance/ DegC : 0.00094/°C
- 2.10 Types of grid : Punched Stainless Steel
- 2.11 Method of connecting elements : Bolted type

3.0 SUPPORT INSULATORS

- 3.1 Material : Porcelain
- 3.2 Rated voltage
- i) For 11 kV NGR : 11.5 KV
- ii) For 3.3 kV NGR : 3.45 KV



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3.3 One minute power frequency dry withstand voltage

- i) For 11kV NGR : 28KV (rms)
- ii) For 3.3kV NGR : 10KV (rms)

3.4 Creepage Distance : [] 25mm/KV [√] 31 mm/KV**4.0 ENCLOSURE****4.1 Material and thickness : Sheet Steel and [] 2.0 [√] 2.5 [] 3.0 mm****4.2 Degree of Protection (As per IS/IEC-60529)**

- i) Enclosure : [√] IP-33 with canopy [] IP-55 with canopy
(In case of IP-33, louvers to be provided with fine wire mesh to make vermin proof)
- i) Terminal Box : IP-55 with canopy

5.0 MOUNTING STRUCTURE (BOLTABLE TYPE)**5.1 Material : Hot dip galvanised standard steel section****5.2 Thickness/deposit of galvanisation : 75 microns/610 g/m²****5.3 Equipment mounting : Base of NGR enclosure at 2.4m above ground****5.4 Whether Welded or Bolttable type : Bolttable type****6.0 TERMINAL CONNECTION****6.1 Type : Bushing****6.2 Material : Porcelain****6.3 Rated voltage**

- i) For 11kV NGR : 11.5KV
- ii) For 3.6kV NGR : 3.45KV

**6.4 One minute power frequency
dry withstand voltage**

- i) For 11kV NGR : 28KV (rms)
- ii) For 3.3kV NGR : 10KV (rms)

6.5 Creepage Distance : [] 25mm/KV [√] 31 mm/KV**6.6 Connection between NGR & transformer : [] Cable [] GI Flat [√] Copper Flat (50X 8mm)**



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6.7 Connection of NGR to ground

: Tinned copper flat (50 X 8mm) with Fork connector up to 100mm above ground (Bidder's Scope).

Required hardware for connection to GS Flat (of size 65mm x 8mm) in bidder's scope. The tinned copper flat shall be insulated from mounting structure through porcelain insulators.

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DATA SHEET-C
(To be filled up by bidder)

1.0 General

- 1.1 Make/Type :
- 1.2 *Quantity* Nos. :
- 1.3 Service :
- 1.4 Reference Standard :

2.0 Resistor

- 2.1 Rated Voltage (Volt) :
- 2.2 Net Resistance at 50 Deg. C (ohm) :
- 2.3 Resistance per resistor element at 50 Deg. C :
- 2.4 Tolerance limit on resistance at 50 Deg. C (%) :
- 2.5 Total no. of resistor elements per path :
- 2.6 No. of parallel path :
- 2.7 Material of resistor element :
- 2.8 Electrical Resistivity (Ohm-cm) :
- 2.9 Temperature Co-efficient of resistance/ DegC :
- 2.10 Current rating
- a) Short time rating Amps., Secs :
- 2.11 Types of grid :
- 2.12 Temperature rise (over Ambient 50 Deg. C) :
- 2.13 Method of connecting elements :

3.0 Insulation level

- 3.1 One minute power frequency withstand volt. KVrms :

4.0 Support insulator between Resistor and Enclosure

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- | | | |
|------------|--|---|
| 4.1 | Make | : |
| 4.2 | Material | : |
| 4.3 | Creepage distance | : |
| 4.4 | Voltage rating | : |
| 4.5 | One minute power frequency withstand volt.(dry) KVRms : | |
| 5.0 | Terminal connection | |
| 5.1 | Type | : |
| 5.2 | Make | : |
| 5.3 | Material | : |
| 5.4 | Voltage rating | : |
| 5.5 | Power frequency withstand volt. KVRms | : |
| 6.0 | Enclosure Cubcle | |
| 6.1 | Enclosure material | : |
| 6.2 | Thickness of enclosure materials | : |
| 6.3 | Degree of protection | : |
| 6.4 | Reference standard | : |
| 6.5 | Painting shade | : |
| 6.6 | Thickness of paint (mm) | : |
| 6.7 | Dimension of NGR cubicle with resistor | : |
| 6.8 | Weight of complete NGR cubicle
with resistors (W/O Mounting structure) | : |
| 7.0 | Test Voltage | |
| 7.1 | One minute power frequency withstand volt.(dry) KVRms : | |
| 7.2 | Impulse withstand voltage (peak) KV | : |
| 8.0 | Mounting Structure | |
| 8.1 | Materials | : |
| 8.2 | Dimensions | : |

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8.3	Paints/Galvanisation	:
8.4	Wt. Of mounting structure	:
8.5	Whether space heater arrangement provided	:
8.6	Whether welded or bolted type	:
8.7	Thickness of Galvanisation	:



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SECTION – II

GENERAL TECHNICAL SPECIFICATION



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1.0 SCOPE OF ENQUIRY

- 1.1 This specification covers the design, manufacture, assembly, testing and inspection at vendor's/sub-vendor's works, packing and despatch to site of neutral grounding resistor as described in the various sections of this specification.
- 1.2 Although erection and commissioning is not included in vendor's scope, the vendor shall still not be absolved of his responsibility of establishing the correctness of equipment at site.

