



Bharat Heavy Electricals Limited

(A Govt. Of India Undertaking)

Power Sector, Eastern Region

BHEL Bhawan, Plot No. DJ-9/1, Sector- II,
Salt Lake City, Kolkata, WEST BENGAL, INDIA

Phone: 033-23398220, 23211690, FAX: 033-
23211960

NOTICE INVITING TENDER (NIT)

OFFERS ARE INVITED FROM REPUTED & EXPERIENCED BIDDERS (MEETING PRE-QUALIFICATION CRITERIA AS MENTIONED) **THROUGH E-PROCUREMENT PORTAL <https://bhel.abcprocure.com> ONLY** for THE SUBJECT JOB BY THE UNDERSIGNED ON BEHALF OF BHARAT HEAVY ELECTRICALS LIMITED AS PER THE TENDER DOCUMENT. ISSUE OF TENDER TO ANY BIDDER SHALL NOT CONSTRUCT THAT THE BIDDER IS CONSIDERED TO BE QUALIFIED. FOLLOWING POINTS RELEVANT TO THE TENDER MAY PLEASE BE NOTED AND COMPLIED WITH.

Salient Features of NIT

SL NO	ISSUE	DESCRIPTION	
i	E-TENDER NUMBER	PSER:PUR:PMX:373(II):049:(ENQ:19:PP:0015:PUR:62) DTD:13/08/2019	
ii	Broad Scope of job	Design, Supply and Expert Supervision for installation works of Borosilicate Glass Block Lining including Wet Stack Flow Model Study for 275 m tall twin flue chimney for Unit#2 & single flow chimney for U#3 at 3x660 MW BARH Stage-I, Dist. -Patna, Bihar.	
iii	ISSUE OF TENDER DOCUMENTS	a) Online through e-procurement platform at https://bhel.abcprocure.com b) In BHEL website (www.bhel.com & CPP Portal) : For tender view purpose only	1. Applicable 2. Applicable
iv	DUE DATE & TIME OF OFFER SUBMISSION	Date: 23/08/2019, Time: 15-00 Hrs. IST <i>(Offer to be submitted online only through e-procurement platform at https://bhel.abcprocure.com)</i>	Applicable
v	TECHNO-COMMERCIAL BID OPENING OF TENDER	Date: 23/08/2019, Time: 16-00 Hrs. IST <i>(online only through e-procurement platform at https://bhel.abcprocure.com , participating bidders may witness the same online only)</i>	Applicable
vi	EMD AMOUNT	<i>Not Applicable</i>	<i>Not Applicable</i>
vii	COST OF TENDER	--	<i>Not Applicable</i>
viii	LAST DATE FOR SEEKING CLARIFICATION	Date: 17/08/2019	Applicable
ix	SCHEDULE OF Pre Bid Discussion (PBD)	If any, shall be intimated through Tender Change Notice (TCN)	<i>Not Applicable</i>

x	INTEGRITY PACT & DETAILS OF INDEPENDENT EXTERNAL MONITOR (IEM)	IEM DETAILS NAME : Mrs. Pravin Tripathi, IA & AS (Retd.) ADDRESS: D-243, Anupam Gardens, Lane IB, Neb Sarai, Sainik Farms, New Delhi – 110 068 EMAIL: pravin.tripathi@gmail.com	<i>Applicable</i>
xi	Latest updates	Latest updates on the important dates, Amendments, Correspondences, Corrigenda, Clarifications, Changes, Errata, Modifications, Revisions, etc to Tender Specifications will be hosted in BHEL webpage (www.bhel.com) →Tender Notifications →View Corrigendum & CPP Portal →Tender Notice & E-PROCUREMENT PORTAL (https://bhel.abcprocure.com). Bidders to keep themselves updated with all such information.	<i>Shall be intimated to bidder</i>

The offer shall be submitted as per the instructions of tender document. Only One set of tender document (**in original, downloaded from website**) signed by authorised company rep. of bidder and stamped on each page shall be submitted as detailed further, as given below. Bidders to note specifically that all pages of tender document, including these NIT pages etc. appearing in the website for this particular tender shall be submitted by them (after signing/stamping on each page) as a part of their offer. **Price shall not be mentioned by them anywhere in the techno-commercial portion of offer. Price shall be mentioned in the relevant price schedule only and to be submitted in e-procurement portal/platform in the form and manner mentioned in tender.**

For E-PROCUREMENT ASSISTANCE & TRAINING, M/s E-PROCUREMENT TECHNOLOGIES LIMITED HELPDESK PERSONS AS PER FOLLOWING: -

- Mr. Swapnil Hamilton, Support Executive, Ph: +91 7940270549, e-mail ID: swapnil.h@eptl.in
- Mr. Hardik Oza, Support Executive, Ph: +91 7940270560, e-mail ID: hardik.oza@eptl.in
- Mr. Ankur Bhatt, Support Executive, Ph: +91 7940270590, e-mail ID: ankur.bhatt@eptl.in
- Mr. Prashant Rajyaguru, Asst. Manager - Implementation & Support, Ph: +91 7940270545 / 08160087732/ 09016859416, e-mail ID: prashant@eptl.in

or for any difficulty in downloading the tender from internet website, they should contact this office (Sr. Engineer, Purchase or AGM, Purchase Phone no. 033-23398222/8220). No alteration/changes by bidders is permitted in the tender/NIT appeared in the website.

- Successful bidder shall have to submit additional set of tender/sign on tender document provided by BHEL, if so decided by BHEL.
- This is an E-tender floated online through our E-Procurement Site <https://bhel.abcprocure.com>. The bidder should respond by submitting their offer online only in our e-Procurement platform at <https://bhel.abcprocure.com>. Offers are invited in two-parts only. No Hard copy bid or bids through email/ fax shall be accepted. Bids are invited in two parts & shall be submitted as described below:***

OFFER DESCRIPTION	DOCUMENTS TO BE UPLOADED & MODALITY OF UPLOADING
TECHNICAL OFFER	1. Scanned copy of Covering letter of offer (To be attached in Attachment section) 2. Scanned copy of Entire tender documents signed & stamped in each page by authorized representative of the bidder except price bid (To be attached in Attachment section). 3. Scanned copy of Techno-Commercial Offer (To be attached in Attachment section) 4. Duly filled all annexures except price & unpriced format (To be attached in Attachment section). 5. Copy of records notes of Pre-Bid Conference, if applicable/ pre-bid MOM. (To be attached in Attachment section) 6. Copy of Tender change notice (TCN), if applicable (To be attached in Attachment section) 7. All supporting documents/ Annexures etc. as applicable (To be attached in Attachment section). 8. No deviation certificate in bidder's letterhead as per format given in Tender (To be attached in Attachment section).
PRE-QUALIFICATION PART	9. Pre-qualifying documents with all credentials as per tender. (To be attached in PQ Attachment section)
UNPRICED PRICE BID	10. Price schedule–Unpriced but mentioning only quoted / unquoted against each item as per tender. (To be attached in Unpriced bid Attachment section)
PRICE BID	11. Duly filled in Price Schedule as per tender. (To be attached in price bid Attachment section) Any other document uploaded in the price bid, apart from tendered Price schedule, shall not be taken into cognizance for evaluation of offer.

SPECIAL NOTE:

- A) Offer & documents submitted with the offer shall be signed and stamped in each page by authorised representative of the bidder. No overwriting/correction in tender documents by bidders shall be allowed. However, if correction is unavoidable, the same may be signed by authorized signatory.
- B) All documents / Annexures submitted with the offer shall be properly annexed and placed in respective places of the offer as per enclosure list mentioned in the covering letter. BHEL shall not be responsible for any missing documents.

C) Integrity Pact

- (a) IP is a tool to ensure that activities and transactions between the Company and its Bidders/Contractors are handled in a fair, transparent and corruption free manner. Following Independent External Monitors (IEMs) on the present panel have been appointed by BHEL with the approval of CVC to oversee implementation of IP in BHEL.

SI	IEM	Address	Email
1.	Mrs. Pravin Tripathi, IA & AS (Retd.)	D-243, Anupam Gardens, Lane IB, Neb Sarai, Sainik Farms, New Delhi – 110 068	pravin.tripathi@gmail.com

- (b) The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory) along with techno-commercial bid (Part-1, in case of two/three part bid). Only those bidders who have entered into such an IP with BHEL would be competent to participate in the bidding. In other words, entering into this Pact would be a preliminary qualification.

(c) Please refer Section-8 of IP for Role and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to any of the above IEM(s). All correspondence with the IEMs shall be done through email only.

Note :

No routine correspondence shall be addressed to the IEM (phone/ post/ email) regarding the clarifications, time extensions or any other administrative queries, etc on the tender issued. All such clarification/ issues shall be addressed directly to the tender issuing (procurement) department's officials whose contact details are provided below:

Details of contact person:

Name : Avijit Pan
Deptt : Purchase
Address : BHEL Bhawan, DJ 9/1 Sec-II, Salt Lake, Kol-91
Phone : (Landline/ Mobile):033-23398224
Email : avijitpan@bhel.in
Fax : 033-23211960

Name : Ujjwal Howlader
Deptt : Purchase
Address : BHEL Bhawan, DJ 9/1 Sec-II, Salt Lake, Kol-91
Phone : (Landline/ Mobile):033-23398222
Email : ujjwalh@bhel.in
Fax : 033-23211960

- 3.0 No deviation with respect to tender clauses and no additional clauses/ suggestions/clarification in Techno-commercial bid/Price bid shall normally be considered by BHEL. Bidders are requested to positively comply with the same. Offers with deviation are liable for rejection.
- 4.0 BHEL reserves the right to accept or reject any or all offer without assigning any reasons thereof. BHEL also reserve the right to cancel the tender wholly or partly without assigning any reason thereof. BHEL also reserve the right to split/part award the job. Also, BHEL shall not entertain any correspondence from bidders in this matter (except for the refund of EMD).
- 5.0 Since the job shall be executed at site, the bidders must visit site/ work area and study the job content, facilities available, availability of materials, prevailing site conditions including Law and Order situation, applicable Wage structure, Wage rules, present condition of machines etc. before quoting for this tender. They may also consult this office before submitting their offers, for any clarifications regarding scope of work, facilities available at sites or on terms and conditions. No additional claim shall be entertained by BHEL in future, on account of non-acquaintance of site/machine conditions at the time of bidding.
- 6.0 For any clarification on the tender document, you may seek the same in writing or through e-procurement portal/platform as per specified format within the last date of seeking clarification as per tender. BHEL shall not be responsible for receipt of queries after due date of seeking clarification due to postal delay, and receipt of any query after due date shall not be entertained.
- 8.0 BHEL may decide holding Pre-bid Discussion [PBD] with all intending bidders. On such communication from BHEL, the bidder shall ensure participation for the same at the appointed time, date and place as may be decided by BHEL. Outcome of PBD (if any) shall also form part of tender.
- 9.0 In case of absence of any queries from bidder(s), their quoted price will be PRESUMED to be final and complete with reference to the tender documents (including Tender change notes (TCNs), clarifications, corrigendum issued by BHEL, if any). Bidders are requested to study the tender documents in detail and prepare their queries/clarifications accordingly. All such queries / clarifications shall be cleared/replied by BHEL. Such clarification letters, corrigendum and/or Tender change notes (TCNs), if issued by BHEL, shall form part of tender document.

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- 10.0 In the event of any conflict between requirement of any clause of this specification/ documents /drawings /data sheets etc. or requirements of different codes/ standards specified/ contradictions between any two clauses of tender document, the same to be brought to the knowledge of BHEL by bidders in writing for clarification before due date of seeking clarification, otherwise, more stringent requirement as may be interpreted by BHEL shall prevail and shall be binding on you. Any typing error/missing pages/ other clerical errors in the tender documents, noticed by you must be pointed out before submission of offer, or else, BHEL's interpretation shall prevail & binding on you.
- 11.0 Unless specifically mentioned otherwise, bidder's quoted price shall deemed to be in compliance with tender including PBD.
- 12.0 Tender document containing above mentioned volumes shall be signed & stamped in all pages including this covering letter. Price bid shall be furnished in the specified format enclosed with the tender. Any additional copy, if required, may be taken by photocopying from the tender document given in the web.
- 13.0 **The Bidder has to satisfy the Pre-Qualifying Requirements stipulated for this Tender in order to be qualified. The Price Bids of only those bidders will be opened, who will qualify for the subject job on the basis of pre-qualification evaluation & Techno-Commercial bids etc. BHEL reserves the right to reject the bidders with unsatisfactory past performance in the execution of a contract. BHEL's decision in this regard shall be final & binding.**
- 14.0 While BHEL reserve the right to open the price bid of the offers in camera, the date & time to open the PRICE BID, tender opening shall be intimated to the bidders in case BHEL decides it to be 'Public opening' and in such a case, one authorised representative of the bidder shall be allowed to attend.
- 15.0 Price Bids shall be evaluated in the manner as prescribed in Price Schedule. However, Unit Rates shall also be furnished if applicable in the Price Schedule.
- 16.0 ***Bid should be free from correction, overwriting, using corrective fluid, etc. Any interlineation, cutting, erasure or overwriting shall be valid only if they are attested under full signature(s) of person(s) signing the bid else bid shall be liable for rejection.***
- 17.0 Bidders are required to submit their BEST price as per tender Price Schedule format in e-procurement portal/platform in the form & manner as mentioned in tender.
- 18.0 ***"BHEL reserves the right to go for Reverse Auction (RA) (Guidelines as available on www.bhel.com) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno- commercial evaluation. Bidders to give their acceptance with the offer for participation in RA. Non- acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.***
- 19.0 ***Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit 'Process compliance form' (to the designated service provider) as well as 'Online sealed bid' in the Reverse Auction. Non-submission of 'Process compliance form' or 'Online sealed bid' by the agreed bidder(s) will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).***

20.0 *The bidders have to necessarily submit online sealed bid less than or equal to their envelope sealed price bid already submitted to BHEL along with the offer. The envelope sealed price bid of successful L1 bidder in RA, if conducted, shall also be opened after RA and the order will be placed on lower of the two bids (RA closing price & envelope sealed price) thus obtained. The bidder having submitted this offer specifically agrees to this condition and undertakes to execute the contract on thus awarded rates.*

In case of enquiry through e-procurement portal/platform, the sealed electronic price bid (e-bid) is to be treated as sealed envelope bid.

21.0 *If it is found that L1 bidder has quoted higher in online seal bid in comparison to envelope sealed bid for any item(s), the bidder will be issued a warning letter to this effect. However, if the same bidder again defaults on this count in any subsequent tender in the unit, it will be considered as fraud and will invite action by BHEL as per extant guidelines for suspension of business dealings with suppliers/ contractors (as available on www.bhel.com).*

22.0 *Reverse Auction is the type of auction typically conducted to buy goods / items over Internet in which the lowest price bidder wins. In case, the bidders are willing to know the details about the methodology, they may please contact HEAD/PURCHASE OR SR. ENGINEER /PURCHASE, BHEL, KOLKATA.*

23.0 *However, if Reverse Auction process is not adopted or Reverse Auction is unsuccessful as defined in the RA rules/procedures, or for whatsoever reason, then the 'PRICE BID' and price impacts (if any), already submitted in e-procurement portal/platform, submitted by the bidder shall be opened for deciding the successful bidder, as per BHEL's standard practice. BHEL's decision in this regard will be final and binding on bidder.*

24.0 *Bidders are requested to note that the accepted / agreed tender terms (technical, commercial or on Reverse Auction) in their original offer can not be altered / withdrawn by their own during the processing of tender.*

25.0 *The Bidder along with its associate/collaborators/sub-contractors/sub-vendors/consultants/service providers shall strictly adhere to BHEL Fraud Prevention Policy displayed on BHEL website <http://www.bhel.com> and shall immediately bring to the notice of BHEL management about any fraud or suspected fraud as soon as it comes to their notice.*

26.0 *The offers of the bidders who are on the banned list as also the offer of the bidders, who engages the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL web site www.bhel.com.*

27.0 *The bidder shall submit documents in support of possession of 'Qualifying Requirements' duly self certified and stamped/ digitally signed (as applicable) by the authorized signatory, indexed and properly linked in the format for PQR. In case BHEL requires any other documents/proofs, these shall be submitted immediately.*

28.0 *The bidder may have to produce original document for verification if so decided by BHEL.*

29.0 *Suspension of Business dealings with Suppliers/ Contractors: BHEL reserves the right to take action against contractors who fail to perform or indulge in malpractices, by suspending business dealings with them as detailed in Annexure-A.*

30.0 "For this procurement, Public Procurement (Preference to Make in India), Order 2017 dated 15/06/2017, 28/05/2018 & 29/05/2019 and subsequent Orders issued by respective Nodal Ministry shall be applicable even if issued after issue of this NIT but before finalization of contract/PO/WO against this NIT. In the event of any Nodal Ministry prescribing higher or lower percentage of purchase preference and/ or local content in respect of this procurement, same shall be applicable".

31.0 "MSE suppliers can avail the intended benefits in respect of the procurements related to the Goods and Services only (Definition of Goods and Services as enumerated by Govt. of India vide Office Memorandum F. No. 21(8)/2011-MA dtd. 09/11/2016 office of AS & DC, MSME) if they submit along with the offer, attested copies of either EM II certificate having deemed validity (five years from the date of issue of acknowledgement in EM II) /Udyog Aadhar Memorandum(UAM) or valid NSIC certificate or EM II certificate along with attested copy of a CA certificate (Format enclosed at Annexure-B where deemed validity of EM II certificate of five years has expired) applicable for the relevant financial year (latest audited). Date to be reckoned for determining the deemed validity will be the date of bid opening (Part 1 in case of two part bid). Non submission of such documents will lead to consideration of their bid at par with other bidders. No benefit shall be applicable for this enquiry if any deficiency in the above required documents are not submitted before price bid opening. If the tender is to be submitted through e-procurement portal, then the above required documents are to be uploaded on the portal. Documents should be notarized or attested by a Gazetted officer."

Any Bidder falling under MSME category, shall furnish the following details & submit documentary evidence/Govt. Certificate etc. in support of the same along with their techno-commercial offer: -

Type under MSME	SC/ST owned	Women owned	Others
Micro			
Small			
Medium			

Note: - If the bidder does not furnish the above, offer shall be processed construing that the bidder is not falling under MSME category.

32.0 Order of Precedence: In the event of any ambiguity or conflict between the Tender Documents, the order of precedence shall be in the order below: -

- i) Amendments/Clarifications/Corrigenda/Errata/Tender change notice (TCN) etc. issued in respect of the tender documents by BHEL
- ii) Notice Inviting Tender (NIT)
- iii) Price Schedule
- iv) Technical Specifications - Part-D
- v) Special Conditions of Contract - Part-C
- v) General Conditions of Contract (GCC) - Part-B

All the bidders are requested to note that all the errata / technical clarifications / corrigendum / extension etc. shall be published THROUGH E-PROCUREMENT PORTAL <https://bhel.abcpurchase.com> and in website www.bhel.com & <http://eprocure.gov.in> . As such, all the bidders are requested to be in continuous touch with these websites.

for BHARAT HEAVY ELECTRICALS LTD.

SR. ENGINEER (PURCHASE)

Agency	Contact details	
BHEL, PSER, Kolkata	Address	BHARAT HEAVY ELECTRICALS LIMITED, POWER SECTOR – EASTERN REGION 2ND FLOOR, BLOCK-DJ, PLOT- 9/1, SECTOR, SALT LAKE CITY, KOLKATA – 700 091
	Phone no.	033-23398222, 23398220, 23211690
	FAX no.	033-23211960
	E-mail ID	ujjwalh@bhel.in , sukhen@bhel.in
M/s E-PROCUREMENT TECHNOLOGIES LIMITED	For E-PROCUREMENT ASSISTANCE & TRAINING, M/s E-PROCUREMENT TECHNOLOGIES LIMITED HELPDESK PERSONS AS PER FOLLOWING: - 1) Mr. Swapnil Hamilton, Support Executive, Ph: +91 7940270549, e-mail ID: swapnil.h@eptl.in 2) Mr. Hardik Oza, Support Executive, Ph: +91 7940270560, e-mail ID: hardik.oza@eptl.in 3) Mr. Ankur Bhatt, Support Executive, Ph: +91 7940270590, e-mail ID: ankur.bhatt@eptl.in 4) Mr. Prashant Rajyaguru, Asst. Manager - Implementation & Support, Ph: +91 7940270545 08160087732/ 09016859416, e-mail ID: prashant@eptl.in	

Enclosures:

01. Annexure-I: Pre-Qualification Criteria.
02. Annexure- II: No Deviation Certificate
03. Part-D: General Terms & conditions for Reverse Auction
04. Annexure-A: Suspension of business dealing with Suppliers
05. Annexure-B: Certificate by Chartered Accountant
06. Format for Declaration for Relation in BHEL.
07. Format for seeking clarification
08. Tender documents

ANNEXURE - I

PRE – QUALIFICATION CRITERIA

FINANCIAL CRITERIA

1(A) BIDDER SHOULD HAVE AVERAGE MINIMUM ANNUAL FINANCIAL TURNOVER USD 875847 OR INR 6.04 Cr DURING LAST 3 (THREE) YEARS, ENDING ON 31.03.2018 AND HAVING POSITIVE NET WORTH AS ON LATEST AUDITED ACCOUNTS AS SUBMITTED FOR PARA 1(C).

1(B) BIDDER MUST HAVE EARNED PROFIT IN ANY ONE OF THE LAST THREE FINANCIAL YEARS ENDING ON 31.03.2018. AUDITED BALANCE SHEET AND PROFIT & LOSS ACCOUNT OF THE COMPANY FOR LAST 3 (THREE) FINANCIAL YEARS, ENDING ON 31.03.2018 NEED TO BE SUBMITTED IN SUPPORT OF ABOVE.

1(C) IN CASE AUDITED BALANCE SHEET AND PROFIT & LOSS ACCOUNT HAS NOT BEEN SUBMITTED FOR ALL THREE YEARS INDICATED ABOVE THEN THE APPLICABLE FINANCIAL AUDITED STATEMENTS SUBMITTED BY THE BIDDERS AGAINST THE REQUISITE THREE YEARS WILL BE AVERAGED FOR THREE YEARS.

1(D) IF FINANCIAL STATEMENTS ARE NOT REQUIRED TO BE AUDITED STATUTORILY, THEN INSTEAD OF AUDITED FINANCIAL STATEMENTS, FINANCIAL STATEMENTS ARE REQUIRED TO BE CERTIFIED BY CHARTERED ACCOUNTANT.

2. INDIAN BIDDER SHOULD HAVE VALID PAN.

TECHNICAL CRITERIA

FOR BOROSILICATE GLASS BLOCK LINING:

A. BIDDER SHOULD BE THE MANUFACTURER / AUTHORISED SUPPLIER OF OEM (ORIGINAL EQUIPMENT MANUFACTURER) OF “BOROSILICATE GLASS BLOCK LINING SYSTEM.

B. THE BIDDER SHOULD HAVE SUPPLIED “BOROSILICATE GLASS BLOCK LINING OF MINIMUM 38 MM THICKNESS” WHICH HAVE BEEN IN SUCCESSFUL OPERATION FOR SIMILAR APPLICATION IN AT LEAST TWO UNITS, LOCATED AT DIFFERENT LOCATIONS FOR A PERIOD NOT LESS THAN TWO (02) YEARS.

THE BIDDER SHALL FURNISH FOLLOWING SUPPORTING DOCUMENTS FOR ASSESSMENT OF BIDDER W.R.T. PQR:

I. BIDDER SHALL FURNISH THE PO COPY / SUPPORTING DOCUMENTS OF AT LEAST TWO EXECUTED CONTRACTS AS MENTIONED ABOVE AT ‘B’.

II. CORRESPONDING CERTIFICATE FROM OWNER FOR SUCCESSFUL OPERATION OF ‘BOROSILICATE GLASS BLOCK LINING SYSTEM’ AS MENTIONED ABOVE AT ‘B’.

NOTE:

A) OWNER PERFORMANCE FEEDBACK CERTIFICATES FOR EXECUTED CONTRACT WHICH HAS BEEN SUCCESSFULLY IN USE FOR AT LEAST TWO YEARS INDICATING PROJECT NAME, DATE OF ISSUE OF CERTIFICATE AND NAME/ DESIGNATION OF THE CERTIFICATE ISSUER.

B) ANY ADDITIONAL DOCUMENT REQUIRED IN SUPPORT OF THE ABOVE DOCUMENTS TO ESTABLISH THE CORRELATION BETWEEN THE ABOVE DOCUMENTS AND THE SUPPLIED ITEMS SHALL BE PROVIDED BY THE BIDDER.

C) BIDDER TO SUBMIT ALL SUPPORTING DOCUMENTS IN ENGLISH. IF DOCUMENTS SUBMITTED BY BIDDER ARE IN LANGUAGE OTHER THAN ENGLISH, A SELF-ATTESTED ENGLISH TRANSLATED DOCUMENT SHOULD ALSO BE SUBMITTED.

D) NOTWITHSTANDING ANYTHING STATED ABOVE, BHEL RESERVES THE RIGHT TO ASSESS THE CAPABILITIES AND CAPACITY OF THE BIDDER /COLLABORATORS TO PERFORM THE CONTRACT, SHOULD THE CIRCUMSTANCES WARRANT SUCH ASSESSMENT IN THE OVERALL INTEREST OF BHEL.

E) AFTER SATISFACTORY FULFILMENT OF ALL THE ABOVE CRITERIA/ REQUIREMENT, OFFER SHALL BE CONSIDERED FOR FURTHER EVALUATION AS PER NIT AND ALL THE OTHER TERMS OF THE TENDER SUBJECT TO CUSTOMER’S APPROVAL.

FOR WET STACK FLOW MODEL STUDY:

A. THE BIDDER/BIDDER'S AGENCY SHOULD HAVE CARRIED OUT WET STACK FLOW STUDY WHICH HAS SUCCESSFULLY PERFORMED AT LEAST TWO (2) FLOW MODEL STUDIES, IN SEPARATE COAL FIRED POWER PLANTS, OF WET STACK INSTALLED AFTER WET LIMESTONE BASED FGD ABSORBER (WITHOUT REHEATING OF CLEANED FLUE GAS), AND BASED ON THE STUDIES DEVELOPED AT LEAST TWO (2) WET STACK LIQUID COLLECTION SYSTEMS WHICH ARE IN SUCCESSFUL OPERATION FOR A PERIOD OF AT LEAST TWO (2) YEARS RECKONED AS ON THE DATE OF CONSIDERATION FOR APPROVAL.

THE BIDDER SHALL FURNISH FOLLOWING SUPPORTING DOCUMENTS FOR ASSESSMENT OF BIDDER W.R.T. PQR:

I. IN CASE THE BIDDER ENGAGES AN AGENCY FOR CONDUCTING WET STACK FLOW MODEL STUDY THEN A MOU / CONSORTIUM AGREEMENT BETWEEN THE BIDDER & AGENCY SHALL BE SUBMITTED BY THE BIDDER.

II. EXPERIENCE LIST OF BIDDER/BIDDER'S AGENCY OF WET STACK FLOW MODEL STUDY FOR LAST 5 YEARS.

III. BIDDER SHALL FURNISH THE PO COPY/ STUDY REPORTS/ SUPPORT DOCUMENTS OF AT LEAST ONE EXECUTED CONTRACT AS INDICATED IN THE EXPERIENCE LIST.

BIDDER SHALL FURNISH FOLLOWING IN SUPPORT OF SUCCESSFUL COMPLETION OF WET STACK FLOW MODEL STUDY AND DESIGN OF THE CONDENSATE COLLECTION SYSTEM:

I. OWNER PERFORMANCE FEEDBACK CERTIFICATES FOR EXECUTED CONTRACT WHICH HAS BEEN SUCCESSFULLY IN USE FOR AT LEAST TWO YEARS INDICATING PROJECT NAME, DATE OF ISSUE OF CERTIFICATE AND NAME/ DESIGNATION OF THE CERTIFICATE ISSUER.

NOTE: -

A) PURCHASE ORDER COPY, SUPPORT DRAWINGS AND DOCUMENTS/ TECHNICAL DETAILS ETC. ARE TO BE SUBMITTED ALONG WITH THE BID, FOR WHICH THE BIDDER INTENDS TO FURNISH THE PERFORMANCE FEEDBACKS, FOR REFERENCE PURPOSE ONLY.

B) ANY ADDITIONAL DOCUMENT REQUIRED IN SUPPORT OF THE ABOVE DOCUMENTS TO ESTABLISH THE CORRELATION BETWEEN THE ABOVE DOCUMENTS AND THE SUPPLIED ITEMS SHALL BE PROVIDED BY THE BIDDER.

C) BIDDER TO SUBMIT ALL SUPPORTING DOCUMENTS IN ENGLISH. IF DOCUMENTS SUBMITTED BY BIDDER ARE IN LANGUAGE OTHER THAN ENGLISH, A SELF- ATTESTED ENGLISH TRANSLATED DOCUMENT SHOULD ALSO BE SUBMITTED.

D) NOTWITHSTANDING ANYTHING STATED ABOVE, BHEL RESERVES THE RIGHT TO ASSESS THE CAPABILITIES AND CAPACITY OF THE BIDDER/COLLABORATORS TO PERFORM THE CONTRACT, SHOULD THE CIRCUMSTANCES WARRANT SUCH ASSESSMENT IN THE OVERALL INTEREST OF BHEL.

E) AFTER SATISFACTORY FULFILMENT OF ALL THE ABOVE CRITERIA/ REQUIREMENT, OFFER SHALL BE CONSIDERED FOR FURTHER EVALUATION AS PER NIT AND ALL THE OTHER TERMS OF THE TENDER SUBJECT TO CUSTOMER'S APPROVAL.

ANNEXURE - II

FORMAT FOR NO DEVIATION CERTIFICATE
(To be submitted in the bidder's letter head)

To,
Bharat Heavy Electricals Limited,
POWER SECTOR – EASTERN REGION
2nd FLOOR, Block-DJ, Plot- 9/1, SECTOR
SALT LAKE CITY, KOLKATA – 700 091
FAX – 033-2321-1960

Job: “Design, Supply and Expert Supervision for installation works of Borosilicate Glass Block Lining including Wet Stack Flow Model Study for 275 m tall twin flue chimney for Unit#2 & single flow chimney for U#3 at 3x660 MW BARH Stage-I, Dist. -Patna, Bihar.”

Tender No.: PSER:PUR:PMX:373(II):049:(ENQ:19:PP:0015:PUR:62) Date 13/08/2019.

Dear Sir/Madam,

With reference to above, this is to confirm that as per tender conditions, we have visited site before submission of our offer and noted the job content & site conditions etc. We also confirm that we have not changed/modified the tender documents as appeared in the websites and in case of observance at any stage, it shall be treated as null and void.

We hereby confirm that we have not taken any deviation from tender clauses together with other references as enumerated in the above referred NIT *and confirm our acceptance to **reverse auctioning process*** and we hereby convey our unqualified acceptance to all terms and conditions as stipulated in the tender and NIT.

In the event of observance of any deviation in any part of our offer at a later date whether implicit or explicit, the deviations shall stand null & void.

We confirm to have submitted offer strictly in accordance with tender instructions.

Thanking you,

Yours faithfully,

(Signature, date & seal of authorized
representative of the contractor)

PART-D:
General Terms & Conditions of Reverse Auction

Against this enquiry for the subject item/ system with detailed scope of supply as per enquiry specifications, BHEL may resort to "REVERSE AUCTION PROCEDURE" i.e., ON LINE BIDDING (THROUGH A SERVICE PROVIDER). The philosophy followed for reverse auction shall be English Reverse (No ties).

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.
2. Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit 'online sealed bid' in the Reverse Auction. Non-submission of 'online sealed bid' by the bidder for any of the eligible items for which techno-commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.
3. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.
4. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.
5. Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.
6. Bidders have to fax the Process Compliance form (**Annexure-III of Business Rule Document of Reverse Auction – shall be shared to bidders along with intimation of RA schedule**) before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.
7. In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at "Total Cost to BHEL" like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, GST and loading factors (for non-compliance to BHEL standard Commercial terms & conditions) for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.
8. Reverse auction will be conducted on scheduled date & time.
9. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.
10. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, (**as per Annexure-IV of Business Rule Document of Reverse Auction**) as provided on case-to-case basis to Service provider within two working days of Auction without fail.
11. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL's standard practice.
12. Bidders shall be required to read the "Terms and Conditions" section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the 'Business Rules of Reverse Auction', which will be communicated before the Reverse Auction.
13. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action as per extant BHEL guidelines, shall be initiated by BHEL and the results of the RA scrapped/ aborted.
14. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.
15. In case BHEL decides to go for reverse auction, the H1 bidder (whose quote is highest in online sealed bid) will not be allowed to participate in further RA process provided minimum three bidders are left after removal of H1 bidder. In case of tie for H1 bid (identical online sealed bids), 15 minutes' additional time shall be provided and all the participating bidders shall be informed by mail/message on bidding screen to enable bidders submit revised online sealed bids so as to break the tie.
16. In case H1 bidder happen to be MSE and was removed from further bidding but is within L1 + 15% band, then this bid shall also be considered and to be processed in line with 'Public Procurement Policy for Micro & Small Enterprises (MSEs) order, 2012'.

