

PROJECT:	WBPDCS Sagardighi
ITEM:	Supply & Services of ISOLATORS
SUBJECT:	BID SPECIFIC ATC

1.	For any technical clarification , please contact Mr. Naveen Tripathi, Dy. Manager (TBEM). Contact No. 0120-06748527; e-mail: tripathi@bhel.in
2.	For any commercial clarification , please contact Mr. Sandeep, Dy. Manager (TBMM). Contact No. 0120-6748540; e-mail: kumar.sandeep@bhel.in
3.	Terms of Payment:
(Supply & Services)	As per GTC of GeM (Payment due date shall be as per GEM) Supply Payment: 95% of payment from the date of receipt of complete invoice along with documents in 3 sets (original + 2 copies) as follows: - LR / GR duly endorsed by BHEL Site Official. - Material Receipt Certificate issued by BHEL Site Official. - GST Compliant Tax Invoice - Packing List (Case-wise) - Copy of Transit Insurance Certificate from underwriters. - Material Inspection Clearance Certificate (MICC) issued by BHEL Quality Management - Guarantee Certificate - Copy of Performance Bank Guarantee (PBG) - Certificate of acceptance of Type Test Reports issued by BHEL Engineering Management wherever specifically mentioned in the Purchase Order 5% of payment days from the date of receipt of complete invoice along with documents in 3 sets (original + 2 copies) as follows: - Certificate of successful completion of Supervision of Erection, Testing & Commissioning at Site if it is in the scope of the supplier or Certificate of successful completion of Testing & Commissioning at Site if it is in the scope of the supplier. - Certificate of completion of final documentation as per Purchase Order / Technical Specification issued by BHEL Engineering Management Note: In-case commissioning is delayed beyond reason not attributable to supplier. Supplier may claim the balance 05% of supply portion after 12 months from the date of last delivery. Upon submission of BG with equivalent amount and the certificate endorsed by BHEL Site In-Charge citing the details that the “delay in commissioning is not attributable to supplier”. Vendor has to submit the duly signed check-list along with Bill. Payment terms for supervision of ETC: 100% payment along with applicable GST from the date of receipt of complete GST compliant Tax invoice along with certificate of successful completion of Testing & Commissioning at Site issued by BHEL Site Official / Construction Management in 3 sets (Original + 2 copies). Note: Vendor to quote minimum 02% for supervision portion else BHEL will recalculate prices of contract & fix the prices of supervision charges as two (02) % of total ex-works value of supply portion and it will be deemed as acceptable to L1 bidder.

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4.	Terms of Delivery:
As per GeM. However, unloading at site is in the scope of BHEL. Bidders to quote price accordingly.	
5.	Delivery Time:
32 Weeks (224 days) from the date of PO by BHEL as per Activity schedule (Annexure-A&B). Early Delivery is acceptable. Note: In case, BHEL's delivery requirement is not met by vendor(s), then a chance may be given to all such vendors to review their quoted delivery schedule in line with BHEL's delivery requirement. However, if vendor fails to meet the requisite delivery plan, then BHEL reserves the right not to consider the offer of such vendor(s).	
6.	Prices:
The quoted prices shall be on Firm basis including packing and forwarding charges . Price to be quoted as inclusive of GST. i.e. Ex-Works + F&I + GST.	
7.	Liquidated Damage of delayed Delivery:
As per GeM terms and conditions.	
8.	Item & BOQ:
BOQ: As per Clause No. 1.3 of Section-1 of Technical specification.	
9.	Technical Specification:
Technical specification no. TB-445-316-002 Rev 00 . No permissible Technical Deviation has been envisaged. Bidders to quote as per Technical Specification.	
10.	Pre-Qualification Requirement:
As specified in Technical Specifications	
11.	MQP (Manufacturing Quality Plan):
MQP format is indicative only, however inspection shall be carried out as per approved Quality Plan. Supplier has to submit Quality Plan to BHEL for Customer approval.	
12.	Inspection:
Inspection shall be carried out as per customer as per approved Quality Plan.	
13.	Destination / Delivery Location:
Dy General Manager (I/C projects) C/O BHEL-TBG, Sagardighi Thermal Power Plant, Post Office - Manigram, Dist.-Murshidabad, West Bengal, PIN. 742237, GSTN No.: 19AABCT3027C1ZQ, Site in charge: Subir Kumar Dhal- Engineer- 9434300911 - subir@bhel.in	
14.	Bill to Address:
Bharat Heavy Electricals Limited-TBG, 10th Floor, Plot No.C-20/1A/1, Joy Tower, Sector-62, Noida-201301, U.P. GSTN-09AAACB4146P2ZC	

15.	Guarantee Clause (Defect Liability Period):
The equipment / material supplied and services rendered (if applicable) shall be guaranteed to be free from all defects and faults in design & engineering, material, workmanship & manufacture and in full conformity with the Purchase Order / Contract, Technical Specifications & approved drawings / data sheets, if any, "Eighteen (18) months from the date of Completion of the Facilities (01.04.2024) or twelve (12) months from the date of Operation Acceptance/PG TEST (01.07.2024) (or any part thereof), whichever occurs first". Note: In case ordering is delayed beyond 01.07.2024 (i.e. date of completion/installations) then, guarantee clause shall be 18 months from the date of last delivery.	
16.	Performance Bank Guarantee:

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Performance BG to be kept valid till the completion of guarantee period.

“Bidder agrees to submit performance security required for execution of the contract within the time period mentioned. In case of delay in submission of performance security, enhanced performance security which would include interest (SBI rate + 6%) for the delayed period, shall be submitted by the bidder. Further, if performance security is not submitted till such time the first bill becomes due, the amount of performance security due shall be recovered as per terms and conditions defined in NIT / Contract, from the bills along with due interest.”

17. Bidders to ensure that Third party / customer issued certificates being submitted as proof of PQR qualification should have verifiable details of document / certificate issuing authority such as name & designation of Issuing Authority and its organization contact number and e-mail Id etc. In case the same found not available, Purchaser has right to reject such document from evaluation.

18. Acceptance of Offer:

Bidder's offer will be technically acceptable subject to final acceptance of vendor by ultimate customer as approved supplier. Price Bid will be opened only for those bidders in respect of which vendor approval is received from WBPDCS. Necessary credentials/documents to be submitted for approval by Customer as per format.

19. Deviations:

- a) Technical Deviation: No Technical Deviation is envisaged.
- b) Commercial Deviation: No Commercial Deviation is envisaged.

20. All other terms & conditions shall be as per GTC of GeM

Signature & Seal of supplier

Date

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ACTIVITY SCHEDULE FOR MAIN ITEMS

Annexure-A

SL. NO.	ACTIVITY	ACTIVITY TIME IN WEEKS
1.	Submission of documents necessary for getting manufacturing clearance Drawings, data sheets (In scope of vendor)	04
2.	Review and Approval of documents and issue of manufacturing clearance (In scope of BHEL)	06
3.	Manufacturing Time (In scope of vendor)	19
4.	Inspection (In scope of BHEL)	01
5.	Issue of MICC (In scope of BHEL)	01
6.	Dispatch (In scope of vendor)	01
7.	Supervision activity considered from the date of PO/Contract (32 Weeks for supply + 08 Weeks for site readiness + 12 Weeks for services)	52 Weeks

Note – 1 - Supplier to ensure every revised submission incorporating comments within 2 weeks from the date of comments by BHEL.

1. Inspection call to be issued 2 weeks in advance.
2. Supplier must ensure the completeness and correctness of the requisite documents before submission for approval. Delay in approval on account of incomplete / inadequate information shall be the responsibility of supplier.
3. Inspection call should be given in the prescribed format only. Inspection calls not in the prescribed format shall not be entertained.

Signature & Seal of Supplier
Date

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ACTIVITY SCHEDULE FOR SPARES ITEMS

Annexure-B

SL. NO.	ACTIVITY	ACTIVITY TIME IN WEEKS
1.	Submission of documents necessary for getting manufacturing clearance Drawings, data sheets (In scope of vendor)	04
2.	Review and Approval of documents and issue of manufacturing clearance (In scope of BHEL)	06
3.	Manufacturing Time (In scope of vendor)	36
4.	Inspection (In scope of BHEL)	02
5.	Issue of MICC (In scope of BHEL)	02
6.	Dispatch (In scope of vendor)	02

Note – 1 - Supplier to ensure every revised submission incorporating comments within 2 weeks from the date of comments by BHEL.

1. Inspection call to be issued 2 weeks in advance.
2. Supplier must ensure the completeness and correctness of the requisite documents before submission for approval. Delay in approval on account of incomplete / inadequate information shall be the responsibility of supplier.
3. Inspection call should be given in the prescribed format only. Inspection calls not in the prescribed format shall not be entertained.

Signature & Seal of Supplier
Date

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Annexure-V

Item/Package Name :	Supply & Supervision of ETC for Isolators
Enquiry No.:	
Project:	WBPDCS Sagardighi
Type of project	
Percentage of Local Content	(Bidder to enter the applicable % of local content)

Format of Self certification regarding Local Content in line with PPP-MII order, 2017 & its revision dated 04.06.2020.

Date:.....

I _____ S/o, D/o, W/o, _____ Resident of _____ hereby solemnly affirm and declare as under:

That I will agree to abide by the terms and conditions of the Public Procurement (Preference to Make in India) Order, 2017 (*hereinafter PPP-MII order*) of Government of India issued vide Notification No: P-45021/2/2017-BE-II dated 15/06/2017, its revision dated 04/06/2020 and any subsequent modifications/Amendments, if any.

That the information furnished hereinafter is correct to the best of my knowledge and belief and I undertake to produce relevant records before the procuring entity/BHEL or any other Government authority for the purpose of assessing the local content of goods/services/works supplied by me for **(Enter the name of the Equipment/Item for Project).**

That the local content for all inputs which constitute the said goods/services/works has been verified by me and I am responsible for the correctness of the claims made therein.

That the goods/services/works supplied by me for **(Enter the name of the Equipment/Item for Project)** contains.....% **(mention the Local content in %age)** Local Content.

That the value addition for the purpose of meeting the 'Minimum Local Content' has been made by me at **(Enter the details of the location(s) at which value addition is made).**

That in the event of the local content of the goods/services/works mentioned herein is found to be incorrect and not meeting the prescribed supplier class categorization criteria as per said order, based on the assessment of procuring agency (ies)/BHEL/Government Authorities for the purpose of assessing the local content, action shall be taken against me in line with the PPP-MII order and provisions of the Integrity pact/ Bidding Documents.

I agree to maintain the following information in the Company's record for a period of 8 years and shall make this available for verification to any statutory authority.

- i. Name and details of the Local Supplier
(Registered Office, Manufacturing unit location, nature of legal entity)
- ii. Date on which this certificate is issued

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Annexure-V

- iii. Goods/services/works for which the certificate is produced
- iv. Procuring entity to whom the certificate is furnished
- v. Percentage of local content claimed and whether it meets the Minimum Local Content prescribed
- vi. Name and contact details of the unit of the Local Supplier (s)
- vii. Sale Price of the product
- viii. Ex-Factory Price of the product
- ix. Freight, insurance and handling
- x. Total Bill of Material
- xi List and total cost value of input used to manufacture the Goods/to provide services/in construction of works
- xii. List and total cost of input which are domestically sourced. Value addition certificates from suppliers, if the input is not in-house to be attached
- xiii. List and cost of inputs which are imported, directly or indirectly

For and on behalf of..... (Name of firm/entity)

Authorized signatory (To be duly authorized by the Board of Directors)

<Insert Name, Designation and Contact No.>

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SCHEDULE OF COMMERCIAL DEVIATION

The following are the deviations/ variations exception from the General Terms and Conditions:

SL. NO.	CLAUSE NO. OF TERMS AND CONDITIONS	STATEMENT OF DEVIATION
	NIL DEVIATION	NIL DEVIATION

In case, this schedule is not submitted, it will be presumed that the equipment /material to be supplied under this contract is deemed to be in compliance with the General Terms and Conditions.