2.0 CODES & STANDARDS

- 2.1 The material, constructional features and various processes involved in manufacture shall comply with latest revision of Indian Standards.
- 2.2 The design, material, construction, manufacture, inspection, testing and performance of Neutral Grounding Resistor shall conform to the latest revision of relevant standards and codes of practices mentioned in Datasheet – A.
- 2.3 In case of conflict between the applicable reference standard and this specification, this specification shall govern.

3.0 DESIGN REQUIREMENTS AND CONSTRUCTIONAL FEATURES

- 3.1 The NGR is used for medium resistance grounding of MV (11 / 6.6 / 3.3KV) or LV (415 V) system. NGR shall be connected between earth pit and neutral point of applicable transformer.
- 3.2 The NGR shall be suitable for limiting the desired value of earth fault current and duty as specified in BOQ-Cum-Price Schedule in NIT.
- 3.3 The resistor unit shall be natural air-cooled type suitable for installation at outdoor/ indoor locations.
- 3.4 The NGR will be installed in hot humid and tropical atmosphere. All equipment, accessories and wiring shall be provided with tropical finish to prevent fungus growth.

4.0 TERMINAL POINTS OF SUPPLY:

- a) Neutral grounding resistor along with suitable cable glands and lugs for incoming cables from transformer neutral.
- b) Supporting structure along with insulators and necessary foundation hardware.
- c) Bushing along with tinned copper strip of suitable cross-section (as specified in Datasheet-A / BOQ-cum-Price Schedule in NIT) and connecting hardware for neutral connection of transformer. Copper strip will be applicable only when cable connection is not applicable and vice-versa.
- d) All Civil works, Erection & commissioning of equipment are excluded from bidder's scope.
- e) Termination and Jointing kits are excluded from bidder's cope.

5.0. SPECIFIC TECHNICAL REQUIREMENTS

5.1 NEUTRAL GROUNDING RESISTOR



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- 5.1.1 Each Neutral Grounding Resistor shall be formed of non-aging (grade ASTM-A240/AISI-304 or better) corrosion resistant punched stainless steel elements or FECRAL (AISI-406) as specified in data sheet-A for high value (say 300A/400/500A) of earth fault current and of FECRAL (AISI-406) material for low value (say 1A) of earth fault current. Resistance material mentioned above shall have high electrical resistivity and low temperature co-efficient of resistance.
- 5.1.2 Resistor bank shall be provided in series and parallel combination to achieve the overall resistance value. Minimum two banks in parallel shall be provided in the system, unless specified otherwise.
- 5.1.3 The resistor unit shall consist of suitable no. of elements. All the elements shall be mounted inside the cubicle so as to ensure ease of inspection and replacement of individual element. For Low value of earth fault current edge wound configuration of resistance material is also acceptable.
- 5.1.4 Each resistor element shall possess a balanced combination of both Mechanical and Electrical properties over entire intended operating temperature range without any harmful effect on the elements and their accessories.
- 5.1.5 All the resistor elements consisting the NGR shall be assembled and supported inside the cubicle in such a way that no distortion or breakage will occur during the passage of specified fault current to earth.
- 5.1.6 All elements connection shall be bolted type to ensure stable resistance value throughout the working life of the unit.
- 5.1.7 Wet process type brown glass porcelain insulators shall be used between Tie-rod and end support structure and shall also be used to insulate the resistor bank from enclosure. Porcelain insulators shall have high creepage value (as specified in Data sheet-A) suitable for heavily polluted atmosphere charged with dust particles. Interposing insulator (except Mica) shall be provided to insulate resistor tier.
- 5.1.8 The resistor elements shall be provided with necessary installations and shall have maximum temperature rise as specified in Data Sheet-A.
- 5.1.9 The NGR shall be provided with suitable taps for cable/strip connection as specified in Section-I.
- 5.1.10 In case the connection between neutral terminal of transformer and NGR is through a copper strip, then copper strip shall be supplied by bidder. The required hardware for the termination of copper flat at both ends shall be supplied by the bidder.
- 5.2 ENCLOSURE:**
- 5.2.1 Each neutral grounding resistor shall be housed in weather-proof enclosure having Degree of Protection as specified in Data Sheet-A. Enclosure shall be cold rolled sheet steel having a minimum thickness of 2 mm. Suitable ventilating louvers shall be provided on sides to ensure proper ventilation. The louvers shall be provided with fine wire mesh to make vermin proof.
- 5.2.2 The terminals for neutral and earthing connections shall be housed in separate vermin-proof, weather-proof terminal box with min. IP-55 degree of ingress protection.
- 5.2.3 A separate canopy shall be provided above enclosure roof with a suitable air gap between them. It shall also cover the terminal compartment. Suitable lifting arrangement shall be provided to lift the canopy.
- 5.2.4 The bottom of the enclosure shall be provided with a drain plug to remove water that may get collected in the enclosure.