ANNEXURE-A

1.0	<u>Suspension of Business dealings with Suppliers/ Contractors</u>
1.1	BHEL reserves the right to take action against Suppliers/ Contractors who fail to perform or indulge in malpractices, by suspending business dealings with them.
1.2	Suspension of business dealings with Suppliers/ Contractors could be in the form of following: -- a) Hold within the unit for specific item(s)/ material category(ies)/ type of work(s) for one year. b) Hold within the unit for all item(s)/ material category(ies)/ type of work(s) for two years c) Banning across BHEL for all items/ material category(ies)/ type of work(s) for three years. The Supplier may be either put on hold or banned, as detailed hereinafter on the basis of one or more of the category wise reasons as enumerated hereunder.
1.3	1.3.1 Hold within the unit for a specific item(s)/ material category(ies)/ type of work(s) shall be imposed in the following cases, if i) In the last three consecutive supplies of a specific material category, average quality rating, as provided in the supplier performance rating (SPR) as per SEARP, falls below 80% of the quality weightage. This is irrespective of supplies against PO(s) having single/ multiple delivery schedules. Note: Not applicable in cases for erection works of Power Sector Regions, where separate guidelines for evaluation of capacity of bidders is being followed. ii) Two consecutive delays, for reasons of delay attributed to the Supplier, in execution of the contracts where delay occurred is such that a) prescribed maximum LD time limits of the contracts is exceeded or b) delay period has equaled/ exceeded half the original delivery period specified in the contracts whichever among the above is earlier. iii) a) Overall SPR (Supplier Performance Rating) in that particular Unit in line with SEARP falls below 60% of the specific material category. b) Bids of contractors (in PS-MSX portal) shall not be considered (if average score of last six months falls 60% or below as per guidelines for evaluation of capacity of bidders formula). Note: – for (b), No specific period of hold shall be applicable. iv) Supplier works are under strike/ lockout for a period of more than three months.
1.3.1	

1.3.2	Hold within the unit for all item(s)/material category(ies)/ type of work(s) shall be put in the following cases, if i) Supplier tampers with tendering procedure affecting ordering process. ii) Supplier has misused BHEL documents/ drawings/ technical information or has breached the confidentiality agreement with BHEL. iii) after placement of order, Supplier fails to execute the contract. iv) within warranty period as per contract, Supplier continues to supply low/ less/ non-performing equipment/ services, repetitive failures, remains non-responsive. v) Wherever risk purchase clause (amounting to more than 5% of contract value) has been invoked.
1.4	Banning across BHEL shall be imposed in following cases, if
1.4.1	i) After price bid opening but before placement of order, Supplier withdraws his offer or varies it in any manner within the validity period. ii) "Supplier is found to be responsible for submitting fake/ false/ forged documents, certificates, or information or misrepresentation/ wilful suppression of facts, or has resorted to unethical, illegal means or has forged BHEL documents, certificates etc. for securing business, meeting PQR or for enlistment in BHEL or with customers other than BHEL." iii) In spite of warnings, the Supplier persistently violates or circumvents the provisions of labour laws/ regulations/ rules or other statutory requirements. iv) Supplier is found to be involved in cartel formation or in any other act so as to influence the bidding process or influence the price. v) The Supplier has indulged in malpractices or misconduct such as bribery, corruption and fraud, pilferage, coercion etc. vi) The Supplier is found guilty by any court of law for criminal activity/ offences involving moral turpitude in relation to business dealings. vii) Supplier is found to have obtained any internal information/ documentation of BHEL by unauthorized means. viii) The foreign Principals along with the representing Agent shall be banned together if information submitted by them about their precise relationship, commission/ remuneration etc. payable/ receivable and other particulars as asked by BHEL, as per the extant guidelines regarding dealing with Agents of Foreign Suppliers is found false/ incorrect, at any stage. ix) Supplier has substituted, damaged, failed to return, or unauthorizedly disposed off free issue materials/ tools etc. of BHEL.
1.4.2	A Supplier can also be banned with the approval of Director (E, R&D) provided a direction to this effect has been received from the administrative ministry of the Government.

Note: Above shall be applicable along with **Guidelines for "Suspension of Business dealings with Suppliers/ Contractors"** available in BHEL website <http://www.bhel.com>. These shall form part of tender documents.

ANNEXURE-B

Certificate by Chartered Accountant on letter head

This is to Certify that M/S
.....,
(hereinafter referred to as 'company') having its registered office at
..... is registered under MSMED Act 2006, (Entrepreneur
Memorandum No (Part-II)
dtd:..... ,
Category: (Micro /Small)). (Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as per the latest audited financial year as per MSMED Act 2006 is as follows:

1. For Manufacturing Enterprises: Investment in plant and machinery (i.e. original cost excluding land and building and the items specified by the Ministry of Small Scale Industries vide its notification No.S.O.1722(E) dated October 5, 2006 :

Rs..... Lacs

2. For Service Enterprises: Investment in equipment (original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED Act, 2006:

Rs..... Lacs

(Strike off whichever is not applicable)

The above investment of Rs Lacs is within permissible limit of Rs..... ..Lacs for..... Micro / Small (Strike off which is not applicable) Category under MSMED Act 2006.

Or

The company has been graduated from its original category (Micro/ Small) (Strike off which is not applicable) and the date of graduation of such enterprise from its original category is (dd/mm/yyyy) which is within the period of 3 years from the date of graduation of such enterprise from its original category as notified vide 5.0. No. 3322(E) dated 01.11.2013 published in the gazette notification dated 04.11.2013 by Ministry of MSME.

Date:

(Signature)

Name-

Membership number -

Seal of Chartered Accountant

DECLARATION FOR RELATION IN BHEL

(To be typed and submitted in the Letter Head of the Company/Firm of Bidder failing which the offer of Bidder is liable to be summarily rejected)

To,

(Write Name & Address of Officer of BHEL inviting the Tender)

Dear Sir,

Sub: **Declaration for relation in BHEL**

Ref: 1) NIT/Tender Specification No:,

I/We hereby submit the following information pertaining to relation/relatives of Proprieter/Partner(s)/Director(s) employed in BHEL.

Tick (√) any one as applicable:

1. The Proprietor, Partner(s), Director(s) of our Company/Firm DO NOT have any relation or relatives employed in BHEL

OR

2. The Proprietor, Partner(s), or Director(s) of our Company/Firm HAVE relation/relatives employed in BHEL and their particulars are as below:

(i)

(ii)

Signature of the Authorized Signatory

Note:

1. Attach separate sheet, if necessary.
2. If BHEL Management comes to know at a later date that the information furnished by the Bidder is false, BHEL reserves the right to take suitable against the Bidder/Contractor.

FORMAT FOR SEEKING CLARIFICATION

(To be typed and submitted in the Letter Head of the Company/Firm of Bidder)

To,

(Write Name & Address of Officer of BHEL inviting the Tender)

Dear Sir,

Sub: **Request for Clarification**

Ref: 1) NIT/Tender Specification No:
2) All other pertinent issues till date

Sl no	Reference clause of Tender Document	Existing provision	Bidder's query	BHEL's clarification
1				
2				
3				

Yours faithfully,

(Signature, date & seal of Authorized Representative of the Bidder)

PART – B: GENERAL CONDITIONS OF CONTRACT (GCC)

SL. NO.	BHEL STANDARD TERMS	SUPPLIER CONFIRMATION
01	Our requirement is for use AT 3X660 MW BARH STAGE-I, DIST-PATNA, BIHAR Offers are invited to submit in three-parts. Part-I: TECHNICAL-CUM-COMMERCIAL AND UN PRICED BID: Consisting of complete technical details, catalogues, drawings and all commercial terms. (Money values shall not be indicated i.e; un price bid). Following formats are to be filled and submitted in a single cover super scribing as Technical - cum - Commercial and Un Priced Bid, Tender Enquiry No. and Due Date. :-- (i) EMD, if any, as per tender. Please arrange to submit EMD in a separate sealed envelope inside the envelope containing techno-commercial bid i.e PART-I of tender. (ii) Technical Specification details confirming to technical specification (PART C OF TENDER) & Catalogues to be enclosed (if any) (iii) BHEL Standard Terms & Conditions. (iv) Un Price Bid (v) Confirmation of pre-qualification criteria & All documents to be downloaded from BHEL's website www.bhel.com. PART- II: PRE-Q: All PRE-Q documents to be submitted. Part-III: PRICE BID Price to be quoted in the format enclosed. (Any preconditions for price will not be accepted and the tender will be rejected). Techno-commercial & Pre- Q bids shall be opened first & afterwards price bid shall be opened for qualified bidder, who have qualified in Techno-commercial & pre-q bid. <u>If the vendor submits offer i.e. Technical & Price bid together, the offer shall be liable for rejection.</u> <u>Note: In order to maintain sanctity of the tender system, it is advised that one Agent cannot represent two suppliers or quote on their behalf in a particular tender.</u> <u>In the tender, either one agent on behalf of the principal/OEM or Principal/OEM itself can bid but both cannot bid simultaneously for same item/product.</u>	
02	If any vendor sought to quote through their agents "They have to inform to BHEL in advance, before opening date. Otherwise the offer will be treated as Unsolicited Offer and same will not be opened".	
03	BHEL keeps its right to reject / load any offer which is having deviations to BHEL Specifications, Standard Terms & Conditions. All the bidders shall submit their offers only by filling the original BHEL tender documents. No other offer will be entertained. In case of Technical-Cum-Commercial bid, copy of the price bid has to be used to indicate commercial terms without price.	

SIGNATURE OF THE BIDDER WITH SEAL AND DATE

SL. NO.	BHEL STANDARD TERMS	SUPPLIER CONFIRMATION
04	The equipment offered shall be strictly conforming to the specification and for complete unit.	
05	No offer for individual accessories or part machinery will be accepted.	
06	<u>TERMS OF PAYMENT:</u> AS PER SPECIAL CONDITIONS OF CONTRACT (SCC) & TCC: PART-C OF TENDER All original documents shall be sent to “Head-HR, BHEL-PSER, Salt Lake Office” along with GST Invoice. Payment shall be made through e-payment mode. Successful bidder shall have to submit the requisite details in RTGS format.	
07	<u>GUARANTEE/WARRANTY:</u> As specified in SPECIAL CONDITIONS OF CONTRACT (SCC) & TCC: PART-C OF TENDER	
08	<u>DELIVERY:</u> As specified in SPECIAL CONDITIONS OF CONTRACT (SCC) & TCC: PART-C OF TENDER <u>Offer with delivery period beyond as mentioned in Part-C shall be liable for rejection.</u> However, in case due to any reasons if the same is accepted by BHEL, the same shall be loaded for the delayed delivery period & percentage of loading shall be as per clause no.10 of GCC (LD clause).	
09	<u>DISCOUNTS:</u> Discounts offered by the vendor in price shall not be entertained by BHEL. The vendor should factor in his discount in the price offer only. In spite of the same, if a discount is offered by the bidder, the same shall not be considered for evaluation of the offer, but purchase order shall be issued on bidder's final discounted price.	

SIGNATURE OF THE BIDDER WITH SEAL AND DATE

SL. NO.	BHEL STANDARD TERMS	SUPPLIER CONFIRMATION
10	<u>LIQUIDATED DAMAGE (LD) / PENALTY:</u> Subject to force majeure, If vendor fails to complete the job as per aforesaid completion/delivery period, BHEL shall have the right to recover as liquidated damages (LD) a sum equivalent to 0.5 % of the order value for delay of each week or part thereof. The liability for delay shall not in any case exceed 10 % (ten percent) of the order value. For this purpose, the period of delay shall be the delay attributable to vendor for completion of job as per contract. In case of LD recovery, the applicable GST shall also be recovered from vendor.	
11	<u>PERFORMANCE BANK GUARANTEE (PBG):</u> SPECIAL CONDITIONS OF CONTRACT (SCC) & TCC: PART-C OF TENDER.	
12	The sealed tenders super scribing tender number and due date should be addressed to Sr. Engineer/Purchase or Head/Purchase, Bharat Heavy Electricals Limited, PSER, DJ-9/1, SALT LAKE. SECTOR-II, KOLKATA - 700 091, India.	Not Applicable
13	<u>INSPECTION:</u> Details shall be as per SPECIAL CONDITIONS OF CONTRACT (SCC) & TCC: PART-C OF TENDER.	
14	The manufacturing progress will have to be furnished to us periodically in the form and manner required by us.	
15	Supplier must submit with their offer list of customers (with their full address and their purchase reference number) to whom they have supplied similar machine in the past five years. The year of supply should also be indicated.	
16	The quotation should be valid at least for a period of 90 days from the tender due date of submission (extended, if any). Price Variation Clause will not be entertained	
17	<u>FORCE MAJURE:</u> The vendor shall be subject to force majeure clause defined as under: This force majeure is herein defined as any cause which is beyond the control of the tenderer which they would not have foreseen or with a reasonable amount of diligence could not have foreseen and which subsequently affect the performance of the contract such as SRCC (strike riot and civil commotion), earthquake, flood, acts of god, acts of any government, domestic or foreign including but not limited to war. The tenderer shall not be liable for delay in performing his obligation resulting from any force majeure clause as referred to and/or defined above. The date of completion will be subject to hereinafter provided be extended by a reasonable time even though such cause may occur after tenderer's performance of his obligation has been delayed for other causes.	

SIGNATURE OF THE BIDDER WITH SEAL AND DATE

SL. NO.	BHEL STANDARD TERMS	SUPPLIER CONFIRMATION
18	<u>ARBITRATION & CONCILIATION:</u>	
18.1	<u>ARBITRATION:</u>	
18.1.1	Except as provided elsewhere in this Contract, in case Parties are unable to reach amicable settlement (whether by Conciliation to be conducted as provided in Clause 18.2 herein below or otherwise) in respect of any dispute or difference; arising out of the formation, breach, termination, validity or execution of the Contract; or, the respective rights and liabilities of the Parties; or, in relation to interpretation of any provision of the Contract; or, in any manner touching upon the Contract (hereinafter referred to as the 'Dispute'), then, either Party may, commence arbitration in respect of such Dispute by issuance of a notice in terms of section 21 of the Arbitration & Conciliation Act, 1996 (hereinafter referred to as the 'Notice'). The Notice shall contain the particulars of all claims to be referred to arbitration in sufficient detail and shall also indicate the monetary amount of such claim. The arbitration shall be conducted by a sole arbitrator to be appointed by the Head of the BHEL Power Sector Region issuing the Contract within 60 days of receipt of the complete Notice. The language of arbitration shall be English.	
	The Arbitrator shall pass a reasoned award. Subject as aforesaid, the provisions of Arbitration and Conciliation Act 1996 (India) or statutory modifications or re-enactments thereof and the rules made thereunder as in force from time to time shall apply to the arbitration proceedings under this clause. The seat of arbitration shall be Kolkata (the place from where the contract is Issued). The Contract shall be governed by and be construed as per provisions of the laws of India. Subject to this provision 18.1.1 regarding ARBITRATION, the principal civil court exercising ordinary civil jurisdiction over the area where the seat of arbitration is located shall have exclusive jurisdiction over any DISPUTE to the exclusion of any other court.	
18.1.2	In case of Contract with Public Sector Enterprise (PSE) or a Government Department, the following shall be applicable: In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs)/ Port Trusts inter se and also between CPSEs and Government Departments/Organizations (excluding disputes concerning Railways, Income Tax, Customs & Excise Departments), such dispute or difference shall be taken up by either party for resolution through AMRCD (Administrative Mechanism for Resolution of CPSEs Disputes) as mentioned in DPE OM No. 4(1)/2013-DPE(GM)/FTS-1835 dated 22-05-2018 as amended from time to time.	
18.1.3	The cost of arbitration shall initially be borne equally by the Parties subject to the final allocation thereof as per the award/order passed by the Arbitrator.	
18.1.4	Notwithstanding the existence of any dispute or differences and/or reference for the arbitration, the Contractor shall proceed with and continue without hindrance the performance of its obligations under this Contract with due diligence and expedition in a professional manner unless the dispute inter-alia relates to cancellation, termination or short-closure of the Contract by BHEL.	

SIGNATURE OF THE BIDDER WITH SEAL AND DATE

SL. NO.	BHEL STANDARD TERMS	SUPPLIER CONFIRMATION
18..2	<u>CONCILIATION:</u> If at any time (whether before, during or after the arbitral or judicial proceedings), any Disputes (which term shall mean and include any dispute, difference, question or disagreement arising in connection with construction, meaning, operation effect, interpretation or breach of the agreement, contract), which the Parties are unable to settle mutually, arise inter-se the Parties, the same may, be referred by either party to Conciliation to be conducted through Independent Experts Committee (IEC) to be appointed by competent authority of BHEL from the BHEL Panel of Conciliators. Notes: 1. No serving or a retired employee of BHEL/Administrative Ministry of BHEL shall be included in the BHEL Panel of Conciliators. 2. Any other person(s) can be appointed as Conciliator(s) who is/are mutually agreeable to both the parties from outside the BHEL Panel of Conciliators. The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and as provided in Procedure 2.3 to this GCC (as available in www.bhel.com). The Procedure 2.3 together with its Formats (as available in www.bhel.com) will be treated as if the same is part and parcel hereof and shall be as effectual as if set out herein in this GCC. The Contractor hereby agrees that BHEL may make any amendments or modifications to the provisions stipulated in the Procedure 2.3 (as available in www.bhel.com) to this GCC from time to time and confirms that it shall be bound by such amended or modified provisions of the Procedure 2.3 (as available in www.bhel.com) with effect from the date as intimated by BHEL to it.	
18.3	<u>NO INTEREST PAYABLE TO CONTRACTOR:</u> Notwithstanding anything to the contrary contained in any other document comprising in the Contract, no interest shall be payable by BHEL to Contractor on any moneys or balances including but not limited to the Security Deposit, EMD, Retention Money, RA Bills or the Final Bill, or any amount withheld and/or appropriated by BHEL etc., which becomes or as the case may be, is adjudged to be due from BHEL to Contractor whether under the Contract or otherwise.	
19	<u>JURISDICTION:</u> All disputes or differences arising under out of or in connection with the purchase order shall be subject to the exclusive jurisdiction of court at Kolkata.	
20	<u>RIGHTS OF BHEL:</u> (A) To withdraw any portion of work/supply and/or to restrict / alter the quantum of work/supply as indicated in the contract during the progress of work/supply and get it done through other agency and/or to suit BHEL's commitment to its customer or in case BHEL decides to advance the date of completion due to other emergency reasons / BHEL's obligation to its customer. (B) To terminate the contract or withdraw portion of work/supply and get it done through other agency, at the risk and cost of the contractor after due notice of a period of 14 days' by BHEL in any of the following cases: i) Contractor/Supplier's poor progress of the work vis-à-vis execution timeline as stipulated in the Contract, backlog attributable to contractor/supplier including unexecuted portion of work/supply does not appear to be executable within balance available (#) period considering its performance of execution. ii) Withdrawal from or abandonment of the work by contractor before completion of the work as per contract.	

SL. NO.	BHEL STANDARD TERMS	SUPPLIER CONFIRMATION
	iii) Non-completion of work/Non-supply by the Contractor / Supplier within scheduled completion/delivery period as per Contract or as extended from time to time, for the reasons attributable to the contractor/supplier. iv) Termination of Contract on account of any other reason (s) attributable to Contractor/Supplier. v) Assignment, transfer, subletting of Contract without BHEL's written permission resulting in termination of contract or part thereof by BHEL. vi) Non-compliance to any contractual condition or any other default attributable to Contractor/ Supplier. (#) In-case inputs from BHEL/Customer are likely to be delayed or are actually delayed, this delay may also be taken into account while considering balance period available for execution of Contract. (C) Risk & Cost Amount against Balance Work: Risk & Cost amount against balance work shall be calculated as follows: Risk & Cost Amount= [(A-B) + (A x H/100)] Where, A= Value of Balance scope of Work/Supply (*) as per rates of new contract B= Value of Balance scope of Work/Supply (*) as per rates of old contract being paid to the contractor / supplier at the time of termination of contract i.e. inclusive of PVC & ORC, if any. H = Overhead Factor to be taken as 5 In case (A-B) is less than 0 (zero), value of (A-B) shall be taken as 0 (zero). (*) Balance scope of work / supply (in case of termination of contract): Difference of Contract Quantities and Executed Quantities as on the date of issue of Letter for 'Termination of Contract', shall be taken as balance scope of Work / Supply for calculating risk & cost amount. Contract quantities are the quantities as per original contract. If, Contract has been amended, quantities as per amended Contract shall be considered as Contract Quantities. Items for which total quantities to be executed have exceeded the Contract Quantities based on drawings issued to contractor from time to time till issue of Termination letter, then for these items total Quantities as per issued drawings would be deemed to be contract quantities. Substitute / extra items whose rates have already been approved would form part of contract quantities for this purpose. Substitute / extra items which have been executed but rates have not been approved, would also form part of contract quantities for this purpose and rates of such items shall be determined in line with contractual provisions. However, increase in quantities on account of additional scope in new tender shall not be considered for this purpose. NOTE: In-case portion of work is being withdrawn, contract quantities pertaining to portion of work withdrawn shall be considered as 'Balance scope of work / supply' for calculating Risk & Cost amount. (D) LD against delay in executed work / supply in case of Termination of Contract: LD against delay in executed be work / supply shall be calculated in line with LD clause as per GCC/SCC/TCC/Special note/any other annexure of tender document (in compliance with order of precedence), for the delay attributable to contractor / supplier. For this purpose, contract value shall be taken as Executed Value of work / supply for the purpose of limiting the maximum LD value.	

SIGNATURE OF THE BIDDER WITH SEAL AND DATE

SL. NO.	BHEL STANDARD TERMS	SUPPLIER CONFIRMATION
	Method for calculation of "LD against delay in executed work / supply" is given below. i) Let the time period from scheduled date of start of work till termination of contract excluding the period of Hold (if any) not attributable to contractor / supplier = T1 ii) Let the value of executed work / supply till the time of termination of contract = X iii) Let the Total Executable Value of work / supply for which inputs/fronTS were made available to contractor / supplier and were planned for execution till termination of contract = Y iv) Delay in executed work / supply attributable to contractor/supplier i.e. $T2 = [1 - (X/Y)] \times T1$ v) LD shall be calculated in line with LD clause [as per GCC/SCC/TCC/Special note/any other annexure of tender document (in compliance with order of precedence)] of the Contract for the delay attributable to contractor / supplier taking "X" as Contract Value and "T2" as period of delay attributable to contractor/supplier. (E) Recoveries arising out of Risk & Cost and LD or any other recoveries due from Contractor Following sequence shall be applicable for recoveries from contractor / supplier on whom risk & cost has been invoked, after informing the contractor / supplier of the total proposed recovery: a) Dues available in the form of Bills payable to contractor / supplier, SD, BGs against the same contract. b) Demand notice for deposit of balance recovery amount shall be sent to contractor/supplier, if funds are insufficient to effect complete recovery against dues indicated in (a) above. c) If contractor / supplier fails to deposit the balance amount to be recovered within the period as prescribed in demand notice, following action shall be taken for balance recovery: i) Dues payable to contractor / supplier against other contracts in the same Region / Unit shall be considered for recovery. ii) If recovery cannot be made out of dues payable to the contractor / supplier as above, balance amount to be recovered, shall be informed to other Regions/Units for making recovery from the Unpaid Bills/Running Bills/SD/BGs/Final Bills of contractor / supplier. iii) In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor / supplier.	
21	Consignee Details: -- As per SPECIAL CONDITIONS OF CONTRACT (SCC) & TCC: PART-C OF TENDER All documents / correspondences must bear the Tender no. / Purchase Order No. & Date.	
22	Bank Guarantee: Non submission of 5% BG (if applicable) will attract 5% loading on the offers (N.A).	NOT APPLICABLE

SIGNATURE OF THE BIDDER WITH SEAL AND DATE

23	Penalty Clause: Non acceptance of penalty clause will attract maximum 10% loading on the offer and accordingly proportionate percentage will be loaded for accepting less percentage of penalty clause. Ex: If the supplier has accepted for maximum 5% penalty clause, then balance 5% will be loaded.	
24	For all other Terms & Conditions, if the offer is not confirming to the same, BHEL at its discretion shall load the same and the loading pattern shall be intimated to the bidders before price bid opening. However, BHEL reserves the right to cancel a bid in case of non-acceptance of any terms and conditions finally arrived before price bid opening.	
25	Note: The offers not complying the above Terms & Conditions shall be liable for rejection.	

Note:

01. In case of any conflict / inconsistency in any clause of the tender or between various sections of the tender, bidder should bring the same in writing to BHEL for clarification before submission of the bid, failing which the most stringent interpretation of the clause in favor of BHEL shall be adopted and the same shall be binding to the bidder.
02. Any deviation sought by the bidder should be indicated in the techno-commercial offer.
03. Bidder should write "accepted" in the column "Supplier Confirmation" for each clause.
04. **If any clause left blank, shall be presumed that the clause is accepted by the bidder.**

SIGNATURE OF THE BIDDER WITH SEAL AND DATE

PRICE SCHEDULE (UNPRICED)

PLEASE REFER

E-PROCUREMENT PORTAL <https://bhel.abcprocure.com>

PRICE SCHEDULE

PLEASE REFER

E-PROCUREMENT PORTAL <https://bhel.abcprocure.com>

FORMS AND PROCEDURES

F-01

RTGS FORMAT

Form for getting payment through RTGS (Real Time Gross Settlement)

01. NAME OF VENDOR
02. ADDRESS
03. VENDOR'S BANK A/C NAME
04. VENDOR'S BANK A/C NO.
05. NAME OF BANK
06. NAME OF BRANCH
07. BRANCH PH. NO.
08. CITY
09. IFSC CODE OF THE BRANCH

THE CHARGES IF ANY FOR PAYMENT THROUGH RTGS MAY BE RECOVERED FROM THE BILL SUBMITTED BY US.

SIGNATURE OF AUTHORISED
REPRESENTATIVE OF VENDOR WITH
DATE & SEAL

CONFIRMATION BY BANKER WITH
OFFICE SEAL

Note : Incorrect information will create accounting complications and payment will be delayed.

F-02

Vendor Details

1. **Name & address of the vendor/company:**
2. **PAN No. of the vendor/company (scan copy of PAN Card):**
3. **Contact Person for the vendor/company:**
4. **Mobile number & E-mail of the contact person:**
5. **VAT / TIN:**
5. **CST:**

SIGNATURE OF THE BIDDER WITH DATE & SEAL

F-03
FORMAT FOR DETAILS OF BIDDER

NAME OF BIDDER	
FAX NO.	
Registration Number*	
Name of Partners / Directors	
Bidder Type Indian/ Foreign*	
City*	
State*	
Country*	
Postal Code*	
PAN/TAN Number*	
Company's Establishment Year	
Company's Nature of Business*	
Company's Legal Status* {limited company/undertaking/joint venture/partnership/other}	
Company Category* {micro unit as per MSME/small unit as per MSME/medium unit as per MSME/Ancillary unit/project affected person of this company/ssi/ other}	
Enter Company's Contact Person Details Title(Mr. / Mrs. / Ms. / Dr. / Shri)*	
Contact Name*	
Date Of Birth*	
Correspondence Email* (Correspondence Email ID can be same as your Login ID. All the mail correspondence will be sent only to the Correspondence Email ID.)	
Designation	
Phone*	
Mobile*	

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
 उज्ज्वल हाउलादार / Ujjwal Howlader
 वरिष्ठ अभियन्ता (क्रय) / Sr. Engineer (PUR)
 बी. एच. ई. एल. / पी.एस.ई.आर / BHEL- PSER
 डी.जे. ९/१, साल्ट लेक / DJ-9/1, Salt Lake
 कोलकाता-७०० ०९१ / Kolkata-700 091
 (Office Seal)

For & On behalf of the Bidder/
 Contractor
 (Office Seal)

Place-----
 Kolkata.

Date-----

Witness: सुखेन कुमार मुखर्जी / Sukhen Kr. Mukherjee
 अपर महा प्रबंधक (क्रय) / AGM (Purchase)
 (Name & Address) बी. एच. ई. एल. / पी. एस. ई. आर / BHEL/PSER
 कोलकाता-७०० ०९१ / KOLKATA-700 091

Witness: _____
 (Name & Address) _____

BANK GUARANTEE FOR PERFORMANCE SECURITY

Bank Guarantee No:

Date:

To

NAME

& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of the Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at BHEL House, Siri Fort, Asiad, New Delhi – 110049 through its Unit at Bharat Heavy Electricals Limited, Power Sector Eastern Region, BHEL Bhawan, Plot No 9/1, DJ Block, Sector-II, Salt lake City, Kolkata – 700091 having awarded to (Name of the Vendor / Contractor / Supplier) having its registered office at _____¹ hereinafter referred to as the 'Contractor/Supplier', which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref No.....dated² valued at Rs.....² (Rupees -----)for <Nature of Work>³ (hereinafter called the 'Contract') and the Contractor having agreed to provide a Contract Performance Guarantee, equivalent to% (.... Percent) of the said value of the Contract to the Employer for the faithful performance of the Contract,

we,, (hereinafter referred to as the Bank), having registered/Head office at and inter alia a branch at being the Guarantor under this Guarantee, hereby, irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer a maximum amount Rs ----- (Rupees -----)⁴ without any demur, immediately on a demand from the Employer, .

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____.

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor/ Supplier in any suit or proceeding pending before any Court or Tribunal relating thereto our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment thereunder and the contractors/supplier shall have no claim against us for making such payment.

We thebank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied or discharged.

We BANK further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said Contractor/Supplier from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said Contractor/Supplier and to forbear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Contractor/Supplier or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Contractor/Supplier or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

This Guarantee shall remain in force upto and including.....⁵ and shall be extended from time to time for such period as may be desired by Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor/Supplier but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof.

Unless a demand or claim under this guarantee is made on us in writing on or before the⁶ (3 months more than the present date of validity of Bank Guarantee) we shall be discharged from all liabilities under this guarantee thereafter.

We, BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed.....⁷
- b) This Guarantee shall be valid up to⁸
- c) Unless the Bank is served a written claim or demand on or before⁹ (3 months more than the present date of validity of Bank Guarantee) all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

Any claim or dispute arising under the terms of this document shall only be enforced or settled in the courts of at Kolkata only.

For and on behalf of
(Name of the Bank)

Dated.....

Place of Issue.....

¹ NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.

² DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE

³ PROJECT/SUPPLY DETAILS

⁴ BG AMOUNT IN FIGURES AND WORDS

⁵ VALIDITY DATE

⁶ DATE OF EXPIRY OF CLAIM PERIOD

⁷ BG AMOUNT IN FIGURES AND WORDS.

⁸ VALIDITY DATE

⁹ DATE OF EXPIRY OF CLAIM PERIOD

Note:

1. Units are advised that expiry of claim period may be kept 2/3 months after validity date.

2. In Case of Bank Guarantees submitted by Foreign Vendors-

- a. From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.
- b. From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**
 - b.1** In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank). It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.
 - b.2** In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.

- b.3** The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). In case, of Foreign Vendors, the BG Format provided to them should clearly specify the same.
- b.4** The BG should clearly specify that the demand or other document can be presented in electronic form.