If there is NIL deviation, even then the format to be filled as NIL DEVIATION.

Note : 1. Continuation Sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

2. Deviation mentioned in this schedule shall only be considered.

**This Format is to be submitted in original duly signed by bidder.
Reproduction of the same in any sort is not acceptable.**

Place: é é é é é é é

Date : é é é é é é é .

Signature of the authorized representative of

Bidder's name

:é é é é é é é é é é é é é

Designation:é é é é é é é é é é é é é

..

Company

Seal:é é é é é é é é é é é é é

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SCHEDULE OF TECHNICAL DEVIATION

The following are the deviations/ variations exception from the Technical Specifications:

SL. NO.	CLAUSE NO. OF TERMS AND CONDITIONS	STATEMENT OF DEVIATION
	NIL DEVIATION	NIL DEVIATION

In case, this schedule is not submitted, it will be presumed that the equipment /material to be supplied under this contract is deemed to be in compliance with the Technical Specifications,

If there is NIL deviation, even then the format to be filled as NIL DEVIATION.

Note : 1. Continuation Sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

2. Deviation mentioned in this schedule shall only be considered.

**This Format is to be submitted in original duly signed by bidder.
Reproduction of the same in any sort is not acceptable.**

Place: é é é é é é .

Date : é é é é é é .

Signature of the authorized representative of

Bidder's name :é é é é é é é é é é é é

Designation:é é é é é é é é é é é é é ..

UNPRICED BID

PROJECT:	WBPDC Sagardighi
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Item No.	Item Description	Item Quantity	Unit of Measure	Unit Price (Inclusive of F&I & GST)	GST % Applicable
1	SUPPLY- ISOLATOR : 420KV, 2000A, 50KA FOR 3S, THREE PHASE, HORIZONTAL DOUBLE BREAK (HDB) TYPE ISOLATOR INDIVIDUAL POLE MOTOR OPERATED, ELECTRICALLY GANGED WITH ONE EARTH SWITCH, INDIVIDUAL POLE MOTOR OPERATED, ELECTRICALLY GANGED, ALONG WITH OPERATING MECHANISM & OTHER ACCESSORIES EXCLUDING INSULATOR, STRUCTURE & TERMINAL CONNECTOR ETC.	12	NO	Mention "Quoted" as	Mention GST %
2	SPARES- ISOLATOR : 420KV, 2000A, 50KA FOR 3S, THREE PHASE, HORIZONTAL DOUBLE BREAK (HDB) TYPE ISOLATOR INDIVIDUAL POLE MOTOR OPERATED, ELECTRICALLY GANGED WITH ONE EARTH SWITCH, INDIVIDUAL POLE MOTOR OPERATED, ELECTRICALLY GANGED, ALONG WITH OPERATING MECHANISM & OTHER ACCESSORIES EXCLUDING INSULATOR, STRUCTURE & TERMINAL CONNECTOR ETC.	01	NO	Mention "Quoted" as	Mention GST %
3	SPARES- ISOLATOR : 420KV, GEAR MECHANISM ALONG WITH LINK & NUT	02	SET	Mention "Quoted" as	Mention GST %
4	SPARES- ISOLATOR : 420KV, MOTOR OPERATING MECHANISM BOX WITH ALL ACCESSORIES INCLUDING MOTOR	01	SET	Mention "Quoted" as	Mention GST %
5	SPARES- ISOLATOR : 420KV, OPEN / CLOSE LIMIT SWITCH	03	SET	Mention "Quoted" as	Mention GST %
6	SPARES- ISOLATOR : 400KV, AUXILIARY SWITCH ASSEMBLY FOR MAIN BLADE (6 NO + 6 NC)	03	SET	Mention "Quoted" as	Mention GST %

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7	SPARES- ISOLATOR : 420KV, COPPER CONTACT FINGERS FOR FEMALE & MALE CONTACTS	03	SET	Mention "Quoted" as	Mention GST %
8	SPARES- ISOLATOR : 400KV, DRIVE MOTOR WITH GEAR BOX	01	SET	Mention "Quoted" as	Mention GST %
9	SPARES- ISOLATOR : 420KV, CORONA SHIELDING RING	01	SET	Mention "Quoted" as	Mention GST %
10	SPARES- ISOLATOR : 400KV, SUPPORT BEARING	01	SET	Mention "Quoted" as	Mention GST %
11	SPARES- ISOLATOR : 420KV, INTERLOCKING COIL, TIMERS, KEY INTERLOCK	02	SET	Mention "Quoted" as	Mention GST %
12	SPARES- ISOLATOR : 420KV, POWER CONTACTOR	02	SET	Mention "Quoted" as	Mention GST %
13	SPARES- ISOLATOR : 420KV, AUXILIARY RELAY CONTACTOR	05	NO	Mention "Quoted" as	Mention GST %
14	SPARES- ISOLATOR : 420KV, THERMAL OVER LOAD RELAY	05	NO	Mention "Quoted" as	Mention GST %
15	SPARES- ISOLATOR : 420KV, TERMINAL BLOCK-POWER	10	NO	Mention "Quoted" as	Mention GST %
16	SPARES- ISOLATOR : 420KV, TERMINAL BLOCK-CONTROL	10	NO	Mention "Quoted" as	Mention GST %
17	SPARES- ISOLATOR : 420KV, PUSH BUTTON	02	SET	Mention "Quoted" as	Mention GST %
18	SPARES- ISOLATOR : 420KV, LOCKABLE TYPE SWITCH	02	SET	Mention "Quoted" as	Mention GST %
19	SPARES- ISOLATOR : 420KV, SELECTOR SWITCH	02	SET	Mention "Quoted" as	Mention GST %

PROJECT:	WBPDCL Sagardighi
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20	SPARES- ISOLATOR: 420KV, MCCB/MCB/FUSE UNIT WITH FUSE (AC & DC APPLICATION)	02	SET	Mention as "Quoted"	Mention GST %
Supervision of ETC					
Item Number	Item Description	Item Quantity	Unit of Measure	Unit Price (Inclusive of GST)	GST % Applica ble
21	SERVICES- ISOLATOR : 400KV, SUPERVISION OF ERECTION TESTING AND COMMISSIONING INCLUDING ALIGNMENT CHECK OF HORIZONTAL DOUBLE BREAK (HDB) TYPE ISOLATOR & EARTHSWITCH	6	Man-days	Mention as "Quoted"	Mention GST %

Signature & Seal of Supplier
Date:

	BHARAT HEAVY ELECTRICALS LIMITED TRANSMISSION BUSINESS ENGINEERING MANAGEMENT																			
DOCUMENT No.	TB--445-316-002			Rev no.-00		Prepared	Checked	Approved												
TYPE OF DOC.	TECHNICAL SPECIFICATION			NAME		NKT	MVK	SKS												
TITLE SPECIFICATION FOR 400kV HDB ISOLATORS				SIGN																
				DATE		12.08.21	12.08.21	12.08.21												
				GROUP		TBEM	W.O. No													
				CUSTOMER/CONSULTANT THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD./ DEVELOPMENT CONSULTANTS PRIVATE LIMITED, KOLKATA																
PROJECT				1X660MW, SAGARDIGHI THERMAL POWER EXTENSION PROJECT (UNIT #5)																
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Distribution				To Copies	TBTS	O/C	TBMM	TBQM	TBCM											
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SECTION 1

SCOPE, SPECIFIC TECHNICAL REQUIREMENTS AND QUANTITIES

1.1 SCOPE:

This technical specification covers the requirements of design, manufacture, testing at works, packing and dispatch of Isolators complete with accessories as listed under this specification.

This section covers the specific technical requirements of Isolators. This constitutes minimum technical parameters for the above item as specified by the customer (WBPDCCL). The offered equipment shall also comply with the General Technical Requirements for the project as detailed under section-3 of this specification.

The specification comprise of following sections:

Section-1: Scope, specific technical requirements & Bill of Quantities.

Section-2: Standard technical specification under scope of supplies.

Section-3: General technical requirements for all equipments under the project.

Section-4: Equipment Data Sheet

Section-5: Schedule of Technical Deviations.

In case of any conflict between various sections, order of precedence shall be in the same order as listed above.

The equipment is required for the following project:

Name of customer : The West Bengal Power Development Corporation Ltd.

Name of Consultant : Development Consultants Private Ltd. Kolkata

Name of the project : 1X660MW thermal power extension project Unit-5 at
Sagardighi- 400KV Switchyard

1.2 SPECIFIC TECHNICAL REQUIREMENTS:

Technical parameters	Units	420 kV
Installation		Outdoor
Rated Voltage	kV	400
Highest Voltage	kV	420
Nominal current at 50°C ambient temperature(rms)	A	2000
Temperature rise over 50°C design ambient temperature	°C	As per table 3 of IEC: 62271-1
Rated dynamic Short Time withstand current of isolator and earth switch	kArms	50 for 3 sec
Peak withstand current	kA _P	125
Rated dynamic short time withstand current of isolator and earth switch	kA _P	125
Rated Frequency	Hz	50
Type		Horizontal Double break-HDB

Mounting arrangement		Hot dip galvanized GS Lattice structure
Operating mechanism of main isolator		AC Motor Operated
Operating mechanism of earth switch		AC Motor Operated
Control for Main Isolator		Local & Remote
Control for earth switch		Local with mechanical as well as electrical interlock.
Phase to phase spacing	mm	7000
Plinth height from ground level	mm	300
Centre-line of busbar for equipment connection from the base of support structure (plinth level)	mm	8000
Minimum height of lowest part of support insulator of equipment from ground	mm	2550
Rated full wave Lightning Impulse withstand voltage (1.2/50 micro sec.)		
- between line terminal and ground	kV _p	± 1425
- between terminals with isolator open	kV _p	± 1425 on one terminal and 240kVp Power frequency voltage of opposite polarity on other terminal
Switching impulse withstand voltage (250/2500 micro sec.) dry and wet		
-between line terminal and ground	kV _p	±1050
-between terminals with isolator open	kV _p	± 900 on one terminal and 345 kVp power frequency voltage of opposite polarity on other terminal
One minute power frequency withstand voltage		
- Between live terminal and earth	kV _{rms}	520
- Across open terminals of Isolator	kV _{rms}	610
Min. Corona extinction voltage	kV _{rms}	320
Rated mechanical terminal load		As per Table III of IEC -62271-102.
Mechanical endurance class		Isolator- M2 Earth switch- M0
Minimum Silver coating on Main Contacts		25 microns
Local remote switch indication of Isolators for Substation Automation system (SAS)		Yes
Electrical interlocking coil for Isolators and earth switch		Yes
Maximum radio interference voltage for frequency between 0.5 Hz and 2MHz in all position.	Micro volt	1000 at 266 KVrms
Maximum operating time of isolators	sec	20 sec. or less

