Annexure XI

INTEGRITY PACT

Between

Bharat Heavy Electricals Ltd. (BHEL), a company registered under the Companies Act 1956 and having its registered office at "BHEL House", Siri Fort, New Delhi - 110049 (India) hereinafter referred to as "The Principal", which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the ONE PART

and

_____, (description of the party along with address), hereinafter referred to as "The Bidder/ Contractor" which expression unless repugnant to the context or meaning hereof shall include its successors or assigns of the OTHER PART

Preamble

The Principal intends to award, under laid-down organizational procedures, contract/s for _____

_____

_____ . The Principal values full compliance with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ Contractor(s).

In order to achieve these goals, the Principal will appoint Independent External Monitor(s), who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

Section 1- Commitments of the Principal

1.1 The Principal commits itself to take all measures necessary to prevent corruption and to observe the following principles:-

1.1.1 No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

1.1.2 The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/ additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.

1.1.3 The Principal will exclude from the process all known prejudiced persons.

1.2 If the Principal obtains information on the conduct of any of its employees which is a penal offence under the Indian Penal Code 1860 and Prevention of Corruption Act 1988 or any other statutory penal enactment, or if there be a substantive suspicion in this regard, the Principal will inform its Vigilance Office and in addition can initiate disciplinary actions:

Section 2 - Commitments of the Bidder(s)/ Contractor(s)

2.1 The Bidder(s)/ Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he/ she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

2.1.2 The Bidder(s)/ Contractor(s) will not enter with other Bidder(s) into any illegal or undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

2.1.3 The Bidder(s)/ Contractor(s) will not commit any penal offence under the relevant Indian Penal Code (IPC) and Prevention of Corruption Act; further the Bidder(s)/ Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

2.1.4 Foreign Bidder(s)/ Contractor(s) shall disclose the name and address of agents and representatives in India and Indian Bidder(s)/ Contractor(s) to disclose their foreign principals or associates. The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

2.2 The Bidder(s)/ Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

2.3 The Bidder(s)/ Contractor(s) shall not approach the Courts while representing the matters to IEMs and will await their decision in the matter.

Section 3 - Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/ Contractor(s), before award or during execution has committed a transgression through a violation of Section 2 above, or acts in any other manner such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/ Contractor(s) from the tender process or take action as per the separate "Guidelines on Banning of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 4 - Compensation for Damages

4.1 If the Principal has disqualified the Bidder from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent Earnest Money Deposit/ Bid Security.

4.2 If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to section 3, the Principal shall be entitled to

demand and recover from the Contractor liquidated damages equivalent to 5% of the contract value or the amount equivalent to Security Deposit/ Performance Bank Guarantee, whichever is higher.

Section 5 - Previous Transgression

5.1 The Bidder declares that no previous transgressions occurred in the last 3 years with any other company in any country conforming to the anti-corruption approach or with any other Public Sector Enterprise in India that could justify his exclusion from the tender process.

5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

Section 6 - Equal treatment of all Bidders/ Contractors / Sub-contractors

6.1 The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors. In case of sub-contracting, the Principal contractor shall be responsible for the adoption of IP by his sub-contractors and shall continue to remain responsible for any default by his sub-contractors.

6.2 The Principal will disqualify from the tender process all bidders who do not sign this pact or violate its provisions.

Section 7 - Criminal Charges against violating Bidders/ Contractors /Subcontractors

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the Vigilance Office.

Section 8 - Independent External Monitor(s)

8.1 The Principal appoints competent and credible Independent External Monitor for this Pact. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.

8.2 The Monitor is not subject to instructions by the representatives of the parties and performs his functions neutrally and independently. He reports to the CMD, BHEL.

8.3 The Bidder(s)/ Contractor(s) accepts that the Monitor has the right to access without restriction to all contract documentation of the Principal including that provided by the Bidder(s)/ Contractor(s). The Bidder(s)/ Contractor(s) will grant the monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation. The same is applicable to Sub-contractor(s). The Monitor is under contractual obligation to treat the information and documents of the Bidder(s)/ Contractor(s) / Sub-contractor(s) with confidentiality in line with Non- disclosure agreement.

8.4 The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.

8.5 The role of IEMs is advisory, would not be legally binding and it is restricted to resolving issues raised by an intending bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some bidders. At the same time, it must be understood that IEMs are not consultants to the Management. Their role is independent in nature and the advice once tendered would not be subject to review at the request of the organization.

8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of any tendering process, the matter should be examined by the full panel of IEMs jointly as far as possible, who would look into the records, conduct an investigation, and submit their joint recommendations to the Management.

8.7 The IEMs would examine all complaints received by them and give their recommendations/ views to CMD, BHEL, at the earliest. They may also send their report directly to the CVO and the Commission, in case of suspicion of serious irregularities requiring legal/ administrative action. IEMs will tender their advice on the complaints within 10 days as far as possible.

8.8 The CMD, BHEL shall decide the compensation to be paid to the Monitor and its terms and conditions.

8.9 IEM should examine the process integrity, they are not expected to concern themselves with fixing of responsibility of officers. Complaints alleging mala fide on the part of any officer of the organization should be looked into by the CVO of the concerned organisation.

8.10 If the Monitor has reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant Indian Penal Code/ Prevention of Corruption Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

8.11 The number of Independent External Monitor(s) shall be decided by the CMD, BHEL.

8.12 The word `Monitor' would include both singular and plural.

Section 9 - Pact Duration

9.1 This Pact shall be operative from the date IP is signed by both the parties till the final completion of contract for successful bidder and for all other bidders 6 months after the contract has been awarded. Issues like warranty / guarantee etc. should be outside the purview of IEMs.

9.2 If any claim is made/ lodged during currency of IP, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/ determined by the CMD, BHEL.

Section 10 - Other Provisions

10.1 This agreement is subject to Indian Laws and jurisdiction shall be registered office of the Principal, i.e. New Delhi.

10.2 Changes and supplements as well as termination notices need to be made in writing. Side agreements have not been made.

10.3 If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.

10.4 Should one or several provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

10.5 Only those bidders / contractors who have entered into this agreement with the Principal would be competent to participate in the bidding. In other words, entering into this agreement would be a preliminary qualification.

For & On behalf of the Principal

(Office Seal)

For & On behalf of the Bidder/

Contractor

(Office Seal)

Place----------

Date----------

Witness:_____

(Name & Address) _____

_____

Witness:_____

(Name & Address) _____

_____

PROJECT:	**WBPDCL Sagardighi**
ITEM:	**Supply & Services of Circuit Breaker**
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 GeM Bidding Documents (Payment due date shall be 60 days) Supply Payment: a) 95% of payment within 60 days 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 b) 5% of payment within 60 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: 01** 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 or from the date 01.07.2024, whichever is later, 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”. **Payment terms for supervision of ETC:** 100% payment along with applicable GST within 60 days 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: 02-** 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. ***Vendor has to submit the duly signed check-list along with Bill.***	

PROJECT:	**WBPDCL Sagardighi**
ITEM:	**Supply & Services of Circuit Breaker**
SUBJECT:	**BID SPECIFIC ATC**

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:**
36 Weeks (252 days for Main Supply & 364 days for Spares items) from the date of PO by BHEL as per Activity schedule [For Main Supply 36 weeks (Annexure-A) & for Spares 52 Weeks (Annexure-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). Manufacturing for spares items shall be issued separately by BHEL.	
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-CB-01 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".	

PROJECT:	**WBPDCL Sagardighi**
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SUBJECT:	**BID SPECIFIC ATC**

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:**
Performance BG to be kept valid till the completion of guarantee period with 03 months claim period is extra. "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 WBPDCL. Necessary credentials/documents to be submitted for approval by Customer as per format.	
19.	**Integrity Pact: Bidder(s) has to submit integrity pact with their offer.**
20.	**Deviations:**
a) Technical Deviation: No Technical Deviation is envisaged. b) Commercial Deviation: No Commercial Deviation is envisaged.	
21.	All other terms & conditions shall be as per GTC of GeM

Signature & Seal of supplier

Date

Enclosure:

1. Activity Schedule (A&B)
2. Local Content Format
3. Technical & Commercial deviations sheet
4. BOQ

PROJECT:	**WBPDCL Sagardighi**
ITEM:	**Supply & Services of Circuit Breaker**
SUBJECT:	**BID SPECIFIC ATC**

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)	20
4.	Inspection (In scope of BHEL)	02
5.	Issue of MICC (In scope of BHEL)	02
6.	Dispatch (In scope of vendor)	02
7.	Supervision activity considered from the date of PO/Contract (36 Weeks for supply + 08 Weeks for site readiness + 08 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

PROJECT:	**WBPDCL Sagardighi**
ITEM:	**Supply & Services of Circuit Breaker**
SUBJECT:	**BID SPECIFIC ATC**

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

PROJECT:	**WBPDCL Sagardighi**
ITEM:	**Supply & Services of Circuit Breaker**
SUBJECT:	**BID SPECIFIC ATC**

Annexure-V

Item/Package Name :	**Supply & Supervision of ETC for Isolators**
Enquiry No.:	
Project:	**WBPDCL 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

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.>

PROJECT:	**WBPDCL Sagardighi**
ITEM:	**Supply & Services of Circuit Breaker**
SUBJECT:	**BID SPECIFIC ATC**

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.

Signature of the authorized representative of

Place: é é é é é é é

Bidder's name
:é é é é é é é é é é é é é é é
Date : é é é é é é é .
Designation:é é 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 é

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.

Signature of the authorized representative of

Place: é é é é é é é .
Date : é é é é é é é .

Bidder's name :é é 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 é é ..