List of Consortium Banks *

	Nationalised Banks		Nationalised Banks
1	Allahabad bank	19	Vijaya Bank
2	Andhra bank		Public Sector Banks
3	Bank of Baroda	20	IDBI
4	Canara Bank		Foreign banks
5	Corporation bank	21	CITI Bank N.A
6	Central bank	22	Deutsche Bank AG
7	Indian Bank	23	The Hongkong and Shanghai Banking Corporation Limited
8	Indian Oversea Bank	24	Standard Chartered Bank
9	Oriental bank of Commerce	25	J P Morgan
10	Punjab National Bank		
11	Punjab & Sindh Bank		Private banks
12	State Bank of India	26	Axis Bank
13	State Bank of Hyderabad	27	The Federal Bank Limited
14	Syndicate Bank	28	HDFC
15	State Bank of Travancore	29	Kotak Mahindra Bank
16	UCO Bank	30	ICICI
17	Union Bank of India	31	Indusind Bank
18	United Bank of India	32	Yes Bank

* wef 22.03.2016

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME-IF-CML-REV-00	SCC & TECHNICAL CONDITIONS OF CONTRACT (TCC)	PAGE 1 OF 10

CONTENT

CLAUSE NO	DESCRIPTION
1.0	PROJECT SYNOPSIS AND GENERAL INFORMATION
2.0	SITE VISIT
3.0	GENERAL SCOPE OF WORK
4.0	FACILITIES AT SITE
5.0	TECHNICAL REQUIREMENTS FOR BOROSILICATE GLASS BLOCK LINING SYSTEM
4.0	FACILITIES AT SITE
5.0	TECHNICAL REQUIREMENTS FOR BOROSILICATE GLASS BLOCK LINING SYSTEM
6.0	TECHNICAL SPECIFICATION OF WET STACK FLOW MODEL STUDY
7.0	TIME SCHEDULE
8.0	TERMS OF PAYMENTS
9.0	EXECUTION OF WORK
10.0	DISCREPANCIES AND ADJUSTMENT OF ERRORS
11.0	PROGRESS REPORTING
12.0	DRAWING AND DOCUMENTS
13.0	CONTRACT PRICE
14.0	EVALUATION CRITERIA
15.0	REVISION ON ACCEPTED CONTRACT RATE
16.0	PERFORMANCE BANK GUARANTEE:
17.0	GUARANTEE PERIOD
18.0	INSPECTION:
19.0	TAXES AND DUTIES
20.0	INSURANCE
21.0	LIQUIDATED DAMAGES:
22.0	TEST CERTIFICATES
23.0	IMTE
24.0	PRICE VARIATION COMENSATION (PVC)
25.0	OVER RUN CHARGES (ORC)
26.0	OTHER TERMS

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME-IF-CML-REV-00	SCC & TECHNICAL CONDITIONS OF CONTRACT (TCC)	PAGE 2 OF 10

These Technical conditions shall be construed as part of tender document and shall be read along with General Conditions of Contract. In case of any conflict or inconsistency between the general and these special conditions, the same shall be brought out by the bidder in writing to BHEL for clarification during pre-bid discussions; failing which most stringent interpretation / clause in favour of BHEL shall be adopted and the same shall be binding to the contractor.

CLAUSE NO	DESCRIPTION
1.0	PROJECT SYNOPSIS AND GENERAL INFORMATION
	Project name: BARH SUPER THERMAL POWER PROJECT, STAGE-I No. of Units x capacity: 3 X 660 MW Project setting up by: National thermal Power Corporation Project Location : (i) Place: BARH : (ii) District: PATNA : (iii) State: BIHAR Nearest Railway station: BARH Distance of project location from the Railway station: 3.0 KM (Approx.) Nearest town: BARH Distance of the town from the Project site: 4.0 KM Nearest Commercial Airport: PATNA Distance of airport from the project site: 75 KM. Nearest Road Head: National Highway-31.
2.0	SITE VISIT
	The bidder must visit the work site of 3x660 MW Barh Super Thermal Power Project, Stage-1 site, to acquire full knowledge and information about the conditions prevailing at site as well as, in and around the project site, together with the statutory, obligatory, mandatory requirements of various authorities before submission of the bid.
3.0	GENERAL SCOPE OF WORK
3.1	Scope of this tender covers Design, Supply and Expert Supervision for installation works of Borosilicate Glass Block Lining including Wet Stack Flow Model Study for 275 m tall twin flue chimney for Unit#2 & single flow chimney of U#3 at 3x660 MW Barh Stage-I, Dist-Patna Bihar.
3.2	BRIEF SCOPE OF WORK:
3.2.1	SUPPLY: The scope of work includes but not limited to design, engineering, supply of material and services required for completion of the work scope as follows:
3.2.1.1	Supply of Borosilicate Glass Block Lining of 51 mm thickness material confirming to physical & chemical properties mentioned in specifications, Handling, storage & transportation up to CIF Mumbai (for foreign bidders) /FOR Site (for Indigenous bidder) with adequate packing including Epoxy Primer and Adhesive Membranes etc. all complete, for application of borosilicate glass block lining system over mild steel flue liners.
3.2.1.2	Supply of required adhesives / membrane, epoxy primer and special T&P (as mentioned in clause 3.5.8) exclusively required for installation of Borosilicate Glass Blocks shall also be in the scope of vendor. Nominal adhesive/ membrane thickness shall be minimum 3 mm behind & between each block. A 1.5 mm thick layer should be troweled onto the liner as well as to the sides and back of each block before installation (No extra payment shall be made for Epoxy Primer, Adhesive / Membrane and special T&Ps required for application of borosilicate glass block lining system over mild steel flue liners). It is bidder's responsibility to assess and furnish material including wastage etc. necessary to complete the work covered in this scope unless otherwise stated.
3.2.1.3	The bidder shall also provide a ten (10) year full replacement guarantee and bear the cost of replacement including material, application manpower, supervision and T&P if the lining system would fail to protect the chimney flue from internal deterioration or any other defect found during operation, as per specifications.

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME-IF-CML-REV-00	SCC & TECHNICAL CONDITIONS OF CONTRACT (TCC)	PAGE 3 OF 10

3.2.1.4	Submission of the drawings and getting it approved from BHEL / NTPC for borosilicate glass block lining system, condensate extraction system.
3.2.2	SUPERVISION:
3.2.2.1	Expert Supervision and technical support should be provided by bidder during erection of boro-silicate lining system inside MS flue cans along with demonstration and training to erection agency. Number of supervisors to be deployed and period of deployment should be as per site requirement duly agreed with BHEL. The installation of Borosilicate Glass Lining Blocks, mixing of two components adhesive membrane by automatic mixing machine etc. all complete shall be executed by erection agency under the expert supervision of Borosilicate Glass Lining Blocks supplier.
3.2.3	WET STACK FLOW MODEL STUDY
3.2.3.1	The intent of this enquiry/ specification is to carry out the Wet stack flow model study of 3X660 MW NTPC BARH STPP STAGE I (FGD System Package) project for complete duct system from absorber outlet to the top of the stack, design and optimization of gas flow and liquid collection system to mitigate stack liquid discharge (SLD) and shell corrosion, Preparation of final report and recommendations, preparation of drawings/ documents for execution of collection system, obtaining approval on documents from BHEL/ Customer/ customer's consultant, Preparation of BOQ, preparation of bought out item specification, procurement assistance for specialized items, site visit as specified later in the specification & as necessary for completeness in all respects and for efficient & trouble free operation of chimney and liquid collection system for project as per the Technical Specification for Wet Stack Flow Model Study
3.3	The Customer "(NTPC)" and "BHEL" may depute their representative for checking and supervision of important stages of work. The bidder shall be required to provide all facilities for inspection of works at no extra cost to BHEL. Any defect in quality of work or deviations from drawings / specifications pointed out during such inspection shall be made good by the bidder in the same way as if pointed out by the BHEL Engineer, without any cost implication to BHEL.
3.4	The work under this contract shall be carried out as per BOQ Cum Rate Schedule attached as volume-III . The description / specifications as per BOQ (Bill of Quantities) shall be read along Terms and Conditions of Contract Page 6 with technical specifications. Quantities mentioned in the BOQ cum Rate schedule are approximate only and liable for variation due to change of scope of work / variation in schedule of quantities, changes in design etc. The tenderers shall undertake to execute actual quantities as per advice of BHEL Engineer and accordingly the final contract price shall be worked out on the basis of quantities actually executed and payments will also be regulated for the same. The quantities indicated against each item may vary to any extent and no compensation will be payable in variation of Individual quantity.
3.5	BIDDER 'S SCOPE ALSO INCLUDES FOLLOWING:
3.5.1	Bidder will work in close coordination with NTPC / BHEL Engineering Representative. The NTPC/ BHEL Representative is authorized to sign off and verify that supply has been performed in accordance with NTPC / BHEL design documents and drawings.
3.5.2	Bidder shall coordinate all Work with the erection contractor and NTPC / BHEL Work Force to ensure maximum efficiency and safety.
3.5.3	Bidder shall perform all interrelated collateral and incidental Work required, but not specifically covered elsewhere to produce the desired intention of this Contract. The intended final result of this project is a sealed chimney liner in which neither flue gas nor moisture can escape in the chimney annulus space.
3.5.4	Bidder shall supply daily project monitoring, inspection reports, other project documentation.
3.5.5	Drawings and additional information pertinent to the work are in the scope of bidder.
3.5.6	For Supervision Work: The schedule of execution of work for required supervision services shall be intimated by BHEL. Normal working shall be 06 days per week.
3.5.7	Special T&Ps 1. Mixing Machine: In order to ensure consistent, high quality mixing of the components of the lining system adhesive, (an) automated mixing machine(s) should be provided using a min. 3,200 W mixer motor, with fail-safe protection

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME-IF-CML-REV-00	SCC & TECHNICAL CONDITIONS OF CONTRACT (TCC)	PAGE 4 OF 10

	against the operator error of mixing the main adhesive component without its hardener. The mixing machine SHALL be CE –approved. The mixing machine SHALL have thermal motor protection to minimize failure and fire risk. 2. Bidder shall provide all special equipment, tools and instruments required for handling and storage, and for test and maintenance of borosilicate lining system provided under this Contract. Any special tools/tackels, machinery required to maintain the controlled environment during installation of borosilicate glass block shall be in the scope of bidder. Note: No extra payment shall be made for Mixing Machine and special T&Ps required as mentioned above.
3.6	Any activity which is necessarily required for satisfactory execution of any item of BOQ in line with technical specifications shall be deemed to be included in BOQ item even if it is not described in the item description and no extra payment shall be made against such activity.
4.0	FACILITIES AT SITE
4.1	BHEL will provide only work cabin at site and storage shed for Borosilicate Glass Lining System free of charge.
5.0	TECHNICAL REQUIREMENTS FOR BOROSILICATE GLASS BLOCK LINING SYSTEM
	AS PER TECHNICAL SPECIFICATION FOR BOROSILICATE GLASS BLOCK LINING SYSTEM
6.0	TECHNICAL SPECIFICATION OF WET STACK FLOW MODEL STUDY
	Refer document “TECHNICAL SPECIFICATION FOR WET STACK FLOW MODEL STUDY 3X660 MW NTPC BARH STPP STAGE I
7.0	TIME SCHEDULE
7.1	SUPPLY: UNIT#2 For Foreign Bidder: Borosilicate Glass Block lining material should reach at Mumbai (CIF) within 04 months from PO date. For Indigenous Bidder: Borosilicate Glass Block lining material should reach Barh Site within 4.5 Months from date of PO. Receipted LR (Signed & stamped) shall be treated as date of delivery for Levying LD. UNIT#3 For Foreign Bidder: Borosilicate Glass Block lining material should reach at Mumbai (CIF) within 05 months from PO date. For Indigenous Bidder: Borosilicate Glass Block lining material should reach Barh Site within 5.5 Months from date of PO. Receipted LR (Signed & stamped) shall be treated as date of delivery for Levying LD.
7.2	SUPERVISION: Schedule of supervision works shall be intimated by BHEL construction manager separately, in advance as per actual site requirement. Supplier shall arrange for deputation of supervisors within 2 weeks of BHEL intimation
7.3	WET STACK FLOW MODEL STUDY: “Wet Stack Flow Model Study” for U#2 shall start within four weeks of PO and to be completed in 90 days. “Wet Stack Flow Model Study” for U#3 shall start within four weeks of PO and to be completed in 120 days
7.4	Bidder has to mobilize adequate resources to meet BHEL’s commitments to their customer as indicated from time to time. In the event the bidder fails to respond to these requirements, BHEL shall take appropriate actions to meet customer’s commitments in line with the provisions of Contract.
7.5	The work under the scope of this contract is deemed to be completed in all respects,

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME-IF-CML-REV-00	SCC & TECHNICAL CONDITIONS OF CONTRACT (TCC)	PAGE 5 OF 10

	only when all the works are carried out as per satisfaction of BHEL. The decision of BHEL on completion date shall be final and binding on the contractor.
7.6	In order to meet above schedule in general, and any other intermediate targets set, to meet customer/ project schedule requirements, bidder shall arrange & augment all necessary resources from time to time on the instructions of BHEL without any extra cost to BHEL.
8.0	TERMS OF PAYMENTS
8.1	For supply of Borosilicate Glass Block Lining
	For Indigenous bidder: - Eighty percent (80%) of basic price of materials supplied, as per PO, along with 100% taxes and duties (as applicable), shall be paid against receipt of material at site on pro-rata basis. - Ten percent (10%) of basic price of materials supplied will be released on prorated basis after receipt of Material Receipt Certificate (MRC) from project site engineer of Owner/ Purchaser, on submission of all final documents for the package, duly certified by Engg. Deptt. of purchaser. - Ten percent (10%) of basic price of materials supplied will be released on prorated basis after completion of application work certified by project site engineer of Owner/ Purchaser, on submission of all final documents for the package, duly certified by Engg. Deptt. of purchaser. For Foreign Bidder: - Eighty percent (80%) of basic price of materials supplied, as per PO, along with taxes and duties (as applicable), shall be paid against CIF Mumbai through usance LC. - Ten percent (10%) of basic price of materials supplied, as per PO, along with taxes and duties (as applicable), shall be paid against MRC within one month from date of MRC through usance LC. - Ten percent (10%) of basic price of materials supplied, as per PO, along with taxes and duties (as applicable), shall be paid against after completion of application work certified by project site engineer of Owner/ Purchaser within one month from date of completion of application work through usance LC.
8.2	For Wet Stack Flow Model study: 75% basic Payment shall be made after approval of study model report by customer. Balance 25% along with applicable taxes & duties shall be made completion of application work certified by project site engineer of Owner/ Purchaser within one month from date of completion of application work .
8.3	DOCUMENTS TO BE SUBMITTED BY VENDOR FOR PAYMENT
	By Indigenous Bidder: - Invoice – original+1 copy - Receipted LR (signed & stamped)/ confirmation from site regarding receipt of packages/ Boxes original/ copy - Delivery order- 2 copies - Packing List - clearly showing number of packages, gross weight and net weight. - original+1 copy - MDCC from BHEL/ Customer –2 copies - Guarantee Certificate – Original + 1 copy - Insurance Intimation - 2 copies (Note: Indigenous vendors seeking payment should submit the Performance Bank Guarantee before first submission of documents for payment as per Clause 16.0) By Foreign Bidder: - Original Full Set of Ocean Bill of Lading - Original Commercial Invoice - Original Packing List - Original Insurance Certificate

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME-IF-CML-REV-00	SCC & TECHNICAL CONDITIONS OF CONTRACT (TCC)	PAGE 6 OF 10

	e. Original Certificate of Origin f. Original Quality Certificate (Note: Foreign vendors seeking payment through Letter of Credit (LC) should submit the Performance Bank Guarantee as per Clause 16.0 before LC opening.)
9.0	EXECUTION OF WORK
9.1	The work shall be executed in a workman like manner and to the entire satisfaction of the Engineer and as per technical specification issued with tender. In case of conflict, the decision of the Engineer I/c shall be final & binding.
10.0	DISCREPANCIES AND ADJUSTMENT OF ERRORS
10.1	Order of precedence shall be as per NIT.
10.2	If there are varying or conflicting provisions made in any one document forming part of the contract, the BHEL Engineer shall be the deciding authority with regard to the document.
11.0	PROGRESS REPORTING :
11.1	Supplier is required to draw mutually agreed monthly program in consultation with BHEL well in advance. Contractor shall ensure achievement of agreed program and shall also timely arrange additional resources considered necessary at no extra cost to BHEL.
11.2	The progress report shall indicate the progress achieved against planned , with reasons indicating delays , if any, and shall give the remedial actions which the SUPPLIER intends to take to make good the slippage or lost time , so that further works again proceed as per the original program and the slippages do not accumulate and effect the overall program.
12.0	DRAWING AND DOCUMENTS
12.1	The detailed drawings, specifications available with BHEL engineers will form part of this tender specification. These documents will be made available to the contractor during execution of work at site. The contractor will also ensure availability of all drawings / documents at work place.
12.2	The data furnished in various annexures enclosed with this tender specification are only approximate and for guidance. However, the change in the design and in the quantity may occur as is usual in any such large scale of work.
12.3	Should any error or ambiguity be discovered in the specification or information the supplier shall forthwith bring the same to the notice of BHEL before commencement of work. BHEL's interpretation in such cases shall be final and binding on the contractor.
12.4	Deviation from design dimensions should not exceed permissible limit. The supplier shall not correct or alter any dimension / details, without specific approval of BHEL.
13.0	CONTRACT PRICE
13.1	The bidder shall quote their rates strictly in accordance with prescribed Price schedule of Volume-III.
13.2	Indigenous Bidders to quote on FOR site basis considering inland transit insurance in BHEL's scope and foreign bidders to quote on CIF basis (Port-Mumbai). For CIF Mumbai delivery, Insurance (Inland) and Transportation (Inland) shall be in BHEL scope. However, FOR site price for foreign bidder will be calculated by loading their CIF (Port-Mumbai) price up to site as per clause 14.3.
13.3	Foreign bidders will have to quote CIF (cost, insurance & freight) basis. For importing materials on CIF basis, bidders to note following: a. As per Incoterms (CIF), risk transfers to buyer when the goods have been released from the destination Port. Shipped on board date mentioned on the clear Bill of Lading or Air way Bill, shall be treated as the date of Shipment/ Dispatch for all contractual purposes including calculation of LD. b. Payment shall be made through Usance L/C. Usance period (120 days) of the L/C shall start from the date of Bill of lading/Air Way Bill. L/C opening charges for initial 120 days shall be in BHEL's scope, however L/C extension charges beyond 120 days till completion of delivery will be to the bidder's account. c. Bill of Lading shall be considered as equivalent document for recognition of dispatch. d. For claiming payment under usance L/C, Bill of lading shall be considered instead of receipted LR. e. Freight is to be quoted as inclusive in basic price by vendor and is not to be quoted

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME-IF-CML-REV-00	SCC & TECHNICAL CONDITIONS OF CONTRACT (TCC)	PAGE 7 OF 10

	separately.
13.4	a) Bids of Indian supplier shall be in Indian Rupee only. b) Bids of foreign suppliers shall be in USD and on CIF basis. c) An authorized representative/ agent can represent only one bidder for the given package.
14.0	EVALUATION CRITERIA
14.1	Tenders will be evaluated on the basis of total cost in INR excluding GST with Cess(if applicable) taken into consideration loadings, if any, and all available financial advantages, including those available from Owner, taxation authorities etc.
14.2	For evaluation, exchange rate (TT selling rate of State Bank of India) as on date of tender opening (Part-I bid in case of two part bid) shall be considered. If the relevant day happens to be a bank holiday, then the forex rate as on the previous bank (SBI) working day shall be taken.
14.3	In case of foreign bidders, the quoted CIF price shall be loaded by following factors to arrive at total FOR Site price: a) Custom Duty as prevailing on date of Price bid opening . c) Port handling/ clearing charges – @ 1% of CIF value. d) Inland freight - @ 1% of CIF value.
15.0	REVISION ON ACCEPTED CONTRACT RATE Quoted/ accepted rates shall remain Firm for any increase or decrease in the Order/ Contract value (Exworks) up to plus or minus 30% (for any amendment) within two years from the date of original PO unless specified otherwise in NIT. The Purchaser shall have the right to increase or decrease quantities and scope up to the above extent of value and Seller/ supplier shall be bound to accept the same at the contracted rates without any escalation.
16.0	PERFORMANCE BANK GUARANTEE:
16.1	Bidder/Supplier shall furnish Performance Bank Guarantee of 5% of the PO Value excluding taxes and duties against Guarantee Period as per Clause No. 3.2.1.3
16.2	The Bank guarantee shall be kept valid at all times during the entire Guarantee period. Same will be released after successful completion of Guarantee period as per Clause No. 3.2.1.3.
17.0	GUARANTEE PERIOD
	Guarantee Period shall be 10 years from the date of successful trial operation of FGD System .
18.0	INSPECTION:
18.1	Bidder will intimate BHEL 21 days in advance after readiness of 100% material at their works along with Manufacturing Test Certificate/Warranty Certificate. BHEL will issue MDCC (Material Dispatch Clearance Certificate) based on Manufacturing Test Certificate. Same shall be given by BHEL within 7 days after Manufacturing Test Certificate will be provided.
18.2	Material shall be dispatched after issuance of MDCC (Material Dispatch Clearance Certificate) by BHEL
19.0	TAXES AND DUTIES
19.1	For Foreign Bidders:
19.1.1	For supply of Borosilicate material (serial No.1 of Price Schedule), price quoted should be CIF Mumbai Port.
19.1.2	For Wet Stack Flow Model study (serial no. 2 of Price schedule), GST shall be payable by purchaser on reverse charge mechanism if bidder is not registered under GST Act. If bidders is registered under GST Act, GST as applicable shall be payable extra and all the provisions relating to GST for domestic bidder shall apply mutatis-mutandis.
19.1.3	Purchaser shall not be liable towards income tax of whatever nature including variations thereof, arising out of this order/contract, as well as tax liability of the seller/ contractor and his personnel.
19.1.4	Deduction of tax at source (TDS/Withholding Tax) at the prevailing rates shall be effected by the purchaser as per applicable Indian Income Tax rules before release of payment. Certificates of Tax deduction will be issued by the purchaser as per statutory provisions.
19.1.5	If bidders is registered under GST Act, TDS under GST shall be deducted at applicable

TENDER NO – PSER:PUR:PMX:373(II):049:(ENQ:19:PP:0015:PUR:62)		
VOLUME-IF-CML-REV-00	SCC & TECHNICAL CONDITIONS OF CONTRACT (TCC)	PAGE 8 OF 10

	rates on gross invoice value from the running bills (RA bills).
19.2	For Domestic Bidders:
19.2.1	All taxes excluding GST & BOCW Cess (as specified elsewhere in the tender) but including, Charges, Royalties, any State or Central Levy and other taxes for materials if any obtained for the work and for execution of the contract shall be borne by successful bidder and shall not be payable extra by BHEL. Any increase of above at any stage during execution of contract, including extension of the contract, shall have to be borne by successful bidder contractor. Bidder's quoted/ accepted rates/ price shall be inclusive of all such requirements.
19.2.2	GST along with Cess (as applicable) legally leviable & payable by successful bidder as per GST Law shall be paid by BHEL, extra. Hence, bidder shall not include GST along with Cess (as applicable) in their quoted rates/ price.
19.2.3	Successful bidder shall furnish proof of GST registration with GSTN Portal covering the services under this contract. Registration should also bear endorsement for the premises from where the billing shall be done by successful bidder on BHEL for this project / work.
19.2.4	Since GST on output will be paid by BHEL separately as enumerated above, bidder's your quoted rates / price should be after considering the Input Credit under GST law at bidder's end.
19.2.5	TDS under Income Tax shall be deducted at prevailing rates on gross invoice value from the running bills (RA bills) unless exemption certificate from the appropriate authority / authorities is furnished.
19.2.6	TDS under GST shall be deducted at applicable rates on gross invoice value from the running bills (RA bills).
19.2.7	Bidder shall note that GST Tax Invoice complying with GST Invoice Rules (Section 31 of GST Act & Rules referred thereunder) wherein the 'Bill To' details shall encompass following. BHEL GSTN – Refer attached GSTN code table of BHEL. Name - BHARAT HEAVY ELECTRICALS LIMITED Address - Shall be intimated later. Specific details of BHEL GSTN, Name and Address as stated above, have been specified elsewhere in the tender.
19.2.8	Successful bidder to intimate immediately on the day of removal of goods (in case of any supply of goods) to BHEL along with all relevant details and send a scanned copy of Tax Invoice to BHEL through following communication mode for enabling BHEL to meet its GST related compliances. Portal address. and Email address – Shall be intimated later. Specific details of above shall be intimated to successful bidder by BHEL at appropriate juncture.
19.2.9	In case of delay in submission of above mentioned documents on the date of despatch, BHEL may incur penalty / interest for not adhering to Invoicing Rules under GST Law. The same will be liable to be recovered from successful bidder, in case such delay is not attributable to BHEL.
19.2.10	In case of raising any Supplementary Tax Invoice (Debit / Credit Note), successful bidder shall issue the same containing all the details as referred to in Section 34 read with Section 31 of GST Act & Rules referred there under.
19.2.11	Successful bidder shall comply with the Time Limit prescribed under the GST Law and rules thereof for raising of the Tax Invoice. If any supply of goods is applicable, successful bidder shall also ensure prompt delivery of goods after despatch.
19.2.12	Bidder shall note that in case GST credit is delayed / denied to BHEL due to delayed / non receipt of goods and / or Tax Invoice or expiry of the timeline prescribed in GST Law for availing such ITC, or any other reasons, not attributable to BHEL, GST amount shall be recoverable from successful bidder along with interest levied/ leviable on BHEL, as the case may be.
19.2.13	Successful bidder shall upload the invoices raised on BHEL in GSTR-1 within the prescribed time as given in the GST Act. Bidder shall note that in case of delay in declaring such invoice in your return and GST credit availed by BHEL is denied or reversed subsequently as per GST Law, GST amount paid by BHEL towards such ITC reversal as per GST law shall be recoverable from the successful bidder along with interest levied / leviable on BHEL.
19.2.14	Way Bill: Successful bidder to arrange for way bill / e-waybill for any transfer of goods

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME-IF-CML-REV-00	SCC & TECHNICAL CONDITIONS OF CONTRACT (TCC)	PAGE 9 OF 10

	for the execution of the contract. Successful bidder has to make their own arrangement at their cost for completing the formalities, if required, with Issuing Authorities, for bringing materials, plants & machinery at site for execution of the works under this contract, Road Permit / Way Bill, if required, shall be arranged by successful bidder and BHEL will not supply any Road Permit/ Way Bill for this purpose.
19.2.15	Any new taxes & duties, if imposed subsequent to due date of offer submission as per NIT & TCN, by statutory authority during contract period (including extension, if the same is not attributable to you), shall be reimbursed by BHEL on production of relevant supporting document to the satisfaction of BHEL. However, you shall obtain prior approval from BHEL before depositing new taxes and duties.
19.2.16	Benefits and / or abolition of all existing taxes must be passed on to BHEL against new taxes, if any, proposed to be introduced at a later date.
20.0	INSURANCE
20.1	For Foreign Vendors Transit Insurance Upto Mumbai Port is in Vendor's Scope and from Mumbai Port to Barh site is in BHEL's Scope.
20.2	For Indigenous Vendor Inland Transit Insurance upto Barh Site shall be in BHEL's Scope. For each dispatch, vendor shall inform the following to the underwriter under intimation to BHEL-PSER and BHEL site office (i) Policy no (ii) Consignee Name (iii) Consignment details (Item with their weight and value (in INR) (iv) Project Name and PO No. (v) LR No and date, Dispatch origin, destination details & Invoice no. Vendor to intimate the underwriters quoting the insurance policy mentioned in purchase order or to be intimated to them separately before the dispatch.
21.0	LIQUIDATED DAMAGES:
21.1	LD shall be 0.5% of the total order value per week of delay or part thereof subject to a maximum of 10% of the total order value. Applicable GST shall also be recovered on such LD amount.
21.2	In case of any amendment/ revision, the LD shall be linked to the amended/revised PO value.
21.3	However, for Indigenous Supplier, Receipted LR (Signed & stamped) shall be treated as date of delivery for Levying LD. And for Foreign Supplier, Shipped on board date mentioned on the clear Bill of Lading or Air way Bill, shall be treated as the date of Shipment/ Dispatch for all contractual purposes including calculation of LD.
22.0	TEST CERTIFICATES
	Necessary test certificates of all materials supplied by contractor are to be produced to BHEL/NTPC prior to use of materials.
23.0	IMTE
	The contractor shall ensure deployment of reliable and calibrated instrument, measuring, and test Equipment (IMTE). The IMTE shall have test calibration certificate from authorized / Govt approved agencies. The contractor shall also keep provision of alternate engagement for such IMTE so that the work does not suffer when a particular IMTE is sent for calibration. Re-testing/ re-calibration shall also be arranged by the contractor at their own cost at regular interval during the period of use as advised by BHEL.
24.0	PRICE VARIATION COMENSATION (PVC)
	Not applicable for this tender.
25.0	OVER RUN CHARGES (ORC)
	Not applicable for this tender.
26.0	OTHER TERMS
26.1	TENDERER TO INFORM HIMSELF FULLY: It is the responsibility of tenderer to keep himself informed about all taxes & duties applicable on materials/ services as prevailing at the time of tendering. If the rates assumed by tenderer are less than the tariff rates prevailing at the time of tendering, the tenderer will be himself responsible for such under quotations.

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME-IF-CML-REV-00	SCC & TECHNICAL CONDITIONS OF CONTRACT (TCC)	PAGE 10 OF 10

1. BOQ as per price schedule for the work “Design, Supply and Expert Supervision for installation works of Borosilicate Glass Block Lining including Wet Stack Flow Model Study for 275 m tall twin flue chimney for Unit#2 & single flow chimney for U#3 at 3x660 MW Barh Stage-I, Dist-Patna Bihar”.
2. TECHNICAL SPECIFICATION FOR BOROSILICATE GLASS BLOCK LINING SYSTEM
3. TECHNICAL SPECIFICATION FOR WET STACK FLOW MODEL STUDY 3X660 MW NTPC BARH STPP STAGE I (FGD System Package)

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME–1F-TS-1, R-0	TECHNICAL SPECIFICATION FOR BOROSILICATE GLASS BLOCK LINING SYSTEM	PAGE 1 OF 6

CONTENTS

CLAUSE NO	DESCRIPTION
1.0	SCOPE OF WORK
2.0	TECHNICAL SPECIFICATION
3.0	TECHNICAL REQUIREMENTS
4.0	STANDARDS AND CODES
5.0	QUALITY ASSURANCE AND QUALITY CONTROL
6.0	SAFETY, NOISE AND ENVIRONMENT REQUIREMENTS
7.0	HANDLING, STORAGE AND PROTECTION
8.0	JOB SITE INSPECTION AND PREPARATION

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME–1F-TS-1, R-0	TECHNICAL SPECIFICATION FOR BOROSILICATE GLASS BLOCK LINING SYSTEM	PAGE 2 OF 6

This volume shall be construed as part of tender document and shall be read along-with other volumes of tender. Unless otherwise specified, in case of any confusion of any clause/ provision of this volume or any conflict/ inconsistency of any clause/ provision of this volume with that of other volumes, the same shall be brought out by the bidder in writing to BHEL for clarification or during pre-bid discussions, if applicable, failing which most stringent interpretation in favour of BHEL shall be adopted and the same shall be binding to the bidder. Unless otherwise specified, all terms & conditions shall be applicable for entire scope and for each part/ package of tender. This volume is common for both supply & service parts.

CLAUSE NO	DESCRIPTION
1.0	SCOPE OF WORK The scope of work under this tender includes design/Engineering, supply, Expert supervision during installation of closed cell Borosilicate glass lining system & Wet stack flow model study in chimneys at 3x660MW BARH STAGE-I Plant. The work is to be executed in Two existing tall R.C.C chimneys of 275m high, one with already erected in position two MS flue cans and other with already erected in position one MS flue can. For more detail about the project refer Annexure-III of the specification.
1.1	Intent of specification The intent of this technical specification is to provide a complete Chimney Lining system to protect the existing MS flue cans in wet/dry condition as per specification. The bidder shall study the specification and make a site visit if required to satisfy himself thoroughly about the nature of work, Workability and suitability of the system. The bidder shall take full responsibility for guaranteed and satisfactory operation of the system as regard to its performance and smooth and reliable working of supplied equipment's/systems. All work shall be carried out as per specification. The bidder shall be responsible for providing material, tools and plants and services as per the scope to fulfill the objective of safe and trouble free operations, maintainability and reliability of the complete work covered under this specification. The bidder shall fulfill all the features of the work as per specification, the relevant codes and standards and adhere to all the local regulations, as applicable. Design, manufacture, supply, construction, erection, and commissioning shall be as per the state of the art technology and satisfy all the statutory and mandatory laws and regulations to its fullest extent.
1.2	Annexures Annexure-I: Preliminary data of Flue gas characteristics shall be as per Annexure-I and specification. Annexure-II: - Chimney liner drawing and GA. However, during detailed engineering, minor modification if any required may also be done with owner's consent but without any extra cost implication. Annexure-III: - FGD layout & Project information
2.0	TECHNICAL SPECIFICATION
2.1	The works includes Design/Engineering, supply and Expert supervision during installation of closed cell Borosilicate glass lining system in the existing chimney which includes but not be limited to the following:
2.1.1	Design, preparation of drawing, material supply preservation of borosilicate glass block, adhesive primer supplied with adequate moisture proof packing, expert supervision during application of borosilicate glass block lining system over MS liner in the existing chimney, including:
2.1.1.1	Design of closed cell Borosilicate glass lining system and getting approval from BHEL/NTPC.
2.1.1.2	Supply of suitable primer, supply of two components adhesive membranes and supply of closed cell borosilicate glass blocks.
2.1.1.3	Expert supervision during the application of borosilicate glass block lining system.