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- 5.2.5 The enclosure shall be supported on insulators placed on mounting structure in such a fashion that it is not easily accessible for man standing on ground level. Any part of insulator shall be at a height 2500 mm above ground/plinth.
- 5.2.6 Each cubicle shall be complete with front access door with handles, lock and also a removable bolted cover. All doors and removable covers shall be properly gasketed with good quality neoprene /synthetic rubber gaskets.
- 5.2.7 All cubicle door hinges shall be concealed type. Each cubicle shall be complete with suitably mounted cable box fitted with removable gland plate of Aluminium of suitable thickness for fixing cable gland. Double compression brass Cable glands and cable lugs of tinned copper shall be in the scope of bidder.
- 5.2.8 All necessary galvanised bolts, nuts washers etc. shall be included by the BIDDER for installation of Cubicle at site.
- 5.2.9 The enclosure shall not be earthed to prevent bypassing of resistor in case of any inadvertent shorting of resistor from inside.
- 5.2.10 Panel space heater arrangement along with thermostat, suitable for connection to 240V AC single supply, shall be provided at the bottom of the panel. The illumination arrangement and switch socket shall also be provided in the panel. The required cable glands, lug etc. required shall be supplied by the bidder.
- 5.2.11 For connection of other end of NGR to ground, Tinned copper flat (of size 50mm x 6mm) with Fork connector up to 300mm above ground with 2 nos. earthing terminal/pad, tapped holes and bolts suitable for Connection of GS Flat shall be provided by Bidder. The tinned copper flat shall be insulated from mounting structure through porcelain insulators. GS flat (size to be informed during detail engineering) for connection of fork connector of NGR to ground shall be in BHEL scope.

6.0 INSPECTION & TESTS

- 6.1 All tests shall be conducted as per relevant IS/IEC/ IEEE standards and shall be performed in the presence of purchaser's representative, if so desired by the purchaser. The bidder shall give at least 21 days advance notice of the date when the tests are to be carried out.
- 6.2 Bidder shall furnish Type Test certificates (temperature rise and DOP tests) conducted on similar type of equipment for purchaser's review at contract stage.
- 6.3 For all components / materials, for which type test reports have been asked for in the specification, such Type tests should have been carried out on identical components / materials. In absence of such type tests reports or in case such reports are not found to be meeting the specification/standards requirements, vendor shall conduct all such type tests without any commercial/delivery implication to BHEL according to the relevant standards and reports shall be submitted to the owner for approval. (Type test charges as per clause 6.4 shall not be applicable in such cases).
- 6.4 The bidder shall indicate cost of carrying out all the Type tests as specified in the specification. The charges for each of the Type tests shall be given separately as BOQ-cum-price schedule as part of NIT. These prices will be applicable in case a type test is required to be conducted by purchaser despite availability of satisfactory type test report as per clause 6.3 above.
- 6.5 All materials & components and shall be procured, manufactured, inspected, and tested by vendor/sub-vendor as per applicable clauses of BHEL Quality Plan no. PE-QP-999-505-E001, (subject to approval of customer) enclosed.



TECHNICAL SPECIFICATION FOR NEUTRAL GROUNDING RESISTOR

SPECIFICATION NO. PE-SS- 999-506-E001

VOLUME II

SECTION - II

REVISION 01

DATE: 19.02.2019

SHEET 4 OF 5

- 6.6 All acceptance and routine tests as per relevant standards shall be carried out by the manufacturer. Charges for all these routine and acceptance tests for all the materials shall be deemed to be included in the bid price.
- 6.7 Test reports of the various tests conducted at the time of inspection shall be furnished by the vendor.
- 6.8 Bidder shall furnish unit prices of all items in the prescribed schedule of BOQ-cum-price schedule as part of NIT. Purchaser reserves the right to add/delete the quantity during detailed engineering as finally required for the project. Unit rate quoted shall be applicable for price adjustment in such cases.
- 6.9 All bought out items shall be procured from reputed manufacturers and shall be subject to approval of purchaser.