PROJECT:	**WBPDCL Sagardighi**
ITEM:	**Supply & Services of Circuit Breaker**
SUBJECT:	**BID SPECIFIC ATC**

Item No.	Item Description	Item Quantity	Unit of Measure	Unit Price (Inclusive of F&I & GST)	GST % Applicable
1	SUPPLY- CIRCUIT BREAKER : 420KV, 50KA FOR 3S, 3150A THREE PHASE SF6 CIRCUIT BREAKER WITHOUT CSD, WITHOUT CLOSING RESISTOR, WITH CORONA SHIELDING, OPERATING MECHANISM, INSULATORS , BASE FRAME, HV TERMINAL PLATES, CONTROL CABINET, SUPPORT STRUCTURE, CABLE GLANDS, LADDER (IF APPLICABLE), MARSHALLING BOX (IF APPLICABLE) AND OTHER ACCESSORIES, COMPLETE IN ALL RESPECTS	02	No	Mention as "Quoted"	Mention GST %
2	SUPPLY- CIRCUIT BREAKER : 420KV, 50KA FOR 3S, 3150A THREE PHASE SF6 CIRCUIT BREAKER (WITH PROVISION OF CSD), WITHOUT CLOSING RESISTOR, WITH CORONA SHIELDING, OPERATING MECHANISM, INSULATORS , BASE FRAME, HV TERMINAL PLATES, CONTROL CABINET, SUPPORT STRUCTURE, CABLE GLANDS, LADDER (IF APPLICABLE), MARSHALLING BOX (IF APPLICABLE) AND OTHER ACCESSORIES, COMPLETE IN ALL RESPECTS	02	No	Mention as "Quoted"	Mention GST %
3	SUPPLY- CIRCUIT BREAKER : 420KV, CONTROLLED SWITCHING DEVICE FOR 3-PH CIRCUIT BREAKER	02	No	Mention as "Quoted"	Mention GST %
4	SUPPLY- CIRCUIT BREAKER : 420KV, SPECIAL CABLES FOR CSD	1000	Meter	Mention as "Quoted"	Mention GST %
5	SUPPLY- CIRCUIT BREAKER : 400KV, FOUNDATION BOLTS FOR CIRCUIT BREAKER, PLATFORM AND LADDER	05	LOT	Mention as "Quoted"	Mention GST %

6	SUPPLY- CIRCUIT BREAKER : PORTABLE SF6 GAS FILLING & EVACUATING EQUIPMENT	01	No	Mention as "Quoted"	Mention GST %
7	SUPPLY- CIRCUIT BREAKER : OPERATION ANALYSER	01	No	Mention as "Quoted"	Mention GST %
8	SUPPLY- CIRCUIT BREAKER : SF6 GAS LEAKAGE DETECTOR	02	No	Mention as "Quoted"	Mention GST %
9	SPARES- CIRCUIT BREAKER : 420KV, 50KA FOR 3S, 3150A THREE PHASE SF6 CIRCUIT BREAKER WITHOUT CSD, WITHOUT CLOSING RESISTOR, WITH CORONA SHIELDING, OPERATING MECHANISM, INSULATORS , BASE FRAME, HV TERMINAL PLATES, CONTROL CABINET, SUPPORT STRUCTURE, CABLE GLANDS, LADDER (IF APPLICABLE), MARSHALLING BOX (IF APPLICABLE) AND OTHER ACCESSORIES, COMPLETE IN ALL RESPECTS	01	No	Mention as "Quoted"	Mention GST %
10	SPARES- CIRCUIT BREAKER : 20 % SPARE SF6 GAS PLUS ADDITIONAL QUANTITY OF SF6 GAS REQUIRED FOR TWO YEARS OF OPERATION OF ALL BREAKERS IN SEPARATE UNUSED CYLINDER	01	LOT	Mention as "Quoted"	Mention GST %
11	SPARES- CIRCUIT BREAKER : ACCUMULATOR WITH ITS ACCESSORIES	01	SET	Mention as "Quoted"	Mention GST %
12	SPARES- CIRCUIT BREAKER : COMPLETE MECHANISM BOX FOR BREAKER	01	No	Mention as "Quoted"	Mention GST %

13	SPARES- CIRCUIT BREAKER : 400KV, CLOSING COILS WITH RESISTOR	06	No	Mention as "Quoted"	Mention GST %
14	SPARES- CIRCUIT BREAKER : 400KV, TRIP COILS WITH RESISTOR	12	No	Mention as "Quoted"	Mention GST %
15	SPARES- CIRCUIT BREAKER : POWER AND CONTROL CONTACTOR, LIMIT SWITCHES, TIMERS ETC.	02	SET	Mention as "Quoted"	Mention GST %
16	SPARES- CIRCUIT BREAKER : 420KV, AUXILIARY RELAY (EACH TYPE)	05	SET	Mention as "Quoted"	Mention GST %
17	SPARES- CIRCUIT BREAKER : AUXILIARY CONTACTORS	02	SET	Mention as "Quoted"	Mention GST %
18	SPARES- CIRCUIT BREAKER : 420KV, GAS DENSITY MONITOR	01	No	Mention as "Quoted"	Mention GST %
19	SPARES- CIRCUIT BREAKER : PRESSURE SWITCH FOR COMPRESSED AIR (IF APPLICABLE) OF EACH TYPE	02	SET	Mention as "Quoted"	Mention GST %
20	SPARES- CIRCUIT BREAKER : DOUBLE INTERRUPTER ASSEMBLY COMPLETE SET	01	SET	Mention as "Quoted"	Mention GST %
21	SPARES- CIRCUIT BREAKER : O" RINGS	03	SET	Mention as "Quoted"	Mention GST %
22	SPARES- CIRCUIT BREAKER : 420KV, SEALS	03	SET	Mention as "Quoted"	Mention GST %

23	SPARES- CIRCUIT BREAKER : DYNAMIC SEALS	03	SET	Mention as "Quoted"	Mention GST %
24	SPARES- CIRCUIT BREAKER : AERO-SHELL FLUID	25	LITRE	Mention as "Quoted"	Mention GST %
25	SPARES- CIRCUIT BREAKER : HOLLOW COLUMN INSULATORS	01	SET	Mention as "Quoted"	Mention GST %
26	SPARES- CIRCUIT BREAKER : SF6 GAS CYLINDER (50KG)	01	No	Mention as "Quoted"	Mention GST %
27	SPARES- CIRCUIT BREAKER : TERMINAL BLOCK OF POWER CIRCUIT	10	No	Mention as "Quoted"	Mention GST %
28	SPARES- CIRCUIT BREAKER : TERMINAL BLOCK OF CONTROL CIRCUIT	10	No	Mention as "Quoted"	Mention GST %
29	SPARES- CIRCUIT BREAKER : COMPLETE SET OF PUSH BUTTON SWITCH	02	SET	Mention as "Quoted"	Mention GST %
30	SPARES- CIRCUIT BREAKER : LOCKABLE TYPE SWITCH	02	SET	Mention as "Quoted"	Mention GST %
31	SPARES- CIRCUIT BREAKER : SELECTOR SWITCH	02	SET	Mention as "Quoted"	Mention GST %

32	SPARES- CIRCUIT BREAKER : 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 % Applicable**
33	SERVICES- CIRCUIT BREAKER : SUPERVISION OF ERECTION, TESTING & COMMISSIONING OF SUPPLIED 420KV, 3-PHASE CIRCUIT BREAKERS AT SITE.TESTING & COMMISSIONING INSTRUMENTS (TIME INTERVAL METER (TIMING KIT), SF6 GAS LEAKAGE DETECTOR & ANY OTHER SPECIAL TOOLS LIKE GAS FILLING ADAPTER ETC) SHALL BE BROUGHT BY SUPPLIER AND SHALL BE TAKEN BACK AFTER SUCCESSFUL COMPLETION OF TESTING AND COMMISSIONING	16	Man-days	Mention as "Quoted"	Mention GST %
34	SERVICES- CIRCUIT BREAKER : 220KV, SUPERVISION OF ERECTION TESTING AND COMMISSIONING OF CONTROLLED SWITCHING DEVICE	08	Man-days	Mention as "Quoted"	Mention GST %
35	SERVICES- CIRCUIT BREAKER : TO & FRO CHARGES APPLICABLE FOR RAIL/ ROAD/ AIR	02	Visit	Mention as "Quoted"	Mention GST %

Signature & Seal of Supplier
Date:

BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION BUSINESS ENGINEERING MANAGEMENT

DOCUMENT No.	TB-445-316-CB01	Rev no.-00	Prepared	Checked	Approved
TYPE OF DOC.	TECHNICAL SPECIFICATION	NAME	NKT	MVK	SKS
TITLE		SIGN			
SPECIFICATION FOR 400kV SF6 CIRCUIT BREKER		DATE	10.10.21	10.10.21	10.10.21
		GROUP	TBEM	W.O. No	445
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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Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS

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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 Circuit Breakers complete with accessories as listed under this specification.