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME–1F-TS-1, R-0	TECHNICAL SPECIFICATION FOR BOROSILICATE GLASS BLOCK LINING SYSTEM	PAGE 3 OF 6

2.1.1.4	Complete onsite Quality assurance (QA) and supervision by borosilicate glass block lining manufacturer/supplier, during surface finish, application of primer, application of two components adhesive membrane, installation of borosilicate glass block on internal surface of MS flue can.
2.1.1.5	Ten (10) year full replacement guarantee for borosilicate glass block, supply, erection/installation, enabling works, labor, material, adhesive, primer, surface preparation, arrangement for application etc. all complete, and fulltime onsite QA supervision during erection & commissioning. During the guarantee period if the lining system fails to protect the chimney flue from deterioration, the bidder shall replace the partially affected portion or complete borosilicate lining system as per time schedule but without any additional cost, including labor, material, surface finish (SA 2 1/2), supply and application of primer, supply and application of two components adhesive membrane, supply and application of closed cell borosilicate glass blocks, arrangement for application on erected flue cans etc all complete with onsite QA supervision of borosilicate glass block supplier.
2.1.1.6	Submission of comprehensive QA documentation.
2.1.2	Expert supervision during installation/Modifications for the following
2.1.2.1	Replacement of the expansion joints with acid resistant materials which shall withstand acidic flue gas and shall also prevent dust accumulation. The space between the expansion joint material and the liner shall be packed and sealed by providing a bolster made up of light weight compressible material suitable for wet stack operations and acid resistant to withstand acidic flue gas condensates. The bolster shall be confined in texturized glass fabric having a final covering of stainless steel wire mesh. Design of expansion joint shall comply EPRI guideline to avoid contact of condensate with expansion joint material and to ensure drainage of condensate. The scope includes all labor, material and tools and plants, transportation, hoisting, fixing in position, drilling, cutting, bolts and bolting, Testing etc. Approval of user handbooks giving details of installation, dismantling and maintenance procedures for the expansion joints shall be obtained from BHEL/NTPC. b) Replacement of Sample port with acid resistant material like C276, fiber gasket etc, and also modification (if required) of existing steel flue liner to suit the same. Measurement for payment shall be done for net weight of Titanium/c276 pipe including flange plate/cover plate only (weld thickness not to be considered) which is welded over liner surface.
2.1.2.2	Modification of Manhole / access door with acid resistant material or with borosilicate glass block lining
2.1.2.3	Provision of suitable Condensate drains/gutter in MS flue cans.
2.1.2.4	Modification in existing RCC mini-shell having AR brick lining.
2.1.2.5	Installation of condensate collection system as per wet stack study report.
2.1.3	Submission of the drawings and getting the same approved from BHEL and the project owner for borosilicate glass block lining system, erection, transportation and storage.
2.1.4	The Bidder shall furnish all design, labor, materials, tools and equipment as per scope for the borosilicate lining system, as indicated and specified in BOQ & elsewhere in the tender.
2.1.5	Bidder shall provide, in the required format and form and in a timely manner, all drawings and documentation required by this Specification and/or required by applicable Standards and codes. A consistent nomenclature shall be used project-wide in naming all component parts within the Scope of Work. This shall apply to all drawings, Bill of Materials, special instructions, etc. The cost of correcting inconsistent nomenclature shall be borne by the Bidder.
2.1.6	Changes in design and drawings already approved by the owner are normally unacceptable. However, should such changes become necessary on an exceptional basis, the Bidder shall obtain the owners approval prior to introducing any such change.

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME–1F-TS-1, R-0	TECHNICAL SPECIFICATION FOR BOROSILICATE GLASS BLOCK LINING SYSTEM	PAGE 4 OF 6

2.2	Bidder Services
2.2.1	Field personnel provided by the Bidder shall be capable and qualified to perform the required duties to the satisfaction of BHEL and the owner.
2.2.2	Erection services: The Bidder shall furnish competent supervision for erecting the equipment provided under this Specification. The erection services shall be coordinated with other agencies in the scope of the subject chimney contract.
3.0	TECHNICAL REQUIREMENTS
3.1	Design parameters
3.1.1	Liner considerations The borosilicate glass block liner will have a thickness of 51 mm, for all its entire length. Proper provisioning should be made for borosilicate lining system for lining around gas sampling ports, expansion joints, man holes and other appurtenances.
3.2	Operating conditions
3.2.1	Operating conditions shall be as per Annexure-I and specification.
3.2.2	A margin of 15 deg centigrade above the operating conditions mentioned in Annexure-I shall be taken while selecting the appropriate material and thickness for design of the lining system.
3.3	Performance Requirements
3.3.1	Borosilicate brick lining system will be designed in such a way that it will not require unscheduled outages for repair except for planned and scheduled routine maintenance and inspections.
3.3.2	Ten (10) year full replacement guarantee, including cost of supply, erection, enabling works, all labor, material, adhesive, primer, surface preparation, arrangement for application etc. all complete, and fulltime onsite QA supervision during erection & commissioning. During the guarantee period if the lining system fails to protect the chimney flue from deterioration, the borosilicate glass block lining manufacturer/supplier shall replace the partially affected portion or complete borosilicate lining system without any additional cost, including all labor, material, surface finish (SA 2 1/2), supply and application of primer, supply and application of two component adhesive membrane, supply and application of closed cell borosilicate glass blocks, arrangement for application on ground or erected flue cans etc all complete with onsite QA supervision of borosilicate glass block supplier.
3.3.3	The lining system shall be tested for its wet stack surface properties by an independent institute of sufficient knowledge and experience, subject to acceptance by the project owner, and furthermore the lining system supplier has a demonstrable track record of providing technical advice and support to customers for the design of environmentally effective liquid control systems in flue gas ducts and chimneys.
3.3.4	The lining system (borosilicate glass block and adhesive) shall be offered by a supplier with demonstrated capabilities in the area of onsite technical support and QA/QC supervision, who employs QA/QC supervisors with a demonstrated experience in technical support and QA/QC supervision of the subject lining system.
3.3.5	The supplied lining system (borosilicate glass block and adhesive) shall be capable of withstanding fire risk for a minimum period of 2 hours as per ASTM E-119. Proper certification from an independent institute of sufficient knowledge and experience shall be submitted by supplier subject to acceptance by the project owner, showing the capability of the lining system (borosilicate glass block and adhesive) to protect the steel chimney flues from structural damage by fire of said rating.
3.3.6	Supplier shall produce certificates from an independent institute of sufficient knowledge and experience, subject to acceptance by the project owner, showing that the workers can do the work on supplied lining system safely, without any adverse health effects and without requiring excessive protective measures.

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME–1F-TS-1, R-0	TECHNICAL SPECIFICATION FOR BOROSILICATE GLASS BLOCK LINING SYSTEM	PAGE 5 OF 6

3.4	Design Requirements
3.4.1	General
3.4.1.1	Design of the borosilicate lining system must be performed by a professional engineer in the design of such system for chimney flues.
3.4.1.2	Specified requirements of this specification are to be regarded as minimum requirements. If the Fabricator's design and/or experience dictate these minimum requirements should be exceeded, the design, supply and application shall be performed accordingly, without any extra cost implication.
3.5	Materials Requirements
	The steel chimney flues, made of mild steel, shall be internally protected with a lining system consisting of 51 mm thk closed cell borosilicate glass blocks, applied with a flexible, chemically resistant adhesive, using a lining system that meets all of the following requirements:
3.5.1	The lining system shall use closed cell borosilicate glass blocks with the following physical properties:
3.5.1.1	Minimum density of $0.144 \times 10^3 \text{ kg/m}^3$
3.5.1.2	coefficient of linear thermal expansion not greater than $5.5 \times 10^{-6} / ^\circ\text{C}$
3.5.1.3	Minimum compressive strength of 1.00 Mpa as per ASTM C 165
3.5.1.4	Minimum flexural strength of 0.62 Mpa as per ASTM C.203/C.240
3.5.1.5	The blocks shall be resistant to thermal cyclic loading under FGD bypass/ hot gas service conditions, and sudden temperature changes, including high temperature spikes.
3.5.2	The borosilicate glass block system shall use a flexible, chemically resistant adhesive, with all required surface preparation, primer, labor, equipment etc., all complete. The adhesive membrane shall be a 2-component having excellent elastomeric properties and be acid & heat resistant. The adhesive membrane shall be applied in between and behind the blocks in a 3 mm thick layer ensuring a proper bond and adhesion. A 1.5 mm thick layer should be trowelled onto the liner as well as to the sides and back of each block before installation. Double buttering technique shall be used to ensure full bond of each block to the liner and to each other. Contractor shall get installation procedure approved by BHEL/NTPC before installation including verification of installation procedure & workmanship standards of the lining system. The adhesive membrane shall have the following properties.
3.5.2.1	tensile strength at 23 °C greater than or equal to 1.0 N/mm ² as per ASTM D.412
3.5.2.2	Resistant to corrosive flue gas environments.
3.5.2.3	Remain elastomeric and flexible under hot gas conditions and sudden temperature changes.
3.5.2.4	The adhesive shall be suitable for trowel application.
3.5.3	The steel surface shall be blast cleaned to a cleanliness of SA 2 ½ and approved by the supplier of the lining system. The substrate shall thereafter be primed using a high performance epoxy primer within a short time window approved by the supplier. The lining system manufacturer shall demonstrate a proven Quality Control system that monitors and documents the key physical properties, as described above.
4.0	STANDARDS AND CODES
4.1	The borosilicate lining system to be provided under this Specification, including all appurtenances and accessories, and shall be designed, fabricated, inspected, tested, stamped and preserved to the extent indicated in said referenced Standards and Codes. Where this Specification does not include such reference, the system, or any of its components, shall be designed, fabricated, inspected, tested and preserved, as applicable, to comply with currently recognized International and/or manufacturer's specification, whichever is stringent and more restrictive.
4.2	In all cases Bidder shall adhere to and comply with the requirements of Indian standards, which are found to be more restrictive than those specified herein.
5.0	QUALITY ASSURANCE AND QUALITY CONTROL
5.1	The Bidder shall submit upon request a copy of Its Quality Assurance Manual

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME–1F-TS-1, R-0	TECHNICAL SPECIFICATION FOR BOROSILICATE GLASS BLOCK LINING SYSTEM	PAGE 6 OF 6

	including Quality Procedures.
5.2	The Bidder shall conduct an inspection and testing program which shall record and verify the essential properties of the constituent materials and the finished liner.
5.3	The Bidder shall conduct test to verify the mechanical properties of borosilicate bricks and adhesive/mortar and the tests shall be documented during the course of design and fabrication, and shall be made available to owner.
5.4	Unless otherwise specified the bidder's standard tests shall be performed on all batches of materials furnished. The owner may or may not elect to witness tests, but the bidder shall notify the Owner's Quality Assurance Department no later than 10 days in advance of all scheduled tests.
6.0	SAFETY, NOISE AND ENVIRONMENT REQUIREMENTS
6.1	SAFETY
	The equipment supplied under this Specification shall meet the U.S. "OCCUPATION, SAFETY, AND HAZARD ADMINISTRATION" (OSHA) requirements or equivalent.
6.1.1	Jobsite Safety and Scrap Disposal
6.1.1.1	Safety programs and procedures shall be within the scope of this Specification, it should be noted that the all materials that are potentially flammable materials and must be handled in keeping with good industry practice and in compliance with the manufacturer's recommendations. Successful bidder should issue necessary instruction to the installation bidder during the application.
6.1.1.2	Successful vendor shall provide to the installation vendor/BHEL the disposal procedure of scrap and waste materials in line with International/Indian applicable rules and regulations
6.1.2	Safety and protection of work and property
	The Bidder shall provide for the procedures for safety and protection of the work and of materials and equipment to be incorporated therein, whether in storage on or off the site. Provide protection guild line at all times against rain, wind, storms, condensation, or heat so as to maintain all work and equipment and materials free from injury of damage. Bidder in coordination with the installation agency should ensure that at the end of each day, all new work likely to be damaged shall be appropriately protected.
6.2	Environmental Data
6.2.1	Should the lining system to be furnished by the Bidder have discharge points to the environment and/or generate waste materials that must be discharged to the environment, the Bidder shall provide, upon Purchaser's request, a plan for the treatment of the discharge/waste to meet current regulations of the Indian government/ regulatory authorities.
6.2.2	The Bidder shall submit, within thirty (30) days of demand, additional information on noise and/or other environmental data. All information shall be prepared in a manner acceptable Indian government/ regulatory authorities.
7.0	HANDLING, STORAGE AND PROTECTION
7.1	Bidder shall furnish guidelines and supervision to BHEL/Installation vendor during handling storage.
8.0	JOB SITE INSPECTION AND PREPARATION
	In coordination with the borosilicate installation agency, successful bidder should submit a plan detailing the application sequence and methods to be employed, including moving, handling, storage, erection, fit up and the methods to be used for environmental protection.

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME–1F-TS-1, R-0	ANNEXURE-1	PAGE 1 OF 3

The Flue Gas Desulphurisation(FGD) system for Barh-I 3X660 MW is being designed to comply with the requirements stipulated under ‘Guarantee point and design point ’ in the table below:

Sl no	Parameter	Units	Guarantee Point	Design point
1.0	Boiler Load in MW(e)		660	VWO
2.0	Type of Coal	-	Worst Coal	Worst Coal
3.0	Ambient air temp.		27°C	45°C
4.0	Relative Humidity		60%	60%
5.0	Coal Flow(T/Hr)		526	557
6.0	Gas flow at FGD inlet when firing respective coal(Nm ³ /sec)*		691(1077 m ³ /s)	759(1212 m ³ /sec)
7.0	Temp. of flue gas at FGD inlet		135 °C	150 °C
8.0	Flue gas composition at FGD system inlet			
8.1	O ₂ (% v/v wet)		6.282	6.064
8.2	CO ₂ (% v/v wet)		10.491	10.139
8.3	H ₂ O (% v/v wet)		12.096	15.075
8.4	SO ₂ (% v/v wet)		0.071	0.068
8.5	N ₂ (% v/v wet)		71.061	68.653
8.6	Inlet SO ₂ (mg/ Nm ³ - wet)		2030	1944
8.7	NO _x		<100 MG/ Nm ³ at 6% O ₂	
8.8	Dust(mg/ Nm ³ - wet)		50	200
8.9	SO ₃ (ppm)		10.5	10.2
8.10	HCl(ppm)-wet		45	45
8.11	HF(ppm)-wet		12	12
9.0	SO ₂ removal efficiency (continuous)(%)		96.91	96.91

*The Flue gas volume in Nm³/sec shall be calculated at 101.325kPa and 273.15 K.

PARAMETERS FOR WET STACK (FOR FLUE VELOCITY ETC)

Parameter	Units	Guarantee Point (660 MW)	Design point (VWO)
Flue gas quantity per boiler	T/Hr	3303	3604
Temp. of flue gas at stack inlet	°C	58.2	62
Flue gas density at stack inlet	Kg/m ³	1.02845	1.00227
Volumetric flow per boiler	M ³ /s	892	999
Flue Arrangement	-	As Existing	As Existing
Stack Height (As per existing Chimney)	M	275	275
Ambient air temp.	°C	27	45
Relative Humidity	%	60	60
Internal flue dia as per existing Chimney (excluding liner thickness)	M	7.65	7.65



352 - 286 A

DATA FOR CHIMNEY DESIGN

GENERAL DATA				
Project Name		Barh 13x660 MW		
Boiler Application		Utility	No. of Chimneys	By PEM (Existing Chimney)
Boiler Capacity		660 MW	Type of Chimney	By PEM (Existing Chimney)
No. of Boilers / No. of Absorbers		Three (03) / Three(03)	Chimney Arrangement	By PEM (Existing Chimney)
Fuels Fired		Coal	Height of Chimney	By PEM (Existing Chimney)
OPERATING CONDITIONS (Per Boiler)				
Boiler Load		Guarantee point		Design point
		660 MW		VWO
Type of Coal		-----		-----
At absorber outlet				
Flue Gas Flow	:	TPH	3303	3604
Flue Gas Volume	:	m ³ / s (wet)	892	999
Flue Gas Temperature	:	°C	58.2	62.0
Flue Gas Density	:	kg /m ³	1.02845	1.00227
FGD OUTLET-FLUE GAS COMPOSITION % BY Volume – (WET BASIS)				
CO ₂	:	%	9.35	8.97
N ₂	:	%	66.81	64.07
O ₂	:	%	5.89	5.65
SO ₂	:	%	0.0021	0.0020
H ₂ O	:	%	17.95	21.31
*DUST SIZE DISTRIBUTION AT CHIMNEY INLET - % MICRONS				
Below 3		94.3	Between 10 - 15	22.19
Between 3 - 5		45.79	Between 15 - 20	15.0
Between 5 - 10		28.8	> 20	10.69
OTHER DATA				
Elevation of Breeching Line of the Duct			NA (Existing Chimney)	
Duct Opening Size			NA (Existing Chimney)	
Chimney Shell Opening Dimensions			NA (Existing Chimney)	
Flue Gas Pressure at Chimney Entry Level			mm WC	PEM Chimney designer to decide
REMARKS: Above mentioned parameters are for one boiler only.				

THIS DRAWING COVERS THE DETAILS OF CAN TYPE - A WHICH FORMS THE MAJOR PORTION OF THE LINER. THERE ARE 20 SUCH CANS IN EACH LINER.

NOTES:-

- ALL DIMENSIONS ARE GIVEN IN MILLIMETRES.
- MILD STEEL PLATE AND ROLLED SECTIONS SHALL CONFORM TO GRADE A OF IS:2062 FOR MATERIALS UP TO 20 MM. IN THICKNESS. MATERIALS MORE THAN 20 MM. IN THICKNESS SHALL CONFORM TO NORMALISED GRADE B OF IS:2062.
- HOT ROLLED SECTIONS SHALL CONFORM TO IS:808 PARTS I TO VI.
- SPECIAL QUALITY BOLTS SHALL BE BLACK GRADE OF PROPERTY CLASS 8.8 CONFORMING TO IS:1367.
- WASHERS, NUTS AND HELICAL SPRING LOCKING WASHERS SHALL BE OF QUALITY CLASS NOT LESS THAN THAT OF THE BOLTS.
- WELDING SHALL CONFORM TO IS:816 & IS:9595 AND TO THE REQUIREMENTS OF THE SPECIFICATION.
- ALL SHOP WELDS USED TO CONNECT RADIUSED PLATES FORMING FLUE CANS AND OTHER BUTT WELDS, WHERE REQUIRED, SHALL BE FULL PENETRATION BUTT WELDS.
- ANY TEMPORARY STIFFENING STEEL WORK REQUIRED DURING FABRICATION, TRANSPORTATION OR ERECTION PURPOSES SHALL BE DESIGNED AND SUPPLIED BY THE CONTRACTOR. SUCH STEEL WORK SHALL BE REMOVED AND FLUE SURFACES MADE GOOD AFTER ERECTION.
- TESTING OF WELDS, UNLESS NOTED OTHERWISE ON THE DRAWINGS, SHALL BE AS FOLLOWS:-
 - FILLET WELDS
 - MACROETCH EXAMINATION ON PRODUCTION COUPONS.
 - 100 % DYE PENETRATION TEST/MAGNETIC PARTICLE TEST.
 - BUTT WELDS
 - 100 % DYE PENETRATION TEST AFTER BACK GAUGING.
 - 10 % (FOR SHOP WELDS) AND 15 % (FOR SITE WELDS) RADIOGRAPHY TEST. WHERE RADIOGRAPHY IS NOT POSSIBLE, ULTRASONIC TESTING WILL BE CARRIED OUT.
- THE WELD RUN TO BE TESTED SHALL BE EVENLY DISTRIBUTED OVER THE TOTAL LENGTH OF APPLICABLE WELDS ON EACH CAN.
- THE PERCENTAGE OF WELDS TESTED SHALL BE INCREASED AS JUDGED NECESSARY BY THE ENGINEER-IN-CHARGE, BUT TO NOT LESS THAN 20 % FOLLOWING IDENTIFICATION OF SIGNIFICANT AMOUNT OF DEFECTIVE WELDS AND ONLY REDUCED TO THE 10/15 % NORM AFTER CONSISTENT QUALITY / INTEGRITY IS RE-ESTABLISHED.
- THE TERM **SHOP** WELD REFERS TO ALL WELDS MADE DURING FABRICATION, OF INDIVIDUAL FLUE CANS AT FABRICATION YARD. **SITE** WELD REFERS TO WELDS MADE DURING FLUE ERECTION FOR JOINING TOGETHER OF CANS WITHIN WIND SHIELD.
- ALL FILLET AND BUTT WELDS ARE TO BE CONTINUOUS.

CONSTRUCTION REFERENCE DRAWINGS:-

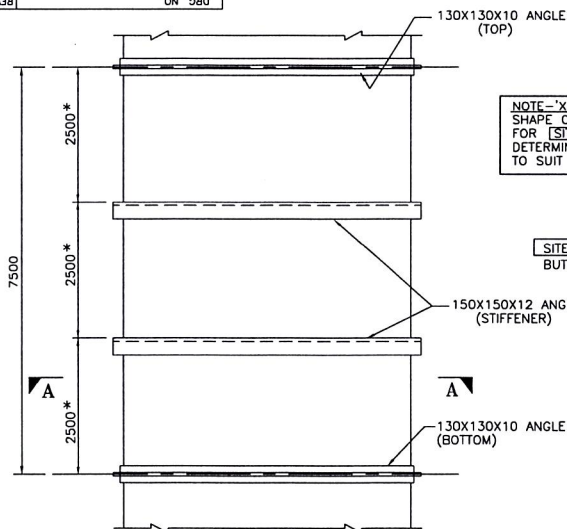
- REFER DRG. NO. 9558-317-POC-C-022 FOR GENERAL ARRANGEMENT OF LINER.



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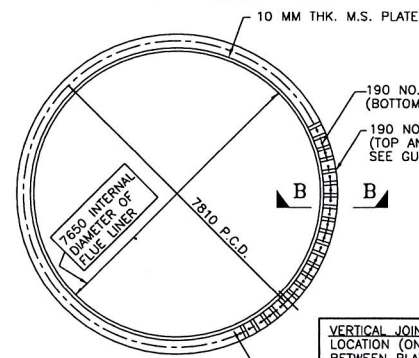
PROJECT BARH SUPER THERMAL POWER PROJECT (3X660 MW), UNIT # 1 & 2									
TITLE CHIMNEY (2X660MW) DETAILS OF LINER / CAN TYPE A									
SIZE A2	SCALE N.T.S.	DRG. NO. 9558-317-POC-C-023	REV. NO. 0						

0	RELEASED FOR CONSTRUCTION		RKS	HKR	--	--	HKR	--	--	DG	01.05.06	
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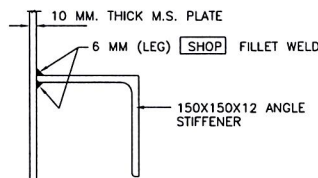


ELEVATION OF TYPICAL CAN-A
(TOTAL NOS. REQUIRED, 20 X 2 = 40)

* ± 100 MM TO OFFSET CIRCUMFERENTIAL WELDS IN THE CANS, IF NECESSARY.



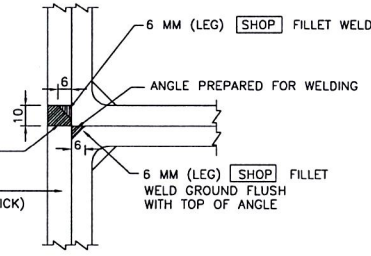
SECTION A - A



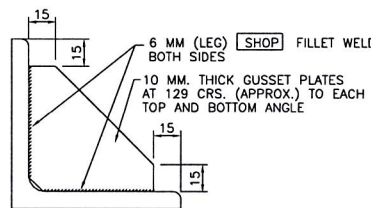
STIFFENER DETAIL

NOTE - 'X'
SHAPE OF EDGE PREPARATION FOR **SITE** WELDS TO BE DETERMINED BY CONTRACTOR TO SUIT HIS METHOD OF WORKING.

SITE FULL STRENGTH BUTT WELD (SEE NOTE - 'X')
M.S. LINER (10 MM. THICK)

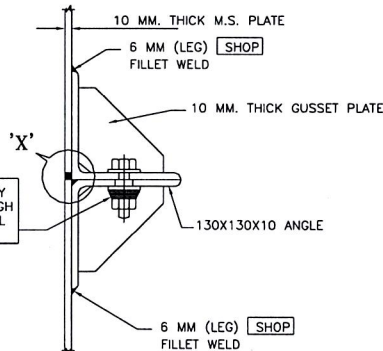


DETAIL - 'X'



SECTION B - B
(SHOWING GUSSET DETAIL)

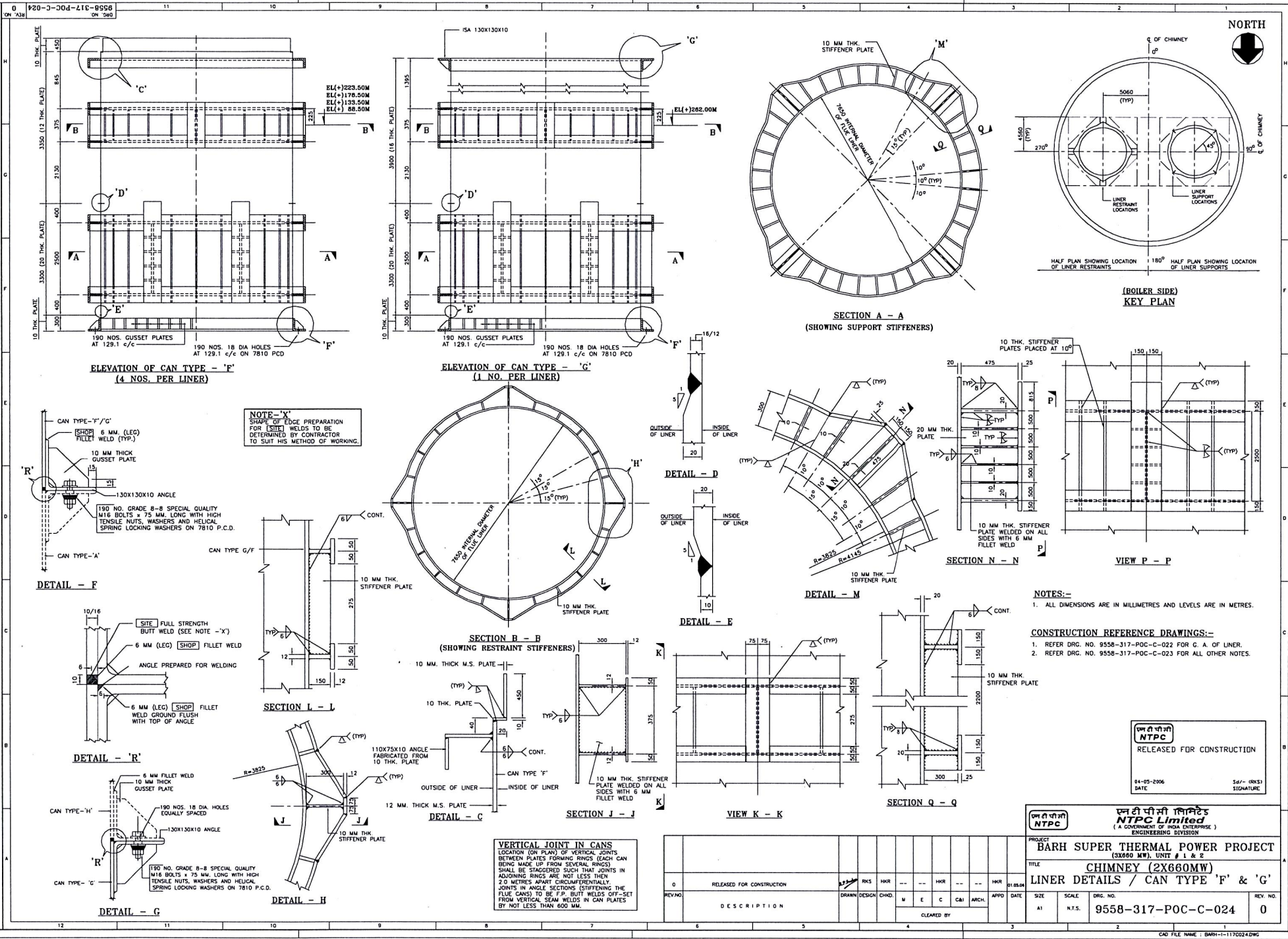
190 NO. GRADE 8-8 SPECIAL QUALITY M16 BOLTS x 75 MM. LONG WITH HIGH TENSILE NUTS, WASHERS AND HELICAL SPRING LOCKING WASHERS

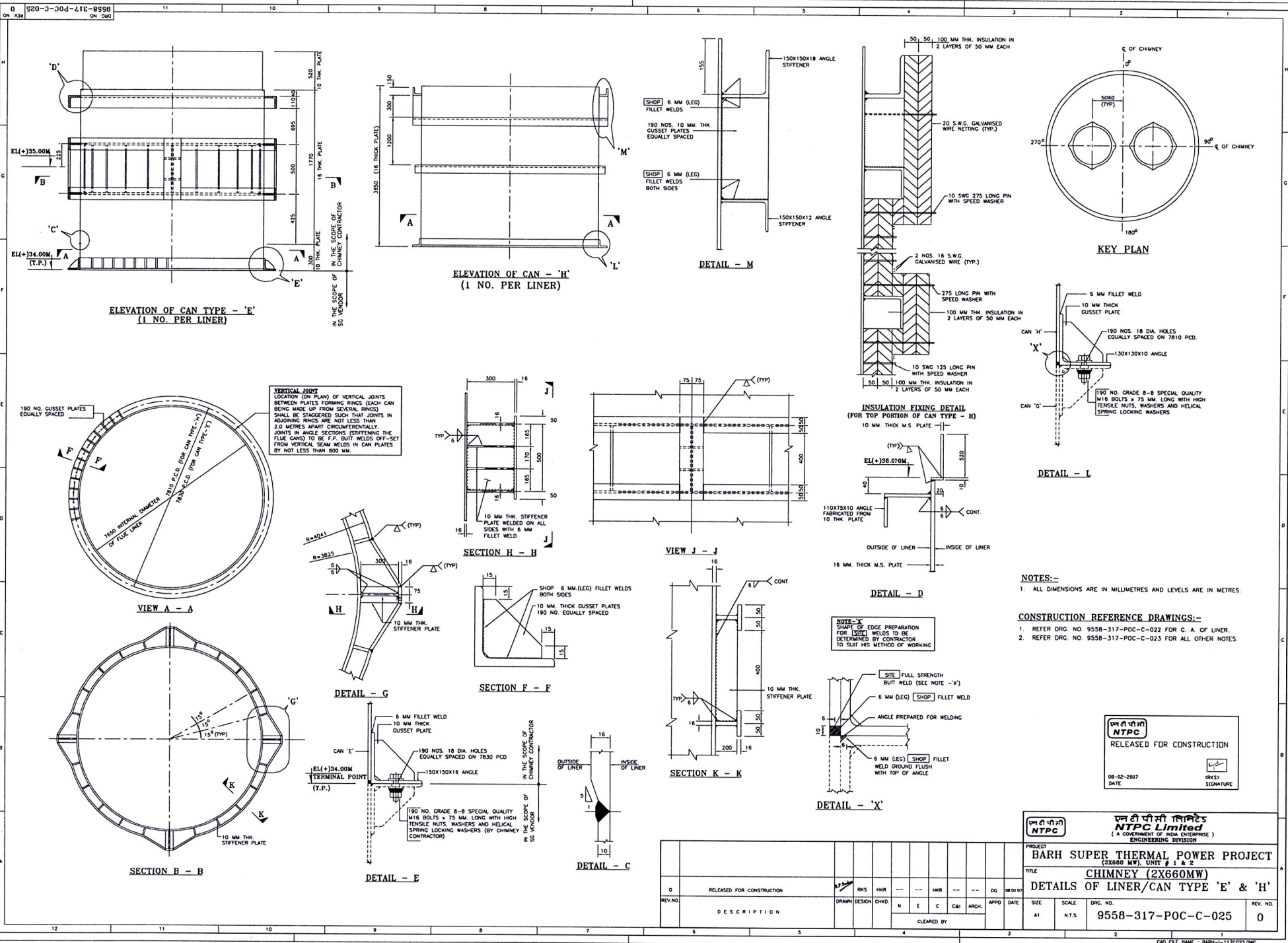


TYPICAL JOINT BETWEEN CANS

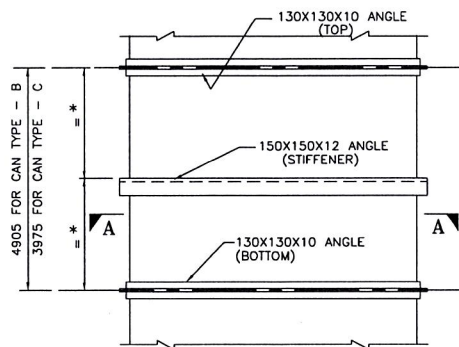
VERTICAL JOINT
LOCATION (ON PLAN) OF VERTICAL JOINTS BETWEEN PLATES FORMING RINGS (EACH CAN BEING MADE UP FROM SEVERAL RINGS) SHALL BE STAGGERED SUCH THAT JOINTS IN ADJOINING RINGS ARE NOT LESS THAN 2.0 METRES APART CIRCUMFERENTIALLY. JOINTS IN ANGLE SECTIONS (STIFFENING THE FLUE CANS) TO BE F.P. BUTT WELDS OFF-SET FROM VERTICAL SEAM WELDS IN CAN PLATES BY NOT LESS THAN 600 MM.

