



DOCUMENT TITLE:
**GENERAL SPECIFICATION FOR LV
BUSDUCTS REQUIRED FOR MAITREE
PROJECT**

SPECIFICATION NO. EP-TS-MAIT-BD-001

REV NO. : 00 DATE : 03.02.2019

SHEET : 1 OF 11

2X660MW MAITREE SUPER THERMAL POWER PLANT BIFPCIL, BANGLADESH

**TECHNICAL SPECIFICATION FOR
BUSDUCT WITH COPPER CONDUCTOR FOR MAITREE
PROJECT**

BHEL DOCUMENT NO. : EP-TS-MAIT-BD-001, REV-00



**BHARAT HEAVY ELECTRICALS LIMITED
ELECTRIC & PHOTOVOLTAIC DIVISION
BANGLORE-560012**



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**IT IS CONFIRMED THAT OUR TECHNICAL OFFER COMPLIES WITH THE SPECIFICATION AND
THAT THERE ARE NO TECHNICAL DEVIATIONS.**

BIDDER'S STAMP & SIGNATURE



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1. SCOPE OF ENQUIRY

This specification covers the design, manufacture, assembly, testing and inspection at vendor's/sub-vendor's works, packing and dispatch to site of low voltage Busduct as described in the various sections of this specification. LV Busduct shall generally conform to IEC Standard 60647. In this specification as 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.

It is not the intent to specify completely herein in all the details of the equipment. Nevertheless, the equipment shall be complete and operative in all respects and shall conform to highest standard of engineering, design and workmanship.

Specific requirements given in **Data Sheet** form part of this specification and shall be fully complied with.

2. CODES AND STANDARDS

The equipments and accessories covered under this specification shall be designed, manufactured and tested in accordance with latest editions of relevant standards.

3.0.0 SCOPE OF SUPPLY & SERVICES

3.1.1 The scope of supply and services covers the complete supply of equipment and services in accordance with the requirements of various sections of the specification. The Scope of supply shall be as per **tender RFQ document**.

3.1.2 Purchaser reserves the right to add/delete the quantity during detailed engineering as finally required for the project.

3.1.3 *The quantities shown in annexures are tentative for bidding purpose only and may vary up to $\pm 30\%$ of the total order value.* Any variation arising during detailed engineering stage will be taken into account for adjustment of contract price based on unit rates quoted in the bid.

3.1.4 Busduct lengths for payment purpose shall be measured from matching flanges. The length of each busduct is indicated elsewhere in specification. Actual quantity will be finalized during detail engineering. Bidder shall furnish unit prices per metre run of busduct, bends, phase changeover chambers and other items in the prescribed schedule of unit prices. Unit rate quoted shall be applicable for price adjustment for variation in quantity.

3.1.5 For Busducts, all required bends, equipment end chambers, copper flexible at equipment end, rubber bellow, silicagel breather, space heater with thermostat, marshalling box, matching flanges, gaskets, and galvanised steel supports with foundation bolts & hardware shall be included in the scope.

3.2.0 SPARES & CONSUMABLES

The Scope of supply shall also include the following. Bidder shall furnish item wise breakup for the Spares:

a) Recommended spares required for a period of three years. (OPTIONAL)



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3.3.0 SCOPE OF SERVICES

- Preparation and submission of drawings & documents in soft and hard form as per the drawings / documents submission schedule.
- Submission of progress report
- Participation in project review / Technical Coordination meetings.
- Conducting performance test at shop.
- Carrying out necessary tests on electrical equipment as required by Purchaser.
- Preparation and submission of all as built drawings related to the contract.

3.4.0 The scope of work will also include such other related works although they may not be specifically mentioned in the above paragraphs and all such incidental items not specified but reasonably implied and necessary for completion of the works as a whole as desired and as directed by the Purchaser / Owner.

4.0.0 EXCLUSION

- Civil works such as foundation.
- Erection & Commissioning of equipment at site.
- Connection to earthing system
- Power & control cable supply and termination

5.0.0 TERMINAL POINTS OF SUPPLY

- a) Cable termination compartment of SSB/PCC/PMCC/MCC/Terminal flange at transformer end of LV Busduct.
- b) Termination at multiway terminal board for control cables.

6.0.0 LAYOUT

Any specific considerations such as minimum clearances required on all sides etc. shall be clearly brought out in the offer.