7.0 PAINTING

- 7.1 All bidders must have 7-tank or 8-tank painting procedure.
- 7.2 All metal parts, surfaces shall be degreased by dipping in hot alkaline solution and rubbed with wire brush to remove oil and scale and then rinsed in water. Alternatively, they may be shot blasted.
- 7.3 Parts shall be pickled by dipping in hydrochloric acid to remove the rust from the surfaces formed during storage of sheets and then rinsed to remove traces of the acid. The cleaning and pre-treatment of all metal parts shall be as per applicable standard.
- 7.4 The surfaces to be painted shall then be prepared by phosphatizing to protect them from further rusting and to create a good bond with the paint.
- 7.5 All parts shall then be subjected to a coat of primer paint. All inside surfaces of enclosure shall be spray painted with black matt finish and outside surfaces of enclosure shall be spray painted with hard semi glossy synthetic enamel or power coated (as specified in Sec-I) of shade as per Sec-I.
- 7.6 Paint thickness shall be minimum 50 microns unless specified otherwise in Sec-I.
- 7.7 Electrostatic or powder painting shall be acceptable subject to purchaser's approval.
- 7.8 Finished parts shall be coated with peelable compound by spraying method to protect the finished product from scratches, grease, dirty and oily spots during handling and transportation.

8.0 PACKING

- 8.1 Specification for the sea worthy packing, if enclosed, for the export jobs shall form part of the specification.

9.0 SPARES



TECHNICAL SPECIFICATION FOR NEUTRAL GROUNDING RESISTOR

SPECIFICATION NO. PE-SS- 999-506-E001

VOLUME II

SECTION - II

REVISION 01

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- 9.1 A list of Erection & commissioning spares (if required by BHEL) along with quantities considered is indicated in **BOQ-cum-price schedule as part of NIT**.
- 9.2 A list of Mandatory spares (if required by BHEL) along with quantities considered is indicated in **BOQ-cum-price schedule as part of NIT**.

10.0 GUARANTEED PERFORMANCE REQUIREMENTS

- 10.1 The vendor shall guarantee satisfactory performance of the equipment supplied under all conditions and requirement as laid down by this specification.
- 10.2 The vendor shall comply with the general requirements of performance guarantee specified elsewhere.

11.0 O & M MANUAL

O & M manual for installation, operation and maintenance of NGR shall be furnished before despatch of the equipment.

Draft O & M manual shall be submitted for purchaser's approval. Manual shall contain minimum following details:

- i) Description of the equipment.
- ii) Salient construction features.
- iii) Packing details.
- iv) Instructions to be followed on receipt at site for storage.
- v) Erection procedure & checks.
- vi) Test to be conducted at site.
- vii) Commissioning procedure.
- viii) Maintenance instructions.

13.0 DELIVERY

The delivery shall be as per NIT (Notice Inviting Tender).

ENDORSEMENT SHEET FOR Q.P. STANDARD QUALITY PLAN (SQP)			
TO BE FILLED IN BY SUPPLIER AT TIME OF SUBMISSION		NTPC	To be filled in by NTPC
PROJECT NAME			<i>REVIEW & ENDORSEMENT BY NTPC</i>
CONTRACT No.			PROJECT SPECIFIC Q.P. NUMBER ALLOTTED
MAIN SUPPLIER	BHEL		Q.P. No.:
MANUFACTURER WORKS & ADDRESS			
ITEM/ EQUIPMENT/ SYSTEM/ SUB-SYSTEM DETAILS i.e. MODEL TYPE/ SIZE/ RATING etc.			REV. No.: DATE:
APPROVED Q.P. No.:	SQP NO 0000-999-QOE-S-045 DATED: 15/12/2011		
<i>Confirmation by Main Supplier (TICK WHICHEVER APPLICABLE)</i>			
I. That the item/ component is identical to that considered for Q.P. approval. OR			
II. That there are minor changes in the item/ component with respect to that considered for Q.P. approval, however the same do not affect the contents of Q.P. OR			
III. That there are minor changes in the item/ component with respect to that considered for Q.P. approval, however the same affect the Q.P. slightly, as indicated below/ in attached sheet.			
A] Annexure -1 (Annexure to Quality Plan) also to be referred along with QP.			
		<u>DISTRIBUTION OF ENDORSEMENT OF</u> A) <ol style="list-style-type: none"> 1. MAIN SUPPLIER 2. MANUFACTURER 3. RIO/ CQA- as applicable 	
SIGN.: (Main Supplier)		SIGN.: (Manufacturer) DATE:	
		BIFPCL (Reviewed / Approved by / Date & Seal)	

ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SIZE ETC.): NEUTRAL GROUNDING RESISTOR (UPTO 66KV)		STANDARD QUALITY PLAN				TO BE FILLED IN BY NTPC							
CONFORMING TO CODE : NTPC TECHNICAL SPECIFICATION		Qp No: 0000-999-QOE-S-045 Rev: 0 Date: 15.12.2011 Page: 01 of 02 VALID UPTO: 14.12.2014				REVIEWED BY: APPROVED BY Banish K. Jha R Garg H Shekhar A K Garg							
SINo	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
					M	C/N				M	C	N	
1	2	3	4	5	6	7	8	9	D*	**	10	11	
1.0 RAW MATERIAL BOUGHT OUT ITEM													
1.01	MS Sheet	a) Thickness	Major	Visual	100%	100%	Appvd. Drg./Spec.	Appvd. Drg./Spec.	QC Records	P	V	-	
	(For NGR Enclosure)	b) Surface finish	"	Visual	100%	100%	IS:2062	No damage/corrosion/Pitting	"	P	V	-	
		c) Chemical & Mechanical Properties	"	Chem/Mech	1/Heat	1/Heat	IS:2062	IS:2062	MTC	V	V	V	
1.02	MS Angle/Flat/Channel (As applicable)	a) Dimensional check	Major	Measure	100%	100%	IS:2062	IS:2062	QC Records	P	V	-	
		b) Surface finish	"	Visual	100%	100%	"	"	QC Records	P	-	-	
		c) Chemical & Mechanical Properties	"	Chem/Mech	1/Heat	1/Heat	"	"	MTC	V	-	-	
		d) Galvanising Check	"	"	100%	100%	Relevant Material Standard		"	V	-	-	Proper galvanising of MS Structural members as required shall be ensured by Manufacturer
1.03	Copper Connector	a) Surface finish	Major	Visual	100%	100%	Relevant Material Standard	No damage/corrosion/Pitting	MTC	P	V	-	
		b) Chemical composition	"	Chem	100%	100%	Relevant Material Standard		"	V	V	V	
		c) Dimensional check	"	Elect	100%	100%	NTPC Spec./Appvd. drg/DS	Appvd. drg/DS	"	P	V	-	
1.04	Resistor Grid (Punched stainless steel grid element type)	a) Surface finish	Major	Visual	100%	100%	Relevant Material Standard	Appvd. Drg/DS	MTC	P	V	-	
		b) Chemical composition	"	Chem	100%	100%	Relevant Material Standard		"	V	V	V	
		c) Resistivity	"	Elect	100%	100%	Appvd. Drg/DS	Appvd. Drg/DS	"	P	V	-	
1.05	Porcelaine Bushing/ Mica Insulator	a) Visual Examination	Major	Visual	100%	100%	IS:5621	IS:5621	QC Records	P	V	-	
		b) Dimensional check	"	Measure	100%	100%	IS:3347	IS:3347	MTC	P	-	-	
		c) Acceptance Test	"	Review	100%	100%	IS:5621	IS:5621	MTC	V	V	V	
2.00 IN-PROCESS CHECKS													
2.01	Treatment of Sheet	a) Surface condition & Galvanising Check	Major	Visual	100%	100%	IS:277	IS:277	QC Record	P	-	-	
2.02	Structural Fabrication & Enclosure	a) Dimensional check	Major	Measure	100%	100%	NTPC Spec./Appvd. drg/DS	NTPC Spec./Appvd. drg/DS	QC Record	P	-	-	

Engg. Div./QA&I

Format No.: QS-01-QA-P-10/F3-RL

ITEM (MATERIAL, CLASS, GRADE, RATING, RANGE, SIZE ETC.) : NEUTRAL GROUNDING RESISTOR (UPTO 66KV)		STANDARD QUALITY PLAN					TO BE FILLED IN BY NTPC				REVIEWED BY						
CONFORMING TO CODE : NTPC TECHNICAL SPECIFICATION		REFERENCE DOCUMENT		ACCEPTANCE NORMS		FORMAT OF RECORD		AGENCY		REMARKS		APPROVED BY					
Q.P. No: 0000-999-QOE-S-045 Rev : 0 Date: 15.12.2011 Page: 02 of 02 VALID UPTO: 14.12.2014		7		8		9		M C N		11		Banish K. Jha Approved R. Garg Approved H. Shekhar Approved A. K. Garg Approved					
CLASS		TYPE OF CHECK		QUANTUM OF CHECK		REFERENCE DOCUMENT		ACCEPTANCE NORMS		FORMAT OF RECORD		AGENCY					
4		5		6		7		8		9		M C N					
Major		Elect		100%		Appvd.drg/DS		Appvd.drg/DS		QC Record		P Y -					
"		"		100%		"		"		"		P Y -					
"		"		100%		"		"		"		P Y V					
Critical		Review		100%		NTPC Tech. spec./ Appvd Drg/DS		NTPC Tech. spec./ Appvd Drg/DS		TC		P W W					
Engineering																	
4.00 FINAL INSPECTION																	
4.01 Routine Test on assembled NGR																	
a) Visual appearance, Rating & CA layout		Critical	Visual	100%	100%	NTPC Technical Specification./ Approved Drawing/Data Sheet.							Test Report	✓	P	W	W
b) Dimensional check		"	Measure	"	"								"	✓	P	W	W
c) No. of grid & arrangement of resistance tier		"	Elect	"	"								"	✓	P	W	W
d) Ohmic value measurement at all taps (if applicable)		Critical	Elect	100%	100%								"	✓	P	W	W
e) Insulation Resistance		"	"	"	"								"	✓	P	W	W
f) HV withstand test		"	"	"	"								"	✓	P	W	W
g) Degree of Protection test on enclosure		"	Physical/ Measure	"	"								"	✓	P	W	W
h) Paint Shade & Thickness		"	"	"	"								"	✓	P	W	W
i) Functional test of all auxiliary Items/Wirings		"	Elect	"	"								"	✓	P	W	W
j) Packing and Delivery		Major	Physical	"	"								"	✓	P	W	W
5.00 DESPATCH																	
LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.																	
** M: MANUFACTURER / SUB-SUPPLIER C: MAIN SUPPLIER, N: NTPC P: PERFORM W: WITNESS AND V: VERIFICATION, AS APPROPRIATE,																	
CHP: NTPC SHALL IDENTIFY IN COLUMN "N" AS "W".																	
Format No.: QS-01-QAI-P-10/13-RL																	
Engg. Div./QA&I																	