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

The specification comprises of following sections:
Section-1: Scope, specific technical requirements and Bill of Quantities
Section-2: Equipment specification under scope of supplies.
Section-3: General technical requirements for all equipments under the project.
Section-4: Guaranteed Technical Particular
Section-5: Check List and 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	
Rated voltage kV (rms)	420
Standard to be followed	IEC-62271-100,60694, IS-12729
Rated frequency (Hz)	50
No.of poles	3
Design ambient Temperature (deg. C)	50
Rated insulation levels-	
Class	
a. Mechanical endurance class b. Electrical endurance class c. Restrike probability class	----M1---- ----E1---- ----C1----
1.Full wave impulse withstand voltage (1.2/50 micro sec.)	
a. between line terminals and ground	± 1425 kVp
b. between line terminals and CB open	± 1425 kVp
c. across isolating distance	± 1425 kVp impulse on one terminal and 240kVp power frequency voltage of opposite

	polarity on other terminal
2. One minute power frequency dry and wet withstand voltage	
a. to earth and between poles	520 kV (rms)
b. across isolating distance	610 kVrms
3. Switching impulse withstand voltage (250/2500 micro sec.) dry and wet	
a. between line terminals and ground	± 1050 kVp
b. between line terminals	± 1575 kVp
c. across isolating distance	900 kVp impulse on one terminal and 345kVP power frequency voltage of opposite polarity on other terminal
Maximum radio interference voltage at 320kV rms phase to ground voltage	1000 Micro volt for frequency between 0.5 MHz and 2 MHz for all equipment.
Corona extinction voltage (kVrms) with circuit breaker open or close ‘	320 (min.)
Minimum creepage distance:	
Phase to ground (mm)	13020
Between CB terminals (mm)	13020
System neutral earthing	Effectively Earthed
Seismic acceleration	0.1g horizontal(it is coming under zone –III)
Thermal rating of auxiliary contacts	10 A at 220 V DC
Breaking capacity of auxiliary contacts constants	2 A DC with circuit time not less than 20 ms
Phase to phase spacing (mm)	7000
Rated continuous current at design Ambient temperature 50°C	3150 A
Rated short circuit current Breaking capacity at rated Voltage	50kA (with percentage DC component as per IEC -62271-100 corresponding to Minimum opening time under operating conditions specified)
Symmetrical interrupting capability (kA rms)	50
Rated short time making current(kAp)	125
Rated peak withstand current(kAp)	125
Short time current carrying capability (kArms)	50 for 3 sec.
Out of phase breaking current capacity (kArms)	12.5
Out of phase making current capacity (kArms)	50 KA
Rated line charging interrupting current at 90 deg. Leading power factor angle	400A (rms)
(The breaker shall be able to interrupt the rated line charging current with a test voltage immediately before opening equal to the product of U/√3 and 1.5 as per IEC - 62271-100).	
Maximum allowable switching over-voltage under any switching condition.	2.3 p.u
Rated small inductive current switching capability with over-voltage less than 2.3pu	0.5 A to 10 A

No. of trip coil	2 per pole
No. of closing coil	1 per pole
Opening time	Not more than 40 miliseconds
closing time	Not more than 100 milisecond
Rated operating duty cycle	O-0.3 sec.-CO-3 min-CO
Auto Reclosing	single phase & three phase auto reclosing
SF6 Gas	As per IEC 60376 &61634
Max. difference in the instants of closing / opening of contacts (ms)	
Within a pole	5/2.5ms
Between poles	7.5/3.5ms
Operating mechanism	Spring / Spring
Auxiliary voltage for closing coil	220 volt DC (85% -110%)
Auxiliary voltage for tripping coil	220 volt DC (70% -110%)
Auxiliary voltage for spring charge motor/ Heater/Lamp/Sockets	240V±10%, 50 Hz, 1-phase two wire AC supply
Auxiliary voltage for compressor/pump motor	415V ±10%, 50 Hz, 3-phase 3 wire AC,
Heater/lamp/socket	240V, 1ph, 50 Hz.
Auxiliary contacts	Each circuit breaker pole shall be provided with an auxiliary switch with a total of twenty independent single pole reversible contacts , exclusively for Owner's use . The auxiliary switch shall be factory assembled with 10 NO and 10 NC contacts per phase for future use of purchaser.
Noise level at base	140 db max at base of CB
Rated terminal load	200kg static
Temperature rise over the design ambient temperature	as per IS/IEC duly adjusted for site condition.
First pole to clear factor	1.3
Number of terminals in common control cabinet	all contacts circuits are to be wired out upto common control cabinet plus 24 terminals exclusively for Owner's use
Mounting	On Hot dip Galvanised steel structure
Interpole cabling (FRLS) of CB in supplier scope	Yes
Terminal connector of CB in supplier scope	NO
Pre insertion resistor	Not applicable
Anti pumping	Required

1.3 QUANTITIES

S No.	Description	Quantity	Unit
1	Main item- 420 kV, 3150 A, 50 kA for 3 Sec, Three phase SF6 Circuit Breaker without CSD without closing resistor with corona shielding, operating mechanism, Insulators , base frame, HV terminal Plates, control cabinet, support structure, cable glands, ladder (if applicable), marshalling box (if applicable) and other accessories, complete in all respects	2	Nos.
2	Main item- 420 kV, 3150 A, 50 kA for 3 Sec, Three phase SF6 Circuit Breaker without closing resistor with corona shielding, operating mechanism, Insulators , base frame, HV terminal Plates, control cabinet, support structure, cable glands, ladder (if applicable), marshalling box (if applicable) and other accessories, complete in all respects (with provision for CSD).	2	Nos.
3	Main item- Controlled Switching Device (CSD) (for 420kV CB at sl no. 2 above) along with all accessories like transducers etc complete in all respect (except special cables) in all respect.	2	Nos.
4	Main item-Special cables$ for CSD. Length = distance from CB to Relay panel	1000	Meter
5	Main item-Foundation/fixing bolts for 420kV, 3-Phase SF6 Circuit Breaker structure, platform, ladder (if applicable) and marshalling box (if applicable) at sl no. 1, 2 and 9. 1Lot = Qty. required for 1 no. 3-Phase 400kV Circuit Breaker.	5	Lot
6	Main item- Portable SF6 gas filling & evacuating equipment as per cl. no. 4.01.05 of section-02	1	No.
7	Main item- Circuit breaker operation analyser as per cl. no. 4.01.05 of section-02	1	No.
8	Main item- Portable SF6 gas leakage detector as per cl. no. 4.01.05 of section-02	2	No.
9	Mandatory spare- 420 kV, 3150 A, 50 kA for 3 Sec, Three phase SF6 Circuit Breaker without CSD without closing resistor with corona shielding, operating mechanism, Insulators , base frame, HV terminal Plates, control cabinet, support structure, cable glands, ladder (if applicable), marshalling box (if applicable) and other accessories, complete in all respects	1	No.

10	Mandatory spare- 20 % spare SF6 gas plus additional quantities of SF6 gas in gas required for two years operation of all breakers(5 Nos) in a separate unused cylinder	1	Lot
11	Mandatory spare- Accumulator with its Accessories	1	Set
12	Mandatory spare- Complete Mechanism Box for Breaker	1	No.
13	Mandatory spare- Closing Coil with resistor	6	Nos.
14	Mandatory spare- Tripping Coil with resistor	12	Nos.
15	Mandatory spare- Power and control Contactor, limit switches, timers etc. 1 Set= 1 Nos for each type & rating	2	Sets
16	Mandatory spare- Auxiliary Relay 1 Set= 1 Nos for each type & rating	5	Sets
17	Mandatory spare- Breaker auxiliary contact 1 Set= 1 Nos for each type & rating	2	Sets
18	Mandatory spare- Gas Density Monitor	1	No.
19	Mandatory spare- Pressure Switch (if applicable) 1 Set= 1 Nos for each type & rating	2	Sets
20	Mandatory spare- Double Interrupter Assembly Complete Set 1 Set= Double interrupter assembly required for 1 complete pole	1	Set
21	Mandatory spare- Set of O-ring 1 Set= 1 Nos for each type & rating	3	Sets
22	Mandatory spare- Set of Seal 1 Set= 1 Nos for each type & rating	3	Sets
23	Mandatory spare- Set of Dynamic Seals 1 Set= 1 Nos for each type & rating	3	Sets
24	Mandatory spare- Aero-shell Fluid	25	Litres
25	Mandatory spare- Hollow Column Insulators 1 Set= Hollow column insulators required for 1 complete pole	1	Set
26	Mandatory spare- SF6 Gas filled Cylinder- 50 Kg	1	No.
27	Mandatory spare- Terminal block of Power circuit	10	Nos.
28	Mandatory spare- Terminal block of Control circuit	10	Nos.

29	Mandatory spare- Complete set of Push Button Switch 1 Set= 1 Nos. for each colour and area of application.	2	Sets
30	Mandatory spare- Locable Type Switch 1 Set= 1 Nos for each type & rating	2	Sets
31	Mandatory spare- Selector Switch 1 Set= 1 Nos for each type & rating	2	Sets
32	Mandatory spare- MCCB/MCB/Fuse unit with fuse (AC & DC application) 1 Set= 1 Nos for each type & rating	2	Sets
33	Services- Supervision of Erection, Testing & Commissioning of supplied 420kV, 3-Phase Circuit breakers at site.Testing & commissioning instruments (Time interval meter (timing kit), SF6 gas leakage detector & any other special tools like gas filling adapter etc) shall be brought by supplier and shall be taken back after successful completion of testing and commissioning.	16	Man days
34	Services- Supervision of Erection, Testing & Commissioning of supplied CSD's at site. (including interface with CB)	8	Man days
35	Services- To and fro charges for Supervision of Erection, Testing & Commissioning of supplied Circuit Breakers & CSD's at site	2	Visits

$ Special cables other than 1100V LT Power & Control Cables required for CSD shall be in bidder's scope. Only distance from CB to Relay panel has been provided at Sl no.4 of BOQ. Total requirement of special cable qty. is to be estimated & supplied by bidder based on number of runs etc. Special cables shall be supplied in single drum length after confirmation from BHEL during detailed engineering stage.

Details of Controlled Switching Device (CSD) application for 420 kV Circuit Breakers is as mentioned below:

S No.	Substation/ SLD Drg No.	Dia	CB without PIR CSD used in switching of -	
			Main Bay CB	Tie Bay CB
1	Sagardighi S/s TB-DG-445-316-E001	425-426-427	without PIR; Trafo. application	without PIR; Trafo. application

NOTE: i.