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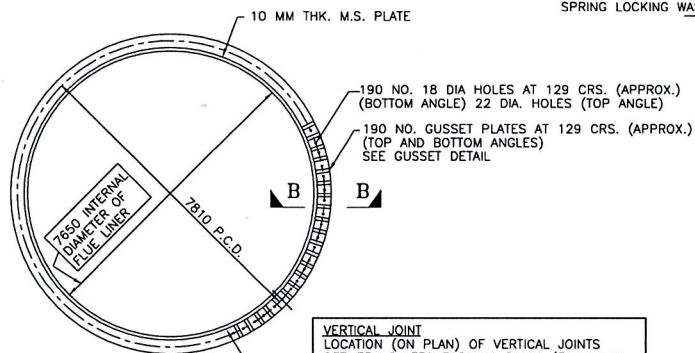
0 REV. NO. 9558-317-POC-C-026



ELEVATION OF CAN TYPE - B & C

CAN TYPE - B 2 NOS. PER LINER
CAN TYPE - C 3 NOS. PER LINER

* + 100 MM TO OFFSET CIRCUMFERENTIAL WELDS IN THE CANS, IF NECESSARY.

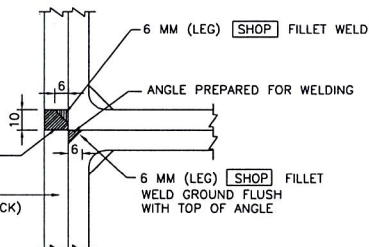


SECTION A - A

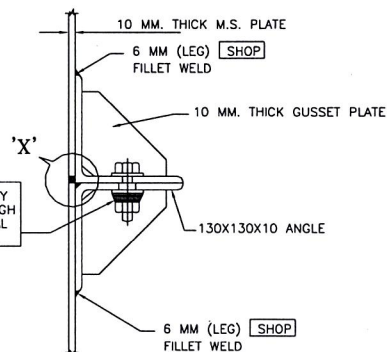
VERTICAL JOINT LOCATION (ON PLAN) OF VERTICAL JOINTS BETWEEN PLATES FORMING RINGS (EACH CAN BEING MADE UP FROM SEVERAL RINGS) SHALL BE STAGGERED SUCH THAT JOINTS IN ADJOINING RINGS ARE NOT LESS THAN 2.0 METRES APART CIRCUMFERENTIALLY. JOINTS IN ANGLE SECTIONS (STIFFENING THE FLUE CANS) TO BE F.P. BUTT WELDS OFF-SET FROM VERTICAL SEAM WELDS IN CAN PLATES BY NOT LESS THAN 600 MM.

NOTE-'X'
SHAPE OF EDGE PREPARATION FOR [SITE] WELDS TO BE DETERMINED BY CONTRACTOR TO SUIT HIS METHOD OF WORKING.

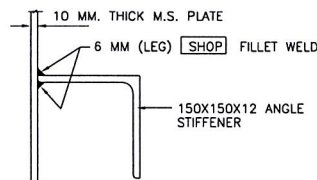
[SITE] FULL STRENGTH BUTT WELD (SEE NOTE -'X')
M.S. LINER (10 MM. THICK)



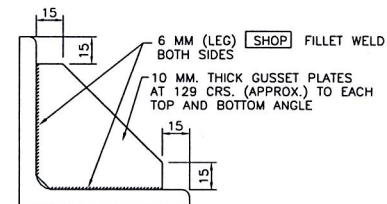
DETAIL - 'X'



TYPICAL JOINT BETWEEN CANS



STIFFENER DETAIL



SECTION B - B (SHOWING GUSSET DETAIL)

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS ARE IN METRES.

CONSTRUCTION REFERENCE DRAWINGS:-

1. DRAWING NO. 9558-317-POC-C-022 FOR GENERAL ARRANGEMENT OF LINER.
2. DRAWING NO. 9558-317-POC-C-023 FOR ALL OTHER NOTES.

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NTPC
RELEASED FOR CONSTRUCTION
08-12-2006
DATE
Sd/- (RKS)
SIGNATURE

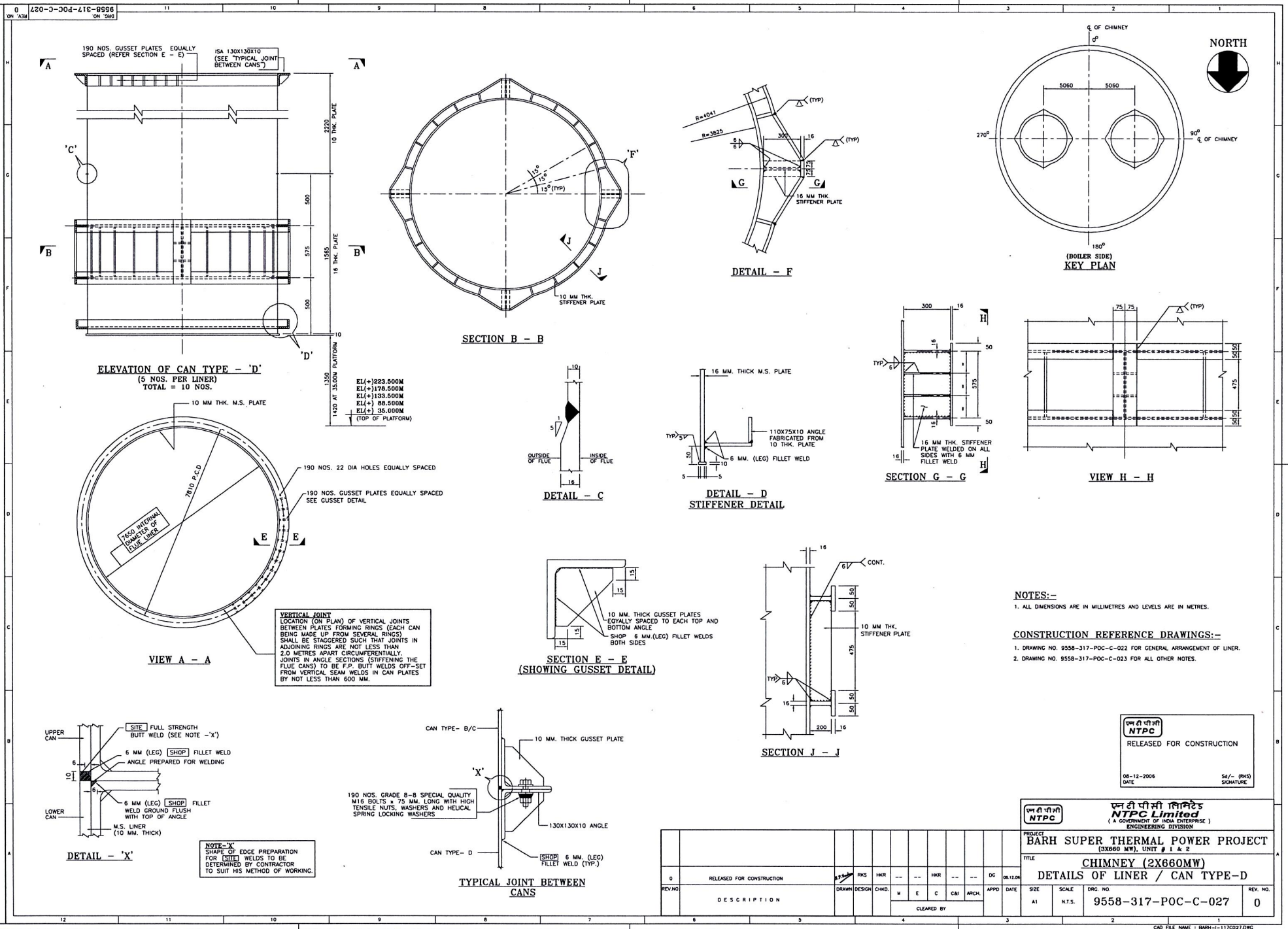
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NTPC

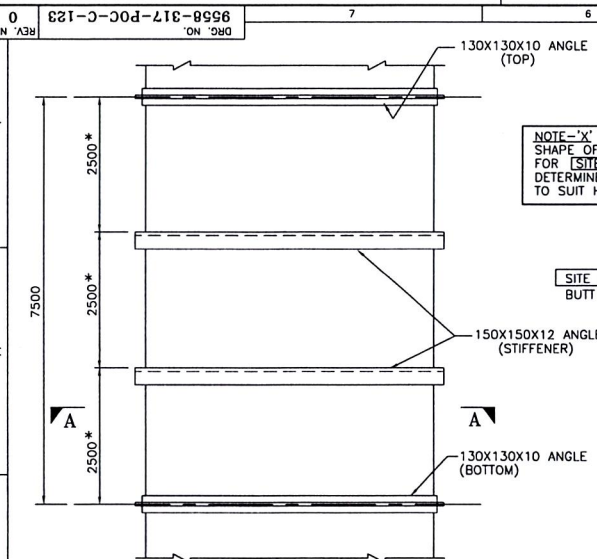
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PROJECT
BARH SUPER THERMAL POWER PROJECT
(3X660 MW). UNIT # 1 & 2

TITLE
CHIMNEY (2X660MW)
DETAILS OF LINER / CAN TYPE B & C

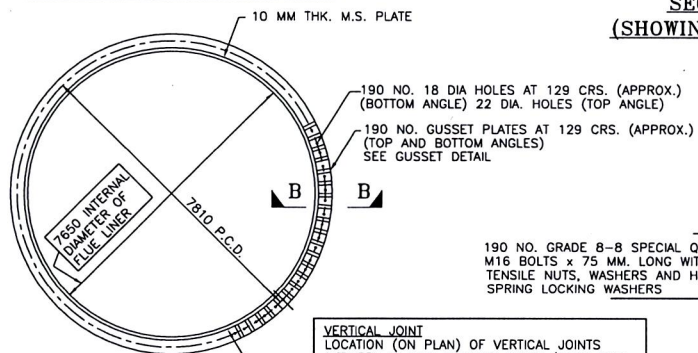
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Cleared By															



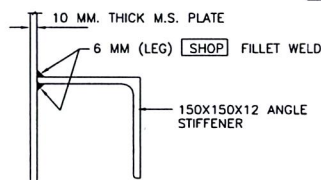


ELEVATION OF TYPICAL CAN-A
(TOTAL NOS. REQUIRED = 20)

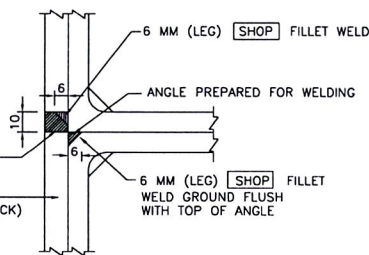
* ± 100 MM TO OFFSET CIRCUMFERENTIAL WELDS IN THE CANS, IF NECESSARY.



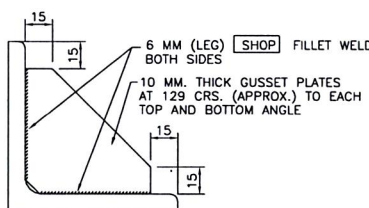
SECTION A - A



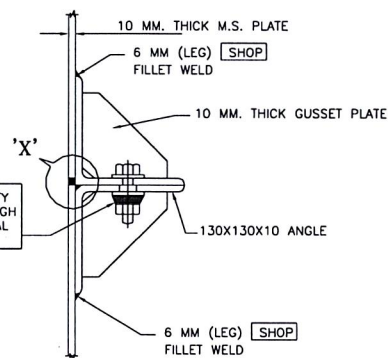
STIFFENER DETAIL



DETAIL - 'X'



SECTION B - B
(SHOWING GUSSET DETAIL)



TYPICAL JOINT BETWEEN CANS

190 NO. GRADE B-8 SPECIAL QUALITY M16 BOLTS x 75 MM. LONG WITH HIGH TENSILE NUTS, WASHERS AND HELICAL SPRING LOCKING WASHERS

VERTICAL JOINT
LOCATION (ON PLAN) OF VERTICAL JOINTS BETWEEN PLATES FORMING RINGS (EACH CAN BEING MADE UP FROM SEVERAL RINGS) SHALL BE STAGGERED SUCH THAT JOINTS IN ADJOINING RINGS ARE NOT LESS THAN 2.0 METRES APART CIRCUMFERENTIALLY. JOINTS IN ANGLE SECTIONS (STIFFENING THE FLUE CANS) TO BE F.P. BUTT WELDS OFF-SET FROM VERTICAL SEAM WELDS IN CAN PLATES BY NOT LESS THAN 600 MM.

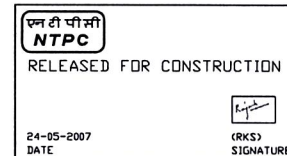
THIS DRAWING COVERS THE DETAILS OF CAN TYPE - A WHICH FORMS THE MAJOR PORTION OF THE LINER. THERE ARE 20 SUCH CANS IN THE LINER.

NOTES:-

- ALL DIMENSIONS ARE GIVEN IN MILLIMETRES.
- MILD STEEL PLATE AND ROLLED SECTIONS SHALL CONFORM TO GRADE A OF IS:2062 FOR MATERIALS UP TO 20 MM. IN THICKNESS. MATERIALS MORE THAN 20 MM. IN THICKNESS SHALL CONFORM TO NORMALISED GRADE B OF IS:2062.
- HOT ROLLED SECTIONS SHALL CONFORM TO IS:808 PARTS I TO VI.
- SPECIAL QUALITY BOLTS SHALL BE BLACK GRADE OF PROPERTY CLASS 8.8 CONFORMING TO IS:1367.
- WASHERS, NUTS AND HELICAL SPRING LOCKING WASHERS SHALL BE OF QUALITY CLASS NOT LESS THAN THAT OF THE BOLTS.
- WELDING SHALL CONFORM TO IS:816 & IS:9595 AND TO THE REQUIREMENTS OF THE SPECIFICATION.
- ALL SHOP WELDS USED TO CONNECT RADIUSED PLATES FORMING FLUE CANS AND OTHER BUTT WELDS, WHERE REQUIRED, SHALL BE FULL PENETRATION BUTT WELDS.
- ANY TEMPORARY STIFFENING STEEL WORK REQUIRED DURING FABRICATION, TRANSPORTATION OR ERECTION PURPOSES SHALL BE DESIGNED AND SUPPLIED BY THE CONTRACTOR. SUCH STEEL WORK SHALL BE REMOVED AND FLUE SURFACES MADE GOOD AFTER ERECTION.
- TESTING OF WELDS, UNLESS NOTED OTHERWISE ON THE DRAWINGS, SHALL BE AS FOLLOWS:-
 - FILLET WELDS
 - MACROETCH EXAMINATION ON PRODUCTION COUPONS.
 - 100 % DYE PENETRATION TEST/MAGNETIC PARTICLE TEST.
 - BUTT WELDS
 - 100 % DYE PENETRATION TEST AFTER BACK GAUGING.
 - 10 % (FOR SHOP WELDS) AND 15 % (FOR SITE WELDS) RADIOGRAPHY TEST. WHERE RADIOGRAPHY IS NOT POSSIBLE, ULTRASONIC TESTING WILL BE CARRIED OUT.
 - THE WELD RUN TO BE TESTED SHALL BE EVENLY DISTRIBUTED OVER THE TOTAL LENGTH OF APPLICABLE WELDS ON EACH CAN.
 - THE PERCENTAGE OF WELDS TESTED SHALL BE INCREASED AS JUDGED NECESSARY BY THE ENGINEER-IN-CHARGE, BUT TO NOT LESS THAN 20 % FOLLOWING IDENTIFICATION OF SIGNIFICANT AMOUNT OF DEFECTIVE WELDS AND ONLY REDUCED TO THE 10/15 % NORM AFTER CONSISTENT QUALITY / INTEGRITY IS RE-ESTABLISHED.
- THE TERM [SHOP] WELD REFERS TO ALL WELDS MADE DURING FABRICATION, OF INDIVIDUAL FLUE CANS AT FABRICATION YARD. [SITE] WELD REFERS TO WELDS MADE DURING FLUE ERECTION FOR JOINING TOGETHER OF CANS WITHIN WIND SHIELD.
- ALL FILLET AND BUTT WELDS ARE TO BE CONTINUOUS.

CONSTRUCTION REFERENCE DRAWINGS:-

- REFER DRG. NO. 9558-317-POC-C-122 FOR GENERAL ARRANGEMENT OF LINER.



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(A GOVERNMENT OF INDIA ENTERPRISE)
ENGINEERING DIVISION

PROJECT
BARH SUPER THERMAL POWER PROJECT
(3X660 MW), UNIT # 3

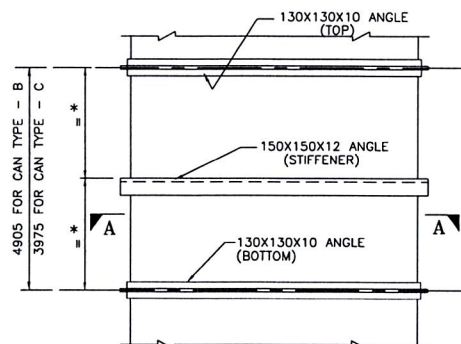
TITLE
CHIMNEY (1X660MW)
DETAILS OF LINER / CAN TYPE A

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE	SIZE	SCALE	DRG. NO.	REV. NO.
0	RELEASED FOR CONSTRUCTION										23.05.07	A2	N.T.S.	9558-317-POC-C-123	0
CLEARED BY															



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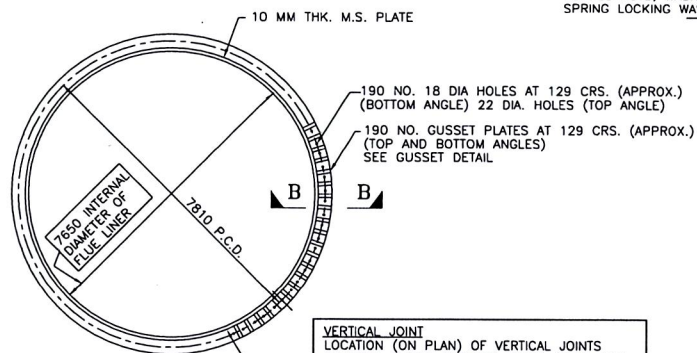
0 9558-317-POC-C-126
REV. NO. DRG. NO.



ELEVATION OF CAN TYPE - B & C

CAN TYPE - B 2 NOS.
CAN TYPE - C 3 NOS.

* ± 100 MM TO OFFSET CIRCUMFERENTIAL WELDS IN THE CANS, IF NECESSARY.

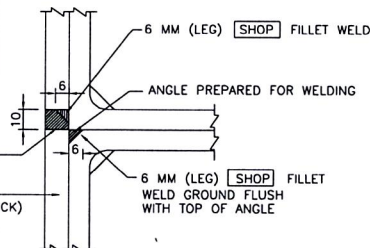


SECTION A - A

VERTICAL JOINT
LOCATION (ON PLAN) OF VERTICAL JOINTS BETWEEN PLATES FORMING RINGS (EACH CAN BEING MADE UP FROM SEVERAL RINGS) SHALL BE STAGGERED SUCH THAT JOINTS IN ADJOINING RINGS ARE NOT LESS THAN 2.0 METRES APART CIRCUMFERENTIALLY. JOINTS IN ANGLE SECTIONS (STIFFENING THE FLUE CANS) TO BE F.P. BUTT WELDS OFF-SET FROM VERTICAL SEAM WELDS IN CAN PLATES BY NOT LESS THAN 600 MM.

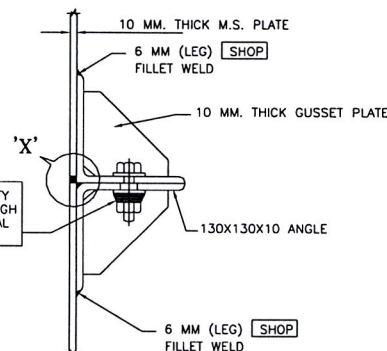
NOTE-'X'
SHAPE OF EDGE PREPARATION FOR [SITE] WELDS TO BE DETERMINED BY CONTRACTOR TO SUIT HIS METHOD OF WORKING.

[SITE] FULL STRENGTH BUTT WELD (SEE NOTE -'X')
M.S. LINER (10 MM. THICK)

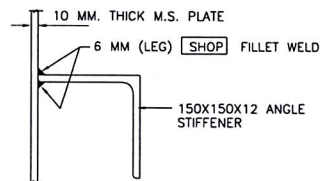


DETAIL - 'X'

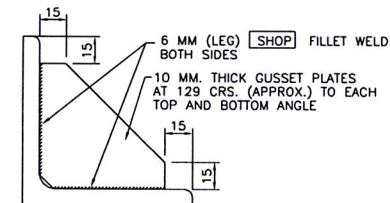
190 NO. GRADE B-8 SPECIAL QUALITY M16 BOLTS x 75 MM. LONG WITH HIGH TENSILE NUTS, WASHERS AND HELICAL SPRING LOCKING WASHERS



TYPICAL JOINT BETWEEN CANS



STIFFENER DETAIL



SECTION B - B
(SHOWING GUSSET DETAIL)

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS ARE IN METRES.

CONSTRUCTION REFERENCE DRAWINGS:-

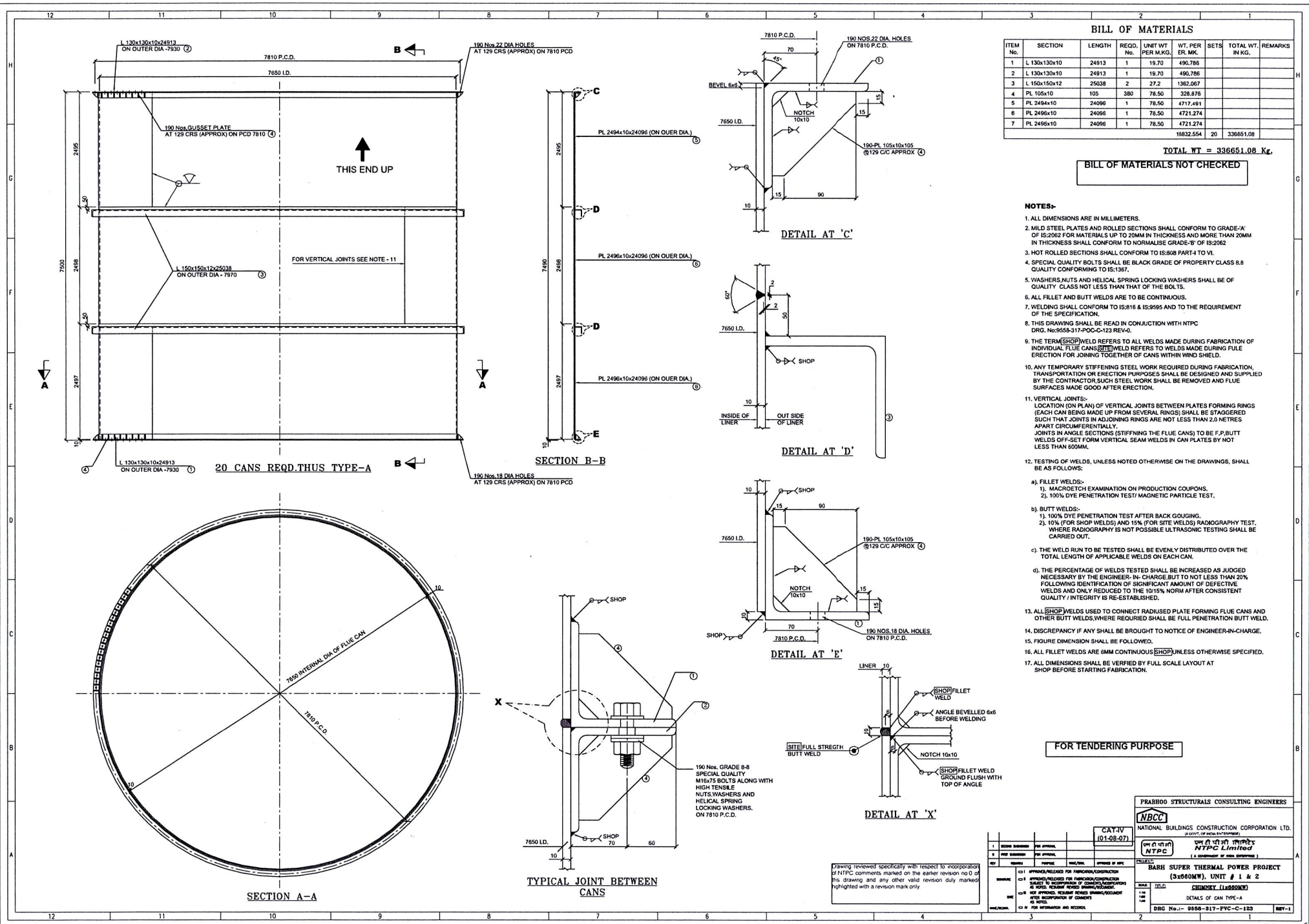
1. DRAWING NO. 9558-317-POC-C-122 FOR GENERAL ARRANGEMENT OF LINER.
2. DRAWING NO. 9558-317-POC-C-123 FOR ALL OTHER NOTES.

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NTPC
RELEASED FOR CONSTRUCTION
24-05-2007
DATE
SIGNATURE

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NTPC Limited
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ENGINEERING DIVISION

PROJECT
BARH SUPER THERMAL POWER PROJECT
(3X660 MW), UNIT # 3
TITLE
CHIMNEY (1X660MW)
DETAILS OF LINER / CAN TYPE B & C

REV. NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	M	E	C	C&I	ARCH.	APPD	DATE	SIZE	SCALE	DRG. NO.	REV. NO.
0	RELEASED FOR CONSTRUCTION											A2	N.T.S.	9558-317-POC-C-126	0
CLEARED BY															



ITEM	SECTION	LENGTH	REQD.	UNIT WT	WT. PER SETS	TOTAL WT	PER M KG	ER. MK	INS
1	PL 300x10x10	2112	1	125.8	114.4/77	125.8	114.4/77		
2	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
3	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
4	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
5	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
6	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
7	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
8	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
9	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
10	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
11	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
12	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
13	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
14	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
15	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
16	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
17	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
18	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
19	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
20	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
21	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
22	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		
23	PL 300x10x10	2112	1	157.0	125.6/106	157.0	125.6/106		

TOTAL WT. = 38,565.287 Kg.

BILL OF MATERIALS NOT CHECKED

CAT-IV : FOR
INFORMATI
ON.
2007.08.27
18:51:28
+05:30

- NOTES:-
1. ALL DIMENSIONS ARE IN MILLIMETERS & LEVELS IN METERS.
 2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH NTPC DRG. NOS:SSR-317-PNC-C-124 REV.0.
 3. ALL FILLET WELDS ARE 6MM CONTINUOUS BROWN.
 4. ALL DIMENSIONS SHALL BE VERIFIED BY FULL SCALE LAYOUT AT 1:10 SCALE.
 5. FOR ALL OTHER NOTES REFER DRG. NOS:SSR-317-PNC-C-123.
 6. FOR DETAILS OF CAT TYPE-F REFER SHEET-1 OF THIS DRAWING.