7 DELIVERY (As per commercial terms and conditions)

8 SPECIFIC TECHNICAL REQUIREMENTS

8.0.1 Each set of busduct shall comprise of the following

- Bus Duct should be designed to prevent accumulation of rain water on top sheet. All gasketed flanged joints shall be suitably protected against direct splashing of rain water in case of outdoor runs.
- Enclosure shall be made with Alluminium alloy & conductor shall be of copper.
- Earth busbar size shall be of 75x10 Cu. 2 runs on either side of busduct.
- Should be provided with filtered drains for drainage of condensate at the lowest points and at such locations where accumulation of condensate can be expected.



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- The Insulators should be mounted in such a way so as to permit easy removal or replacement without disassembly of the bus. The insulator mounting plates shall be designed for cantilever loading to withstand the short circuit.
- The conductor should be fastened on the insulator through fixed and slip joints so as to allow conductor expansion or contraction without straining the insulator.
- The space heater should be provided preferably located near to each insulator to avoid moisture condensation within busduct.
- The Bus Duct should be provided with all matching flanges, wall sealing gaskets, fittings, hardware & supports and other equipments required for termination at the SWGR/PCC/MCC and transformers.
- The Bus Duct should be provided with flexible connections at all equipment termination both at transformer end as well as SWGR/PCC/MCC end to take care of misalignment up to 25mm in all directions.
- Suitable Bi-metallic connectors shall be provided where there is a difference in material of bus conductor & that of equipment terminal connectors.
- The Bus duct should be provided with necessary supporting structures for hanging/supporting which includes indoor/outdoor posts, bolts, shims, baseplates, beams, hangers, brackets, bracings, necessary hardware and other members.
- The Bus Bars should be adequately supported and braced to successfully withstand normal operations, thermal expansion, short circuit forces & at all specified design loads.
- The Bus Duct should be provided with name plates for easy identification of each piece of equipment of busduct and on busduct section.
- Removable bolted disconnect link (**if Applicable**) should be provided in the bus for purpose of isolation and the disconnecting link should consist of removable section of conductor and shall be constructed as to permit easy insertion or removable without any alignment difficulties.
- The Bus Bar on either sides of the link should be firmly supported so that the disconnect link is equal in mechanical strength to any other section of the bus.
- Minimum clearance of **300 mm** should be ensured between the disconnected bus sections when the disconnected link is removed.
- The bus duct enclosure should be provided with extended bellows to allow for temperature changes & vibrations.
- The Vendor should provide above said type test reports for M/s BHEL Review & Acceptance. If not available, type test to be conducted in presence of BHEL without any price implication.

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10 Make of equipments/components shall be subject to purchaser's approval without any price implication. 11 Bidder shall refer to the attached data sheet and comply with out any deviations. 12 <u>PAINING</u> 12.0.1 All surfaces shall be cleaned of loose substances and foreign materials such as dirt, rust, scale, oil, grease, welding flux etc. irrespective of whether the same has been spelt out in the standards or not in order that prime coat is rigidly anchored to the virgin surface. 12.0.2 Surface preparation of all Bus duct shall be carried out in accordance with IS specification. The clean surface shall be given a phosphate coating consisting of a thin layer of zinc, iron or manganese phosphate deposited either by immersion or powder spray. The phosphate coated surface shall have one coat of baking primer of zinc chromate and two coats of stove enamel finish paint. Sufficient quantity of touch-up paint shall be furnished for application at site. 12.0.3 All inside and outside surfaces of enclosure shall be powder coated/Enamel coated, Color shade will be intimated during detailed engineering, no price implication shall be issued for same. 12.0.4 Any other painting procedure followed shall be indicated in offer for acceptance. 12.0.5 Bidder shall furnish painting procedure during detailed engineering for purchaser's acceptance / approval. 13 <u>PACKING & DELIVERY</u> The Vendor shall arrange proper outdoor packing i.e the packing should withstand the power plant climatic conditions for 6 months and transportation of all Equipment from the point of manufacture to the project site. The arrangements shall include, but not be limited to, determination of routes, determination of required permits, payment of required taxes and duties, and notification to the Purchaser. Delivery (Ex-works) of all equipment shall be as per NIT. Crate packing willnot be accepted. Plywood packing of minimum thickness 6mm shall be provided. Further packing shall be in line with the attached packing specification & drawings. 14 <u>QUALITY ASSURANCE, TESTING & INSPECTION</u> 14.0.1 All materials, components and equipment's covered under this specification shall be procured, manufactured, inspected and tested as per the BHEL/customer approved quality plan. There shall be no commercial implication to BHEL on account of QP approval. Stage inspection is applicable for checking of welding correctness.		