1) Total contract value may vary upto ± 10% at contract stage.
2) For item no.2, all wiring necessary for interface of circuit breakers with CSD is deemed to be included in the scope.
3) Supply of terminal connectors for Circuit Breakers is in BHEL scope.
4) Inter pole cabling between Circuit breaker and common marshalling box shall be Non Plug in type.
5) Inter pole cable schedule shall be provided by bidder during detailed engineering stage.
6) i. For item at sl no. 33 & 34 of BOQ, no. of man days consumed in Supervision of erection, testing and commissioning of Circuit Breakers & CSD's shall be duly certified by BHEL Site-incharge.

   ii. Visit charges are covered separately under sl no. 35 of BOQ. No other charges shall be paid by BHEL.

   iii. The following instruments/kits shall be brought by Bidder and shall be taken back after successful completion of testing and commissioning:
   (a) Time Interval meter (Timing kit)
   (b) SF6 Gas leak Detector
   (c) Any other special tools like gas filling adapter etc

7) The following instruments/kits shall be provided by BHEL at site:
   (a) DCRM
   (b) 5kV Insulation tester
   (c) 1kV Insulation tester
   (d) Single phase variac
   (e) Dew Point meter
   (f) Capacitance and Tan Delta Kit
   (g) Contact Resistance measurement kit
   (h) Multimeter

   Circuit Breaker Analyzer - Adaptor/Transducer for analyzer (if required) suitable for breaker shall be scope of bidder.

   Any other instrument(s), if required for Testing/commissioning of Circuit Breaker shall be arranged by Circuit Breaker supplier without any price implication to BHEL.

8) Each circuit breaker shall be furnished with fitting and accessories as listed in the Annexure-B Clause A1 of section -2 of technical specification

1.4 Enclosures:

Sl No	Drg No.	Description
1	TB-DG-445-316-E001 Rev01	SLD of 400kV S/s at Sagardighi (WB)

1.5 TESTS

Routine Test

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

In addition to above tests specified by IEC/IS, the following tests also have to be carried out for specific equipment :

i) The speed curves for EHV circuit breaker shall with the help of a suitable operation analyser to determine the breaker contact movement during opening, closing, auto-reclosing and trip-free operation under normal as well as limiting operating conditions (Control Voltage, pneumatic pressure etc.)

Type Test

Type tests on circuit breaker 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.

Following additional type tests reports to be provided for EHV circuit breaker:

i) Short line fault test.

ii) Out of phase making and breaking test as per IEC.

iii)Rated line charging current breaking test. The breaker shall be able to interrupt the line charging current with a test voltage of 1.4 p.u. instead of 1.2 p.u. as per IEC.

iv)Test to demonstrate ability to withstand 2.5 times the rated voltage across the open circuit breaker at & below lockout pressure.

v) Seismic withstand test in unpressurised condition.

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.

1.6 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.

1.7 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.

a) The CSD shall be designed to operate correctly and satisfactorily with the excursion of auxiliary A/C & DC voltages and frequency as specified in section - GTR. b) The CSD shall meet the requirements of IEC-61000-4-16 class IV for HF disturbance test (for short and long durations both) and fast transient test shall be as per IEC-61000-4-4 level IV and insulation test as per IEC 60255–5.
c) The CSD shall have functions for switching ON & OFF the circuit breakers.
d) The CSD shall get command to operate the breakers manually. The controller shall be able to analyze the current and voltage waves available through the signals from secondaries of CTs & CVTs for the purpose of calculation of optimum moment of the switching the circuit breaker and issue command to circuit breaker to operate.
e) The CSD shall also have an adaptive control feature to consider the next operating time of the breaker in calculation of optimum time of issuing the switching command. In calculation of next operating time of the breaker, the CSD must consider all factors that may affect the operating time of the breaker such as, but not limited to, ambient temperature, control voltage variation, SF6 gas density variations etc. Schematic drawing for this purpose shall be provided by the contractor. The accuracy of the operating time estimation by the controller shall be better than ± 0.5 ms.
f) The CSD should have display facility at the front for the display of settings and measured values.
g) The CSD shall be PC compatible for the setting of various parameters and down loading of the settings and measured values, date, time of switching etc. Window based software for this purpose shall be supplied by the contractor to be used on the owner's PC.
h) The controller shall be suitable for current input of 1 ampere from the secondary of the CTs. and 110 V (Ph to Ph) from the CVTs. The CSD shall withstand transient and dynamic state values of the current from the secondary of the CTs and CVTs.
i) The CSD shall have time setting resolution of 0.1 ms or better.
j) The CSD shall have sufficient number of output/input potential free contacts for connecting the monitoring equipment and annunciation system available in the control room. Necessary details shall be worked out during engineering of the scheme.
k) The CSD shall also record and monitor the switching operations and make adjustments to the switching instants to optimize the switching behavior as necessary. It shall provide self-diagnostic facilities, signaling of alarms and enable downloading of data captured from the switching events.
l) The provision for bypassing the Controlled switching device shall be provided through BCU and SCADA both so that whenever, the CSD is not healthy due to any reason (including auxiliary supply failure), uncontrolled trip/close command can be extended to the circuit Breaker. Alternatively, in case of any non-operation of the CSD after receiving a close/trip command after a pre-determined time delay, the CSD should automatically be bypassed so as to ensure that the trip and close commands are extended to the Trip/Close coils through subsequent command.
m) The CSD shall be provided with a communication port to facilitate online communication of the CSD with Substation automation system directly on IEC 61850 protocols. If the CSD does not meet the protocols of IEC 61850, suitable gateway shall be provided to enable the communication of CSD as per IEC 61850.

4.00.00 **SPECIFIC REQUIREMENTS**

4.01.00 **Circuit Breaker**

4.01.01 Each circuit breaker shall be furnished complete with :

i) Fittings and accessories.
ii) Auxiliary equipment.
iii) First filling of SF6 gas plus 20% spare.

The equipment will be used in the switchyard having characteristics as listed in the Section-1

The equipment will be installed outdoor in a hot, humid and tropical atmosphere.

All equipment, accessories and wiring shall have tropical protection, involving special treatment of metal and insulation against fungus, insects and corrosion.

4.01.02 Type and Duty

The circuit breaker shall be three-pole, sulphur hexafluoride (SF6) type, having internal isolation without any sequential interlock.

The circuit breaker shall be restrike free as per IEC under all duty conditions and shall be capable of performing their duties without opening resistors.

The duty of the circuit breaker shall involve satisfactory interruption of short circuit currents as listed in the Section-1

The breaker shall be suitable for operation even under condition of "phase opposition" arising out of faulty synchronisation.

The breaker shall be capable of clearing the "Kilometric" fault of same magnitude as rated short-circuit current.

The breaker shall be capable of interruption of low reactive currents (lagging/leading) without undue over voltage.

Breakers with multi-break interruptions shall be so designed that the voltage developed across a pole is uniformly distributed over the power breaks.

The circuit breaker shall be capable of :

i) Interrupting line/cable charging current as per IEC without any restrike and without use of opening resistors.

ii) Clearing short line fault (kilometer faults) with source impedance behind the bus equivalent to symmetrical fault current specified.

iii) Breaking 25% of the rated fault current at twice rated voltage under phase opposition condition.

4.01.03 Constructional Feature

Each circuit-breaker shall comprise of three (3) identical poles complete with individual operating mechanism for specified duty. Three poles shall be linked together electrically for simultaneous closing.

The circuit-breaker shall be single pressure type. The design and construction shall be such that there is minimum possibility of gas leakage and ingress of moisture. Further, the arrangement shall be such that condensation of SF6 gas on the internal insulating surfaces of the circuit breaker must not occur under any condition.

Each pole shall form an enclosure filled with SF6 gas independent of two other poles. The SF6 gas density of each pole shall be monitored and regulated by individual temperature compensated gas density monitoring devices, which shall be mounted at a convenient and easily approachable location. The device shall have provision for low gas pressure alarm and breaker lockout arrangement. Also pressure gauge shall be mounted at a convenient height so that gas pressure can be visually observed.

The circuit-breaker shall have proper sealing so that leakage of gas outside is not more than 1% per annum under all conditions of operation. Further, it shall incorporate devices to absorb any moisture which may exist/be released within breaker poles after assembly, gas charging and during operation. The devices shall be so located as to permit easy removal/replacement.

The operating rod connecting the operating mechanism to the arc chamber (SF6 media) shall have adequate seals. All gasketted surfaces shall be smooth, straight and reinforced, if necessary, to minimise distortion and make a tight seal.

The circuit-breaker units shall be complete with associated valves, piping, gauges, pressure switches, seals, lubricants and other accessories/materials to ensure proper assembly and functioning.

Suitable means shall be provided in the gas chamber of circuit breaker for pressure relief so as to avoid damages or distortion during occurrence of abnormal pressure increase or shock waves generated by internal electric fault arcs. The position of vents, diaphragms and pressure relief devices, if provided, shall be so arranged as to minimise danger to personnel in the event of gas or vapour escaping under pressure.

Breaker shall be furnished with first charge of SF6 gas plus additional 20% of total gas used which shall be supplied in non-returnable gas cylinders as spare for future use.

The SF6 gas shall be supplied in properly treated steel cylinder of adequate strength. Chemical analysis of gas supplied shall be furnished for Owner/Purchaser's reference.

The circuit breaker shall be provided with terminal pads of adequate size for connection to Rigid Aluminum tube by expansion type terminal connector. Adequate transversal and vertical force shall be considered for the terminals so as to support the interconnecting tubes spanning around 10 meters during short circuit and wind force.