FOR TENDERING PURPOSE

PROJECT STRUCTURAL CONSULTING ENGINEERS

PROJECT: MAHARAJA SUPER THERMAL POWER PROJECT (3400MW), UNIT # (T-2)-3

CLIENT: MAHARAJA SUPER THERMAL POWER PROJECT

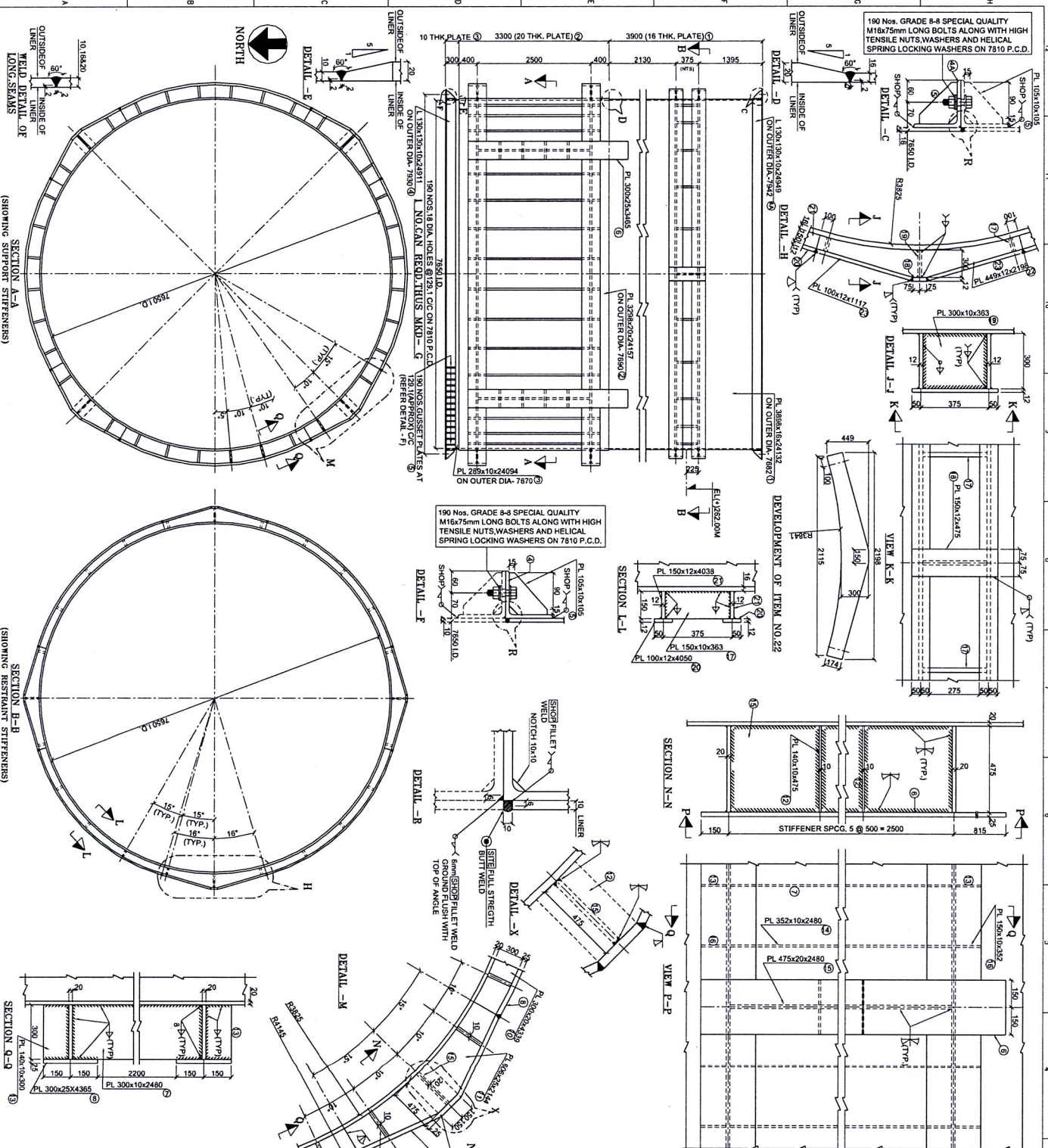
DESIGNER: PROJECT ENGINEER

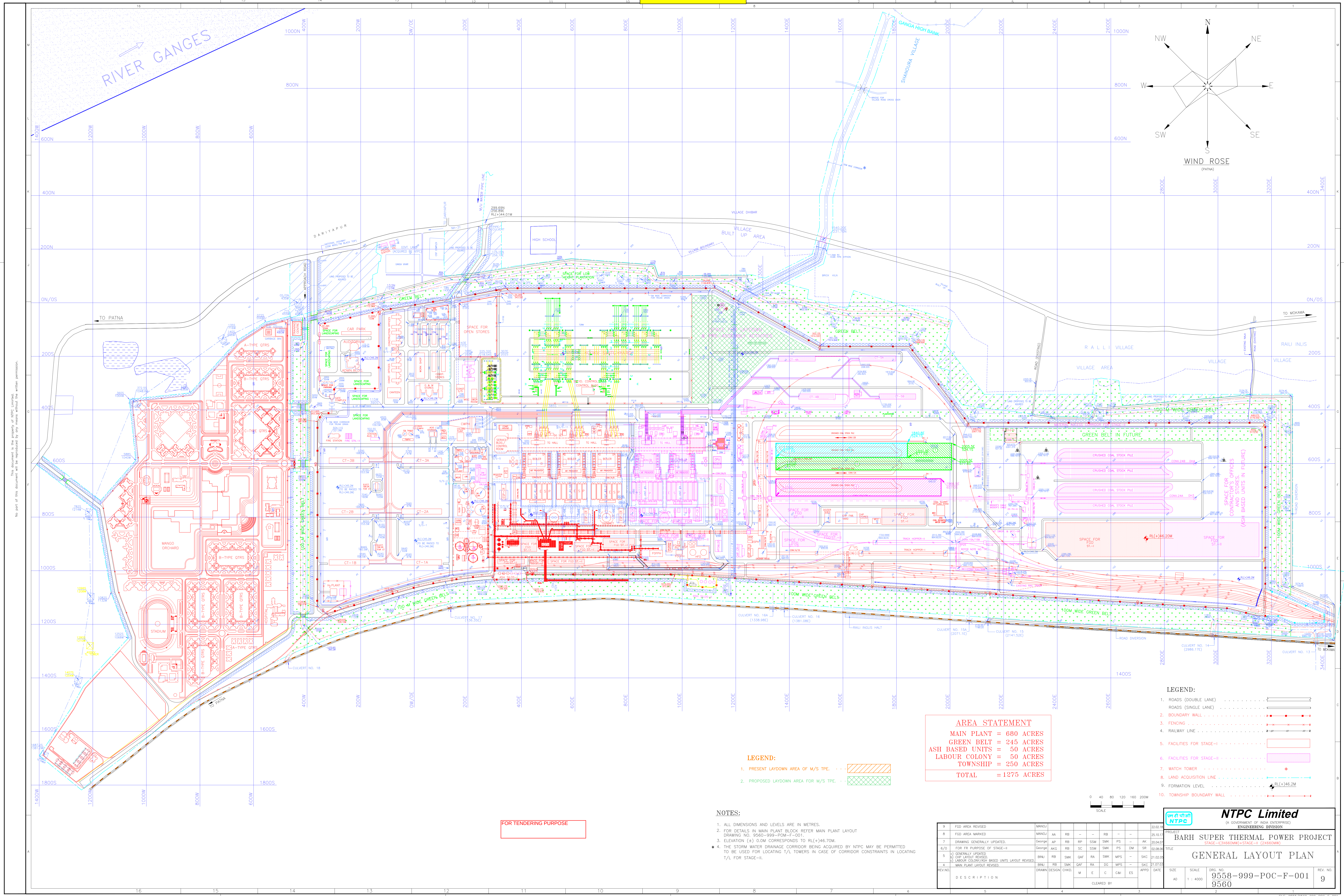
CHECKED: PROJECT ENGINEER

DATE: 2007.08.27

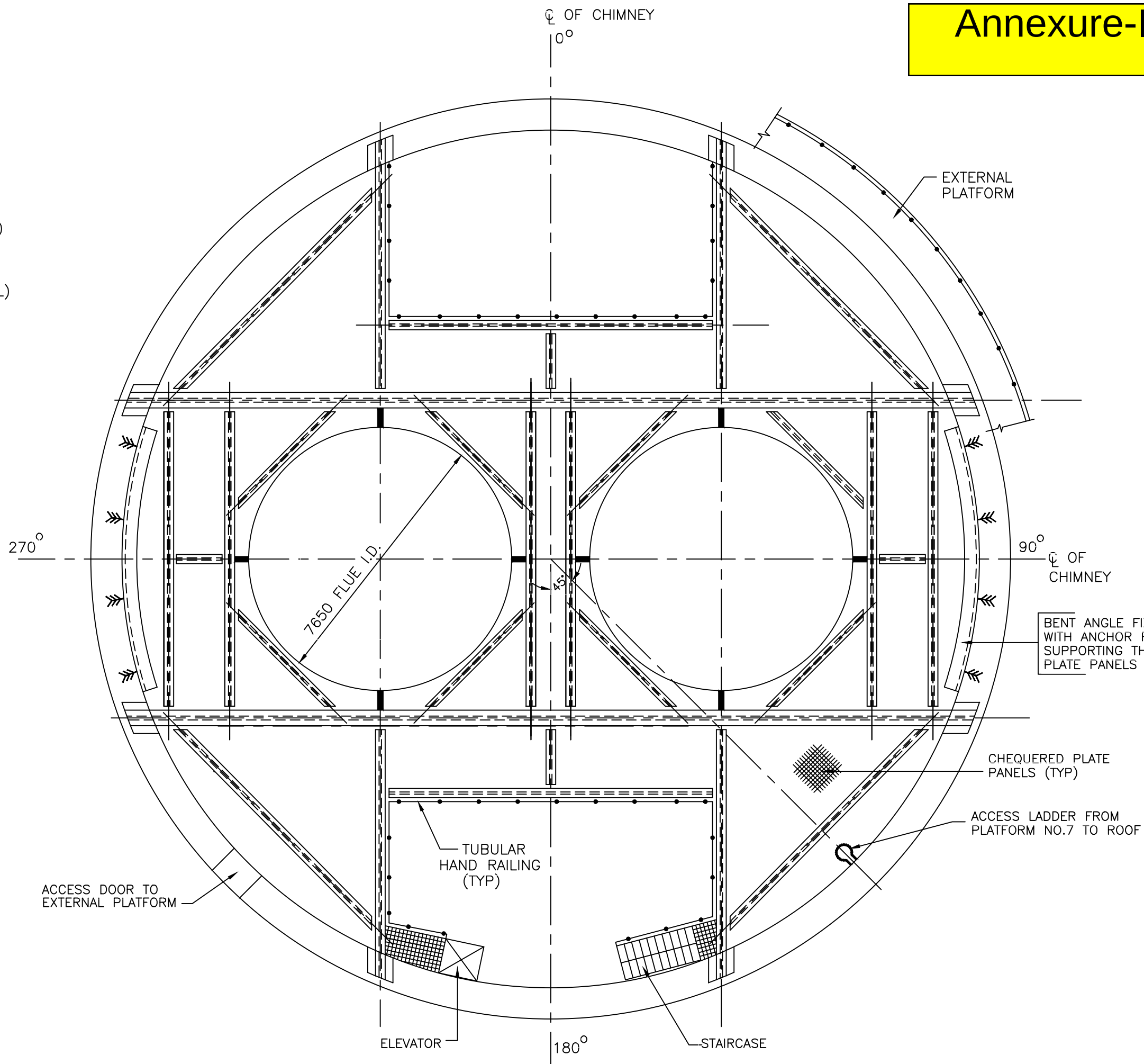
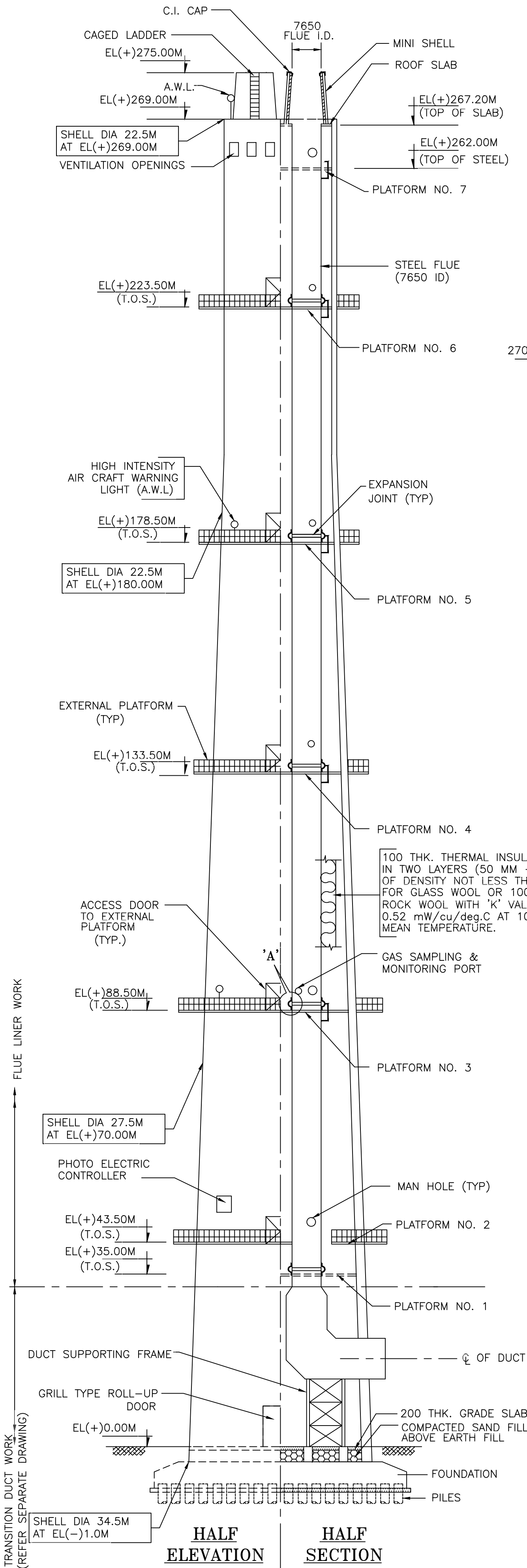
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DRG. NO.: SSR-317-PNC-C-124 REV.0

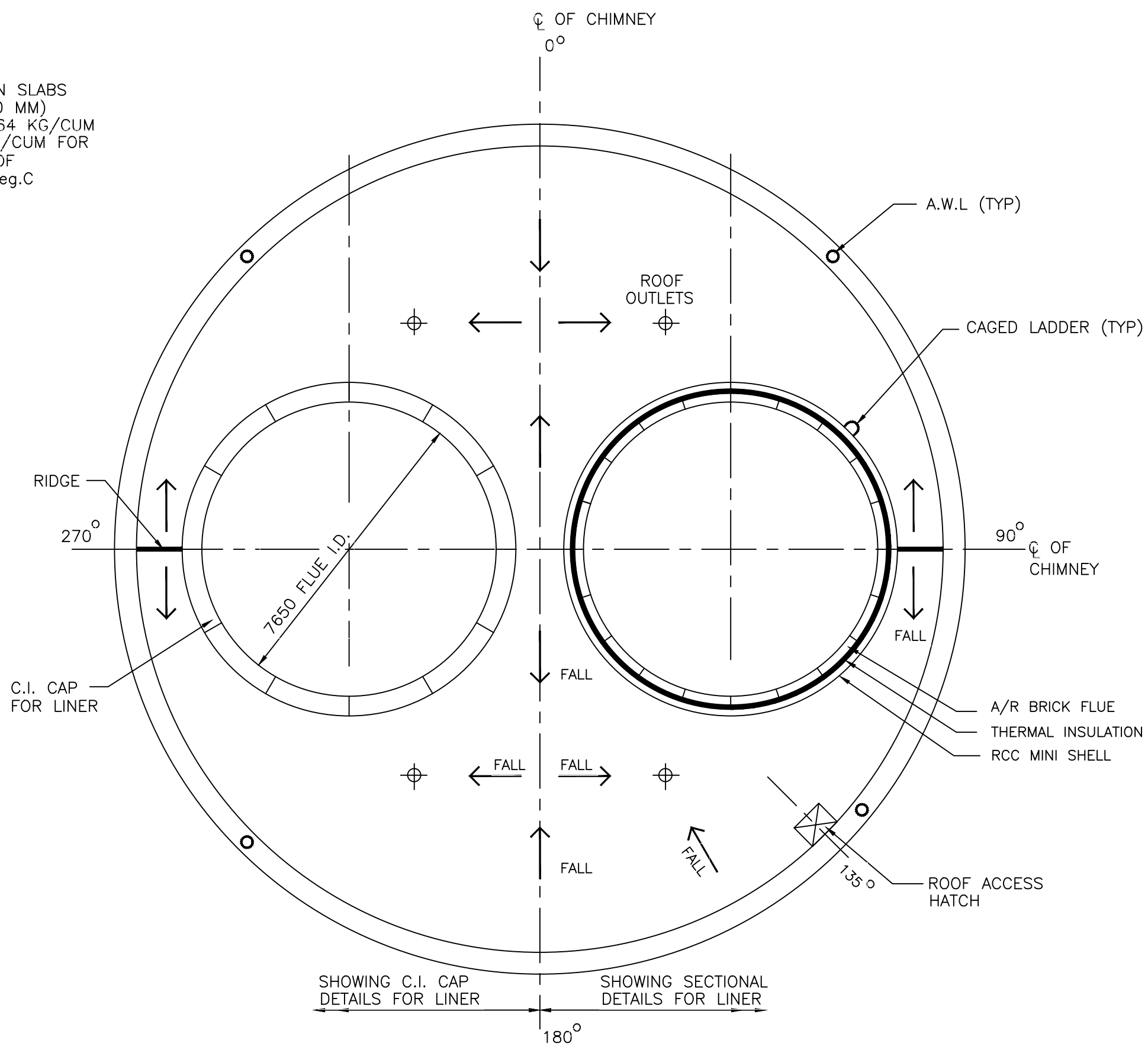




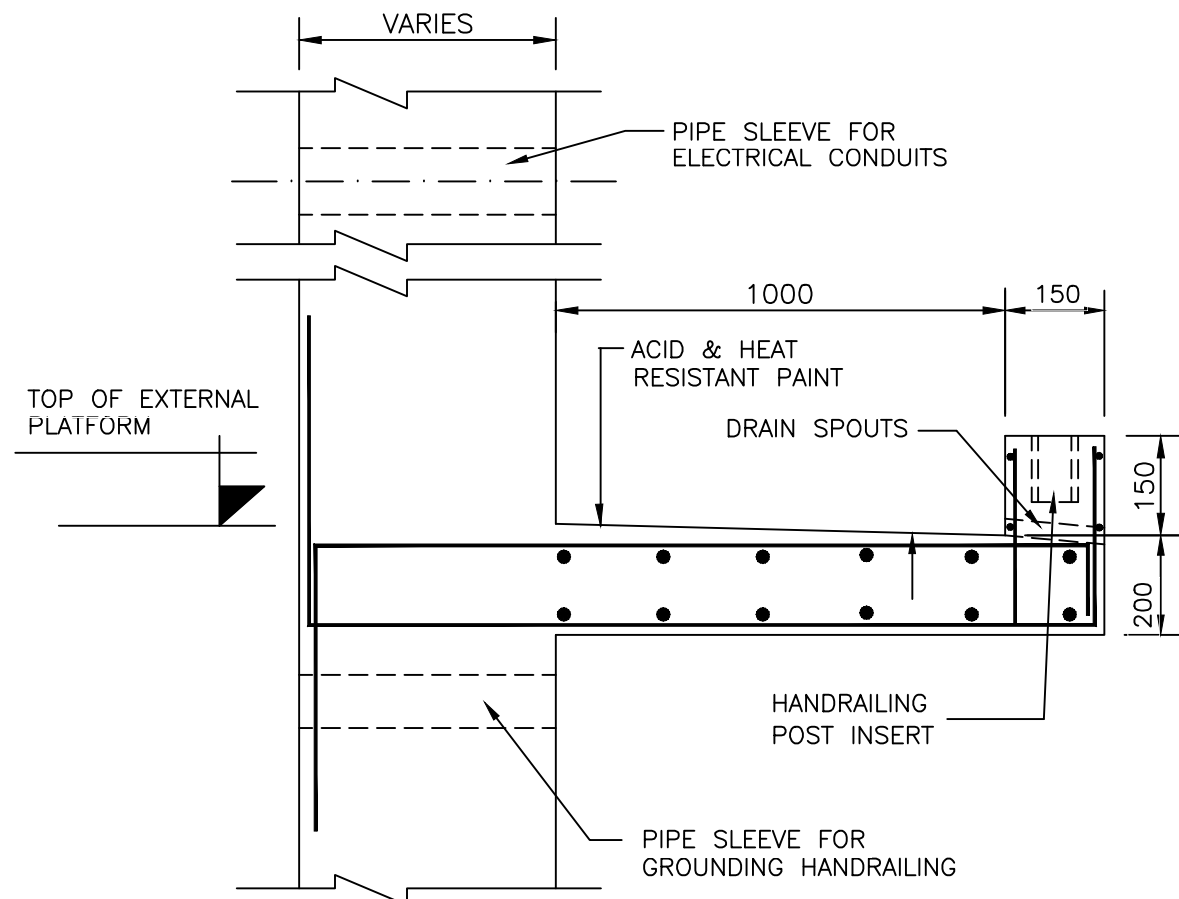
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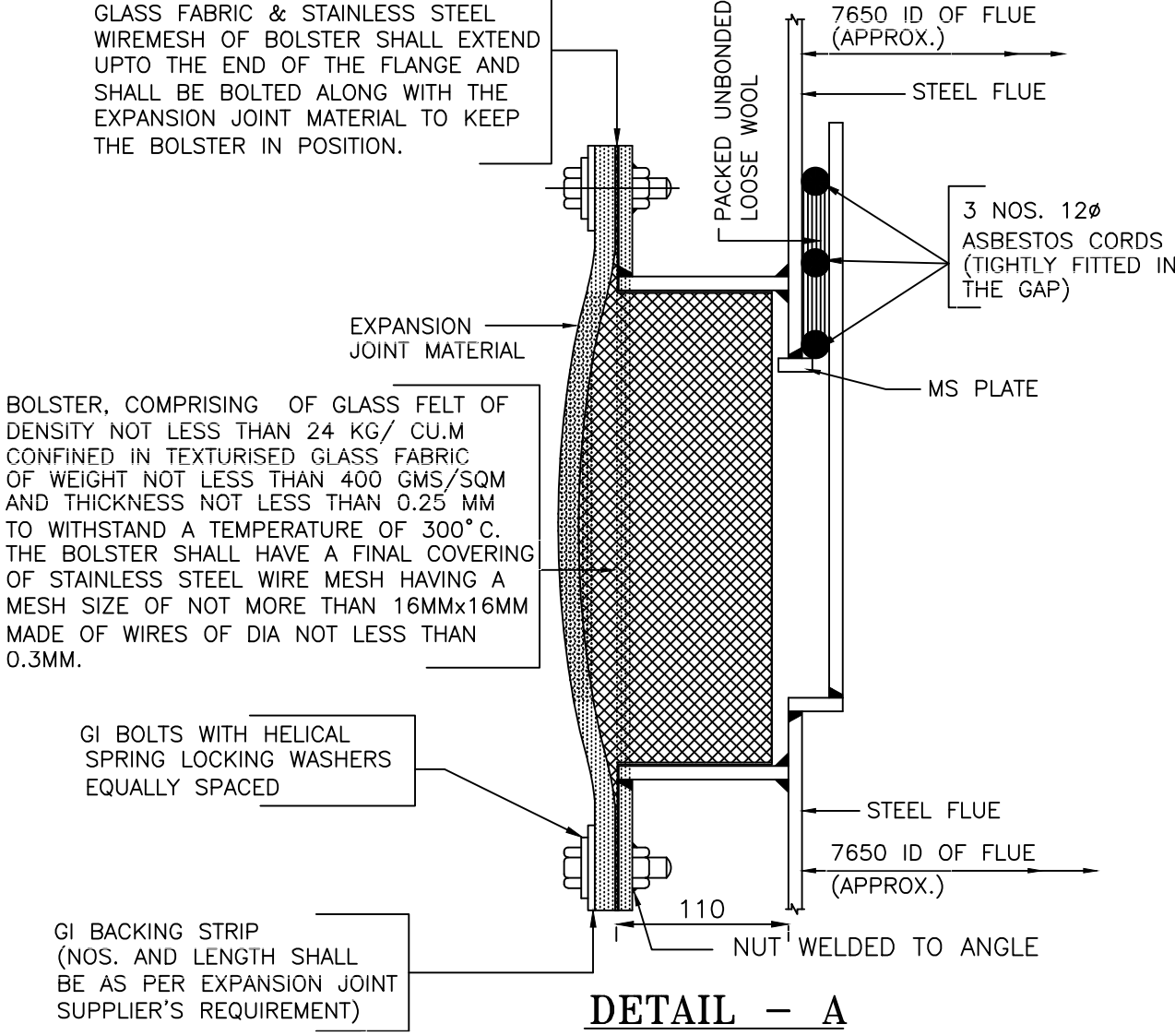
TYPICAL FLOOR PLAN (BOILER SIDE)



ROOF PLAN (BOILER SIDE)



DETAILS OF EXTERNAL PLATFORM

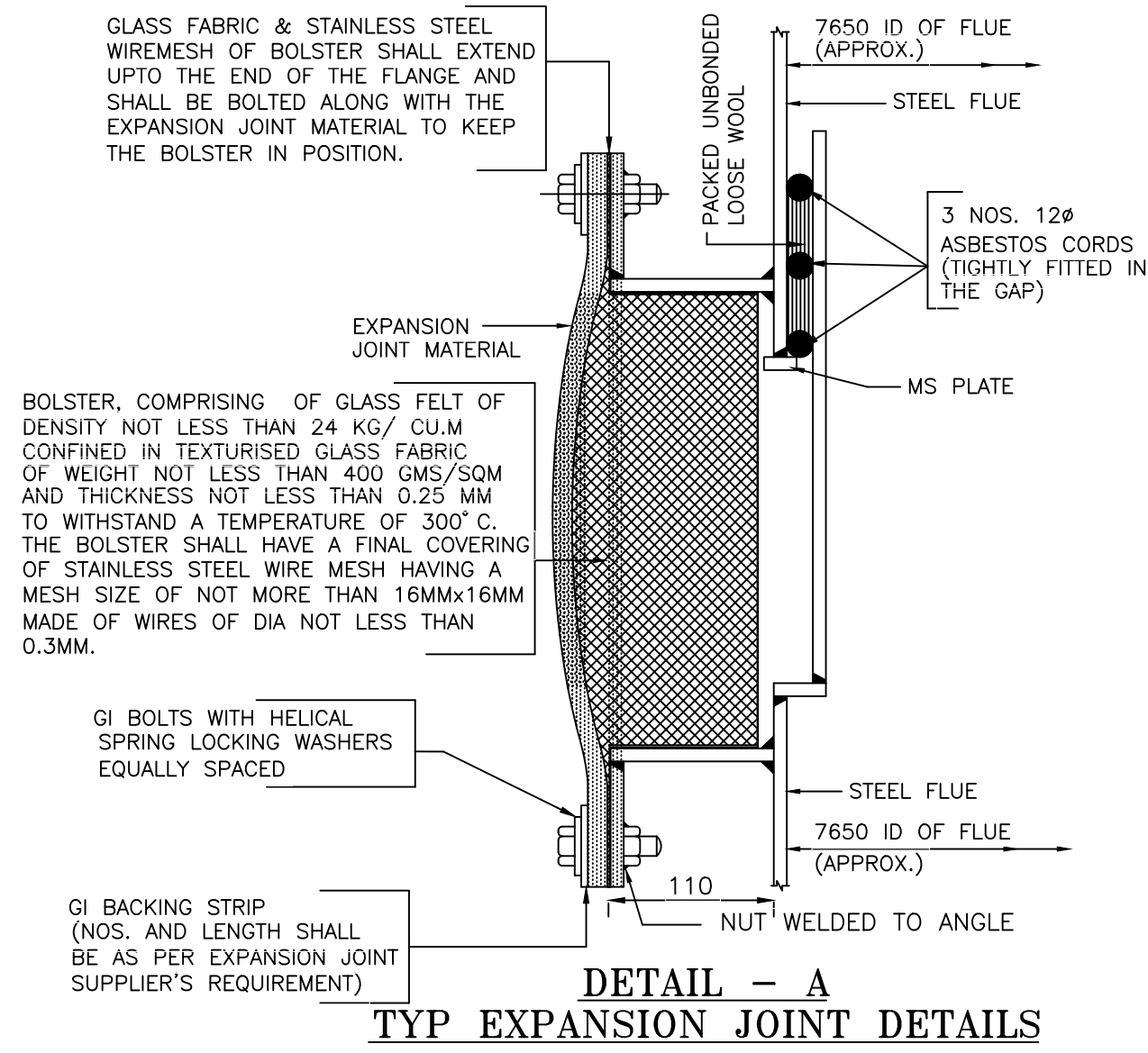
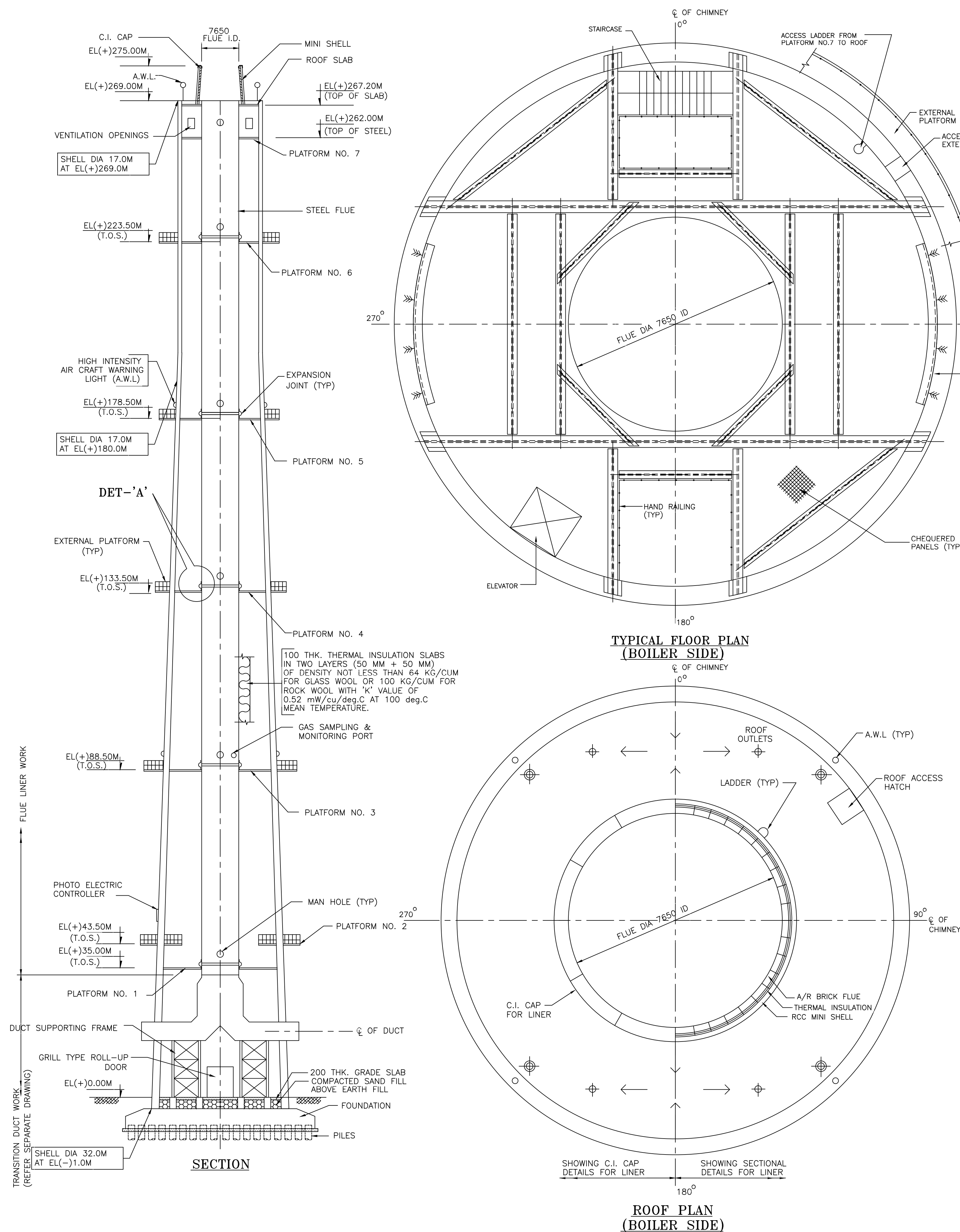


FOR TENDERING PURPOSE

NOTES:-
1. ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS ARE IN METRES.
2. EL(+/-) CORRESPONDS TO RL(+/-)46.70M.

FOR TENDER PURPOSE ONLY

PROJECT				
BARH SUPER THERMAL POWER PROJECT (3X660 MW)				
TITLE				
GENERAL ARRANGEMENT OF TWIN FLUE CHIMNEY FOR UNITS 1 & 2 (2X660 MW)				
SIZE	SCALE	DRG. NO.	REV. NO.	
A2	NTS	9558-317-POC-A-001	A	

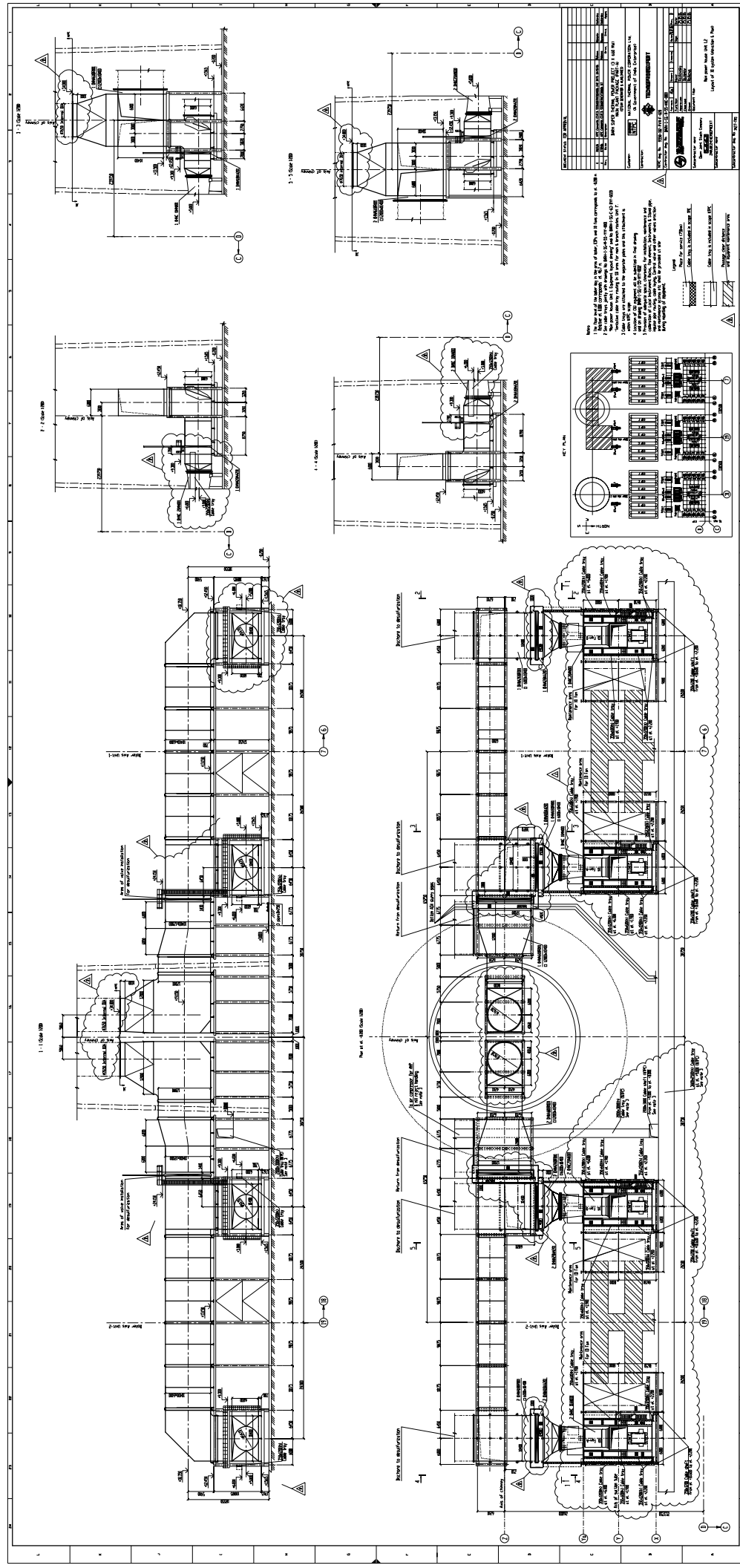


FOR TENDERING PURPOSE

- NOTES:-**
- ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS ARE IN METRES.
 - EL(+/-) CORRESPONDS TO RL(+/-)46.70M.