ANNEXURE TO QUALITY PLAN

SL. NO.	COMPONENT/OPERATION	CHARACTERISTIC CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY		
							P	W	V
1	COMPLETE NGR	1. HV TEST (a) BETWEEN NEUTRAL BUS AND ENCLOSURE (b) BETWEEN RESISTOR ELEMENT AND END SUPPORT STRUCTURE.	100%	APPD. DRG./ DATA SHEET BS-587 / STD. IEEE 32 STD. IEEE 32 clause 10.3.2	APPD. DRG./ DATA SHEET BS-587 / STD. IEEE 32 STD. IEEE 32 clause 10.3.2	TEST REPORT TEST REPORT	2	1	-
			100%				2	1	-

LEGEND: 1 - BHEL/CUSTOMER 2 - VENDOR 3 - SUB-VENDOR P - PERFORM W - WITNESS V - VERIFICATION

ANNEXURE-II to QP

PACKING:

A. Support Structure of NGR shall be despatched in open in such a manner there shall be no damage during transit.

B. NGR shall be despatched in “Crate Packing” using wood.

1.0 PREPARATION OF PACKING CASES:

1.1 DIMENSIONS:

- 1.1.1 Minimum number of planks shall be used for a shook.
- 1.1.2 Thickness of planks for Front, rear, top and bottom sides and binding, jointing battens shall be 25/20mm +2/-3 mm
- 1.1.3 Horizontal, vertical, diagonal planks shall be given for binding
- 1.1.4 Width of binding planks shall be minimum 100mm
- 1.1.5 Distance between any 2 binding planks shall be less than 750mm
- 1.1.6 Diagonal planks shall be used in between vertical binding planks when distance between inner to inner of vertical planks is more than 750mm
- 1.1.7 Distance of the outer edges of these planks from the edge of case shall be less than 250mm.
- 1.1.8 Diagonal planks are not required for top planks and width side, if the width of pallet is less than 750mm.

1.2 JOINTING OF PLANKS:

Single length planks shall be used for cubicles whose overall length is less than 2400mm. For cubicles of length more than 2400mm, jointing is permitted. The jointing shall be done with one single or maximum of 2 planks of wood same as other planks of width 250 mm (minimum) with two rows of nails on either side of the joint in zigzag manner. From the joint along height side, it shall be of lap joint with overlap of at least the width of plank.

1.3 TONGUE AND GROOVE JOINTS

Two consecutive planks shall be joined by tongue and groove joint. Depth of tongue shall be 12+1 mm, thickness of tongue shall be 8 +1 mm. The groove dimensions shall be such that the tongue fits tightly into the groove to make a good joint. This type of joint can be done based on the product requirement wherever required.

1.4 PERMISSIBLE DEFECTS

Wood shall be free from knots, bows, visible sign of infection and any kind of decay caused by insects, fungus, etc.

End splits: Longest end splits at each end shall be measured and lengths added together. The added length shall not exceed 60mm per meter run of shook's. Wood pins shall be used to prevent further development of split.

Surface cracks: Surface cracks with a maximum depth of 3mm are permissible. A continuous crack of any depth all along the length is not allowed.

1.5 OTHER MATERIALS

1.5.1 NAILS

The dia. of the nails shall be 3.15mm. The length of the nails shall be 65mm wherever two planks of 25mm thickness are joined and 75mm wherever a 25mm planks is joined to a 50mm plank.

1.5.2 BLUE NAILS

These are used for nailing bituminized Kraft paper/hessian cloth to the planks. The length of the nails shall be 16mm.

1.5.3 HOOP IRON STRIPS

These are used for strapping the boxes. The width of the strips shall be 19+1mm and thickness 0.6+0.01mm. The material shall be free from rust. If sufficient nailing is done for bigger boxes, strapping need not be done.

1.5.4 CLIPS

These shall be used for strapping the hoop iron strips on the boxes.