4.01.04 Main Contacts and Arc Quenching Chamber

i) The main contacts shall have adequate area and contact pressure for carrying rated continuous and short time current without excessive heating liable to cause pitting and welding. Contacts shall be permanently under pressure of SF6 gas.

ii) If multi-break interrupters are used, they shall be so designed and augmented that a uniform voltage distribution is developed across them.

iii) The tips of the arcing and main contacts shall be heavily silver-plated.

iv) The contacts shall be adjustable to allow for wear, shall be easily replaceable and shall have minimum movable parts and adjustments.

v) Main contacts shall be first to open and last to close so that there will be little contact burning and wear.

vi) Arcing contacts shall be first to close and last to open and shall be easily accessible for inspection and replacement.

vii) The arc quenching device shall be of robust construction and shall not require any critical adjustment. The devices shall be easily accessible and removable for access to the breaker contacts.

4.01.05 Accessories and Attachments

i) Circuit breaker operation analyser shall be supplied to record contact travel, speed and for making measurement of operating timings, pre-insertion timing of closing resistors, synchronization of contacts in ~~one pole or~~ all poles

ii) The SF6 gas density monitor shall be dial type and properly temperature compensated. The sensing probe of SF6 gas leaked detector shall be able to reach all the points on the breaker where leakage is to be sensed. The accuracy of the equipment shall be at least 10 ppm. It shall be free from induced voltage effect.

The density monitor shall meet the following requirements:

a) It shall be possible to dismantle the density monitor for checking/replacement without draining the SF6 gas by using suitable interlocked non-return valve coupling.

b) It shall damp pressure pulsation while filling the gas in service so that flickering of the pressure switch contacts does not take place.

iii) A Portable SF6 gas filling and evacuating system shall be supplied with necessary gas valves, gas cylinders, safety devices, gas purity monitoring devices, regulators, vacuum pump, pressure gauges/switches, hose pipes etc.

4.01.06 Auxiliary Contacts

i) The auxiliary switches required for satisfactory operation of the circuit breaker including auto reclosing (Single shot, single and 3 phase) ON/OFF indicators both in control room and switchyard, discrepancy switch in the mimic diagram in the control room and antipumping features shall be provided on each circuit breaker. In addition, each breaker shall be provided with six (6) normally open and six (6) normally closed electrically separate spare auxiliary contacts, in addition to those required for its own operation and indication.

ii) The auxiliary contacts shall be convertible type so that normally open contacts can be converted into normally close contact & vice-versa at site.

iii) The auxiliary contacts shall be rated 10A at 240 V A.C. and 2A at 220 V D.C with circuit time constant of at least 20 millisecond.

4.01.07 Control & Interlock

i) All electrical and mechanical interlocks which are necessary for safe and satisfactory operation of the circuit breaker shall be furnished. Breaker operation shall be locked in case of low SF6 gas pressure at preset values. Alarms shall be provided for low gas pressure at values higher than lock-out pressure of SF6 gas. It is intended that before lock-out occurs, the breaker shall be in trip position.

ii) The close and trip circuits shall be designed to permit use of momentary contact switches and push buttons.

iii) The breaker shall normally be operated by remote electrical control. Electrical tripping shall be performed by shunt trip coils. Provision shall be made for local electrical/local manual control. For this purpose, local/remote selector switch, close & trip control switch, auxiliary relays, indication lamps etc. shall be provided in the control cabinet for the breaker. In addition local manual trip button shall be provided.

iv) Gas analyser contacts, pressure switch contacts, etc. shall be suitable for direct use as permissive in closing, tripping, annunciation and control circuits. DC supplies for all auxiliary circuits shall be monitored and provision shall be made for remote annunciations.

4.01.08 Insulators

i) Insulator shall be wet-process porcelain, brown glazed and free from all blemishes. Metal parts and hardware shall be hot-dip galvanised.

ii) Insulator shall have adequate mechanical strength and rigidity to withstand the duty involved.

iii) When operated at maximum system voltage, there shall be no electrical discharge. Shielding rings, if necessary, shall be provided.

iv) Insulation shall be coordinated with basic impulse level of the system. The creepage distance shall correspond to heavily polluted atmosphere.

v) All routine tests shall be conducted on insulators as per IEC233/ relevant IS in addition to the following tests :

a) Ultrasonic test.

b) Pressure test.

c) Bending load test in four directions at 50% specified bending load.

d) Bending load test in four directions at 100% specified bending load as acceptance test of lot.

e) Burst pressure test as a sample test.

vi) The insulator porcelain shall be in one integral place in green and fired stage. No jointed porcelain is acceptable.

4.01.09 Operating Mechanism

i) Operating mechanism shall be stored energy type, with motor operated spring – spring charged closing mechanism. Anti-pumping and trip free features complete with 2x100% shunt trip coils shall be provided. The mechanism of the breaker shall be such that the position of the breaker is maintained even after leakage of operating media and/or gas.

ii) The operating mechanism shall be suitable for high speed reclosing (single phase and three phase). It shall be anti-pumping and trip free

(as per IEC definition) electrically and either mechanically or pneumatically under every method of closing (except during manual closing of a breaker for maintenance). A latch checking switch shall be provided on mechanically trip free mechanism to prevent reclosure before the breaker latches have reset.

iii) There shall be no objectionable rebound and the mechanism shall not require any critical adjustment. It shall be strong, rigid, positive and fast in operation.

iv) The operating mechanism shall be such that the failure of any auxiliary spring will not prevent tripping and will not cause trip or closing operation of the power operated closing devices.

v) Mechanical indicator shall be provided to show open and close positions of each pole of the circuit breaker. It shall be located in a position where it will be visible to a man standing on the ground. An operation counter at 1000-1300 mm level shall also be provided. The counter readings shall be visible from the ground even with the mechanism housing closed.

vi) Closing coil and trip coil shall operate correctly at all values of voltage between 85% and 110% of the rated voltage. If additional elements are introduced in the trip coil circuit, their successful operation for similar applications on outdoor breakers shall be clearly brought out in the appropriate schedule.

vii) The close and trip circuits shall be designed to permit use of momentary contact switches and push buttons.

viii) Each breaker pole shall be provided with two (2) independent tripping circuits, valves, pressure switches and coils each connected to a different set of protective relays. The trip coils shall be suitable for trip circuit supervision during both open & close positions of the breaker and the closing coil shall be suitable for pre-close supervision.

ix) The auxiliary switch of the breaker shall be positively driven by the breaker operating rod.

x) All three breaker poles shall operate simultaneously. Pole discrepancy feature shall be provided to trip the breaker out if all the poles do not close simultaneously within the stipulated time.

4.01.10 Spring operated mechanism

Spring operated mechanism shall be complete with motor, opening spring and closing spring with limit switch for automatic charging and other necessary accessories to make the mechanism a complete operating unit shall also be provided.

As long as power is available to the motor, a continuous sequence of the closing and opening operations shall be possible. The motor shall have adequate thermal rating for this duty.

After failure of power supply to the motor one close open operation shall be possible with the energy contained in the operating mechanism.

Breaker operation shall be independent of the motor which shall be used solely for compressing the closing spring. Facility for manual charging of the closing spring shall also be provided. The motor rating shall be such that it requires not more than 30 seconds for full charging of the closing spring.

Closing action of circuit breaker shall compress the opening spring ready for tripping.

When closing springs are discharged after closing a breaker, closing springs shall be automatically charged for the next operation and an indication of this shall be provided in the local and remote control cabinet.

Provisions shall be made to prevent a closing operation of the breaker when the spring is in the partial charged condition. Mechanical interlocks shall be provided in the operating mechanism to prevent discharging of closing springs when the breaker is already in the closed position.

The spring operating mechanism shall have adequate energy stored in the operating spring to close and latch the circuit breaker against the rated making current and also to provide the required energy for the tripping mechanism in case the tripping energy is derived from the operating mechanism.

4.01.11 Sulphur Hexafluoride (SF6) Gas

i) The SF6 gas shall be new and comply with relevant IEC/IS and shall be suitable in all respects for use in the circuit breakers under the various operating conditions.

ii) SF6 gas shall be tested for quality, dew point, air, hydrolysable fluorides and water content as per IEC quoted above and test certificates shall be furnished covering all tests for each lot of SF6 gas. Further site test for moisture and air content to be done prior to commissioning of the breaker.

iii) The high-pressure cylinders in which SF6 gas is shipped and stored at site shall comply with requirements of the following standards and regulations : IS-4379, IS-7311

The cylinders shall also meet Indian Boiler Regulations.

4.01.12 Control Cubicle

i) A common control cubicle shall be furnished to house electrical, controls, monitoring devices and all other accessories except those, which must be located on individual poles.

ii) The cubicle shall be IP-55, of gasketted weatherproof construction, fabricated from sheet steel minimum 2 mm thick.

iii) The cubicle shall have front access door with lock & keys and removable gland plate at the bottom.

iv) Thermostat controlled space heater, internal illumination lamp and 5-pin 5A socket with individual ON-OFF switches shall be provided in the cubicle.

v) For local operation, following shall be provided :

a) LOCAL/REMOTE selector switch.
b) TRIP/CLOSE push buttons.

vi) All electrical, pneumatic connections between the control cubicle and individual poles shall be furnished.

4.01.13 Wiring

i) Wiring shall be complete in all respects to ensure proper functioning of the control, protection, monitoring and interlocking schemes.

ii) DC circuit for trip coil 1 & 2 shall be wired separately so as to connect with duplicate DC supply.

iii) Wiring shall be done with flexible 1100V grade, fire resistant, PVC insulated, switchboard wires with 2.5 mm² stranded copper conductor. Wiring between individual poles and control cubicle shall be routed through rigid G.I. conduit or / and metallic flexible conduits.

iv) Each wire shall be identified at both ends with permanent markers bearing wire numbers as per Contractor's wiring diagram. AC/DC wiring shall have separate colour-coding.

v) Wire termination shall be done with crimping type connectors with insulating sleeves. Wires shall not be spliced between terminals.

vi) All spare contacts of relays, push buttons, auxiliary switches etc. shall be wired up to terminal blocks in the control cubicle.