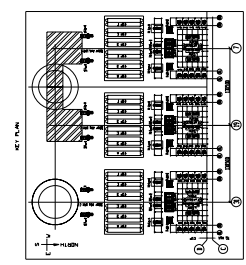
FOR TENDER PURPOSE ONLY

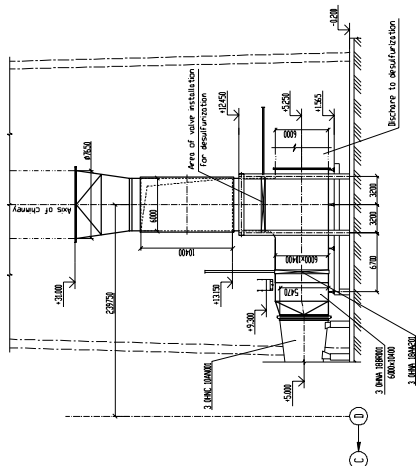
PROJECT			
BARH SUPER THERMAL POWER PROJECT (3x660 MW)			
TITLE			
GENERAL ARRANGEMENT OF SINGLE FLUE CHIMNEY FOR UNIT 3 (1x660 MW)			
SIZE	SCALE	DRG. NO.	REV. NO.
A2	NTS	9558-317-POC-A-001	A

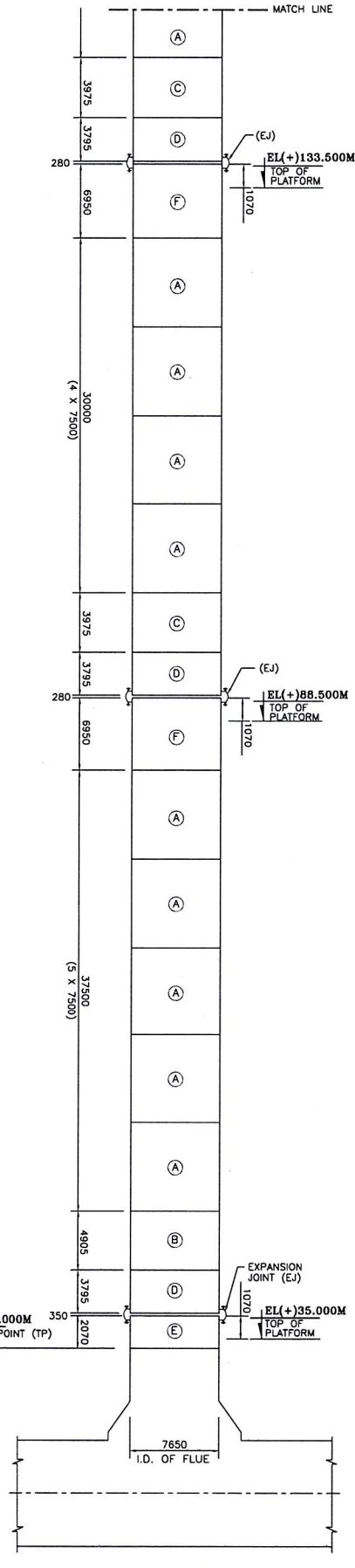


GENERAL NOTES	
1. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	
2. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	
3. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	
4. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	
5. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	
6. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	
7. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	
8. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	
9. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	
10. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	

NOTES	
1. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	
2. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	
3. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	
4. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	
5. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	
6. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	
7. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	
8. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	
9. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	
10. The building is to be constructed in accordance with the requirements of the Building Code of the City of New York.	







NOTES:-

ENGINEERING REFERENCE DRAWING(S):-

CONSTRUCTION REFERENCE DRAWINGS:-

- प्राचीन
NTPC

RELEASED FOR CONSTRUCTION

DATE 26-09-2007

**(CRKS)
SIGNATURE**

एन टी पी सी लिमिटेड
NTPC Limited
(A GOVERNMENT OF INDIA ENTERPRISE)

(A GOVERNMENT OF INDIA ENTERPRISE)

PROJECT BARH SUPER THERMAL POWER PROJECT (200000 MW) RETURN TO 2

(3A660 MW), UNIT # 3

TITLE
CHIMNEY (1X660MT)
GENERAL ARRANGEMENT OF LINER

A2	N.T.S.	9558-317-POC-C-122
----	--------	--------------------

REV. NO
0

PROJECT										BARH SUPER THERMAL POWER PROJECT (32X60 MW), UNIT # 3									
TITLE										CHIMNEY (1X60MW) GENERAL ARRANGEMENT OF LINER									
REVNO										REV. NO									
0										0									
RELEASED FOR CONSTRUCTION										9558-317-P0C-C-122									
DESCRIPTION										A2									
DRAWN DESIGN										SCALE									
CHKD.										DRC. NO.									
M										N.T.S.									
E										0									
C										0									
ARCH.										0									
DATE										0									
APPRO										0									
CLEARED BY										0									

CAD FILE NAME : BARRH-1-117C122.DWG

SUB-SECTION-II-A10

PROJECT INFORMATION- BARH-I 3X660 MW

LOT-IA PROJECTS
FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI
BID DOCUMENT NO.: CS-0011-109(1A)-2

CLAUSE NO.	Project Information			
1.00.00	BACKGROUND Barh Super Thermal Power Project, Stage-I (3x660 MW) & Stage-II (2 x 660MW) coal based is being set up by NTPC near Barh town in Patna district of Bihar.			
1.01.00	LOCATION AND APPROACH The proposed power station is located at the latitude and longitude of 25 deg 29' 10" (N) and 85 deg. 45' 40" (E) respectively. The plant site is situated between National Highway (NH-31) and Patna-Mokama main railway line. The ash disposal area is located on the south of the railway line. Barh, the nearest town, is about 4.0 kms away from the project site. The nearest rail head Barh Railway Station on Patna - Mokama Section of main trunk route, is approximately 3.0 km away from the project site. The nearest airport at Patna is located at a distance of approximately 75 kms from the project site. The Vicinity Plan of the project is enclosed at drawing section at Annexure-I. The nearest airport at Patna is located at a distance of approximately 75 kms. from the project site. The Vicinity Plan of the project is enclosed at ANNEXURE-I. Further to the information's given in this sub-section, Bidders are also advised visit the project site and collect data on local site conditions.			
1.02.00	LAND About 3200 acres of land is acquired/under acquisition under Stage-I of the project. No additional land is envisaged to be acquired under Stage-II. The plant, ash disposal and township shall be accommodated within the land acquired/under acquisition under Stage-I.			
1.03.00	WATER The project site is located near the river Ganges. The make up water requirement for the expansion project is approximately 71 cusecs and the same is proposed to be drawn from river Ganges near village Nawada, at a distance of 2.0 kms. Make-up water pump house is already constructed at the river end in Stage-I with space provision for Stage-II pumps and the plant water requirement will be pumped to the plant through makeup water piping.			
1.04.00	COAL a) Coal requirement for the project shall be met from Amrapali block of North Karanpura Coalfields of CCL. b) The coal quality parameters and Fuel oil characteristics are attached below.			
1.05.00	RAILWAY SIDING For brining the equipment and material to the power house through rail, a permanent railway siding is proposed to be constructed near the project site to provide rail access to unloading bays and transformer yard.			
1.06.00	Steam Generator and ESP data: refer Table-6.			
2.00.00	NOT USED			
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.: CS-0011-109 (1A)-2	SUB SECTION II-A10 PROJECT INFORMATION BARH STPP STAGE-I (3X660 MW)	PAGE 1 OF 30

CLAUSE NO.	Project Information 		
3.00.00	Capacity Stage-I : 3 x 660 MW - Under Construction -Present proposal Stage-II : 2 x 660 MW - Under Operation		
4.00.00	METEOROLOGICAL DATA The meteorological data from the nearest observatory at Patna is placed as ANNEXURE-II.		
5.00.00	CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT All structures and equipment shall be designed for seismic forces adopting the site specific seismic information provided in this document and using the other provisions in accordance with IS:1893 (Part 1 to Part 4). Pending finalization of Part 5 of IS:1893, provisions of part 1 shall be read along with the relevant clauses of IS:1893:1984, for embankments. A site specific seismic study has been conducted for the project site. The peak ground horizontal acceleration for the project site, the site specific acceleration spectral coefficients (in units of gravity acceleration 'g') in the horizontal direction for the various damping values and the multiplying factor (to be used over the spectral coefficients) for evaluating the design acceleration spectra are as given at Appendix-I. Vertical acceleration spectral values shall be taken as 2/3rd of the corresponding horizontal values. The site specific design acceleration spectra shall be used in place of the response acceleration spectra, given at figure-2 in IS:1893 (Part 1) and Annex B of IS:1893 (Part 4). The site specific acceleration spectra along with multiplying factors specified in Appendix-I includes the effect of the seismic environment of the site, the importance factor related to the structures and the response reduction factor. Hence, the design spectra do not require any further consideration of the zone factor (Z), the importance factor (I) and response reduction factor (R) as used in the IS:1893 (Part 1 to Part 4).		
LOT-IA PROJECTS FLUE GAS DESHULPURISATION (FGD) PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.: CS-0011-109 (1A)-2	SUB SECTION II-A10 PROJECT INFORMATION BARH STPP STAGE-I (3X660 MW)
PAGE 2 OF 30			

CLAUSE NO.	Project Information																			
	Damping in Structures The damping factor (as a percentage of critical damping) to be adopted shall not be more than as indicated below for: <table border="1" data-bbox="395 571 1372 844"> <tr> <td>a)</td> <td>Steel structures</td> <td>:</td> <td>2%</td> </tr> <tr> <td>b)</td> <td>Reinforced Concrete structures</td> <td>:</td> <td>5%</td> </tr> <tr> <td>c)</td> <td>Reinforced Concrete Stacks</td> <td>:</td> <td>3%</td> </tr> <tr> <td>d)</td> <td>Steel stacks</td> <td>:</td> <td>2%</td> </tr> </table>				a)	Steel structures	:	2%	b)	Reinforced Concrete structures	:	5%	c)	Reinforced Concrete Stacks	:	3%	d)	Steel stacks	:	2%
a)	Steel structures	:	2%																	
b)	Reinforced Concrete structures	:	5%																	
c)	Reinforced Concrete Stacks	:	3%																	
d)	Steel stacks	:	2%																	
LOT-IA PROJECTS FLUE GAS DESULPHURISATION (FGD) PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.: CS-0011-109 (1A)-2	SUB SECTION II-A10 PROJECT INFORMATION BARH STPP STAGE-I (3X660 MW)	PAGE 3 OF 30																	

CLAUSE NO.	Project Information एन टी पी सी NTPC		
	1.01.00 Method of Analysis Since most structures in a power plant are irregular in shape and have irregular distribution of mass and stiffness, dynamic analysis for obtaining the design seismic forces shall be carried out using the response spectrum method. The number of vibration modes used in the analysis should be such that the sum total of modal masses of all modes considered is at least 90 percent of the total seismic mass and shall also meet requirements of IS:1893 (Part 1). Modal combination of the peak response quantities shall be performed as per Complete Quadratic Combination (CQC) method or by an acceptable alternative as per IS:1893 (Part 1). In general, seismic analysis shall be performed for the three orthogonal (two principal horizontal and one vertical) components of earthquake motion. The seismic response from the three components shall be combined as specified in IS:1893 (Part 1). The spectral acceleration coefficient shall get restricted to the peak spectral value if the fundamental natural period of the structure falls to the left of the peak in the spectral acceleration curve. For buildings, if the design base shear (V_B) obtained from modal combination is less than the base shear ($\bar{V}_B$) computed using the approximate fundamental period (T_a) given in IS:1893:Part 1 and using site specific acceleration spectra with appropriate multiplying factor, the response quantities (e.g. member forces, displacements, storey forces, storey shears and base reactions) shall be enhanced in the ratio of $\bar{V}_B / V_B$. However, no reduction is permitted if $\bar{V}_B$ is less than V_B. For regular buildings less than 12m in height, design seismic base shear and its distribution to different floor levels along the height of the building may be carried out as specified under clause 7.5, 7.6 & 7.7 of IS:1893 (Part 1) and using site specific design acceleration spectra. The design horizontal acceleration spectrum value (A_h) shall be computed for the fundamental natural period as per clause 7.6 of IS:1893 (Part 1) using site specific spectral acceleration coefficients with appropriate multiplying factor given in Appendix-I. Design/Detailing for Ductility for Structures The site specific design acceleration spectra is a reduced spectra and has an in-built allowance for ductility. Structures shall be engineered and detailed in accordance with relevant Indian/International standards to achieve ductility.		
LOT-IA PROJECTS FLUE GAS DESHULPURISATION (FGD) PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.: CS-0011-109 (1A)-2	SUB SECTION II-A10 PROJECT INFORMATION BARH STPP STAGE-I (3X660 MW)	PAGE 4 OF 30

CLAUSE NO.	Project Information	एनटीपीसी NTPC	
	APPENDIX – I (Contd.) <u>SITE SPECIFIC SEISMIC PARAMETERS FOR DESIGN OF STRUCTURES AND EQUIPMENT</u> The various site specific seismic parameters for the project site shall be as follows: 1) Peak ground horizontal acceleration : 0.24g 2) Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') to obtain the design acceleration spectra a) for moment resisting steel frames designed and detailed as per IS:800 : 0.072 b) for braced steel frames designed and detailed as per IS:800 : 0.054 c) for moment resisting RC frames designed and detailed as per IS:456 and IS:13920 : 0.043 d) for RCC Chimney : 0.144 e) for Liquid retaining tanks : 0.087 f) for Steel chimney, Absorber tower : 0.11 g) for design of structures not covered under 2 (a) to 2 (f) above and under 3 below : 0.072 3) Multiplying factor to be applied to the site specific horizontal acceleration spectral coefficients (in units of gravity acceleration 'g') for design of equipment and structures where inelastic action is not relevant or not permitted : 0.144 Note: g = Acceleration due to gravity The horizontal seismic acceleration spectral coefficients are furnished in subsequent pages.		
LOT-IA PROJECTS FLUE GAS DESHULPURISATION (FGD) PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.: CS-0011-109 (1A)-2	SUB SECTION II-A10 PROJECT INFORMATION BARH STPP STAGE-I (3X660 MW)	PAGE 5 OF 30

APPENDIX – I (Contd.)**HORIZONTAL SEISMIC ACCELERATION SPECTRAL COEFFICIENTS****In units of 'g' for BARH STPP**

Period (Sec)	Damping Factor (as a percentage of critical damping)					
	0.80%	1%	1.60%	2%	3%	5%
0.000	1.000	1.000	1.000	1.000	1.000	1.000
0.030	1.000	1.000	1.000	1.000	1.000	1.000
0.040	1.373	1.361	1.327	1.310	1.275	1.212
0.050	1.755	1.728	1.653	1.615	1.539	1.406
0.058	2.066	2.026	1.913	1.856	1.744	1.552
0.059	2.106	2.063	1.945	1.886	1.770	1.570
0.060	2.145	2.101	1.978	1.916	1.795	1.588
0.061	2.184	2.138	2.010	1.946	1.820	1.605
0.062	2.224	2.176	2.043	1.976	1.845	1.623
0.065	2.343	2.289	2.140	2.065	1.920	1.675
0.070	2.542	2.478	2.302	2.214	2.044	1.760
0.071	2.582	2.516	2.334	2.244	2.069	1.776
0.074	2.702	2.630	2.431	2.332	2.143	1.826
0.084	3.107	3.012	2.754	2.627	2.385	1.987
0.094	3.516	3.398	3.077	2.919	2.622	2.142
0.104	3.930	3.787	3.398	3.210	2.856	2.292
0.114	4.349	4.178	3.720	3.498	3.086	2.436
0.120	4.608	4.414	3.912	3.671	3.222	2.521
0.121	4.608	4.445	3.944	3.699	3.245	2.535
0.123	4.608	4.445	4.018	3.757	3.290	2.563
0.124	4.608	4.445	4.018	3.798	3.313	2.577
0.126	4.608	4.445	4.018	3.798	3.368	2.604
0.133	4.608	4.445	4.018	3.798	3.368	2.708
0.601	4.608	4.445	4.018	3.798	3.368	2.708
0.604	4.586	4.445	4.018	3.798	3.368	2.708
0.617	4.489	4.348	4.018	3.798	3.368	2.708
0.622	4.453	4.314	3.982	3.798	3.368	2.708
0.632	4.383	4.245	3.919	3.739	3.368	2.708
0.667	4.153	4.022	3.714	3.543	3.192	2.708
0.767	3.611	3.498	3.229	3.081	2.776	2.356
0.867	3.195	3.095	2.857	2.725	2.456	2.084
0.967	2.865	2.775	2.562	2.444	2.202	1.869
1.067	2.596	2.515	2.321	2.215	1.995	1.694
1.167	2.374	2.299	2.123	2.025	1.824	1.548
1.267	2.186	2.118	1.955	1.865	1.680	1.426
1.367	2.026	1.963	1.812	1.729	1.557	1.322
1.467	1.888	1.829	1.688	1.611	1.451	1.232
1.567	1.768	1.712	1.581	1.508	1.359	1.153
1.667	1.662	1.609	1.486	1.418	1.277	1.084

CLAUSE NO.

Project Information



HORIZONTAL SEISMIC ACCELERATION SPECTRAL COEFFICIENTS
In units of 'g' for BARH STPP

Period (Sec)	Damping Factor (as a percentage of critical damping)					
	0.80%	1%	1.60%	2%	3%	5%
1.767	1.568	1.518	1.402	1.337	1.205	1.023
1.867	1.484	1.437	1.327	1.266	1.140	0.968
1.967	1.408	1.364	1.259	1.201	1.082	0.919
2.067	1.340	1.298	1.198	1.143	1.030	0.874
2.167	1.278	1.238	1.143	1.090	0.982	0.834
2.267	1.222	1.184	1.093	1.042	0.939	0.797
2.367	1.170	1.134	1.046	0.998	0.899	0.763
2.467	1.123	1.088	1.004	0.958	0.863	0.732
2.567	1.079	1.045	0.965	0.921	0.829	0.704
2.667	1.039	1.006	0.929	0.886	0.798	0.678
2.767	1.001	0.970	0.895	0.854	0.769	0.653
2.867	0.966	0.936	0.864	0.824	0.743	0.630
2.967	0.934	0.904	0.835	0.796	0.718	0.609
3.067	0.903	0.875	0.808	0.770	0.694	0.589
3.167	0.875	0.847	0.782	0.746	0.672	0.571
3.267	0.848	0.821	0.758	0.723	0.652	0.553
3.367	0.823	0.797	0.736	0.702	0.632	0.537
3.467	0.799	0.774	0.714	0.682	0.614	0.521
3.544	0.782	0.757	0.699	0.667	0.601	0.510
3.559	0.778	0.754	0.696	0.664	0.596	0.508
3.666	0.756	0.732	0.676	0.645	0.561	0.479
3.765	0.736	0.713	0.658	0.611	0.532	0.454
3.865	0.717	0.694	0.624	0.580	0.505	0.431
3.965	0.699	0.677	0.593	0.551	0.480	0.409
4.017	0.690	0.668	0.578	0.537	0.468	0.399

CLAUSE NO.	Project Information																		
6.00.00	CRITERIA FOR WIND RESISTANT DESIGN OF STRUCTURES AND EQUIPMENT																		
	All structures shall be designed for wind forces in accordance with IS:875 (Part-3) and as specified in this document. See Annexure – B for site specific information.																		
	Along wind forces shall generally be computed by the Peak (i.e. 3 second gust) Wind Speed method as defined in the standard.																		
	Along wind forces on slender and wind sensitive structures and structural elements shall also be computed, for dynamic effects, using the Gust Factor or Gust Effectiveness Factor Method as defined in the standard. The structures shall be designed for the higher of the forces obtained from Gust Factor method and the Peak Wind Speed method.																		
	Analysis for dynamic effects of wind must be undertaken for any structure which has a height to minimum lateral dimension ratio greater than “5” and/or if the fundamental frequency of the structure is less than 1 Hz.																		
	Susceptibility of structures to across-wind forces, galloping, flutter, ovalling etc. should be examined and designed/detailed accordingly following the recommendations of IS:875(Part-3) and other relevant Indian standards.																		
6.00.00	It should be estimated if size and relative position of other structures are likely to enhance the wind loading on the structure under consideration. Enhancement factor, if necessary, shall suitably be estimated and applied to the wind loading to account for the interference effects.																		
	Damping in Structures																		
	The damping factor (as a percentage of critical damping) to be adopted shall not be more than as indicated below for:																		
	<table><tr><td>a)</td><td>Welded steel structures</td><td>:</td><td>1.0%</td></tr><tr><td>b)</td><td>Bolted steel structures</td><td>:</td><td>2.0%</td></tr><tr><td>c)</td><td>Reinforced concrete structures</td><td>:</td><td>1.6%</td></tr><tr><td>d)</td><td>Steel stacks</td><td></td><td>As per IS:6533 & CICIND Model Code whichever is more critical.</td></tr></table>			a)	Welded steel structures	:	1.0%	b)	Bolted steel structures	:	2.0%	c)	Reinforced concrete structures	:	1.6%	d)	Steel stacks		As per IS:6533 & CICIND Model Code whichever is more critical.
	a)	Welded steel structures	:	1.0%															
	b)	Bolted steel structures	:	2.0%															
c)	Reinforced concrete structures	:	1.6%																
d)	Steel stacks		As per IS:6533 & CICIND Model Code whichever is more critical.																
LOT-1A PROJECTS FLUE GAS DESHULPURISATION (FGD) PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.: CS-0011-109 (1A)-2	SUB SECTION II-A10 PROJECT INFORMATION BARH STPP STAGE-I (3X660 MW)	PAGE 8 OF 30															

CLAUSE NO.	Project Information 														
	ANNEXURE-B SITE SPECIFIC DESIGN PARAMETERS The various design parameters, as defined in IS: 875 (Part-3), to be adopted for the project site shall be as follows: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%; text-align: center;">a)</td> <td style="width: 55%;">The basic wind speed "V_b" at tenmetres above the mean ground level</td> <td style="width: 5%; text-align: center;">:</td> <td style="width: 35%;">47 metres/second</td> </tr> <tr> <td style="text-align: center;">b)</td> <td>The risk coefficient "K_1"</td> <td style="text-align: center;">:</td> <td>1.07</td> </tr> <tr> <td style="text-align: center;">c)</td> <td>Category of terrain</td> <td style="text-align: center;">:</td> <td>Category-2</td> </tr> </table>			a)	The basic wind speed " V_b " at tenmetres above the mean ground level	:	47 metres/second	b)	The risk coefficient " K_1 "	:	1.07	c)	Category of terrain	:	Category-2
a)	The basic wind speed " V_b " at tenmetres above the mean ground level	:	47 metres/second												
b)	The risk coefficient " K_1 "	:	1.07												
c)	Category of terrain	:	Category-2												
LOT-IA PROJECTS FLUE GAS DESHULPURISATION (FGD) PACKAGE	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.: CS-0011-109 (1A)-2	SUB SECTION II-A10 PROJECT INFORMATION BARH STPP STAGE-I (3X660 MW)	PAGE 9 OF 30												

CLAUSE NO.	Project Information							
7.00.00	SOIL DATA AND FOUNDATION SYSTEM							
7.01.01	Employer has carried out geotechnical investigation in the areas near to this package. Logs of representative boreholes to be used for bidder's information in the vicinity of proposed area are enclosed with this Annexure-II. The bidder is required to carry out geotechnical investigation as per the clause no. 7.07.00 and ascertain the pile capacity and bearing capacity. The onus of correct assessment / interpretation and understanding of the existing subsoil condition / data is on the Bidder. Ground water table is encountered at a depth of about 0 to 1.0m below natural ground level (NGL) at the time of investigation. Fluctuation may occur in ground water table due to seasonal variation.							
7.01.00	Finished Ground Level (FGL) generally corresponds to RL 46.20 within the plant area as shown in General Layout Plan (GLP). Controlled filling of thickness 3.5 to 4.0 m with soil has been done over Natural Ground Level (NGL) to achieve the FGL as indicated above.							
7.02.00	For excavation depth upto 6.0 m from FGL, contractor shall make arrangements like shoring, strutting or any other method duly approved by the Engineer to retain the sides of excavated area. Contractor may also use sheet piling to protect the sides of excavated area if he so desires. For excavation 6 metres below FGL, sheet piling shall be provided. The design of the sheet pile shall be done by Contractor as per relevant IS codes. The Contractor shall submit the design of sheet piling for Engineers information.							
7.03.00	The natural ground level is varying as per enclosed contour/spot level drawing.							
a)	The foundation system to be adopted for different structures shall be as given in Table – 1 below							
Table – 1: Net Allowable Bearing Pressure <table><tr><th>STRUCTURE</th><th>TYPE OF FOUNDATION TO BE ADOPTED</th></tr><tr><td>FGD and related structures</td><td>Open/Piles</td></tr></table>					STRUCTURE	TYPE OF FOUNDATION TO BE ADOPTED	FGD and related structures	Open/Piles
STRUCTURE	TYPE OF FOUNDATION TO BE ADOPTED							
FGD and related structures	Open/Piles							
b)	During design the Allowable Bearing Pressure shall be as furnished in Table-2. Bidder is required to carry out geotechnical investigation in this area. The allowable bearing pressure shall be adopted after approval of geotechnical investigation report by owner. However, the maximum allowable bearing pressure shall be as per the approved geotechnical report and shall be limited to the values as furnished in Table-2.							
LOT-1A PROJECTS FLUE GAS DESHULPURISATION (FGD) PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.: CS-0011-109 (1A)-2	SUB SECTION II-A10 PROJECT INFORMATION BARH STPP STAGE-I (3X660 MW)	PAGE 10 OF 30				

CLAUSE NO.	Project Information																													
	Table – 2: Net Allowable Bearing Pressure <table><tr><th rowspan="3">Structure</th><th rowspan="3">Founding Level in RL</th><th colspan="3">1.02.00 Net Allowable Bearing Pressure 1.03.00 T/m²</th></tr><tr><th colspan="2">Isolated / Strip</th><th rowspan="2">Rafts (width > 6m) for settlement 75mm</th></tr><tr><th>width upto 6 m for 25mm settlement</th><th>Width upto 6m for 40mm settlement</th></tr><tr><td rowspan="2">FGD and related structures</td><td>1.5 m below NGL</td><td>5.0</td><td>5.5</td><td>7.0</td></tr><tr><td>2.5 m below NGL</td><td>6.0</td><td>7.0</td><td>8.0</td></tr></table> The net allowable bearing pressure higher than above mentioned values shall not be permitted. At intermediate levels the bearing capacity shall be same as the net allowable bearing pressure corresponding to the immediate shallower level mentioned above. c) Permissible Settlement of Foundations: For open foundations, the total permissible settlement and differential settlement shall be governed by IS: 1904 and from functional requirements whichever is more stringent. However, total settlement shall be restricted to the following: <table><tr><td>Isolated, Strip & Raft (Mill foundations/machine foundation)</td><td>25 mm</td></tr><tr><td>Isolated & Strip (Other than Mill foundations/machine foundation)</td><td>40 mm</td></tr><tr><td>Raft (widths greater than 6 m) (Other than Mill foundations/machine foundation)</td><td>75 mm</td></tr></table> In case the total permissible settlement is to be restricted to less than as above specified from functional requirements, then the net allowable bearing pressure shall be reduced after review in consultation with Engineer.					Structure	Founding Level in RL	1.02.00 Net Allowable Bearing Pressure 1.03.00 T/m ²			Isolated / Strip		Rafts (width > 6m) for settlement 75mm	width upto 6 m for 25mm settlement	Width upto 6m for 40mm settlement	FGD and related structures	1.5 m below NGL	5.0	5.5	7.0	2.5 m below NGL	6.0	7.0	8.0	Isolated, Strip & Raft (Mill foundations/machine foundation)	25 mm	Isolated & Strip (Other than Mill foundations/machine foundation)	40 mm	Raft (widths greater than 6 m) (Other than Mill foundations/machine foundation)	75 mm
Structure	Founding Level in RL	1.02.00 Net Allowable Bearing Pressure 1.03.00 T/m ²																												
		Isolated / Strip		Rafts (width > 6m) for settlement 75mm																										
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FGD and related structures	1.5 m below NGL	5.0	5.5	7.0																										
	2.5 m below NGL	6.0	7.0	8.0																										
Isolated, Strip & Raft (Mill foundations/machine foundation)	25 mm																													
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LOT-IA PROJECTS FLUE GAS DESHULPURISATION (FGD) PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.: CS-0011-109 (1A)-2		SUB SECTION II-A10 PROJECT INFORMATION BARH STPP STAGE-I (3X660 MW)	PAGE 11 OF 30																									

CLAUSE NO.	Project Information					
d)	The diameter of pile, minimum length and maximum allowable capacity of piles shall be as given below:					
	Area/ Location	Pile Diameter (mm)	Minimum Length of Bored Pile Below Cut-off Level (m)	Safe Load Capacity in		
				Vertical Comp. (MT)	Pullout (MT)	Lateral (MT)
	FGD and related structures	600	26.0	100.0	35.0	5.0
		600*	27.0*	100	35.0	5.0
Cut off Level (COL) is assumed at 3.0 m below FGL (RL (+) 46.2m). If the COL is shallower than the assumed COL, then the length of the pile shall be increased accordingly. * Cut off Level (COL) is assumed at 1.5 m below FGL (RL (+) 46.2m). If the COL is shallower than the assumed COL, then the length of the pile shall be increased accordingly.						
e)	The criteria for Pile Termination (founding level) shall be as given below:					
	The termination level of the pile shall be decided based on the following criterion					
	i) Minimum length of the pile below COL (cut off level) shall be as specified above					
	ii) The minimum pile length for each group of piles shall be determined based on the nearest borelog. The SPT N value at pile termination level shall not be less than 40. For pile termination, SPT 'N' values shall be used from the nearby borelog data. The boreholes are in the bidder's scope and shall be conducted as per the enclosed scheme.					
f)	iii) However, in no case the length of pile shall be less than the minimum length determined as in (i) or (ii) above whichever is longer, for that pile group.					
	Special Requirements:					
	1) Chemicals in ground water and subsoil, as observed during investigation are:					
LOT-IA PROJECTS FLUE GAS DESHULPURISATION (FGD) PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.: CS-0011-109 (1A)-2		SUB SECTION II-A10 PROJECT INFORMATION BARH STPP STAGE-I (3X660 MW)		PAGE 12 OF 30

CLAUSE NO.	Project Information				एनटीपीसी NTPC
	Chemical	SO₃	Chlorides	pH	
	Ground Water	20 - 56 ppm	34 – 368 ppm	6.8 - 7.2	
	Sub-soil	0.024 - 0.04 %	0.01 - 0.03 %	6.1 - 7.2	
	2) In view of the above, the following shall be adopted.				
	Cement Type	As specified elsewhere in the specifications			
	Concrete Grade	M25 for piles Minimum cement content for piles shall be 400 kg/cum of concrete. Concrete shall be dense and durable. Admixtures in concrete are not permitted			
	Type of Reinforcement	As specified elsewhere in the specifications			
	Cover to Reinforcement	As specified elsewhere in the specifications			

CLAUSE NO.

Project Information



GEOTECH CONSULTANTS PVT. LTD.

NEW DELHI

BORING METHOD: Shell and Auger

NAME OF WORK : Detailed Geotechnical Investigation for Plant and Township Area for Barh Super Thermal Power Project in Bihar.