444832/2021/TBG-TB-ENG-SR

The West Bengal Power Development Corporation Ltd. Bharat Heavy Electricals Ltd.
 1X660 MW Thermal power extension project Unit-5 at Sagardighi- 400KV Switchyard,
 Doc. No. TB -445-316-002, Rev. No.-0, 400kV HDB Isolators–

No. of Auxiliary Contacts (potential free) on each Isolator for buyer use.		10NO+10NC + 4MBB
No. of Auxiliary Contacts (potential free) on each earthing switch for buyer use.		10NO+10NC
Rated current of aux. Contacts	A	10 A at 220 V DC
Breaking capacity of aux. Contacts	A	2 A DC with circuit time constant of not less than 20 ms. At 220 V DC
No. of terminals block in control cabinet		All contacts and control circuits are to be wired upto control cabinet plus 24 nos. evenly distributed spare TB
TB size & Type		(1) TBs shall be stud type (2) Power Cable-Each TBs Should be Suitable for terminating two wires of 16 Sq. mm size on each side (3) Control cable- Each TBs Should be Suitable for terminating two wires of 2.5 Sq. mm size on each side
Seismic acceleration		0.3g Horizontal
Auxiliary voltage for Heater/Lamp/Sockets		240V $\pm$ 10%, 50 Hz, 1-phase two wire AC supply
Motor		415V $\pm$ 10%, 50 Hz $\pm$ 5%, 3-phase AC,
Control and interlock		220V DC(80% -110%)
Degree of protection for operating Mechanism box		IP55
Material of sheet for mechanism box		Steel
Min. thickness of steel sheet	mm	2
System neutral earthing		Effectively earthed
PROPOSED INSULATOR		
Type		Solid core
Creepage distance(minimum)	mm	13020
Standard		IEC 168 or Equivalent
Cantilever strength of Insulator	kN	8
Height of insulator	mm	3650
Top PCD	mm	127
No. of holes on top		4 X M 16

Bottom PCD	mm	300
No. of holes		8 X 18 dia

Note 1 – 415V, 3 phase 4 wire single supply source shall be provided for motor mechanism box /heater/lamp of isolator /earth switch.

Note 2 - Bidder shall provide Power circuit diagram for all isolator / earth switch during detailed engineering stage. **Duplicate wiring on TB shall not be allowed.**

Note 3 - Bidder shall **provide adequate power distribution circuit & TB's** in Isolator Master Drive-Box as follows (as applicable)

1.1. Separate Power TB for Master to Follower-1

1.2. Separate Power TB for Master to Follower-2

1.3. Separate Power TB for Master to Earth-Switch Master.

Note 4 - Bidder to provide **Flexible Copper Braid** for Earthing System for Isolator and earth switch MOM Box (2 number per box), size equivalent to 75X10 mm GS flat. Bidder to provide minimum cross section of 270Sq mm flexible copper braid on each side of M Box. Hole to hole distance for flexible copper braid shall be minimum 200mm. Hardware for installation of flexible copper braid on Isolator Drive Box side as well GI Flat side are to be provided by bidder.

Note 5 - Isolator's Earth switch is to have grounded connection as per technical specification with minimum 2 number's 155 Sqmm Copper (Flexible) Braid.

Note 6 - The disconnect switch shall have padlocking arrangement in both 'Open' and 'Closed' positions.

Note 7 - The mechanical linkages shall be such that the deflection is negligible. Facility of adjustment of the interpole operating rods and locking arrangement shall be provided.

Note 8 - The requirement of lubrication of bearings shall be after 1000 operations or after 5 years whichever is earlier.

Note 9 - Base frame, operating rod and all hardwares shall be hot-dip galvanised.

Note 10 - It may be noted that disconnecting switch and isolator both are same meaning.

1.3 QUANTITIES:

1.3.1 MAIN QUANTITY

S no.	Description	Qty	Unit
1	420kV 2000A 50kA for 3sec three phase, horizontal double break (HDB) type isolator individual pole motor operated, electrically ganged with one earth switch, individual pole motor operated, electrically ganged, along with operating mechanism & other accessories excluding insulator, structure & terminal connector etc.	12	Nos

1.3.2 MANDATORY SPARES

S no.	Description	Qty	Unit
1	420kV 2000A 50kA for 3sec three phase, horizontal double break (HDB) type isolator individual pole motor operated, electrically ganged with one earth switch, individual pole motor operated, electrically ganged, along with operating mechanism & other accessories excluding insulator, structure & terminal connector etc.	1	Nos
2	Complete Set of Gear Mechanism along with Link & Nut 1 Set= 1 Nos. for each type and rating	2	Set
3	Complete set of motor operating mechanism box with all accessories including motor. 1 Set= 1 Nos. for each type and rating	1	Set
4	Limit Switch 1 Set= 1 Nos. for each type and rating	3	Sets
5	Auxiliary Switch (6 NO + 6 NC or as applicable) 1 Set= 1 Nos. for each type and rating	3	Set
6	Copper contact fingers for female & male contacts 1 Set= 1 Nos. for each type and rating	3	Set
7	Drive Motor with gear 1 Set= 1Nos. for each type and rating	1	Set
8	Corona shielding ring 1 Set= 1 Nos for each type and rating	1	Set
9	Bearings 1 Set= 1 Nos for each type and rating	1	Set
10	Interlocking coil, timers, key interlock 1 Set=1 Nos for each rating	2	Set
11	Power Contactor 1 Set= 1 Nos for each type and rating	2	Set
12	Auxiliary Relay Contactor	5	Nos.
13	Thermal Over Load Relay	5	Nos.
14	Terminal Block-Power	10	Nos.
15	Terminal Block-Control	10	Nos.
16	Complete set of Push Button Switch 1 Set= 1 Nos for each colour and area of application	2	Set

17	Locable Type Switch 1 Set= 1 Nos for each type and rating	2	Set
18	Selector Switch 1 Set= 1 Nos for each type and rating	2	Set
19	MCCB/MCB/Fuse unit with fuse (AC & DC application) 1 Set= 1 Nos for each type and rating	2	Set

1.3.3 SERVICES

1	Supervision of erection testing and commissioning including alignment check of horizontal double break (HDB) type Isolator & Earth switch.	06	Man days
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Accessories Required-

- (1) Each Disconnecting switch shall be supplied with Mounting H/W and any other accessory as may be required for fixing the Disconnecting switch with structure for the satisfactory erection /operation of the isolators
- (2) Terminal Connectors, Support Insulators and Support Structure are EXCLUDED from the scope of supplies.

Note1 -Prices for accessories shall be included in the equipment prices.

Note2 - Each disconnecting switch shall be furnished with fitting and accessories as listed in the Annexure-B of section -2 of technical specification.

Note3- The equipment shall also comply with the following:

- a. To facilitate erection of equipment, all items to be assembled at site shall be “match marked”.
- b. All piping, if any between equipment control cabinet/operating mechanism to marshalling box of the equipment, shall bear proper identification to facilitate the connection at site.

Note4- Interlocks-

- i) All electrical and mechanical interlocks necessary for safe and satisfactory operation of the disconnect switch and its earthing switch and associated circuit breaker shall be furnished.
- ii) In addition to the provision of electrical interlocks, earthing switches shall be mechanically interlocked with main isolator.
- iii) The disconnecting switch shall be suitable for sequential interlocking with associated equipment, for closing and opening.

- iv) Interlocks are required to be provided :
- To prevent isolators open on load.
 - To prevent closing of earthing switch when isolator is closed.
 - To prevent closing of the line isolator when earthing switch is closed.
 - Operating of earth blade shall not take place when corresponding main isolator is in operation stroke and vice-versa.

1.4 TESTS

Routine Test

During manufacture and on completion, equipment and its accessories shall be subjected to the Routine Tests as laid down in latest revision of IEC/IS.

In addition to Routine/Acceptance tests as specified in IS/IEC, the following special tests listed under shall be also carried out on 400kV disconnecting switch/Isolator-

- Mechanical operation test (routine test) on 400kV disconnecting switch (main switch and earth switch).

Type Test

Type tests on Isolators shall carried out as stipulated in relevant IEC/Indian Standards. Test certificates for type tests, as stipulated in Indian Standards carried out on similar equipment clamps, connectors etc. shall be furnished.

Bidder shall submit valid type test reports (as per relevant IEC/IS standard) for the tests carried out within last five years from the date of bid opening i.e. 18.03.2018. The reports should have been conducted on identical or similar equipment/components to those offered. In case type test reports are more than 5 years old (from the date of bid opening) or the reports of type tests are found to be technically unacceptable, the type test shall be conducted by the bidder without cost and delivery implication to BHEL.

Special Tests

Test report for below listed special shall be submitted for approval to owner WBPDC/BHEL representative-

- Test on insulators [as per IS:2554; IEC:168].
- Test on terminal connectors [as per IS:5561].
- Test on galvanised components [as per IS:2633].
- Stalled torque test on motor operating mechanism [at 110% of supply voltage].

1.5 INSPECTION & TESTING

Before being fitted on the equipment, all components shall be subjected to routine tests at the Contractors factory, as per the relevant IEC/IS standards. A detailed test report proving the successful passing of such tests shall be provided.

Prior to dispatch, the routine & acceptance tests shall be carried out on equipment in accordance with the applicable IEC /IS and the material shall be offered for final inspection to BHEL and WBDPCL in accordance with agreed quality plan with 15 days advance information.

All the tests shall be carried out in the presence of the BHEL/WBPDCL representative unless the witnessing of tests is waived beforehand by WBPDCL.

The Bidder shall give minimum 15 days advance notice of the date when the tests would be carried out.

The Bidder shall obtain approval for the type test procedure before conducting the type test. The procedure shall specify the test set up, instrument to be used, acceptance norms, interval of recording etc. for the type test to be carried out. In case the Bidder has conducted any of the specified type tests on similar equipment within the last five (5) years as on the date of bid opening i.e. 18.03.2018, he may submit type test report during detail engineering for waive of conducting such test. For these tests, only reports are to be submitted.

In case the Bidder is not able to submit report of the type test(s) conducted within last five (5) years from the date of bid opening i.e. 18.03.2018 or in the case of type test(s) reports are not found to be meeting to specification requirement, the Bidder shall conduct all such test(s) under this contract without cost and delivery implication to BHEL and submit the reports for approval.

For short circuit test, proto-type of similar design and of same capacity with documentary evidence shall be submitted for customer approval.

For newly designed equipment, type test shall be conducted at CPRI or Government approved laboratory at the bidder's cost. Certified reports of all the tests carried out at the works shall be furnished in six (6) sets for approval.

The equipment shall be dispatched from works only after receipt of written approval of the test reports and MDCC.

1.6 SUPERVISION OF ERECTION, TESTING & COMMISSIONING:

Supervision of Erection, testing and commissioning of all supplied 400KV Isolators and earth switches shall be carried out under the supervision of the Isolator manufacturer's representative. The commissioning report shall be prepared and signed by the manufacturer's representative.

However, required unskilled men power/Labor, tools (other than special tools and tackles which shall be in bidder's scope) shall be provided by BHEL.

The respective dates of commencement of erection, testing and commissioning activities by BHEL will be intimated to the equipment supplier from time to time, so that arrangements for supervising the activity can be made accordingly by the manufacturer.