4.01.14 Terminal Blocks

i) 650V grade, multi way terminal block complete with mounting channel, binding screws and washers for wire connections and marking strip for circuit identification shall be provided for terminating the wiring. Terminals shall be stud type, suitable for terminating 2 nos. 2.5 mm2 stranded copper conductor and provided with acrylic insulating cover.

ii) Not more than two wires shall be connected to any terminal. Spare terminals equal in number to 20% active terminals shall be furnished. Separate terminal blocks shall be used for AC/ DC wiring termination.

iii) Terminal blocks shall be located to allow easy access. Wiring shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.

iv) Terminal blocks used for interface with DCS via termination cabinet shall be suitably sized to facilitate proper termination of interconnecting cables.

4.01.15 Support Structures

The equipment shall be supplied with support structures, which are integral part of the breaker.

All support structure shall be hot dip galvanized with minimum 610 gram/sq.m of zinc after full chemical treatment as per relevant standard.

The height of the support structure shall be decided based on, whichever is higher, of the following:

a. The minimum vertical distance from the bottom of lowest porcelain part of the bushing shall be at least 2440 mm from top of the plinth level of the foundation.

b. The height of the lower terminal pad at the specified elevation above the plinth level.

The design of the structure shall be submitted for approval.

4.01.16 Name Plate

Each circuit breaker and its operating devices shall be provided with nameplate clearly marked the particulars in accordance with IEC.

The nameplate shall be provided in visible portion of normal service and installation.

4.01.17 Grounding

Each circuit breaker shall be provided with two ground pads for connection to station ground mat.

The ground pad shall comprise buffed metal surface with two holes, M10 G.I. bolts and spring washers to receive 75x12 mm G.I. flat.

SCHEDULE OF PRE-COMMISSIONING TESTS OF CIRCUIT BREAKERS

a) Insulation resistance test on each pole by H.V. Meggar.

b) Insulation resistance test on control circuit.

c) Measurement of closing time & tripping time.

d) Checking of all joints for gas leakage in case of SF6 insulated breaker.

e) Measurement of contact resistance for all the three phases.

f) Checking the auxiliary circuits associated with circuit breaker.

g) Functional check of breaker operation electrically at 70% and 110% of rated D.C. supply voltage.

h) Checking of Interlocks provided in Control Circuits and tripping through simulated protective relay contacts.

i) Measurement of resistance of closing and tripping coils.

ANNEXURE-B

FITTINGS & ACCESSORIES

A. **Circuit Breaker**

A.I Each Circuit Breaker shall be furnished complete with fittings and accessories as listed below :

1. Operating mechanism complete with all accessories, fittings and double tripping coils and closing coil, pole discrepancy feature and low pressure blocking device etc. as required.
2. Complete SF6 gas system along with valves, pressure switches, pressure gauges, SF6 gas density monitor, etc.
3. Various attachments & accessories for gas filling.
4. Two ground pads per pole suitable for termination of 75 x 10 mm GS flats.
5. Base frame and anchor bolts and nuts.
6. Set of valves, pressure gauges and pressure switches as required.
7. Auxiliary contacts and relays.
8. LOCAL/REMOTE Selector switch, TRIP/CLOSE Push Buttons.
9. Manual tripping devices with protective flap.
10. Mechanical ON-OFF indicator.
11. Operation counters.
12. Weatherproof outdoor type control cubicle and pole boxes having IPW55 enclosure.
13. Set of switch fuse units/MCCB for A.C. and D.C. supply.
14. Space heater with thermostat and ON-OFF switch.
15. Cubicle illumination lamp with ON-OFF switch.
16. 3 Pin 5A Socket with ON-OFF Switch.
17. Terminal blocks and internal wiring - lot as required.
18. Set of pre-fabricated copper pipe with fittings, clamps, and hardware for connection between control cubicle and pole boxes as required.
19. Interconnecting wires, G.I. conduits and accessories for connection between control cubicle and pole boxes.
20. The gas filling and internal pressure monitoring devices per pole for SF6 breakers.
21. Other standard accessories which are not specifically mentioned but supplied with breakers of similar type and rating for efficient and trouble-free operation.
22. First filling of SF6 gas along with 15 % additional for the complete lot in non returnable container.
23. Bimetallic terminal connectors. (Suitable for Al tube / ACSR / AAC – Horizontal / vertical)
24. Supporting galvanized steel structure.

A.II Auxiliary Equipment Common for All Circuit Breakers

1. Portable SF6 gas evacuation and filing system with necessary gas valves, gas cylinders, safety devices, gas purity monitoring devices, regulators, vacuum pump, pressure gauges/switches, hose pipes etc. (One set)
2. Portable SF6 gas leaked detectors (2 sets)
3. Operational analyser to record contact travel, speed and for making measurement of operating timings, synchronisation of contacts in one pole or all poles. (One set)

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

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 modem 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

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 throughly 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

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

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. Earthling of hinged door shall be done by using a separate earth wire.

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

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

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

The West Bengal Power Development Corporation Ltd. Bharat Heavy Electricals Ltd. 1X660 MW Thermal power extension project Unit-5 at Sagardighi- 400KV Switchyard,
–

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

The West Bengal Power Development Corporation Ltd. Bharat Heavy Electricals Ltd. 1X660 MW Thermal power extension project Unit-5 at Sagardighi- 400KV Switchyard,
–

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,
–

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 WBPDCL Sagardighi site.
2. 1 soft copy + 3 sets of hard copy to WBPDCL 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

STATUS CONTRACT

DISTRIBUTION

BHARAT HEAVY ELECTRICALS LTD

TRANSMISSION BUSINESS GROUP

NOIDA

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TO				
NO.				
REV.	DATE	ALTD	CHD	APPD

DEPT CODE		NAME	SIGN	DATE
M	DRN	--		--
	DESN	--		--
	CHD	--		--
	APPD	--		--

TITLE

DEPT. SCALE ---

SIGN

DATE

DRAWING NO.

SHEET -- OF -- REV. --

SIZE-A0

4 3

Fold-1

SCHEDULE-IIID/9

GUARANTEED TECHNICAL PARTICULAR

400KV SWITCHYARD EQUIPMENT AND ACCESSORIES

	CIRCUIT BREAKER	**420 KV**
1.0	Name of Manufacturer	:
2.0	Reference standard	:
3.0	Type	:
4.0	Service	:
5.0	Pole Nos.	:
6.0	Rated Voltage KV $_{rms}$	:
7.0	Rated Frequency Hz	:
8.0	Mechanical Endurance Class	:
9.0	Electrical Endurance Class	:
10.0	Restrike Probability Class	:
11.0	Electromagnetic Compatibility (EMC)	:
12.0	Rated Insulation Level	:
13.1	Rated Lightning Impulse withstand voltage KV$_{peak}$	
	a) Between phase to earth	:
	b) Between phases and CB open	:
	c) Across isolating distance	:
13.2	Rated Switching Withstand Voltage KV $_{peak}$	
	a) Between phase to earth	:
	b) Between phases	:

	c) Across isolating distance	:
13.3	Rated one minute power frequency withstand voltage KV $_{rms}$	
	a) Between phase to earth	:
	b) Between phases	:
	c) Across isolating distance	:
14.0	Corona extinction voltage with CB open or close in normal atmospheric conditions KV $_{rms}$(min)	:
15.0	Max. radio interference voltage at 1.1 U_{rated} /√3 Micro-Volts	:
16.0	Rated normal Current at site condition Amps	:
17.0	Limit of temperature rise	:
18.0	Rated Making & Breaking Capacity	
18.1	Rated Short-circuit breaking current (Symmetrical) KA $_{rms}$	:
18.2	Percentage D.C. component	:
18.3	Rated short-circuit making current KA $_{peak}$	:
18.4	Rated peak withstand current KA $_{peak}$	:
18.5	Rated short time withstand current for rated duration of 1 sec. KA $_{rms}$	:
18.6	Rated line charging breaking current Amps $_{rms}$	:
18.7	Rated Out of phase breaking current In % of rated Short Ckt. Breaking current	:
18.8	Rated Out of phase making current In % of rated out of phase Breaking current	:
18.9	Characteristic for short-line fault	:

related to rated short-circuit breaking current

18.10 Rated capacitive switching breaking (Ams)/ in rush making current (KA $_{peak}$) :

18.11 TRV Characteristics :

19.0 Inductive current breaking capability without exceeding over voltage by 2.0 pu. :

20.0 First pole to clear factor :

21.0 Operating mechanism

21.1 Type with functional description write-up :

21.2 Whether trip free operation with anti pumping arrangement provided :

21.3 Spring charged mechanism

a) Rated Power KW :

b) Rated supply voltage, phase & frequency and operating range V & Hz :

c) Spring Charging time :

d) Safety interlock provided :

21.4 Electro hydraulic operated mechanism

a) Rated Power KW :

b) Rated Supply Voltage, Phase and frequency :

c) Operating Pressure and range Kg/m^2 :

d) Safety interlock provided :

e) Operating Pressure of Nitrogen Kg/m^2 :