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14.0.2 All equipments supplied shall be of type tested quality.

14.0.3 *Successful bidder shall furnish test certificates of all type tests already carried out by the bidder on similar type of equipment after award of contract for busducts at contract stage. The type tests should have been either conducted at an independent laboratory (NABL Accredited) or should have been witnessed by NTPC/BHEL/EIL. The purchaser shall review the type tests certificates furnished by the bidder at contract stage.*

14.0.4 *In absence of valid type tests certificates or in case such certificates are not found to be meeting the relevant standard requirements, vendor shall conduct all such tests according to relevant standards free of cost to purchaser and reports shall be submitted to purchaser for approval.*

14.0.5 Inspection shall be carried out as per the BHEL /Customer approved Quality Plan.

14.0.6 All important components shall be of type tested quality. The Contractor shall furnish type test report on components identical to those being offered for approval before fabrication of LV BusDuct.

14.0.7 All material used for the construction of the equipment shall be new and in accordance with the requirements of this specification. Materials utilised shall be those which have established themselves for use in such applications.

14.0.8 All tests shall be conducted as per relevant 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.

18.1.2 The LV Bus Duct shall be subjected to all routine and acceptance tests as per relevant standards and the test reports should be valid as per relevant IS/IEC.

18.1.3 Purchaser may get type tests repeated even after submission of the valid test certificates by the bidder. Hence bidder shall indicate charges for the type test (OPTIONAL) as indicated in price schedule.

18.1.4 Routine and type test certificates shall be furnished for all bought out items if applicable.

18.1.5 All routine tests in accordance with the latest version of applicable standard shall be conducted for all the Switchgears. The charges for carrying out all routine tests shall be deemed to be included in the bid price.

18.1.6 Test reports of the various tests conducted at the time of inspection shall be furnished by the vendor before dispatch of the Switchgear .

15 PERFORMANCE GUARANTEE

Bidders shall guarantee that satisfactory performance of the equipment supplied under all conditions and requirements as laid down by this specification.

16 AS BUILT DRAWINGS

Though only supply of equipment is under bidder's scope, bidder may note that all as-built corrections(as given by purchaser to vendor) shall have to be incorporated in the originals by



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the vendor and copies of the as built corrected drawings/documents as per requirement shall be submitted by the vendor.

17 DOCUMENTS

17.0.1 Drawings/Documents Required Along With The Bid

Following documents are to be furnished by bidder as technical offer:

- a) duly Un-priced copy of tender BOQ stamped and signed by the bidder.
- b) A copy of the sheet "Instructions to Bidders for Preparing Technical Offer" duly stamped and signed by the bidder.
- c) A copy of sheet "List Of Contents" duly stamped and signed by the bidder.
- d) Technical deviation / clarification, if any

No other information/ document (other than those mentioned above) shall be furnished by the bidder along with the technical offer, unless specifically mentioned elsewhere in specification. If so furnished, same shall not be considered by BHEL.

17.0.2 Drawings/Documents To Be Submitted After Award Of Contract

Below drawings/documents to be submitted after award of contract.

1. General Notes
2. Type Test reports
3. Data sheet
4. Manufacturing drawing of Busduct.

17.0.3 O&M MANUAL:

O&M manual for installation, operation and maintenance shall be furnished before dispatch of the equipment. Draft O&M manual shall be submitted for purchaser's approval within two weeks of inspection. Manual shall contain minimum following details:

- a) Description of the equipment
- b) Salient construction features
- c) Packing details
- d) Instructions to be followed on receipt at site for storage
- e) Erection procedure & checks
- f) Tests to be conducted at site
- g) Commissioning procedure
- h) Maintenance instructions
- i) List of spares
- j) Approved GA drawing
- k) Approved Data Sheets
- l) Technical leaflets of all important components

17.0.4 Statutory and regulatory requirements as per IE rule 1956 with amendment-3 rule 1986, rules nos.35, 42, 50 & 51 will be adhered to.



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18.0.0

CUSTOMER SPECIFICATION & DATA SHEET

General

The LV bus duct shall of the phase segregated type (Non-segregated phase bus duct is acceptable for LV connections, subject to provision of type test certificate of an independent test authority) and connect the LV side of the 11/0.415 kV auxiliary transformers (if the currents are exceeding 1000A) to the unit boards and station boards respectively.