1.7 TECHNICAL QUALIFYING REQUIREMENTS:

As per **Annexure A** - for 400kV DISCONNECTING SWITCH/ISOLATOR.

1.8 TECHNICAL DEVIATIONS:

In general, no deviation from the requirements specified in various clauses of this specification shall be allowed and hence, a certificate to this effect shall have to be furnished along with the offer, however bidder shall furnish list of conflicts/ ambiguities/ deviations (if any) in Schedule of Technical Deviations. Any conflicts/ ambiguities/ deviations mentioned elsewhere in technical offer shall not be reviewed. In case the deviations mentioned in the Schedule of Technical Deviations are not technically acceptable, the offer of the bidder will be liable to rejection.

1.9 QUALITY PLAN

The contractor shall carry out contract works in accordance with sound quality management principles which shall include such as controls which are necessary to ensure full compliance to all requirements of the specification & applicable international standards. These quality management requirements shall apply to all activities during design, procurement, manufacturing, inspection, testing, packaging, shipping, inland transportation, storage, site erection & commissioning. Contractor shall submit detailed Quality Plan for BHEL / customer's approval.

- - X X - -

SECTION-2
STANDARD TECHNICAL SPECIFICATION

MODEL TECHNICAL SPECIFICATION

SECTION-SWITCHGEAR - ISOLATOR

(REV. NO. 11B)

Following are the major changes made in the Technical specification, Section-Switchgear - ISOLATOR, Rev. 11B:

Clause No.	Major Modification
1.2.1	Interpole cables deleted from scope of manufacturer
3.1(e)	Current Density value deleted
5(m)	Common Marshalling Box deleted
5(n)	Plug-in type terminals for interconnecting cables deleted

Notes: The above is the list of major changes with respect to previous revision (Rev. 11/11A). However, the bidders are advised to read the entire section for other changes and quote accordingly.

SWITCHGEAR – ISOLATOR

CONTENTS

Clause.No. No.	Description	Page
1.0	General	4
2.0	Duty requirements	4
3.0	Constructional Features	5
4.0	Earthing Switches	8
5.0	Operating Mechanism	9
6.0	Operation	10
7.0	Terminal Connector stud/pad	11
8.0	Support Structure	12
9.0	Tests	12
10.0	Mandatory Spares	12
11.0	Technical Parameters	12
12.0	Pre-Commissioning Tests	13

Annexure-

SWITCHGEAR - ISOLATOR

1.0 GENERAL:

- 1.1 The Isolators and accessories shall conform in general to IEC: 62271-102/103 except to the extent explicitly modified in specification and shall be in accordance with requirement of Section ~~GTR~~ **1**.
- 1.2 Complete isolator with all the necessary items for successful operation shall be supplied including but not limited to the following:
 - 1.2.1 Isolator with complete Support Insulators, operating rod insulator, base frame, linkages, operating mechanism, control cabinet, interlock etc.
 - 1.2.2 All necessary parts to provide a complete and operable isolator installation, control parts and other devices whether specifically called for herein or not.
 - 1.2.3 The isolator shall be designed for use in the geographic and meteorological conditions as given in Section ~~GTR~~ and Section ~~Project~~ **3**.

2.0 DUTY REQUIREMENTS:

- a) Isolators and earth switches shall be capable of withstanding the dynamic and thermal effects of the maximum possible short circuit current of the systems in their closed position. They shall be constructed such that they do not open under influence of short circuit current.
- b) The earth switches, wherever provided, shall be constructionally interlocked so that the earth switches can be operated only when the isolator is open and vice versa. The constructional interlocks shall be built in construction of isolator and shall be in addition to the electrical interlocks. Suitable mechanical arrangement shall also be provided for delinking electrical drive for manual operation.
- c) In addition to the constructional interlock, isolator and earth switches shall have provision to prevent their electrical and manual operation unless the associated and other interlocking conditions are met. All these interlocks shall be of failsafe type. Suitable individual interlocking coil arrangements shall be provided. The interlocking coil shall be suitable for continuous operation from station DC supply and within a variation range as stipulated in Section ~~GTR~~ **1**.
- d) The earthing switches shall be capable of discharging trapped charges of the associated lines.

- e) The isolator shall be capable of making/breaking normal currents when no significant change in voltage occurs across the terminals of each pole of isolator on account of make/break operation.

3.0 CONSTRUCTIONAL FEATURES:

Isolators shall be outdoor, off-load type. Earth switches shall be provided on isolators wherever called for, with possibility of being mounted on any side of the isolator. ~~800kV isolator design shall be double break or vertical break or knee-type.~~ 420kV & below rated isolators shall be double break type, unless specified otherwise. Isolator design shall be such as to permit addition of earth switches at a future date. The features and constructional details of isolators, earth switches and accessories shall be in accordance with requirements stated hereunder:

3.1 Contacts:

- a) The contacts shall be self aligning and self cleaning type and shall be so designed that binding cannot occur after remaining in closed position for prolonged period in a heavily polluted atmosphere.
- b) No undue wear or scuffing shall be evident during the mechanical endurance tests. Contacts and spring shall be designed so that readjustments in contact pressure shall not be necessary throughout the life of the isolator or earthing switch. Each contact or pair of contacts shall be independently sprung so that full pressure is maintained on all contacts at all time.
- c) Contact springs shall not carry any current and shall not lose their characteristics due to heating effects.
- d) The moving contact of double break isolator shall have preferably turn-and-twist type or other suitable type of locking arrangement to ensure adequate contact pressure.
- e) Flexible braided copper, where used, shall have corrosion resistant coating such as tinning or silvering.

3.2 Base :

Each single pole of the isolator shall be provided with a complete galvanised steel base provided with holes and designed for mounting on a standard supporting structure. Common base frame shall be provided for 400/220/132kV isolators suitable for mounting on ~~pipe~~ structures.

3.3 **Blades :**

- a) All metal parts shall be of non-rusting and non-corroding material. All current carrying parts shall be made from high conductivity electrolytic copper/aluminium. Bolts, screws and pins shall be provided with lock washers. Keys or equivalent locking facilities if provided on current carrying parts shall be made of copper silicon alloy or stainless steel or equivalent. The bolts or pins used in current carrying parts shall be made of non-corroding material. Ferrous parts, other than stainless steel shall not be used in close proximity of main current path. All ferrous castings, if used elsewhere shall be made of malleable cast iron or cast-steel. No grey iron shall be used in the manufacture of any part of the isolator.
- b) The live parts shall be designed to eliminate sharp joints, edges and other corona producing surfaces, where this is impracticable, adequate corona rings shall be provided. Corona shields are not acceptable. Corona rings shall be made up of aluminum/aluminum alloy.
- c) Isolators and earthing switches including their operating parts shall be such that they cannot be dislodged from their open or closed positions by short circuit forces, gravity, wind pressure, vibrations, shocks, or accidental touching of the connecting rods of the operating mechanism.
- d) The isolator and earth switch shall be designed such that no lubrication of any part is required except at very infrequent intervals. i.e. after every 1000 operations or after 5 years whichever is earlier.

3.4 **Insulator :** (Data for reference purpose)

- a) The insulator shall conform to IS: 2544, IEC-60168 and IEC-60815. The porcelain of the insulator shall conform to the requirements stipulated under Section-GTR.
- b) Pressure due to the contact shall not be transferred to the insulators after the main blades are fully closed.
- c) Insulator shall be type and routine tested as per IEC-60168. Besides following additional routine/acceptance tests shall also be conducted:
 - (i) Bending load test in four directions at 50% of minimum bending load guaranteed on all insulators, as a routine test.
 - (ii) Bending load test in four directions at 100% of minimum bending load as a sample test on each lot.

- (iii) Torsional test on sample insulators of a lot.
- (iv) Ultrasonic test as a routine test.
- d) Requirement of Insulators of Isolators shall be as follows:

i) **For 800 kV Insulator:**

Cantilever strength (min.)	=	1000kg
Top PCD	=	225 mm
No. of holes	=	4 x M16
Bottom PCD	=	356 mm
No. of holes	=	8 x 18mm dia.

✓ ii) **For 420 kV Insulator:**

Cantilever strength (min.)	=	1000kg
Top PCD	=	127 mm
No. of holes	=	4 x M16
Bottom PCD	=	325 mm 300 mm.
No. of holes	=	8 x 18mm dia

iii) **For 245 kV Insulator:**

Cantilever strength (min.)	=	1000kg
Top PCD	=	127 mm
No. of holes	=	4 x M16
Bottom PCD	=	275 mm
No. of holes	=	8 x 18mm dia

iv) **For 145 kV Insulator:**

Cantilever strength (min.)	=	600kg
Top PCD	=	127 mm
No. of holes	=	4 x M16
Bottom PCD	=	254 mm
No. of holes	=	8 x 18mm dia

3.5 **Name Plate :**

Specification

The name plate shall conform to the requirements of ~~IEC~~ incorporating year of ~~manufacture.~~

4.0 EARTHING SWITCHES :

- a) Where earthing switches are specified these shall include the complete operating mechanism and auxiliary contacts.
- b) The earthing switches shall form an integral part of the isolator and shall be mounted on the base frame of the isolator.
- c) Earthing switches shall be only locally operated.
- d) Each earth switch shall be provided with flexible copper/aluminum braids for connection to earth terminal. These braids shall have the same short time current carrying capacity as the earth blade. The transfer of fault current through swivel connection will not be accepted.
- e) The plane of movement and final position of the earth blades shall be such that adequate electrical clearances are obtained from adjacent live parts in the course of its movement between ON and OFF position.
- f) The frame of each isolator and earthing switches shall be provided with two reliable earth terminals for connection to the earth mat.
- g) The earth switch should be able to carry the same fault current as the main blades of the Isolators and shall withstand dynamic stresses.
- h) 800kV, 420 kV & 245 kV earth switches shall also comply with the requirements of IEC-62271-102, in respect of induced current switching duty as defined for Class-B and short circuit making capability class E-0 for earthing switches.
- i) Earth switch blade in open condition shall not project (from the centre line of Insulator) by more than 4200mm for 400kV and 2810mm for 220kV respectively.

5.0 OPERATING MECHANISM :

- a) The bidder shall offer motor operated Isolators and earth switches. Isolators of 36 kV and below and earth switches of 72.5 kV and below rating shall be manual operated.

- b) Control cabinet/operating mechanism box shall conform to the requirement stipulated in Section-~~GTR-1~~ and shall be made of cast aluminium/aluminum sheet of adequate thickness (minimum 3 mm) or stainless steel (grade-304) of minimum thickness 2mm.
- c) A "Local/Remote" selector switch and a set of open/ close push buttons shall be provided on the control cabinet of the isolator to permit its operation through local or remote push buttons.
- d) Provision shall be made in the control cabinet to disconnect power supply to prevent local/remote power operation.
- e) Motor shall be an AC motor and conform to the requirements of Section-~~GTR: 1.~~
- f) Suitable reduction gearing shall be provided between the motor and the drive shaft of the isolator. The mechanism shall stop immediately when motor supply is switched off. If necessary a quick electro-mechanical brake shall be fitted on the higher speed shaft to effect rapid braking.
- g) Manual operation facility (with handle) should be provided with necessary interlock to disconnect motor.
- h) Gear should be of forged material suitably chosen to avoid bending/jamming on operation after a prolonged period of non-operation. Also all gear and connected material should be so chosen/surface treated to avoid rusting.
- i) Blocked rotor test of motor shall be conducted as a routine test. During the blocked rotor test, overload protection relay should operate to prevent failure of motor.
- j) Only stranded conductor shall be used for wiring. Minimum size of the conductor for control circuit wiring shall be 1.5 sq.mm. (Copper).
- k) The operating mechanism shall be located such that it can be directly mounted on any one of the support structure.
- l) Snap type limit/auxiliary switches shall be used with Factory set values. No adjustment shall be required at site during commissioning.