21.5 Pneumatic Operated Mechanism

	a) Rated Power KW	:
	b) Rated Supply Voltage, Phase and frequency	:
	c) Operating Pressure and range Kg/m^2	:
	d) Safety interlock provided	:
	e) Air consumption like	:
22.0	Opening time ms	:
23.0	Closing time ms	:
24.0	Rated Operating Sequence	
	For Auto Reclosing breakers	:
	For Non Auto Reclosing breakers	:
25.0	Rated Supply Voltage and frequency for	
25.1	Closing	:
25.2	Tripping	:
25.3	Spring Charge Motor	:
25.4	Compressor / Pump Motor	:
25.5	Heater/Lamp/Socket	:
26.0	Minimum Creepage distance mm	:
27.0	Phase to phase spacing of terminal conductor mm	:
28.0	Elevation of lower most terminal Conductor above Plinth level mm	:
29.0	Rated Terminal Load Kgf	:
30.0	Noise level (db) at the base of CB	:
31.0	Mounting structure	:
32.0	Seismic Acceleration	:
33.0	SF_6 Gas	:

34.0	Total break time measured from the instant of trip circuit energization		:
34.1	At 10% breaking capacity mS		:
34.2	At 100% breaking capacity mS		:
35.0	Arcing time		
35.1	At 10% breaking capacity mS		:
35.2	At 100% breaking capacity mS		:
36.0	Total length of arc.	mm	:
37.0	Breaks per pole	No.	:
38.0	Length of break per pole mm		:
39.0	Contact Travel		
39.1	Length of travel	mm	:
39.2	Rate of travel	M/S	:
40.0	Make time	mS	:
41.0	Spring charging time Sec		:
42.0	Reclosing time with rated control voltage applied and measured from the instant of trip coil energization.		
42.1	Minimum dead time for first auto reclose mS		:
42.2	Range of adjustment for single auto reclose mS		:
43.0	Recovery voltage distribution between breaks in % of single line to earth fault %		:
44.0.	Type of devices, if any, to limit the rate of restriking voltage		:
45.0	Short circuit type test certificate furnished? Yes/No		
45.1	Certificate/Report No.		:

45.2	Oscillogram No.	:
46.0	Contacts	
46.1	Type	:
	a) Main	:
	b) Arcing	:
46.2	Material	
	a) Main	:
	b) Arcing	:
46.3	Whether the contacts are silver plated Yes/No	:
46.4	Thickness of silver coating mm	:
46.5	Contact pressure Kg/Cm^2	:
47.0.	Type of Arc control device	:
48.0	Whether main air column and interrupters are pressurised ?	:
49.0	Maximum pressure developed in the arcing chamber at rated breaking capacity Kg/Cm^2	:
50.0	Time limit for which the breaker can be kept open, if any	:
51.0	Auxiliary Contacts	
51.1	Total nos. of contacts furnished	
	a) Normally open Nos	:
	b) Normally closed Nos	:
51.2	Spare contacts available for interlocks in addition to those required for breaker's own operation and indication	:
	a) Normally open Nos	:
	b) Normally closed Nos	:

51.3	Contact type convertible or fixed?	:	
51.4	Contact Rating at		220VDC 240AC
	a) Make and Continuous Amps	:	
	b) Break (Inductive) Amps	:	
52.0	Permissible variation of 220V D.C.		
52.1	Closing	:	
52.2	Tripping	:	
53.0	Permissible variation of working pressure of Breaker	:	
53.1	Closing	:	
53.2	Tripping	:	
54.0	Air Consumption in liters (At NTP)		
54.1	Duty cycle (0-3 ' CO-3 ' CO)	:	
54.2	Closing	:	
54.3	Opening	:	
54.4	Total scavenging & leakage	:	
55.0	Volume of air receiver per pole	:	
56.0	Minimum blocking air pressure		
56.1	Closing Ata	:	
56.2	Tripping	:	
57.0	Minimum clearance		
57.1	Phase to ground mm	:	
57.2	Phase to phase mm	:	
58.0	Arrangement provided for		
58.1	Pole discrepancy	:	
58.2	Trip free/Fixed trip	:	
58.3	Anti pumping	:	

59.0	Operating mechanism	:
60.0	Power requirement at 220V D.C.	
60.1	Closing coil Watt	:
60.2	Tripping coil Watt	:
60.3	Spring charging motor Watt	:
61.0	Type of interlocks furnished	
61.1		:
61.2		:
61.3		:
61.4		:
62.0	Accessories	
62.1	Furnished as per Annexure? Yes/No	:
62.2	If not, Deviation sheet duly filled up? Yes/No	:
63.0	Bushings	
63.1	Make	:
63.2	Type	:
63.3	Reference standard	:
63.4	Voltage class KV	:
63.5	Momentary dry withstand voltage KV	:
63.6	Visible discharge voltage KV	:
63.7	One minute dry withstand voltage KV	:
63.8	One minute wet withstand voltage KV	:
63.9	Impulse withstand voltage KV peak	:

63.10	Under oil puncture voltage KV	:
63.11	Creepage distance, total/ Protected mm	:
63.12	Height required to remove the bushing mm	:
63.13	Permissible safe cantilever loading on bushing	:
64.0	Nature of insulating medium of bushing	:
65.0	Volume of insulating medium of bushing	:
66.0	Overall dimensions of the circuit breaker complete with bushing, mechanism box etc. mm	:
67.0	Circuit Breaker Weight	
67.1	Total Weight Kg	:
67.2	Impact for foundation design to include dead load plus impact value on opening at max. interrupting rating in dead load Kg	:
68.0	Shipping dimension of the largest package (L x B x H). mm	:
69.0	Shipping weight of the heaviest package Kg	:
70.0	Spare quantity of SF6 gas furnished? If so, indicate the total quantity	:
71.0	Number of openings, the Circuit Breaker is capable of performing without inspection, replacement of contacts or other main parts.	
71.1	At 50% rated current	:
71.2	At 100% rated current	:
71.3	At 50% rated breaking capacity	:

71.4 At 100% rated breaking capacity :

SECTION - 5

Put a tick mark (√) on 'YES' if the specified requirement is met, or put a tick mark on 'NO', if the specified requirement is not met and give comments in the "Remarks" column.

CHECK LIST FOR 420 KV CIRCUIT BREAKERS

S. No.	PARTICULARS	420 kV		Remarks
1	Rated voltage (KV rms)	420 KV	YES/NO	
2	Frequency (Hz).	50	YES/NO	
3	Number of Poles	3	YES/NO	
4	Neutral grounding	Solidly earthed	YES/NO	
5	Rated continuous current (A) at design Ambient temperature	3150	YES/NO	
6	Type	Outdoor SF6	YES/NO	
7	Type of operation	Individually Operated single Poles	YES/NO	
8	Rated Short circuit current breaking Capacity at rated voltage	50 KA with percentage DC Component as per IEC -62271-100 corresponding to minimum Opening time under operating Conditions specified	YES/NO	
9	Symmetrical interrupting capability (kA rms)	50	YES/NO	
10	Rated short circuit making current (kA peak)	125	YES/NO	
11	i) Short time current carrying capability for three sec. (kA rms) ii) Out of phase breaking current capacity (kA rms)	50 12.5	YES/NO YES/NO	
12	Rated operating duty	0-0.3 sec CO -3 min-CO Cycle	YES/NO	
13	Reclosing	Single Phase & three phase auto closing	YES/NO	
14	First pole to clear factor	1.3	YES/NO	
15	Rated line charging interrupting current at 90 deg. Leading power factor angle A (rms)	400	YES/NO	
	(The breaker shall be able to interrupt the rated line charging current with test voltage Immediately before opening equal to the product of U/√3 & 1.4 as per IEC: 62271-100		YES/NO	
16	Temperature rise over the design ambient temperature	As per IEC: 62271 -100	YES/NO	
17	Total opening time as per IEC (ms)	40	YES/NO	
18	Rated opening time as per IEC (ms)	40	YES/NO	

19	Total closing time (ms)	Not more than 100 ms	YES/NO	
20	Operating mechanism	spring - spring	YES/NO	
21	Max. difference in the instants of Closing/opening of contacts i) Within a pole ii) Between poles (opening) iii) Between poles (closing)	As per section -1 of Technical specification	YES/NO	
22	The above voltage shall be at rated control voltage and rated operating and quenching Media pressures		YES/NO	
23	Trip coil closing coil voltage	220 V DC with variation as specified	YES/NO	
24	Noise level at base of CB	140 dB (max.)	YES/NO	
25	Rated terminal load	As per IEC	YES/NO	
26	Auxiliary contacts	Besides requirement of Specification, The bidder shall wire up 10NO +10 NC Contacts for future use of purchaser per phase	YES/NO	
27	No of terminals in common control cabinet	All contacts & control circuits to be Wired out up to common control Cabinet plus 24 terminals exclusively for Purchaser's use.	YES/NO	
28	Maximum allowable switching overvoltage Under any switching condition	2.3 p.u	YES/NO	
29	Full wave impulse withstand voltage (1.2/50 microsec.) - between line terminals and ground - between terminals with circuit breaker open -across isolating distance(impulse on one terminal and other terminal earthed)	 ±1425 kV peak ±1425 kV peak ± 1425 kVp impulse on one terminal and 240 kVp power frequency voltage of opposite polarity on other terminal	 YES/NO YES/NO YES/NO	
30	Switching impulse withstand voltage (250/2500 micro-second) dry and wet - between line terminals and ground - between phases - between terminals with circuit breaker open	 ± 1050 kV peak ± 1575 kV peak 900 kVp impulse on one terminal and 345 kVp power frequency voltage of opposite polarity on other terminal	 YES/NO YES/NO YES/NO	
31	One minute power frequency dry withstand voltage - between line terminals and ground	 520 kV rms	 YES/NO	