1.5.5 BRACKETS

These brackets are used for nailing to the corners of cubicle boxes. The brackets shall be of mild steel of thickness min 2mm and width 25+1mm. The brackets shall be of "L" shape, the length of each side being 100+2mm. Two holes shall be provided towards the end of each side for screwing /nailing.

1.5.6 MULTI LAYERED CROSS LAMINATED POLYTHELENE FILM

100GSM (Colourless) Multi Layered Cross Laminated Polyethylene Film are used to make covers to the jobs individually. The cross lamination gives qualities of extra toughness, together with flexibility and lightness coupled with good weather resistance to ultra violet rays.

1.5.6 RUBBERISED COIR:

The rubberized coir is used as cushioning material. For the packing of loose items, items are to be arrested by using rubberized coir. For the packing of cubicles rubberized coir of thickness 25mm and width 75mm shall be used.

1.5.7 FASTENERS

Bolts, double nuts, spring washers will have to be used to hold the job to the bottom plank of the box so that there shall be no jerk on the NGR during transit.

1.5.8 PACKING SLIP:

Packing slip kept in the polyethylene bag shall be placed in the box at appropriate place. In addition, one more packing slip covered in polyethylene cover and packing slip holder shall be nailed to front / rear of case.

1.5.9 MARKING PLATE:

Marking on the packing case shall be done as per the manufacturer standard.

RATE CONTRACT
BOQ-CUM-PRICE SCHEDULE - NEUTRAL GROUNDING RESISTOR

SR. No.	ITEM CODE.	DESCRIPTION	UNIT	QTY.	UNIT PRICE	TOTAL PRICE
		MAIN ITEMS				
1.0	506-15029-A	NGR 11 KV (600A, 10 SEC, 11.06 OHMS)	Nos	49	(0.364892 * X) / 49	(0.364892 * X)
2.0	506-15019-A	SUPPORTING STRUCTURE FOR 11 kV NGR	Nos	42	(0.048314 * X) / 42	(0.048314 * X)
3.0	506-15030-A	NGR 3.3 KV (600A, 10 SEC, 3.32 OHMS)	Nos	98	(0.348053 * X) / 98	(0.348053 * X)
4.0	506-15021-A	SUPPORTING STRUCTURE FOR 3.3 kV NGR	Nos	90	(0.077069 * X) / 90	(0.077069 * X)
5.0	506-15022-A	COPPER BUSBAR 50X8 MM OF 10M LENGTH	Nos	132	(0.161672 * X) / 132	(0.161672 * X)
TOTAL PRICE (EX-WORKS)					X	

Notes:

- Bidder has to quote "X" as total Ex-works value. Based on this price, unit price shall be derived for all items as per formula indicated above.
- The unit prices shall apply for adjustment of variation in quantity as stipulated above.



**PRE-QUALIFYING REQUIREMENTS (PQR)
FOR NEUTRAL GROUNDING RESISTOR
FOR RATE CONTRACT**

PE-PQ-RC-505-E001

REV. 00 DATE: 21.03.2025

SHEET 1 OF 1

ITEMS: Neutral grounding resistor (NGR) along with supporting structure

Applicable Type- NGR 300A or above

SCOPE: Supply : YES ;

Erection & Commissioning: No

1	Vendor should be a manufacturer of applicable type of NGR.
2	Availability of type test certificates conducted at independent Lab or witnessed by third party as per relevant IS/ International standard for applicable type of NGR.
3	Vendor should have in-house facility for design and manufacturing of applicable type of NGR.
4	Vendor should have in-house capability to carry out all routine and type tests for applicable type of NGR. In case facilities for type test are not available with the vendor, these tests can be conducted at Govt. Lab/ Govt. approved independent Lab.
5	Manufacturing capacity of at least 10 nos. of applicable type of NGR per month.
6	Supplied at least 20 nos. of applicable type of NGR in one or more orders.
7	Minimum two (2) nos. purchase orders for applicable type of NGR shall be submitted which should not be more than five (5) years old from date of techno-commercial bid opening for establishing continuity in business.

General Points of PQR

1. Consideration of offer shall be subject to customer's approval of vendors, if applicable.
2. Vendor to submit all supporting documents in English. If documents submitted by vendor are in language other than English, a self-attested English translated document should also be submitted.
3. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the vendor to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.
4. After satisfactory fulfilment of all the above criteria/ requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.
5. Attached Annexure-I to be filled by the vendors on quality & general terms. Requisite Documents (like factory registration certificate, R&D set-up details etc.) asked in the Annexure-I, shall also be attached as Annexure-F2.1 to Annexure F2.17 along with the filled response in the Annexure-I.