6.0 OPERATION :

- a) The main Isolator and earth switches shall be individual pole operated for 800/420 kV and gang operated in case of 245 kV & 145 kV. However, 245 kV Tandem Isolators shall be individual-pole operated. The operating mechanism of all the three poles shall be well synchronized and interlocked.
- b) The design shall be such as to provide maximum reliability under all service conditions. All operating linkages carrying mechanical loads shall be designed for negligible deflection and strain less than 1%. The length of inter insulator and interpole operating rods shall be capable of adjustments, by means of screw thread which can be locked with a lock-nut after an adjustment has been made. The isolator and earth switches shall be provided with "over dead center" device in the operating mechanism at open and close position to prevent accidental opening by wind, vibration, short circuit forces or movement of the support structures.
- c) Each isolator/pole of isolator and earth switch shall be provided with a manual operating handle enabling one man to open or close the isolator with ease while standing at ground level. Non-detachable type manual operating handle shall have provision for padlocking. For detachable type manual operating handles, suitable provision shall be made inside the operating mechanism box for parking the detached handles. The provision of manual operation shall be located at a convenient operating height from the base of isolator support structure.
- d) The isolator contacts shall be positively driven by the operating mechanism continuous control throughout the entire cycle of operation. The operating pipes and rods shall be sufficiently rigid to maintain positive control under the most adverse conditions and when operated in tension or compression for isolator closing / opening operation. They shall also be capable of withstanding all torsional and bending stresses due to operation of the isolator. Wherever supported, the operating rods shall be provided with bearings on each support and at the either ends. The operating rods/ pipes shall be provided with suitable universal couplings to account for any angular misalignment.
- e) All rotating parts shall be provided with grease packed roller or ball bearings in sealed housings designed to prevent the ingress of moisture, dirt or other foreign matter. Bearings pressure shall be kept low to ensure long life and ease of operation. Locking pins wherever used shall be rust-proof.
- f) Signaling of closed position shall not take place unless it is certain that the movable contacts, have reached a position in which rated normal current,

peak withstand current and short time withstand current can be carried safely. Signaling of open position shall not take place unless movable contacts have reached a position such that clearance between contacts is atleast 80% of the isolating distance.

- g) The position of movable contact system (main blades) of each of the Isolators and earthing switches shall be indicated by a mechanical indicator at the lower end of the vertical rod of shaft for the Isolators and earthing switch. The indicator shall be of metal and shall be visible from operating level.
- h) The contractor shall furnish the following details alongwith quality norms, during detailed engineering stage:
 - (i) Current transfer arrangement from main blades of isolator alongwith milli volt drop immediately across transfer point.
 - (ii) Details to demonstrate smooth transfer of rotary motion from motor shaft to the insulator alongwith stoppers to prevent over travel.

7.0 TERMINAL CONNECTOR STUD/PAD:

The isolator terminal pads/studs shall be made of high quality copper or aluminum and shall be conforming to Australian standard AS-2935 for rated current. The terminal pad shall have protective covers which shall be removed before interconnections. Only terminal pads shall be used for current ratings above 1250A. Terminal pads shall be mounted below the current transfer contacts so that the cantilever pull from the terminal connector is not transferred through the current transfer point to the support insulator. The terminal pad shall be suitable for horizontal plane connection with terminal connector. The terminal pads for all isolators with 3150A & above rating shall have six holes for terminal pad.

8.0 SUPPORT STRUCTURE:

800 kV/420 ✓ kV/245 kV/145 kV Isolators along with Earth switches shall be suitable for mounting on standard support structures.

9.0 TESTS:

- 9.1 In continuation to the requirements stipulated under Section-~~GTP~~¹ the isolator alongwith its earthing switch and operating mechanism should have been type tested as per IEC/IS and shall be subjected to routine tests in accordance with IEC-62271-102. Minimum 1000 Nos. mechanical operations in line with mechanical endurance test, M0 duty, shall be carried out on 1 (one) isolator out

of every lot of Isolators, assembled completely with all accessories including insulators, as acceptance test for the lot. The travel characteristics measured at a suitable location in the base of insulator along with motor current/power drawn, during the entire travel duration are to be recorded at the start and completion and shall not vary by more than (+/-) 10% after completion of 1000 cycles of operation. After completion of test, mechanical interlock operation to be checked.

9.2 The test reports of the type tests as per IEC 62271-102 and the following additional type tests (additional type tests are required for isolators rated above 72.5 kV only) shall also be submitted for the Employer's review.

- (i) Radio interference voltage test as per Annexure-~~D~~ of Section-~~GTR~~. 2
- (ii) Corona Extinction Voltage test as per Annexure-~~D~~ of Section-~~GTR~~. 2
- (iii) Seismic withstand test on isolator mounted on Support structure as per Annexure-~~D~~ of Section-~~GTR~~. The test shall be performed in the following position : 2

Isolator open	E/S Closed
Isolator open	E/S Open
Isolator Closed	E/S Open

10.0 MANDATORY SPARES:

Bidder shall include in his proposal mandatory spares as mentioned in the Bidding Documents.

11.0 ~~TECHNICAL PARAMETERS:~~ As per table given at ~~Annexure-I:~~

12.0 PRE-COMMISSIONING TESTS : As per Annexure-C

ANNEXURE-A

Rev-00

TECHNICAL PRE-QUALIFYING REQUIREMENTS
FOR 400KV DISCONNECTING SWITCH/ISOLATOR

Disconnecting switches being offered should be from manufacturer who has manufactured and supplied minimum thirty (30) nos. of Disconnecting switch of offered voltage class or higher, suitable for air insulated substation/ switchyard and which must have been in successful operation# for a minimum period of two (2) years as on date of Notice to proceed(NTP) i.e. 01.07.2020.

Note: # - Manufacturer must provide performance certificates issued by the Employer/Utility Certifying the successful operation of above Disconnecting switches without any adverse remark.


02/9/21
Prepared


M. Vijay Kumar
02/09/21
Checked


31/2/21
Approved



WBPDC

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase - III

ANNEXURE-B FITTINGS AND ACCESSORIES

Disconnecting switch

Each disconnecting switch shall be furnished complete with fittings and accessories as listed below :

1. Clamp-type bimetallic terminal connector for conductor.
2. Ground pads for 75x10 mm flat.
3. Base frame with anchor bolts, nuts and washers.
4. Operating mechanism with all accessories including operating rod of required length, for disconnect switch and for earth switch
5. Starters, relays and auxiliary switches.
6. Local / Remote selector switch.
7. Open / Stop / Close push buttons.
8. Spare auxiliary switches 6 NO + 6 NC.
9. Mechanical ON-OFF indicator
10. Weather-proof mechanism box with lock and key for disconnect switch and for earth switch, where indicated.
11. Set of fuse switches for A.C. and D.C. supply.
12. Space heater with thermostat and ON-OFF switch.
13. Internal illumination lamp with ON-OFF switch.
14. 3 pin 5A socket outlet with ON-OFF switch.
15. Terminal blocks and wiring - lot.
16. Earthing switch, if specified, complete with safety interlocks and 4 NO + 4 NC spare auxiliary switches.
17. Flexible copper braid for grounding of operating rod.



ANNEXURE C

SCHEDULE OF PRE-COMMISSIONING TESTS OF
400 KV DISCONNECTING SWITCH/ISOLATOR

- a) Insulation Resistance test on each pole by H.V. Meggar.
- b) Insulation Resistance test on control circuit.
- c) Measurement of contact resistance for all the three phases.
- d) Checking the auxiliary circuits associated with Disconnect Switch.
- e) Functional check of Disconnecting Switch operations electrically at 70% and 110% of rated D.C. Supply voltage.
- f) Manual checking of operations (close - open) by handle for both main and earthing switches.
- g) Checking of interlocks (mechanical and electrical) for both main switch and earthing switch.

ANNEXURE- D**CORONA AND RADIO INTERFERENCE VOLTAGE (RIV) TEST****1. General**

Unless otherwise stipulated, all equipment together with its associated connectors, where applicable, shall be tested for external corona (for 400kV & above) both by observing the voltage level for the extinction of visible corona under falling power frequency voltage and by measurement of radio interference voltage (RIV) for 132kV and above.

2. Test Levels:

The test voltage levels for measurement of external RIV and for corona extinction voltage are listed under the relevant clauses of the specification.

3. Test Methods for RIV:

3.1 RIV tests shall be made according to measuring circuit as per International Special-Committee on Radio Interference (CISPR) Publication 16-1(1993) Part -1. The measuring circuit shall preferably be tuned to frequency with 10% of 0.5 Mhz but other frequencies in the range of 0.5 MHz to 2 MHz may be used, the measuring frequency being recorded. The results shall be in microvolts.

3.2 Alternatively, RIV tests shall be carried out in accordance with relevant IEC of respective equipment or NEMA standard Publication No. 107-1964.

3.3 In measurement of, RIV, temporary additional external corona shielding may be provided. In measurements of RIV only standard fittings of identical type supplied with the equipment and a simulation of the connections as used in the actual installation will be permitted in the vicinity within 3.5 meters of terminals.

3.4 Ambient noise shall be measured before and after each series of tests to ensure that there is no variation in ambient noise level. If variation is present, the lowest ambient noise level will form basis for the measurements. RIV levels shall be measured at increasing and decreasing voltages of 85%, 100%, and 110% of the specified RIV test voltage for all equipment unless otherwise specified. The specified RIV test voltage for 765kV, 400 kV, 220 KV is listed in the detailed specification together with maximum permissible RIV level in microvolts.

3.5 The metering instruments shall be as per CISPR recommendation or equivalent device so long as it has been used by other testing authorities.

3.6 The RIV measurement may be made with a noise meter. A calibration procedure of the frequency to which noise meter shall be tuned shall establish the ratio of voltage at the high voltage terminal to voltage read by noise meter.

4. Test Methods for Visible Corona

The purpose of this test is to determine the corona extinction voltage of apparatus, connectors etc. The test shall be carried out in the same manner as RIV test described above with the exception that RIV measurements are not required during test and a search technique shall be used near the onset and extinction voltage, when the test voltage is raised and lowered to determine their precise values. The test voltage shall be raised to 110% of specified corona extinction voltage and maintained there for five minutes. In case corona inception does not take place at 110%, test shall be stopped, otherwise test shall be continued and the voltage will then be decreased slowly until

ANNEXURE D

all visible corona disappears. The procedure shall be repeated at least 4 times with corona inception and extinction voltage recorded each time. The corona extinction voltage for purposes of determining compliance with the specification shall be the lowest of the four values at which visible corona (negative or positive polarity) disappears. Photographs with laboratory in complete darkness shall be taken under test conditions, at all voltage steps i.e. 85%, 100%, and 110%. Additional photographs shall be taken at corona inception and extinction voltages. At least two views shall be photographed in each case using Panchromatic film with an ASA daylight rating of 400 with an exposure of two minutes at a lens aperture of f/5.6 or equivalent. The photographic process shall be such that prints are available for inspection and comparison with conditions as determined from direct observation. Photographs shall be taken from above and below the level of connector so as to show corona on bushing, insulators and all parts of energised connectors. The photographs shall be framed such that test object essentially, fills the frame with no cut-off.