Copper conductors shall be used for busduct.

The design shall be in accordance with the best modern practice employed in the construction of heavy current air insulated equipment and particular attention shall be given to the necessity for withstanding without damage or danger, the electro-mechanical stresses which may arise during normal or fault conditions and which may be due to firing, vibration, fluctuations in temperature, flashover or other causes. The design shall be such that any mechanical damage due to a fault on the connections themselves should be confined as far as possible to the immediate vicinity of the fault.

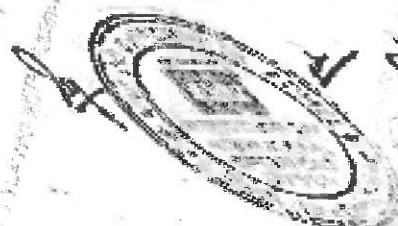
A common enclosure for the busbars shall be designed to exclude dust and moisture so that the installation is suitable for operation over long periods without the need for maintenance or clearing of internal components. Barriers shall be used to segregate the phases.

The connections at the transformer terminals shall be provided with suitable metal enclosures. The enclosures shall be formed of metal sheet fixed on substantial supports.

Where the busbar connections are installed external to the building the enclosure shall be completely weatherproof and where necessary shall be painted to ensure protection against the effects of adverse environmental conditions.

Where steel is used for supports it shall be galvanized to EN ISO 1461. Painting and finishing shall comply with relevant parts of the Specification.

Adequate means of access shall be provided to permit inspection, maintenance, insulator cleaning and the reading of temperature indicator devices used in the temperature rise test. It shall only be possible to remove bolted panels with a special key.



ENCLOSURE FOR LV BUSDUCTS
REQUIREMENT FOR MAITREE

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Conductors

The busbar and connections shall be copper.

Connections shall be as short and straight as possible.

Each length of conductor between joints shall, unless otherwise approved, be supported on not less than two sets of insulators. Positive contact must be made at all times between the conductor and the insulator top cap.

All busbar joints and connections shall be bolted or welded. The bolts and nuts shall be of high tensile non-magnetic material, and shall be securely locked by locknuts, locking plates or approved lock washers.

Earthing

The structures, enclosures, screens, and insulator supports shall be continuously and effectively earthed in an approved manner. All joint faces shall be tinned.

The busbar earthing facilities shall be provided with facilities for connection to the station earthing system.



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19.0.0 CUSTOMER DATA SHEET:

LV Segregated Phase Bus Duct		
Manufacturer		
Type	Segregat ed Phase	
Rated Insulation Voltage	V	
Rated current	A	
Rated short time withstand current (1 sec)	kA	
Rated peak withstand current	kA(peak)	
Bus conductor Material		
Cross section of phase conductor	mm ²	
Cross section of neutral conductor	mm ²	
Cross section of earth conductor	mm ²	
Material of Enclosure		
Dimensions (height x width)	mm x mm	

Busduct conductor shall be of copper.

Busduct enclosure shall be of Alluminium alloy.





Bharat Heavy Electricals Limited
Electroporcelains Division, Bangalore – 560 012

Control Panel Business Group

Doc. No. EP-CPBG-PQR-NSPBD-001

REV.001

DATE: 19.06.2018

Pre-qualification requirement for 415V Low Voltage Non-Segregated Phase Bus duct (NSPBD)

1. Vendor shall be original manufacturer for 415V LT non segregated phase bus duct.
2. Vendor shall have complete in-house manufacturing and routine testing facility.
3. Vendor/Bidder shall have valid type test certificate as mentioned below for rating 1600A & above.
 - a. Short circuit type test (50KA for 1Sec.)
 - b. Heat Run test/Temperature rise test.
 - c. Degree of protection IP-55.
4. Vendor must have supplied at least 300 meter of non-segregated phase bus duct(NSPBD) rating 1600A and above comprise of maximum 3 orders in last 5 years and each order must have minimum 50 meter quantity.
5. The manufacturer must have *ISO 9001* certification and quality plan for design, manufacturer and testing of NSPBD.
6. BHEL/END USER may visit the factory for assessment, irrespective of documents submitted.
7. The technically qualified vendors confirming all the above Qualification criteria shall be referred to END USER for final approval. Only END USER accepted vendor's bids shall be considered for further process in tender.

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