	- between terminals with circuit breaker open	610 kV rms	YES/NO	
32	Corona extinction voltage (kV rms) with Circuit Breaker in all positions	320 (min)	YES/NO	
33	Maximum radio interference voltage (micro volts) at 1.1 Urated/sq.rt.3 for frequency between 0.5 MHz and 2 MHz at 266 kV rms. in all positions	1000	YES/NO	
34	Minimum Creepage distance:- i) Phase to ground (mm) ii) Between CB Terminals (mm)	 13020 13020	 YES/NO YES/NO	
35	Phase to phase spacing	7000 mm	YES/NO	
36	Seismic acceleration	0.3g horizontal	YES/NO	
37	Rated Terminal Load	As per IEC	YES/NO	
38	Thermal Rating of Auxiliary Contacts	10 A at 240 V AC	YES/NO	
39	Breaking Capacity of auxiliary contacts	5 A at 220V DC with circuit time constant not less than 20 ms.	YES/NO	
40	~~Pre-insertion resistor requirement~~			
	Rating (ohms)	400	NA	
	Minimum Electrical pre-insertion time (ms)	8		
	opening of PIR contacts	As per Spec		
41	General			
	a) Whether OGA drawing enclosed		YES/NO	
	b) Filled in GTP furnished		YES/NO	
	c) Special cable for CSD (Interpole + CSD to Relay Panels) included in scope		YES/NO	
	d) Interpole cabling included in scope alongwith required Glands, Lugs etc. Termination chart shall be submitted alongwith the drawings.		YES/NO	
	e) All Type Test Reports as per IEC 62271 - 100, not older than 5 years prior to the date of technical bid opening, are available with bidder		YES/NO	
	f) Whether GI support structure included in Supply		YES/NO	
	g) Whether foundation bolts for breakers and cabinets included in scope of supply		YES/NO	
	h) Whether documentation schedule as per specification agreed by bidder.		YES/NO	
	i) No. of Aux. contacts per pole for purchaser's usage	10 NO + 10 NC	YES/NO	
	j) Min clearance in Air (mm) (i) Between Live Parts (ii) Live Part to Earth (iii) Live Part to ground with Support Structure / Stool	7000		

	k) Control Cabinet - Degree of Protection Type Tested for IP 55 within last 5 years	IP 55 (Min.)	YES/NO	
42	Mandatory spares included in scope of supply as per section- 1		YES/NO	
43	Supervision of Erection, testing and commissioning included in scope		YES/NO	
44	Bidder to comply customer requirements as per Technical Specification		YES/NO	

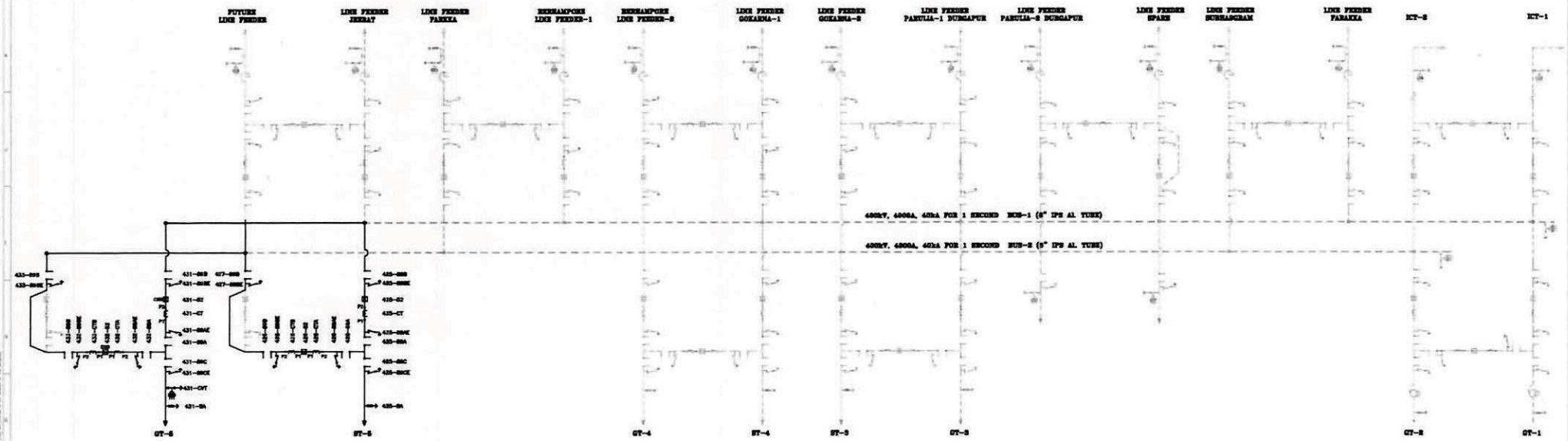
SCHEDULE OF TECHNICAL DEVIATIONS

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

S.No.	Page No.	Clause No.	Deviation	Reason / Justification

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



BILL OF QUANTITY (MAIN EQUIPMENT) :-

S.L	ITEM DESCRIPTION	kV	QTY.	SYMBOL
1.	3150A,3-PH ,50kA FOR 3 SEC, SF6 CB SUITABLE FOR 1ø & 3ø OPERATION WITHOUT CLOSING RESISTOR WITH CONTROLLED SWITCHING DEVICE (CSD).	420	02	CSD
2.	3150A,3-PH ,50kA FOR 3 SEC, SF6 CB SUITABLE FOR 1ø & 3ø OPERATION WITHOUT CLOSING RESISTOR WITHOUT CONTROLLED SWITCHING DEVICE (CSD).	420	02	
3.	2000A,3-PH, 50KA FOR 3 SEC, HCB ISOLATOR(ELECTRICALLAY GANGED MOTOR & MANUAL OPERATED) WITH 1E/S (MECHANICALLY GANGED MANUAL OPERATED).	420	12	
4.	2000 A, 50KA FOR 3 SEC, 6 CORE CURRENT TRANSFORMER, 120% EXTENDED CURRENT 1 PH.	420	18	
5.	4400+10%,-5% pF,3 WINDING CVT 50KA FOR 3 SEC, 1PH.	420	03	
6.	SURGE ARRESTER(METAL OXIDE GAPLESS TYPE) 1-PH. 10kA CLASS-3	360	06	

CT DETAILS:-

CORE No.	APPLICATION	RATIO	BURDEN	KPV (MIN)	I_e AT VK (MAX)	R_{ct} (MAX AT 75 °C)	ACCURACY CLASS
CORE 1	BUS DIFFERENTIAL MAIN	2000/1A 1600/1A 800/1A	-	2000 V 1600 V 800 V	30mA ON 2000/1 tap 50mA ON 1600/1 tap 125mA ON 800/1 tap	10 Ω 5 Ω 2.5 Ω	PS
CORE 2	BUS DIFFERENTIAL CHECK	2000/1A 1600/1A 800/1A	-	1600 V 1000 V 500 V	30mA ON 2000/1 tap 50mA ON 1600/1 tap 125mA ON 800/1 tap	10 Ω 5 Ω 2.5 Ω	PS
CORE 3	METERING	2000/1A 1600/1A 800/1A	40VA 40VA 40VA	-	-	-	0.2S,0.5FS10
CORE 4	SPARE	2000/1A 1600/1A 800/1A	40VA 40VA 40VA	-	-	-	0.2S,0.5FS10
CORE 5	TRANSF. BACKUP/LINE BACKUP PROTECTION	2000/1A 1600/1A 800/1A	-	4000 V 2500 V 1000 V	20mA ON 2000/1 tap 50mA ON 1600/1 tap 120mA ON 800/1 tap	10 Ω 5 Ω 2.5 Ω	PS
CORE 6	TRANSF. DIFFL./LINE PROTECTION	2000/1A 1600/1A 800/1A	-	4000 V 2500 V 1000 V	30mA ON 2000/1 tap 50mA ON 1600/1 tap 120mA ON 800/1 tap	10 Ω 5 Ω 2.5 Ω	PS

GT CVT DETAILS:-

	PARTICULARS	SEC 1	SEC 2	SEC 3
400kV CVT 4400pF	RATIO	400kV/√3 / 110V/√3	400kV/√3 / 110V/√3	400kV/√3 / 110V/√3
	APPLICATION	PROTECTION	PROTECTION	METERING
	BURDEN	100 VA	100 VA	100 VA
	ACCURACY CLASS	3P	3P	0.2

REFERENCE

400kV SINGLE LINE DIAGRAM
DRG. 12A05-DWG-E-0002

PLOT PLAN FOR 400 kV SAGARDIGHI SUBSTATION
DRG. PE-DG-445-100-M001

NOTES:-

01) UNITS SWYD SYSTEM: 400KV 50kA FOR 1SEC
02) EQUIPMENT: 400KV 50kA FOR 1 SEC.
03) CREEPAGE: 31mm/kV.
04) SYSTEM SHALL BE SOLIDLY GROUNDED.

LEGEND TABLE

PRESENT BHEL SCOPE
FUTURE/EXISTING SCOPE

WEST BENGAL POWER DEVELOPMENT CORPN. LTD.
SAGARDIGHI THERMAL POWER STATION 1 X 600 MW
PHASE -III, EXTENSION UNIT # 5
DEVELOPMENT CONSULTANTS PRIVATE LIMITED KOLKATA
SINGLE LINE DIAGRAM FOR 400kV SAGARDIGHI SUBSTATION

ANNEXURE-A **Rev-01**

TECHNICAL QUALIFYING REQUIREMENTS

FOR 400KV SF6 CIRCUIT BREAKERS

SF6 Circuit Breakers being offered should be from manufacturer who has manufactured and supplied minimum fifteen (15) nos. of SF6 Circuit Breakers of offered voltage class or higher, 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 SF6 Circuit breakers without any adverse remark.

30.06.21
Prepared

30/06/21
Checked

30/06/21.
Approved 30/6/21