For recording purpose, modern devices utilizing UV recording methods such as image intensifier may also be used.

- 4.1 The test shall be recorded on each photograph. Additional photograph shall be taken from each camera position with lights on to show the relative position of test object to facilitate precise corona location from the photographic evidence.
- 4.2 In addition to photographs of the test object preferably four photographs shall be taken of the complete test assembly showing relative positions of all the test equipment and test objects. These four photographs shall be taken from four points equally spaced around the test arrangement to show its features from all sides. Drawings of the laboratory and test set up locations shall be provided to indicate camera positions and angles. The precise location of camera shall be approved by Employer's inspector, after determining the best camera locations by trial energisation of test object at a voltage which results in corona.
- 4.3 The test to determine the visible corona extinction voltage need not be carried out simultaneously with test to determine RIV levels.
- 4.4 However, both test shall be carried out with the same test set up and as little time duration between tests as possible. No modification on treatment of the sample between tests will be allowed. Simultaneous RIV and visible corona extinction voltage testing may be permitted at the discretion of Employer's inspector if, in his opinion, it will not prejudice other test.

5. **Test Records:**

In addition to the information previously mentioned and the requirements specified as per CISPR or NEMA 107-1964 the following data shall be included in test report:

- a) Background noise before and after test.
- b) Detailed procedure of application of test voltage.
- c) Measurements of RIV levels expressed in micro volts at each level.
- d) Results and observations with regard to location and type of interference sources detected at each step.
- e) Test voltage shall be recorded when measured RIV passes through 100 microvolts in each direction.
- f) Onset and extinction of visual corona for each of the four tests required shall be recorded.

ANNEXURE D**SEISMIC WITHSTAND TEST PROCEDURE**

The seismic withstanding test on the complete equipment (for 132kV and above) shall be carried out alongwith supporting structure.

The Bidder shall arrange to transport the structure from his Contractor's premises/ POWERGRID sites for the purpose of seismic withstand test only.

The seismic level specified shall be applied at the base of the structure. The accelerometers shall be provided at the Terminal Pad of the equipment and any other point as agreed by the Employer. The seismic test shall be carried out in all possible combinations of the equipment. The seismic test procedure shall be furnished for approval of the Employer.

The frequency range for the earthquake spectra shall be as per IEC-6227-300.

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SECTION-3

3.0 GENERAL

This section stipulates the General Technical Requirements under the Contract and will form an integral part of the Technical Specification.

The provisions under this section are intended to supplement general requirements for the materials, equipments and services covered under other respective sections and are not exclusive.

However in case of conflict between the requirements specified in this section and requirements specified under other sections, the requirements specified under respective sections shall hold good.

3.1 PROJECT INFORMATION AND SYSTEM PARAMETERS

a)	Customer/ Purchaser/ Owner	The West Bengal Power Development Corporation Ltd.
b)	Consultant/Owner's Engineer	Development Consultants Private Ltd. Kolkata
c)	Project Title	1X660MW thermal power extension project Unit-5 at Sagardighi- 400KV Switchyard
d)	Location	Site is located at Manigram village of Murshidabad district in West Bengal and around 240km from Kolkata. 13km north of Sagardighi town by the side of the SMGR(Sagardighi Manigram –Gankar –Raghunathganj) road at a distance of 20km from National Highway 34 . Nearest railway station is Manigram adjacent to the site on Bandel-Barhawara branch line and 6.5km from Sagardighi railway station on Sainthia-Azimhunj line of eastern railway. Nearest Airport –Kolkata. Nearest Seaport-Kolkata/Haldia
e)	Altitude	34 m above MSL
f)	Transport Facilities	Road/Rail
g)	Postal Address	To follow
SITE CONDITIONS		
a)	Maximum Design ambient dry bulb temperature	50°C
b)	Minimum Design ambient dry bulb temperature	5°C
c)	Average Relative humidity (for design)	73 %
d)	Maximum relative humidity	84%
e)	Pollution Severity	Heavily Polluted
f)	Seismic zone	III

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g)	Wind velocity	47m/sec.
h)	Wind pressure	150kg/sq.mts
i)	Terrain category	2
j)	Risk coefficient (K1)	1.07
k)		
l)	Average rainfall	1389mm

SYSTEM PARAMETERS

Nominal system voltage	400 kV
Highest system voltage	420 kV
System voltage variation	-5% to +5%
Basic Impulse level(dry /wet)	1425kVp
Power frequency withstand voltage dry/wet	630kVrms
Switching Impulse withstand voltage (Phase to Earth)	1050kVp
Switching Impulse withstand voltage (Phase to Phase)	1575kVp
Lightning impulse withstand voltage (kVp between live terminals and earth.)	1425kVp
Lightning impulse withstand voltage (kVp impulse on one terminal and other terminal earthed) (across isolating distance).	1665kVp
Maximum radio interference voltage at 320kV rms phase to ground voltage	1000 micro volts for frequency between 0.5 MHZ and 2.0 MHZ
Rated short time current	50 kA for 1 sec
Frequency	50 Hz, +3% to -5%
Creepage distance	31 mm/kV
System Earthing	Effectively earthed

AUXILIARY POWER SUPPLY

3 phase A.C power supply	415V $\pm$ 10%, 50 Hz $\pm$ 5%, 3-phase 4 wire,50kA, solidly earthed, combined voltage and frequency variation $\pm$ 10%
1 phase A.C power supply	240V $\pm$ 10%, 50 Hz +3% to -5%, 1-phase AC supply
D.C. power supply	220V +10% to -15%, 2-wire , ungrounded 48V $\pm$ 10%, 2 wire system positively earthed

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3.2 GENERAL TECHNICAL REQUIREMENT

3.2.1 TYPE TESTS

All equipment/systems to be supplied shall conform to type tests as per relevant standards and proven type. The Bidder / Contractor shall furnish the reports of all the type tests carried out in within last **five years from date of bid opening i.e. 18.03.2018.** as listed in relevant clauses in respective electrical specification and relevant standards for all components / equipment / systems. These reports should be for the tests conducted on identical/similar components/equipment/systems to those offered/proposed to be supplied under this contract.

Type tests done in an independent government laboratory or in the presence of representative of State Electricity Board or other reputed public undertakings, the type test reports of the same shall be submitted for scrutiny /approval. If these are found suitable and technically acceptable, conducting of type tests shall be waived off.

In case Contractor is not able to submit report of type test(s) conducted in last five years, or in case type test report(s) are not found to be meeting the specification/relevant standard requirements, then all such tests shall be conducted under this contract by the Bidder free of cost to Employer/Purchaser, and reports shall be submitted for approval. No charges shall be paid under this contract. All acceptance and routine tests as per relevant standards and specification shall be deemed to be included in the bid price.

3.2.2 CODES AND STANDARDS

All materials and equipment shall generally comply in all respect with the latest edition of relevant international electro-technical commission (IEC) or any other internationally accepted standard which ensure equal or better quality or relevant Indian standard(IS) mentioned against each equipment and this specification.

3.3 MATERIAL/WORKMANSHIP

3.3.1 General Requirements

Where the specification does not contain characteristics with reference to workmanship, equipment, materials and components of the covered Equipment it is understood that the same must be new, of highest grade of the best quality of their kind conforming to best engineering practice and suitable for the purpose for which they are intended.

The design of the Works shall be such that installation, future expansions, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety, subject to mutual agreements and shall be used throughout the design. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned and restrained to fulfill their required function. In general screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from purchaser.

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Whenever possible, all similar part of the Works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall be interchangeable with, and shall be made of the same materials and workmanship as the corresponding parts of the Equipment supplied under the Specification. Where feasible, common component units shall be employed in different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.

All materials and equipment shall be installed in strict accordance with the manufacturer's recommendation(s). Only first-class work in accordance with the best modern practices will be accepted. Installation shall be constructed as being the erection of equipment at its permanent location. This, unless otherwise specified, shall include unpacking, cleaning and lifting into position, grouting, leveling, aligning, coupling of or bolting down to previously installed equipment bases/foundations, performing the alignment check and final adjustment prior to initial operation, testing and commissioning in accordance with the manufacturer's tolerances and instructions and the Specification. All factory assembled rotating machinery shall be checked for alignment and adjustments made as necessary to re-establish the manufacture's limits suitable guards shall be provided for the protection of personal on all exposed rotating and / or moving machine parts and shall be designed for easy installation and removal for maintenance purpose. The spare equipment(s) shall be installed at designated locations and tested for healthiness. The Contractor shall apply oil and grease of the proper specification to suit the machinery, as is necessary for the installation of the equipment. Lubricants used for installation purposes shall be drained out and the system flushed through where necessary for applying the lubricant required for operation. The Contractor shall apply all operational lubricants to the equipment installed by him. All oil, grease and other consumables used in the Works/ Equipment shall be purchased in India unless the Contractor has any special requirement for the specific application of a type of oil or grease not available in India. In such is the case he shall declare in the proposal, where such oil or grease is available. He shall help purchaser in establishing equivalent Indian make and Indian Contractor. The same shall be applicable to other consumables too.

3.3.2 Provisions For Exposure to Hot and Humid climate

Outdoor equipment supplied under the specification shall be suitable for service and storage under tropical conditions of high temperature, high humidity, heavy rainfall and environment favorable to the growth of fungi and mildew. The indoor equipments located in non-air conditioned areas shall also be of same type.

3.4 PAINTING

The painting of equipment shall be as follows:

Epoxy based with suitable additives. The thickness of finish coat shall be minimum 80 microns (minimum total DFT shall be 100 microns). However in case electrostatic process of painting is offered for any electrical equipment, minimum paint thickness of 80 microns shall be

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acceptable for finish coat.

Painting process shall be of powder coating type. All surface shall be cleaned , phosphated and given two coats of rust –resistant primer followed by two coats of finish paints . The interior of all panels cabinets and enclosures shall be finished with gloss white enamel. Two final powder coats of synthetic enamel paint of light grey shade(631 of IS-5) shall be given to exterior surface of all the panels. Sufficient quantities of touch paint shall be furnished for application at site. All The indoor cubicles shall be of same colour scheme and for other miscellaneous items, **colour scheme will be approved by the purchaser.**

3.5 PROTECTION

All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic protecting device. All ends of all valves, piping and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage.

All equipment accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus, insects and corrosion. The parts which are likely to get rusted, due to exposure to weather should also be properly treated and protected in a suitable manner. Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent entry of insects.

3.6 FUNGISTATIC VARNISH

Besides the space heaters, special moisture and fungus resistant varnish shall be applied on the parts, which may be subjected or predisposed to the formation of fungi due to the presence or deposit of nutrient substances. The varnish shall not be applied to any surface of part where the treatment will interface with the operation or performance of the equipment. Such surfaces or parts shall be protected against the application to the varnish.

3.7 SURFACE FINISH

All interiors and exteriors of tanks, control cubicles and other metal parts shall be thoroughly cleaned to remove all rust, scales, corrosion, greases or other adhering foreign matter. All steel surfaces in contact with insulating oil as far as accessible, shall be painted with not less than two coats of heat resistant, oil insoluble, insulating paints.