**ANNEXURE- 1****SUB-VENDOR QUESTIONNAIRE**

i.	Item/Scope of Sub-contracting			
ii.	Address of the registered office	Details of Contact Person (Name, Designation, Mobile, Email)		
iii.	Name and Address of the proposed Sub-vendor's works where item is being manufactured	Details of Contact Person: (Name, Designation, Mobile, Email)		
iv.	Annual Production Capacity for proposed item/scope of sub-contracting			
v.	Annual production for last 3 years for proposed item/scope of sub-contracting			
vi.	Details of proposed works			
1.	Year of establishment of present works			
2.	Year of commencement of manufacturing at above works			
3.	Details of change in Works address in past (if any)			
4.	Total Area			
	Covered Area			
5.	Factory Registration Certificate	Details attached at Annexure – F2.1		
6.	Design/ Research & development set-up (No. of manpower, their qualification, machines & tools employed etc.)	Applicable / Not applicable if manufacturing is as per Main Contractor/purchaser design Details attached at Annexure – F2.2 (if applicable)		
7.	Overall organization Chart with Manpower Details (Design/Manufacturing/Quality etc)	Details attached at Annexure – F2.3		
8.	After sales service set up in India, in case of foreign sub-vendor (Location, Contact Person, Contact details etc.)	Applicable / Not applicable Details attached at Annexure – F2.4		
9.	Manufacturing process execution plan with flow chart indicating various stages of manufacturing from raw material to finished product including outsourced process, if any	Details attached at Annexure – F2.5		
10.	Sources of Raw Material/Major Bought Out Item	Details attached at Annexure – F2.6		
11.	Quality Control exercised during receipt of raw material/BOI, in-process, Final Testing, packing	Details attached at Annexure – F2.7		



ANNEXURE- 1

SUB-VENDOR QUESTIONNAIRE

12.	Manufacturing facilities <i>(List of machines, special process facilities, material handling etc.)</i>	<i>Details attached at Annexure – F2.8</i>												
13.	Testing facilities <i>(List of testing equipment)</i>	<i>Details attached at Annexure – F2.9</i>												
14.	If manufacturing process involves fabrication then- List of qualified Welders List of qualified NDT personnel with area of specialization	<i>Applicable / Not applicable</i> <i>Details attached at Annexure – F2.10</i> <i>(if applicable)</i>												
15.	List of out-sourced manufacturing processes with Sub-Vendors' names & addresses	<i>Applicable / Not applicable</i> <i>Details attached at Annexure. –F2.11</i> <i>(if applicable)</i>												
16.	Supply reference list including recent supplies	<i>Details attached at Annexure – F2.12</i> <i>(as per format given below)</i>												
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 10%;">Project/ package</th> <th style="width: 15%;">Customer Name</th> <th style="width: 30%;">Supplied Item (Type/Rating/Model /Capacity/Size etc)</th> <th style="width: 20%;">PO ref no/date</th> <th style="width: 15%;">Supplied Quantity</th> <th style="width: 10%;">Date of Supply</th> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>	Project/ package	Customer Name	Supplied Item (Type/Rating/Model /Capacity/Size etc)	PO ref no/date	Supplied Quantity	Date of Supply							
Project/ package	Customer Name	Supplied Item (Type/Rating/Model /Capacity/Size etc)	PO ref no/date	Supplied Quantity	Date of Supply									
17.	Product satisfactory performance feedback letter/certificates/End User Feedback	<i>Attached at annexure - F2.13</i>												
18.	Summary of Type Test Report (Type Test Details, Report No, Agency, Date of testing) for the proposed product <i>(similar or higher rating)</i> Note:- Reports need not to be submitted	<i>Applicable / Not applicable</i> <i>Details attached at Annexure – F2.14</i> <i>(if applicable)</i>												
19.	Statutory / mandatory certification for the proposed product	<i>Applicable / Not applicable</i> <i>Details attached at Annexure – F2.15</i> <i>(if applicable)</i>												
20.	Copy of ISO 9001 certificate <i>(if available)</i>	<i>Attached at Annexure – F2.16</i>												
21.	Product technical catalogues for proposed item (if available)	<i>Details attached at Annexure – F2.17</i>												
<table style="width: 100%;"> <tr> <td style="width: 33%;">Name: </td> <td style="width: 33%;">Desig: </td> <td style="width: 33%;">Sign: </td> <td style="width: 33%;">Date: </td> </tr> </table>			Name:	Desig:	Sign:	Date:								
Name:	Desig:	Sign:	Date:											

Company's Seal/Stamp:-

ANNEXURE-A	
List of projects considered for rate contract of Neutral Grounding Resistor	
1	2X800 MW LARA STPS
2	2X800 MW SINGRAULI STPS
3	2X800 MW DVC KODERMA THERMAL POWER STATION PHASE-II
4	1X800 MW SIPAT STPP STAGE-III PROJECT
5	1X800 MW EPC PACKAGE FOR DARLIPALI STPP, STAGE-II
6	2X660 MW RAGHUNATHPUR SG
7	1X800 MW SCCL SINGARENI TPP