All metal surfaces exposed to atmosphere shall be given two primer coats of zinc chromate and two coats of epoxy paint with epoxy base thinner. All metal parts not accessible for painting shall be made of corrosion resisting material. All machine finished or bright surfaces shall be coated with a suitable preventive compound and suitably wrapped or otherwise protected. All paints shall be carefully selected to withstand tropical heat and extremes of weather within the limit specified. The paint shall not scale off or wrinkle or be removed by abrasion due to normal handling. All external painting shall be as per shade no. 631 of IS:5.

3.8 GALVANIZING

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All ferrous parts including all sizes of nuts, bolts, Plain and spring washers, support channels, structures, shall be hot dip galvanized conforming to latest version of IS:2629 or any other equivalent authoritative standard. However, hardware less than M12 size shall be electro-galvanized. Minimum weight of zinc coating shall be 610 gm/sq.m and minimum thickness of coating shall be 85 microns for all items thicker than 6mm. For items lower than 6 mm thickness, requirement of coating shall be as per relevant ASTM.

3.9 PACKING

The following details are to be clearly indicated in the material forwarding documents:

- a) Name and address of the consignee.
- b) Purchase order number.
- c) Name of supplier/s.
- d) Description of equipment / material.
- e) Net weight.
- f) Gross weight.

Each package shall be accompanied by a packing note (in weather proof paper).

All the equipment shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. On request of the purchaser, the Contractor shall also submit packing details/associated drawing for any equipment material under his scope of supply, to facilitate the purchaser to repack any equipment/ material at a later date, in case the need arises. Any material found short inside the packing cases shall be supplied by the supplier without any extra cost. The cases containing easily damageable material shall be very carefully packed and marked with appropriate caution symbol i.e. fragile, handle with care, use no Hooks etc.

3.10 HANDLING, STORING AND INSTALLATION

Contractor may engage manufacturer's Engineers to supervise if required for unloading, transportation to site, storing, testing and commissioning of the various equipment being procured by them separately. In case of any doubt/misunderstanding as to the correct interpretation of manufacturer's drawings or instructions, necessary clarifications shall be obtained from the purchaser. Contractor shall be held responsible for any damage to the equipment consequent to not following manufacturer's drawings/instructions correctly.

Where assemblies are supplied in more than one section, contractor shall make all necessary mechanical and electrical connections between sections including the connection between buses. Contractor shall also do necessary adjustments/alignments necessary for proper operation of circuit breakers, isolators and their operating mechanisms. All components shall be protected against damage during unloading, transportation, storage, installation, testing and commissioning.

Contractor shall be responsible for examining all the shipment immediately of any damage, shortage, discrepancy etc. for the purpose of Purchaser's information only. Any demurrage, pilferage and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor. The Contractor shall be fully responsible, for the equipment/material until the

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same is handed over to the purchaser in an operating condition after commissioning.

The minimum phase to earth, phase to phase and section clearance along-with other technical parameters for the various switchyard voltage levels to be maintained shall be strictly as per the approved drawings.

The design and workmanship shall be in accordance with the best engineering practices to ensure satisfactory performance throughout the service life. If at any stage during the execution of the Contract, it is observed that the erected equipment(s) do not meet the above minimum clearances, the Contractor shall immediately proceed to correct the discrepancy at his risks and costs.

3.11 DEGREE OF PROTECTION

The enclosures to be installed shall be provided with degree of protection as detailed here under:

- a) Installed out door: IP-55
- b) Installed indoor in air conditioned area: IP-31
- c) Installed in covered area IP:52
- d) Installed indoor-in non-air-conditioned area where possibilities of entry of water is limited:IP-41
- e) For LT switchgear (AC & DC distribution Boards): IP-54
- f) 11kV & 3.3kV Switchgears: IP4X
- g) 415V MCC / DBs / Fuse Board IP52 for indoor and IP65 for outdoor.
- h) Motor (Indoor/Outdoor): IP55
- i) Motor Actuator: IP65
- j) Control and Relay Panel in AC area: IP3X
- k) Control and Relay Panel in normal area: IP42
- l) Pushbutton Station/Kiosk/Panel - Indoor IP55
- m) Pushbutton Station/Kiosk/Panel -Outdoor IP65
- n) Indoor Junction boxes for cables / wires: IP55
- o) Outdoor lighting fixtures: IPW65
- p) Battery Charger Panel: IP42

The degree of protection shall be in accordance with IS:13947, (Part-1)/IEC-947(Part-1). Type test report/or degree of protection test on each type of the box shall be submitted for approval.

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3.12 RATING PLATES, NAME PLATES AND LABELS

Type or serial number together with details of the loading conditions under which the item of the substation in question has designed to operate and such diagram plates as may require by the Purchaser. The rating plate of each equipment shall be according to IEC requirements.

All such nameplate instruction plates, rating plates shall be bilingual with Hindi inscription first followed by English. Alternately two separate plates one with Hindi and other with English inscriptions may be provided. All measurements shall be in M.K.S units.

3.13 EARTHING

Equipment shall be provided with two grounding pads suitable for connection to galvanized steel flat. Control panels, Relay panel, outdoor marshalling boxes, Junction boxes, lighting panels and distribution board shall be provided with two grounding pads, for connection to galvanized steel flat. The two pads shall be provided, one each at the middle of the two opposite sides of the bottom frame of the equipment. Earthing of hinged door shall be done by using a separate earth wire. GS flat size is 75x10 mm.

3.14 TERMINAL BLOCKS AND WIRING

Control and instrument leads from the switchboards or from other equipment will be brought to terminal boxes or control cabinets in conduits. All Inter-phase and external connections to equipment or to control cubicles will be made through terminal blocks.

Terminal blocks shall be 1100 V grade box –clamp type and have continuous rating to carry the maximum expected current on the terminals. Those shall be of molded piece complete with insulated barriers stud type terminals, washers nuts and lock nuts. Screw clamp, overall insulated, insertion type, rail mounted terminals can be used in place of stud type terminals. But preferably the terminal blocks shall be non-disconnecting stud type equivalent to Elmex type CATM4, Phoenix cage clamp type of Wedge or equivalent. The Insulating material of terminal block shall be nylon 6.6 which shall be free of halogens, fluorocarbons etc.

Terminal block for current transformer and voltage transformer secondary leads shall be provided with test links and isolating facilities. The current transformer secondary leads shall also be provided with short circuiting and earthing facilities.

The terminal shall be that maximum contact area is achieved when a cable is terminated. The terminal shall have a locking characteristic to prevent cable from escaping from the terminal clamp unless it is done intentionally. The conducting part in contact with cable shall preferably be tinned or silver plated however Nickel plated copper or zinc plated steel shall also be acceptable. The terminal blocks shall be of extensible design. The terminal blocks shall have locking arrangement to prevent its escape from the mounting rails.

The terminal blocks shall be fully enclosed with removable covers of transparent, non

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deteriorating type plastic material. Insulating barriers shall be provided between the terminal blocks. These barriers shall not hinder the operator from carrying out the wiring without removing the barriers.

Unless otherwise specified terminal blocks shall be suitable for connecting the following conductors on each side.

All circuits except CT circuits : Minimum of 2 nos. of 2.5 sq.mm, copper flexible.

All CT circuits : Minimum of 4 nos. of 2.5 sq.mm, copper flexible..

The arrangements shall be in such a manner so that it is possible to safely connect or disconnect terminals on live circuits and replace fuse links when the cabinet is live. At least 20 % spare terminals shall be provided on each panel/cubicle/box and these spare terminals shall be uniformly distributed on all terminals rows.

There shall be a minimum clearance of 250mm between the first bottom row of terminal block and the associated cable gland plate. Also the clearance between two rows of terminal blocks shall be a minimum of 150 mm. The Supplier shall furnish all wire, conduits and terminals for the necessary inter-phase electrical connection (where applicable) as well as between phases and common terminal boxes or control cabinets.

All input and output terminals of each control cubicle shall be tested for surge withstand capability in accordance with the relevant IEC Publications, in both longitudinal and transverse modes. The supplier shall also provide all necessary filtering, surge protection, interface relays and any other measures necessary to achieve an impulse withstand level at the cable interfaces of the equipment.

3.15 CONTROL CABINETS, JUNCTION BOXES, TERMINALS BOXES AND MARSHALLING BOXES FOR OUTDOOR EQUIPMENTS

All types of boxes, cabinets etc. shall generally conform to and be tested in accordance with IS-5039, IS-8623 or IEC-439, as applicable and the clause given below.

Control cabinet, Junction boxes, Marshalling boxes & Terminal boxes shall be made of **CRCA sheet** steel of minimum 2 mm thickness. The thickness of door s/covers shall not be less than 1.6 mm. The box shall be properly braced to prevent wobbling. There shall be sufficient reinforcement to provide level surfaces, resistance to vibrations and rigidity during transportation and installation. Cabinet/boxes shall be free standing floor mounting type, wall mounting type or pedestal mounting type as per requirements.

Cabinet /boxes shall be provided with double hinged doors with padlocking arrangements. The distance between two hinges shall be adequate to ensure uniform sealing pressure against atmosphere. The quality of gaskets shall be such that it does not get damaged/cracked during the operation of the equipment.

All door, removable covers and plates shall be gasketed all around with suitably profiled

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Neoprene gaskets. The gasket shall be tested in accordance with approved quality plan. The quality of gasket shall be such that it does not get damaged /cracked during the years of the equipment or its major overhaul whichever is earlier. All gasketed surfaces shall be smooth, straight and reinforced if necessary to minimize distortion and to make a tight seal. Ventilating Louvers, if provided, shall have screen and filters. The screen shall be fine wire mesh made of brass.

All boxes/cabinets shall be designed for the entry of cables from bottom by means of weather proof and dust-proof connections. Boxes and cabinets shall be designed with generous clearances to avoid interference between the wiring entering from below and any terminal blocks or accessories mounted within the box or cabinet. Suitable cable gland plate projecting at least 150 mm above from the base of the Marshalling Kiosk/box shall be provided for this purpose along with the proper blanking plates. Necessary number of cable glands shall be supplied and fitted on this gland. The gland shall project at least 25mm above gland plate to prevent entry of moisture in cable crutch. Gland plate shall have provision for some future glands to be provided later, if required.

3.16 SPACE HEATERS

The heater shall be suitable for continuous operation at 240 V AC supply voltage and shall be provided with on – off switch and fuse shall be provided for heater.

One or more adequately rated, thermostatically connected heaters shall be supplied to prevent condensation in any compartment. The heater shall be installed in the lower portion of the compartment and electrical connections shall be made from below the heater to minimize deterioration of supply wire insulation. The heaters shall be suitable to maintain the compartment temperature to prevent condensation.

The heaters shall be suitably designed to prevent any contact between the heater wire and air and shall consist of coiled resistance wire centered in metal sheath and completely encased in a highly compacted powder of Magnesium Oxide or other material having equal heat conduction and electrical insulation properties, or they shall consist of a resistance wire wound on a ceramic and completely covered with a ceramic material to prevent any contact between the wire and air. Alternatively, they shall consist of resistance wire mounted into a tubular ceramic body built into an envelope of stainless steel or the resistance wire is wound on a tubular ceramic body and embedded in glaze the surface temperature of the heaters shall be restricted to a value which will not shorten the life of the heater sheaths or that of insulated wire or other component in the compartments.

3.17 QUALITY

BHEL quality plan to be followed subject to TBEM / customer's approval.

3.18 DOCUMENTATION

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3.18.1 LIST OF DOCUMENTS

The bidder shall submit a detailed list of drawings / documents along with the bid proposal which he intends to submit to the Employer after award of the contract.

The supplier shall necessarily submit all the drawings / documents unless any thing is waived.

All engineering data submitted by the Contractor after final process including review and approval by the Employer shall form part of the Contract Document and the entire works performed under this specification shall be performed in strict conformity, unless otherwise expressly requested by the Employer in Writing.

3.18.2 DRAWINGS

All drawings submitted by the Contractor including those submitted at the time of bid shall be in sufficient detail to indicate the type, size, arrangement, material description, Bill of Materials, weight of each component, break-up for packing and shipment, the external connections, fixing arrangement required, the dimensions required for installation and interconnections with other equipment and materials, clearances and spaces required for installation and interconnection between various portions of equipment and any other information specifically requested in the specifications.

Each drawing submitted by the Contractor shall be clearly marked with the name of the Employer, name of consultant, the unit designation, contract no., and the name of the Project. If standard catalogue pages are submitted, the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.

Further work by the Contractor shall be in strict accordance with these drawings and no deviation shall be permitted without the written approval of the Employer if so required.

All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawing shall be at the Contractor's risk. The Contractor may make any changes in the design which are necessary to make the equipment conform to the provisions and intent of the Contract and such changes will again be subject to approval by the Employer. Approval of Contractor's drawing or work by the Employer shall not relieve the contractor of any of his responsibilities and liabilities under the Contract.

3.18.3 APPROVAL PROCEDURE

The scheduled dates for the submission of these as well as for, any data/information to be furnished by the Employer would be discussed and finalized at the time of award. The supplier shall also submit required no. of copies as mentioned in this specification of all drawings/design documents/test reports for approval by the Employer. The following schedule shall be followed

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generally for approval.

i.	Initial submission of drawings and data sheet	Within 2 (two) weeks from PO date.
ii.	Approval/comments/by employer on Initial submission	Within 2 (two) weeks of receipt
iii.	Resubmission	Within 1 (one) weeks (whenever from date of comments required) Including both ways postal time.
iv.	Approval or comments	Within 1 week of receipt of resubmission
v.	Furnishing of distribution copies	1 week from the date of last approval.

Note: The contractor may please note that all resubmissions must incorporate, all comments given in the submission by the Employer failing which the submission of documents is likely to be returned. Every revision shall be a revision number, date and subject, in a revision block provided in the drawing, clearly marking the changes incorporated.

The title block of drawings shall contain the following information incorporated in all contract drawings. Please refer enclosed sheet for details of Title block.

3.18.4 DOCUMENTS TO BE SUBMITTED ALONGWITH OFFER

- 1) Drawings
- 2) Guaranteed Technical Particulars
- 3) Type Test Reports
- 4) Manufacturing Quality Plan

3.18.5 DOCUMENTATION SCHEDULE

S. No.	DESCRIPTION	TENDER STAGE	CONTRACT STAGE FOR APPROVAL	FINAL DOCUMENTATION	
			Prints	Prints	CDs
1	Drawings and Data Sheets	1	6	7	4 nos of all drawings/ documents
2	Drawings “As Built”	-	-	7	
3	Type Test Reports	1	6	7	
4	Erection Manuals	-	6	7	
5	Operation and Maintenance Manuals	-	6	7	
6	Manufacturing Quality Plan	1	6	7	
7	Field Quality Plan	1	6	7	
8	Inspection Test Reports	-	-	7	

The West Bengal Power Development Corporation Ltd. Bharat Heavy Electricals Ltd.
 1X660 MW Thermal power extension project Unit-5 at Sagardighi- 400KV Switchyard,
 Doc. No. TB-SPEC-ISO-445-02, Rev. No.-0, 400kV HDB ISOLATOR –

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O & M Manuals shall be submitted 3 months prior start of unit commissioning,
 The manual shall be submitted as follows-

1. 1 soft copy + 12 sets of hard copy to WBPDCCL Sagardighi site.
2. 1 soft copy + 3 sets of hard copy to WBPDCCL Corporate office.

Soft copies of drawings at contract stage shall also be submitted in **PDF format**.

Drawings will also be submitted in mini cartridges in AUTOCAD Release -14 package or any other CAD package along with conversion files for all major items.

Final Documentation shall be submitted in bound volumes with Customer & Project etc. written on top.

CUSTOMER:							
		THE WEST BENGAL POWER DEVELOPMENT CORPN. LTD.(WBPDCL) 1X660MW,SAGARDIGHI THERMAL POWER EXTENSION PROJECT (UNIT #5)					
CONSULTANT:		DEVELOPMENT CONSULTANTS PRIVATE LIMITED KOLKATA					
JOB NO.	445		BHARAT HEAVY ELECTRICALS LTD TRANSMISSION BUSINESS GROUP NOIDA				
STATUS	CONTRACT						
DISTRIBUTION							
TO			COPY RIGHT AND CONFIDENTIAL				
NO.			The information on this document is the property of				
REV.	DATE	ALTD	CHD	APPD	BHARAT HEAVY ELECTRICALS LIMITED it must not be used directly or indirectly in any way detrimental to the interest of the company.		
			TITLE				

			DEPT CODE		NAME	SIGN	DATE
			DRN		--		--
			DESN		--		--
			CHD		--		--
			APPD		--		--
			DEPT.		SCALE	DRAWING NO.	
			SIGN			-----	
			DATE			SHEET -- OF -- REV. --	
4			3		SIZE-A0		
Fold-1							
TB ENG SR							



WBPDCL

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

SECTION-4

EQUIPMENT DATA SHEET

B	DISCONNECTING SWITCH	
1.0	Manufacturer's Name	:
2.0	Reference standard	:
3.0	Type	:
4.0	Service	:
5.0	Poles No.	:
6.0	Frequency Hz	:
7.0	Rated voltage (Normal/Max.) KV	:
8.0	Rated current	
9.1	Rated continuous Current Amps	:
9.2	Derated due to site ambient temperature Amps	:
9.3	Short time current for 3 secs. KA rms	:
9.4	Dynamic KA _{peak}	:
10.0	Temperature rise above 50°C ambient	
10.1	At rated normal current °C	:
10.2	At rated short time current °C	:
11.0	Current density at minimum cross section of disc switch blade A/mm ²	:
12.0	Maximum current the isolator can safely interrupt	:



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Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

- 12.1 Bus/line charging current Amp. :
- 12.2 Potential transformer magnetizing current Amp. :
- 13.0 Clearance
- 13.1 Live parts to ground mm :
- 13.2 Phase to Phase mm :
- 13.3 Fixed contact to blade in open position mm :
- 14.0 Rated insulation level
- 14.1 Standard impulse withstand voltage positive and negative polarity
 - a) Across the isolating distance :
KV_{peak}
 - b) To earth & between poles KV :
peak
- 14.2 One minute power frequency withstand voltage
 - a) Across the isolating distance :
KV_{rms}
 - b) To earth & between poles KV :
rms
- 14.3 Rated Switching impulse withstand voltage
 - a) Across the isolating distance :
KV_{peak}
 - b) Between phase to earth KV :
peak
 - c) Between phases KV_{peak} :
- 15.0 Operating mechanism
- 15.1 Type :



**WBPDC**

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Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

- 15.2 Motor rating
- a) Output KW :
- b) Voltage Volts :
- 15.3 Range of operating voltage % :
- 15.4 Control voltage with range $V_{\pm}$ % :
- 15.5 Torque required to operate the gang operated disconnecting switch Kg.M :
- 16.0 Main Contacts
- 16.1 Type :
- 16.2 Material :
- 16.3 Contact pressure Kg/cm² :
- 16.4 Contact area mm² :
- 16.5 Whether silver plated? :
- 16.6 Thickness of silver plating mm :
- 17.0 Auxiliary Contacts
- 17.1 Spare contacts furnished
- a) Normally open Nos. :
- b) Normally close Nos. :
- 17.2 Type: convertible or fixed? :
- 17.3 Contact Rating at : 220V D.C. 240V A.C.
- a) Make and continuous Amps :
- b) Break (Inductive) Amps :
- 18.0 Operating time of motor operated mechanism
- 18.1 Opening Secs. :
- 18.2 Closing Secs :



**WBPDC**

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

- 19.0 Rotating blade feature at the end of travel provided :
- 20.0 No. of operations that disc switch can withstand without deterioration of contacts :
- 21.0 Type of interlocks furnished :
- 21.1 :
- 21.2 :
- 21.3 :
- 22.0 Accessories furnished as specified in Annexure :
- 23.0 Insulator :
- 23.1 Make :
- 23.2 Type :
- 23.3 Reference standard :
- 23.4 Number of units per stack :
- 23.5 Voltage class KV :
- 23.6 One (1) minute power frequency withstand voltage :
- a) Dry KV :
- b) Wet KV :
- 23.7 Puncture withstand voltage KV :
- 23.8 Full wave (1.2/50 us wave) impulse withstand voltage :
- a) Positive polarity KV crest :
- b) Negative polarity KV crest :
- 23.9 Creepage distance in air mm :
- 23.10 Tensile strength Kg :



**WBPDC**

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

- 23.11 Cantilever strength (Upright) Kg :
- 23.12 Compression strength Kg :
- 23.13 Torsional strength Kg :
- 23.14 Weight of the unit Kg :
- 23.15 Catalogue furnished? :
- 24.0 Dimension of Disconnecting Switch :
(L x B x H) mm
- 25.0 Weight of the Disconnecting Switch :
Kg
- C EARTHING SWITCH**
- 1.0 Make :
- 2.0 Type :
- 3.0 Reference standard :
- 4.0 Service :
- 5.0 Poles :
- 6.0 Rating
- Short time for 3 sec KA rms :
- Peak Short time KA peak :
- Making current KA peak :
- 7.0 Operating mechanism :
- 8.0 Mounting :
- 9.0 Torque required to operate the :
gang operated earthing switch
Kg. M
- 10.0 Auxiliary contacts
- 10.1 No. of contacts furnished
- a) Normally open Nos. :
- b) Normally close Nos. :



**WBPDCL**

EPC Bid Document
Sagardighi Thermal Power Project
1x660 MW Unit No. 5, Phase – III

10.2 Type: Convertible or fixed?

Contact Rating at : 220V D.C. 240V A.C

10.3 a) Make and continuous Amps :

b) Break (Inductive) Amps :

11.0 Type of interlocks furnished

11.1 :

11.2 :

11.3 :

12.0 Weight of the earthing switch Kg :



DEVIATION SCHEDULE

SECTION-5

SCHEDULE OF TECHNICAL DEVIATIONS

Bidder shall list below all technical deviation clause wise w.r.t. tender specifications:

S.No.	Page No.	Clause No.	Deviation	Reason / Justification
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Any deviation not specifically brought out in this section shall not be admissible for any commercial implication at later stage. Except to the technical deviations listed in this schedule, bidder's offer shall be considered in full compliance to the tender specifications irrespective of any such deviation indicated / taken elsewhere in the submitted offer.

Date:

Tenderer's Stamp & Signature