PROJECT NO : 2507
BORING SIZE : 150 MM
CO-ORDINATES : 900S, 430E
WATER TABLE : 0.75 M
RECORDED ON : 27/10/2002

TABLE NO : 252
BORE HOLE NO. : BH-127
TERMINATION DEPTH : 30.45 M
BORING START DATE : 24/10/2002
BORING FINISH DATE : 26/10/2002

Elevation in metre	Sample Depth Below Reference Level (m)	Sample Reference No.	SPT Observed 'N' value	Standard Penetration Curve		Visual Description of Soil with IS Classification	Depth (m)	IS Symbol	Grain Size Analysis				Liquid Limit	Plastic Limit	Shrinkage Limit	Bulk Density (gm/cc)	Dry Density (gm/cc)	Natural Moisture Content (%)	Specific Gravity	Void Ratio (eg)	Shear Test			Consolidation Test											
									Gravel (%)	Sand (%)	Silt (%)	Clay (%)									Type of Test	Cohesion C (kg/cm ²)	Friction Angle ϕ (Deg.)	Pressure Range (kg/cm ²)	Cv X 10 ⁻⁴ (cm ² /Sec)	Mv X 10 ⁻² (cm ² /kg)	Compression Index (Cc)	Free Swell Index (%)	Swell Pressure (kg/cm ²)						
42.281	0.00	DS1	10	10	10	CH: Greyish Clayey Silt	0					53	24																						
41.781	0.50	UDS1	10	10	10	CI: Silty to Brownish Clayey Silt of Medium Plasticity	1.50																												
39.281	3.00	UDS2	12	12	12				1	4	72	23	41	22		1.87	1.51	23.8																	
	4.16	PT2	13	13	13																														
	6.00	UDS3																																	
	7.16	PT3																																	
	9.00	UDS4																																	
	10.15	PT4																																	
	12.00	UDS5																																	
30.281	12.15	PT5	19	19	19	CI: Very Silty Yellowish Clayey Silt of Medium Plasticity	12.00		1	76	22	43	23		1.94	1.58	22.8								UUT	0.55	6								
	15.00	UDS6																																	
	16.15	PT6	39	39	39	CI: Hard Yellowish Sandy Silt of Low Plasticity	16.00																												
	18.00	UDS7																																	
	19.15	PT7	53	53	53		20.00																												

LOT-1A PROJECTS
FLUE GAS DESULPHURISATION (FGD)
PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC. NO.: CS-0011-109 (1A)-2

SUB SECTION II-A10
PROJECT INFORMATION
BARH STPP STAGE-I
(3X660 MW)

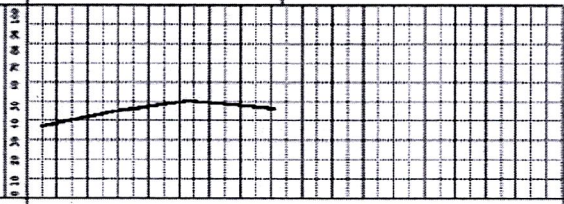
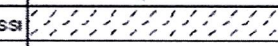
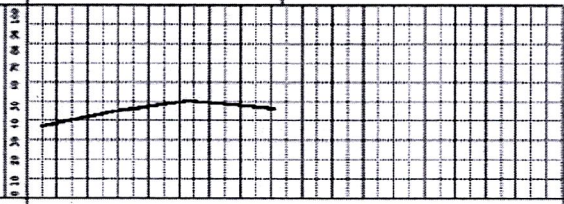
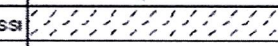
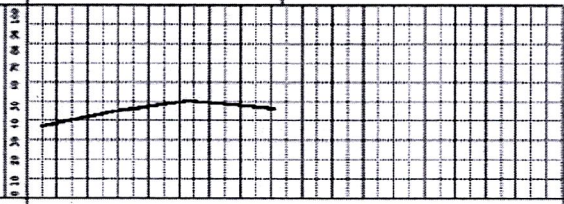
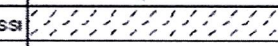
PAGE 14 OF 30

CLAUSE NO.	Project Information																																																																							
	GEOTECH CONSULTANTS PVT. LTD. NEW DELHI BORING METHOD: Shell and Auger NAME OF WORK : Detailed Geotechnical Investigation for Plant and Township Area for Barh Super Thermal Power Project in Bihar.	PROJECT NO : 2507 BORING SIZE : 150 MM CO-ORDINATES : 900S, 430E WATER TABLE : 0.75 M RECORDED ON : 27/10/2002 TABLE NO : 253 BORE HOLE NO. : BH-127 TERMINATION DEPTH : 30.45 M BORING START DATE : 24/10/2002 BORING FINISH DATE : 26/10/2002																																																																						
	Standard Penetration Curve <table border="1"> <thead> <tr> <th>Elevation in metre</th> <th>Sample Depth Below Reference Level (m)</th> <th>Sample Reference No.</th> <th>SPT Observed 'N' value</th> </tr> </thead> <tbody> <tr> <td>21.281</td> <td>21.00</td> <td>UDS8</td> <td>96</td> </tr> <tr> <td></td> <td>22.15</td> <td>SPT8</td> <td></td> </tr> <tr> <td></td> <td>24.00</td> <td>UDS9</td> <td>95</td> </tr> <tr> <td></td> <td>25.15</td> <td>SPT9</td> <td></td> </tr> <tr> <td>19.281</td> <td>27.00</td> <td>UDS10</td> <td>42</td> </tr> <tr> <td></td> <td>28.15</td> <td>SPT10</td> <td></td> </tr> <tr> <td></td> <td>30.15</td> <td>SPT11</td> <td>40</td> </tr> </tbody> </table>	Elevation in metre	Sample Depth Below Reference Level (m)	Sample Reference No.	SPT Observed 'N' value	21.281	21.00	UDS8	96		22.15	SPT8			24.00	UDS9	95		25.15	SPT9		19.281	27.00	UDS10	42		28.15	SPT10			30.15	SPT11	40	Grain Size Analysis <table border="1"> <thead> <tr> <th>Gravel (%)</th> <th>Sand (%)</th> <th>Silt (%)</th> <th>Clay (%)</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>8</td> <td>83</td> <td>6</td> </tr> <tr> <td>2</td> <td>1</td> <td>78</td> <td>19</td> </tr> </tbody> </table> Shrinkage Limit : 20 Plastic Limit : 22 Liquid Limit : 39 Soil Description of Soil with IS Classification <table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Soil Description</th> </tr> </thead> <tbody> <tr> <td>20.00</td> <td>CI: Hard Yellowish Sandy Silty of Low Plasticity</td> </tr> <tr> <td>24.00</td> <td>CI: Hard Greyish Clayey Silty of Medium Plasticity</td> </tr> <tr> <td>30.45</td> <td></td> </tr> </tbody> </table> Shear Test <table border="1"> <thead> <tr> <th>Type of Test</th> <th>Cohesion C (Kg/cm²)</th> <th>Friction Angle ϕ (Deg.)</th> </tr> </thead> <tbody> <tr> <td>UCT</td> <td>1.35</td> <td></td> </tr> </tbody> </table> Consolidation Test <table border="1"> <thead> <tr> <th>Pressure Range (Kg/cm²)</th> <th>$C_v \times 10^{-4}$ (cm²/Sec)</th> <th>$M_v \times 10^{-2}$ (cm²/Kg)</th> <th>Compression Index (Cc)</th> <th>Free Swell Index (%)</th> <th>Swell Pressure (Kg/cm²)</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> Void Ratio (e_g) : . Specific Gravity : . Natural Moisture Content (%) : 18.5 Dry Density (gm/cc) : 1.70 Bulk Density (gm/cc) : 2.01 Shrinkage Limit : 20 Plastic Limit : 22 Liquid Limit : 39	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	3	8	83	6	2	1	78	19	Depth (m)	Soil Description	20.00	CI: Hard Yellowish Sandy Silty of Low Plasticity	24.00	CI: Hard Greyish Clayey Silty of Medium Plasticity	30.45		Type of Test	Cohesion C (Kg/cm ²)	Friction Angle ϕ (Deg.)	UCT	1.35		Pressure Range (Kg/cm ²)	$C_v \times 10^{-4}$ (cm ² /Sec)	$M_v \times 10^{-2}$ (cm ² /Kg)	Compression Index (Cc)	Free Swell Index (%)	Swell Pressure (Kg/cm ²)						
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WORKING METHOD: Shell and Auger
NAME OF WORK : Detailed Geotechnical Investigation for Plant
and Township Area for Bath Super Thermal
Power Project in Bilhar.

PROJECT NO	: 2507	TABLE NO	: 254
BORING SIZE	: 150 MM	BORE HOLE NO.	: BH-128
ECO-ORDINATES	: 900S, 520E	TERMINATION DEPTH	: 30.45 M
WATER TABLE	: 0.0 M	BORING START DATE	: 03/10/2002
RECORDED ON	: 06/10/2002	BORING FINISH DATE	: 05/10/2002

[illegible]

CLAUSE NO.	Project Information																																																																																																																																																																																																																																																																																
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LOT-1A PROJECTS

FLUE GAS DESULFURISATION (FGD)

PACKAGE

TECHNICAL SPECIFICATION

SECTION-VI, PART-A

BID DOC. NO.: CS-0011-109 (1A)-2

SUB SECTION II-A10

PROJECT INFORMATION

BARH STPP STAGE-I

(3X660 MW)

PAGE 17 OF 30

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	COOLING WATER ANALYSIS <table><tr><th>Sl. No.</th><th>Constituent</th><th>as</th><th>mg per litre</th></tr><tr><td>1.</td><td>Calcium</td><td>CaCO₃</td><td>493</td></tr><tr><td>2.</td><td>Magnesium</td><td>CaCO₃</td><td>212</td></tr><tr><td>3.</td><td>Sodium</td><td>CaCO₃</td><td>250</td></tr><tr><td>4.</td><td>Potassium</td><td>CaCO₃</td><td>28</td></tr><tr><td>5.</td><td>Total Cations</td><td>CaCO₃</td><td>983</td></tr><tr><td>6.</td><td>Total Alkalinity</td><td>CaCO₃</td><td>643</td></tr><tr><td>7.</td><td>P-Alkalinity</td><td>CaCO₃</td><td>Nil</td></tr><tr><td>8.</td><td>Chloride</td><td>CaCO₃</td><td>233</td></tr><tr><td>9.</td><td>Sulphate</td><td>CaCO₃</td><td>107</td></tr><tr><td>9.</td><td>Total Anions</td><td>CaCO₃</td><td>983</td></tr><tr><td>11.</td><td>Silica (Reactive)</td><td>SiO₂</td><td>15</td></tr><tr><td>12.</td><td>Iron</td><td>Fe</td><td>1</td></tr><tr><td>13.</td><td>pH Value</td><td>-</td><td>8.6-9</td></tr><tr><td>14.</td><td>Turbidity</td><td>NTU</td><td>50</td></tr></table> Note : The C.W system is expected to operate at about 2.5 Cycles of Concentration. As CW blow down water (Service Water) is tapped from discharge of CW pumps, the water quality of CW Blow down water shall be same as that above.				Sl. No.	Constituent	as	mg per litre	1.	Calcium	CaCO ₃	493	2.	Magnesium	CaCO ₃	212	3.	Sodium	CaCO ₃	250	4.	Potassium	CaCO ₃	28	5.	Total Cations	CaCO ₃	983	6.	Total Alkalinity	CaCO ₃	643	7.	P-Alkalinity	CaCO ₃	Nil	8.	Chloride	CaCO ₃	233	9.	Sulphate	CaCO ₃	107	9.	Total Anions	CaCO ₃	983	11.	Silica (Reactive)	SiO ₂	15	12.	Iron	Fe	1	13.	pH Value	-	8.6-9	14.	Turbidity	NTU	50
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CLAUSE NO.	Project Information																				
	ANALYSIS OF DM WATER TO BE USED FOR MAKE-UP WATER TO CONDENSER <table><tr><th>Sl.No.</th><th>Characteristics</th><th>Value</th></tr><tr><td>1.</td><td>Silica (Max.)</td><td>0.02 ppm as Sio2</td></tr><tr><td>2.</td><td>Iron as Fe</td><td>Nil</td></tr><tr><td>3.</td><td>Total hardness</td><td>Nil</td></tr><tr><td>4.</td><td>pH value</td><td>6.8 -7.2</td></tr><tr><td>5.</td><td>Conductivity</td><td>Not more than 0.1 excluding the effects of free CO2</td></tr></table>			Sl.No.	Characteristics	Value	1.	Silica (Max.)	0.02 ppm as Sio2	2.	Iron as Fe	Nil	3.	Total hardness	Nil	4.	pH value	6.8 -7.2	5.	Conductivity	Not more than 0.1 excluding the effects of free CO2
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LOT-IA PROJECTS FLUE GAS DESHULPURISATION (FGD) PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.: CS-0011-109 (1A)-2	SUB SECTION II-A10 PROJECT INFORMATION BARH STPP STAGE-I (3X660 MW) PAGE 19 OF 30																		

CLAUSE NO.

Project Information



ANNEXURE-I



LOT-1A PROJECTS
FLUE GAS DESULPHURISATION (FGD)
PACKAGE

TECHNICAL SPECIFICATION
SECTION-VI, PART-A
BID DOC. NO.: CS-0011-109 (1A)-2

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(3X660 MW)

PAGE 20 OF 30

CLAUSE NO.

Project Information



ANNEXURE-II

CLIMATOLOGICAL TABLE
BASED ON OBSERVATIONS FROM 1981 TO 1990

Station: **Barh** Altitude: **157m** Date: **15/10/2014**

Month	Mean Temperature				Extreme Temperature		Humidity		Rainfall		Total Rainfall (mm)	Total Rainfall (mm)	Total Rainfall (mm)
	Jan	Feb	Mar	Apr	Max	Min	Max	Min	Max	Min			
Jan	14.5	15.2	16.1	17.0	28.5	8.5	75	25	12.5	0.5	12.5	12.5	12.5
Feb	15.8	16.5	17.4	18.3	29.5	9.5	70	20	11.5	0.5	11.5	11.5	11.5
Mar	17.2	18.0	18.9	19.8	30.5	10.5	65	15	10.5	0.5	10.5	10.5	10.5
Apr	18.6	19.4	20.3	21.2	31.5	11.5	60	10	9.5	0.5	9.5	9.5	9.5
May	20.0	20.8	21.7	22.6	32.5	12.5	55	5	8.5	0.5	8.5	8.5	8.5
Jun	21.4	22.2	23.1	24.0	33.5	13.5	50	0	7.5	0.5	7.5	7.5	7.5
Jul	22.8	23.6	24.5	25.4	34.5	14.5	45	0	6.5	0.5	6.5	6.5	6.5
Aug	24.2	25.0	25.9	26.8	35.5	15.5	40	0	5.5	0.5	5.5	5.5	5.5
Sep	25.6	26.4	27.3	28.2	36.5	16.5	35	0	4.5	0.5	4.5	4.5	4.5
Oct	27.0	27.8	28.7	29.6	37.5	17.5	30	0	3.5	0.5	3.5	3.5	3.5
Nov	28.4	29.2	30.1	31.0	38.5	18.5	25	0	2.5	0.5	2.5	2.5	2.5
Dec	29.8	30.6	31.5	32.4	39.5	19.5	20	0	1.5	0.5	1.5	1.5	1.5
Total													

CLAUSE NO.

Project Information



महाराष्ट्र सरकार
CLIMATOLOGICAL TABLE

स्टेशन नाम

STATION NAME

आक्षा
LAT. LONG. ELEVATION

उपरी
STATION NAME

1981 ते 1989 पर के मासिक व वार्षिक
BASED ON OBSERVATIONS FROM 1981 TO 1989

वायु तापमान												वायु												बारिश											
MEAN												EXTREMES												HUMIDITY											
AIR TEMPERATURE												DATE												RELATIVE HUMIDITY											
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STATION										DATE										TIME									
NAME										YEAR										HOUR									
LATITUDE										LONGITUDE										LOCAL TIME									
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TABLE - 1

COAL CHARACTERISTICS

Sl. No.	Description	Symbol	Design Coal	Worst Coal	Best Coal	Range of Adequacy Coal
1	2	3	4	5	6	7
A. PROXIMATE ANALYSIS (As received basis)						
1.	Total Moisture	%	15.00	17.00	12.00	10 - 20
2.	Ash	%	40.00	42.00	34.00	30 - 46
3.	Volatile matter	%	19.00	18.00	22.00	24 - 18
4.	Fixed carbon	%	26.00	23.00	32.00	36 - 18
B. ULTIMATE ANALYSIS (As received basis)						
1.	Carbon	C%	31.37	28.93	40.08	46 - 24.75
2.	Hydrogen	H2%	3.40	2.40	3.50	3.6 - 2.2
3.	Nitrogen	N2%	1.5	1.45	1.78	1.8 - 0.4
4.	Oxygen (By difference)	O2%	7.75	7.26	8.03	8.1 - 5.5
5.	Sulphur	S%	0.40	0.5	0.36	0.30 - 0.5
6.	Carbonates	CO3%	0.3	0.26	0.15	0.10 - 0.35
7.	Phosphorous	P2%	0.28	0.20	0.10	0.1 - 0.3
8.	Total Moisture	H2O%	15.0	17.0	12.0	10 - 20
9.	Ash	%	40.0	42.0	34.0	30.0 - 46.0
10.	Total	%	100	100	100	
11.	Gross Calorific Value	KCal/Kg	3300	2800	4000	4500 - 2500
12.	Hard grove index		55	50	60	45 - 65

CLAUSE NO.	Project Information						
	Sl. No.	Description	Symbol	Design Coal	Worst Coal	Best Coal	Range of Adequacy Coal
	1	2	3	4	5	6	7
	C. ASH ANALYSIS						
	1.	Silica	(SiO ₂)%	59.79	61.3	56.7	62.0 - 56.0
	2.	Alumina	(Al ₂ O ₃)%	25.36	28.0	23.5	28.0 - 23.0
	3.	Iron Oxide	(Fe ₂ O ₃)%	7.2	6.0	10.0	6.0 - 10.0
	4.	Titania	(TiO ₂)%	1.2	1.0	1.5	1.0 - 1.7
	5.	Phosphoric Anhydride	(P ₂ O ₅)%	2.6	1.5	3.0	1.0 - 3.0
	6.	Lime	(CaO)%	0.88	0.5	1.5	0.5 - 1.7
	7.	Magnesia	(MgO)%	0.55	0.4	1.0	0.4 - 1.1
	8.	Sulphuric Anhydride	(SO ₃)%	1.2	0.5	1.4	0.5 - 1.7
	9.	Alkalies (Na ₂ O+K ₂ O) (%) (by difference)		1.22	0.8	1.4	0.6 - 1.8
	NOTE: Na ₂ O content in the above shall not be more than 0.1%						
	D. ASH FUSION RANGE (Under reducing atmosphere)						
	a)	Initial Deformation Temperature (IDT) °C		1100	1100	1100	1100 - 1150
	b)	Hemispherical temperature °C		1300	1250	1350	1250 - 1400
	c)	Flow temperature °C		1400	1350	1400	1400 - 1450
LOT-1A PROJECTS FLUE GAS DESULPHURISATION (FGD) PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.: CS-0011-109 (1A)-2		SUB SECTION II-A10 PROJECT INFORMATION BARH STPP STAGE-I (3X660 MW)		PAGE 25 OF 30	

TABLE-2

LIGHT DIESEL OIL CHARACTERISTICS

AS PER IS 1460-2000

Characteristics	LDO
1. Pour Point (max)	21 deg.C & 12°C for Summer and Winter respectively
2. Kinematic viscosity in centistokes at 40 deg.C	2.5 to 15
3. Sediment percent by mass (max)	0.10
4. Total sulphur percent by mass (max)	1.5
5. Ash percentage by mass (max)	0.02
6. Carbon residue (Rans bottom) percent by pass (max.)	1.50
7. Acidity in organic	Nil
8. Flash point(Min.) - Pensky Martens	66 deg.C
9. Copper strip corrosion for 3 hours at 100°C	Not worse than No. 2
10. Water content, % by volume(max)	0.25
11. GCV (Kcal/kg)	10,000

CLAUSE NO.	Project Information																																																																									
	 TABLE -3 FUEL OIL CHARACTERISTICS <table border="1" data-bbox="389 562 1326 1794"> <thead> <tr> <th>Sl. No.</th><th>Characteristics</th><th>Heavy Furnace Oil IS-1593 1971 Grade HV</th><th>Low Sulphur Heavy Stock (LSHS)</th><th>Heavy Petroleum Stock (HPS)</th></tr> </thead> <tbody> <tr> <td>1.</td><td>Total sulphur content</td><td>4.5% Max.</td><td>1.0% Max.</td><td>4.5% Max.</td></tr> <tr> <td>2.</td><td>Gross calorific value (KCal/kg)</td><td>of the order of 11,000</td><td>of the order of 11,000</td><td>9,500 (min)</td></tr> <tr> <td>3.</td><td>Flash Point (Min)</td><td>66 deg C</td><td>75 deg C</td><td>75 deg C</td></tr> <tr> <td>4.</td><td>Water content by volume (Max)</td><td>1.0%</td><td>1.0%</td><td>1.0%</td></tr> <tr> <td>5.</td><td>Sediment by weight (Max)</td><td>0.25%</td><td>0.25%</td><td>0.25%</td></tr> <tr> <td>6.</td><td>Asphaltene content by weight (Max.)</td><td>2.5%</td><td>2.5%</td><td>2.5%</td></tr> <tr> <td>7.</td><td>Kinematic viscosity in Centistokes at - 50deg C (Max)</td><td>370</td><td>180</td><td>500</td></tr> <tr> <td>8.</td><td>Ash Content by weight (Max.)</td><td>0.1%</td><td>0.05%</td><td>0.1%</td></tr> <tr> <td>9.</td><td>Acidity (inorganic)</td><td>Nil</td><td>Nil</td><td>Nil</td></tr> <tr> <td>10.</td><td>Pour Point (Max.)</td><td>57 deg C</td><td>72 deg C</td><td></td></tr> <tr> <td>11.</td><td>Sodium content</td><td>—</td><td>—</td><td>100 ppm</td></tr> <tr> <td>12.</td><td>Vanadium content</td><td>25 ppm</td><td>25 ppm</td><td>25 ppm</td></tr> <tr> <td>13.</td><td>Specific heat below pour point (KCal/Kg °C)</td><td></td><td>0.65</td><td></td></tr> </tbody> </table>				Sl. No.	Characteristics	Heavy Furnace Oil IS-1593 1971 Grade HV	Low Sulphur Heavy Stock (LSHS)	Heavy Petroleum Stock (HPS)	1.	Total sulphur content	4.5% Max.	1.0% Max.	4.5% Max.	2.	Gross calorific value (KCal/kg)	of the order of 11,000	of the order of 11,000	9,500 (min)	3.	Flash Point (Min)	66 deg C	75 deg C	75 deg C	4.	Water content by volume (Max)	1.0%	1.0%	1.0%	5.	Sediment by weight (Max)	0.25%	0.25%	0.25%	6.	Asphaltene content by weight (Max.)	2.5%	2.5%	2.5%	7.	Kinematic viscosity in Centistokes at - 50deg C (Max)	370	180	500	8.	Ash Content by weight (Max.)	0.1%	0.05%	0.1%	9.	Acidity (inorganic)	Nil	Nil	Nil	10.	Pour Point (Max.)	57 deg C	72 deg C		11.	Sodium content	—	—	100 ppm	12.	Vanadium content	25 ppm	25 ppm	25 ppm	13.	Specific heat below pour point (KCal/Kg °C)		0.65	
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LOT-IA PROJECTS FLUE GAS DESHULPURISATION (FGD) PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.: CS-0011-109 (1A)-2	SUB SECTION II-A10 PROJECT INFORMATION BARH STPP STAGE-I (3X660 MW)	PAGE 27 OF 30																																																																						

Table-4

S.No	Constituent	As	mg/l (except pH & turbidity)
1.	Calcium	CaCO ₃	200.5
2.	Magnesium	CaCO ₃	92
3.	Sodium + Potassium	CaCO ₃	96
4.	Total Cations	CaCO ₃	388.50
5.	Chloride	CaCO ₃	106
6.	Sulphate	CaCO ₃	58.5
7.	Alkalinity	CaCO ₃	224
8.	Total Anions	CaCO ₃	388.50
9.	Iron(total)	Fe	0.3
10.	Silica	SiO ₂	10
11.	pH value	---	7.0-8.5
12.	Turbidity	NTU	10

Note: Clarified water is used for CW system as make up & the CW system is expected to operate at about 5.0 – 5.5 Cycles of Concentration (COC) with suitable chemical treatment program using acid, scale & corrosion inhibitor dosing. As CW blow down water is tapped from CW system, the water quality of CW blow down shall accordingly be arrived by the bidder.

Table-5

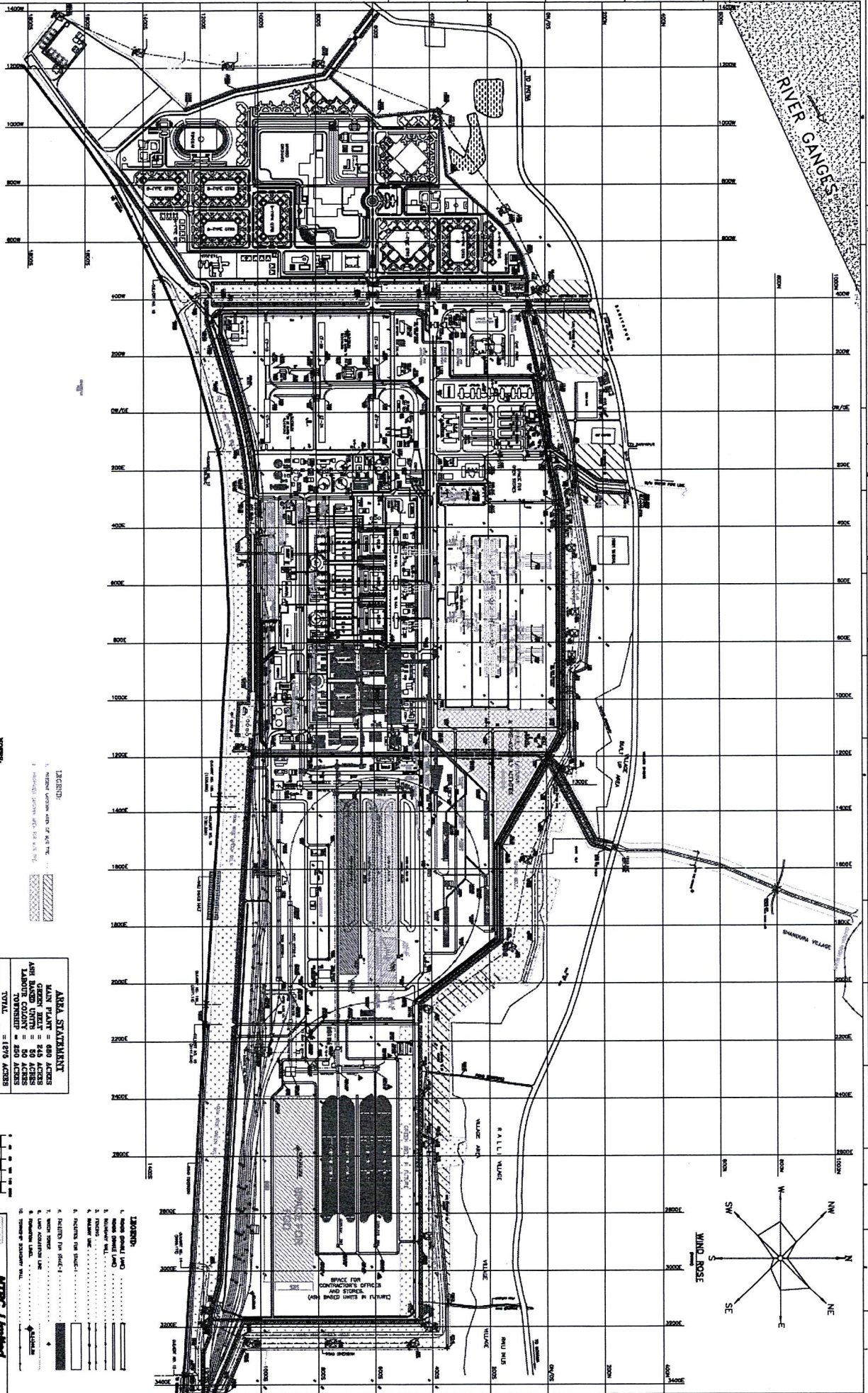
ANALYSIS OF DM WATER

Sl.No.	Characteristics	Value
1.	Silica (Max.)	0.02 ppm as SiO ₂
2.	Iron as Fe	Nil
3.	Total hardness	Nil
4.	pH value	6.8 to 7.2
5.	Conductivity	Not more than 0.1 µs/cm

CLAUSE NO.	Project Information			
1.00.00	Table-6			
	STEAM GENERATOR DATA			
	1.	Location	Outdoor	
	2.	Operation	Base load	
	3.	Type	Pulverised coal fired	
	4.	Maximum Continuous Rating	2225 Tonns/hr.	
	5.	Steam pressure at SH outlet	256 Kg/cm ² (a)	
	6.	Steam temperature at SH outlet	540°C	
	7.	Oil for start up and flame stabilisation	LDO/HFO	
	8.	Fuel oil system sizing	30% of Boiler MCR for HFO	
	9.	Pulverised coal size	Minimum 70% through 200 Mesh and 99% thru 50 mesh	
	10.	Type of pulveriser	Vertical spindle mills	
	11.	Type of oil burners	Air/Steam atomised for LDO/ HFO	
12.	No. of air heaters	2 Nos PAPH, 2 Nos SAPH		
13.	No. of ID Fans	Two (Axial Type, both working)		
2.00.00	ESP DATA			
	1.	Location:	Downstream side of Air preheaters	
	2.	Operation:	Base load	
	3.	Type:	Rigid Discharge frame	
	4.	Rapping:	Intermittent	
LOT-IA PROJECTS FLUE GAS DESHULPURISATION (FGD) PACKAGE		TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC. NO.: CS-0011-109 (1A)-2	SUB SECTION II-A10 PROJECT INFORMATION BARH STPP STAGE-I (3X660 MW)	PAGE 29 OF 30

CLAUSE NO.	Project Information																																												
	 List of Drawings placed below in this sub section: <table border="1"> <thead> <tr> <th>Sl.no.</th> <th>Drawing description</th> <th>Drawing no.</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>General Layout Plan</td> <td>9562-999-POC-F-001</td> </tr> <tr> <td>2.</td> <td>Topographical Survey</td> <td>9562-999-POC-F-002</td> </tr> <tr> <td>3.</td> <td>Equipment Layout Plan</td> <td>9562-999-POM-A-001</td> </tr> <tr> <td>4.</td> <td>ID system-Elevation & Plan</td> <td>(a) 9562-102-PVM-F-009 (b) 9562-102-PVM-F-008</td> </tr> <tr> <td>5.</td> <td>Chimney foundation</td> <td>Refer details below</td> </tr> </tbody> </table> Chimney Details <table border="1"> <thead> <tr> <th>Sl. No.</th> <th>Project</th> <th>Chimney shell outer diameter at ground level (m)</th> <th>Chimney foundation outer diameter (m)</th> <th>Type of foundation</th> <th>Level of Top of foundation (m)</th> <th>Level of Bottom of foundation (m)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Barh-I Unit#3</td> <td>32</td> <td>48.94</td> <td>Raft supported on piles</td> <td>RL(+) 45.70</td> <td>RL(+) 41.45</td> </tr> <tr> <td>2</td> <td>Barh-I Unit#1 & 2</td> <td>34.5</td> <td>55.78</td> <td>Raft supported on piles</td> <td>RL(+) 45.70</td> <td>RL(+) 40.95</td> </tr> </tbody> </table>						Sl.no.	Drawing description	Drawing no.	1.	General Layout Plan	9562-999-POC-F-001	2.	Topographical Survey	9562-999-POC-F-002	3.	Equipment Layout Plan	9562-999-POM-A-001	4.	ID system-Elevation & Plan	(a) 9562-102-PVM-F-009 (b) 9562-102-PVM-F-008	5.	Chimney foundation	Refer details below	Sl. No.	Project	Chimney shell outer diameter at ground level (m)	Chimney foundation outer diameter (m)	Type of foundation	Level of Top of foundation (m)	Level of Bottom of foundation (m)	1	Barh-I Unit#3	32	48.94	Raft supported on piles	RL(+) 45.70	RL(+) 41.45	2	Barh-I Unit#1 & 2	34.5	55.78	Raft supported on piles	RL(+) 45.70	RL(+) 40.95
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- NOTES:**
1. ALL DIMENSIONS AND LOCATIONS ARE IN METERS.
 2. THE PROJECT IS A 1000 MW ASH SUPER THERMAL POWER PROJECT.
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AREA STATEMENT

ASH PLANT	= 800 ACRES
ASH POND	= 80 ACRES
ASH COOLING TOWER	= 80 ACRES
LABOUR COLONY	= 80 ACRES
TOWNSHIP	= 800 ACRES
TOTAL	= 1970 ACRES

1. Ash Plant

2. Ash Pond

3. Ash Cooling Tower

4. Labour Colony

5. Township

6. Road

7. River

8. Canal

9. Fencing

10. Boundary

11. Water

12. Sewer

13. Electricity

14. Gas

15. Telephone

16. Post Office

17. School

18. Hospital

19. Market

20. Police Station

21. Fire Station

22. Jail

23. Bank

24. Post Office

25. School

26. Hospital

27. Market

28. Police Station

29. Fire Station

30. Jail

31. Bank

32. Post Office

33. School

34. Hospital

35. Market

36. Police Station

37. Fire Station

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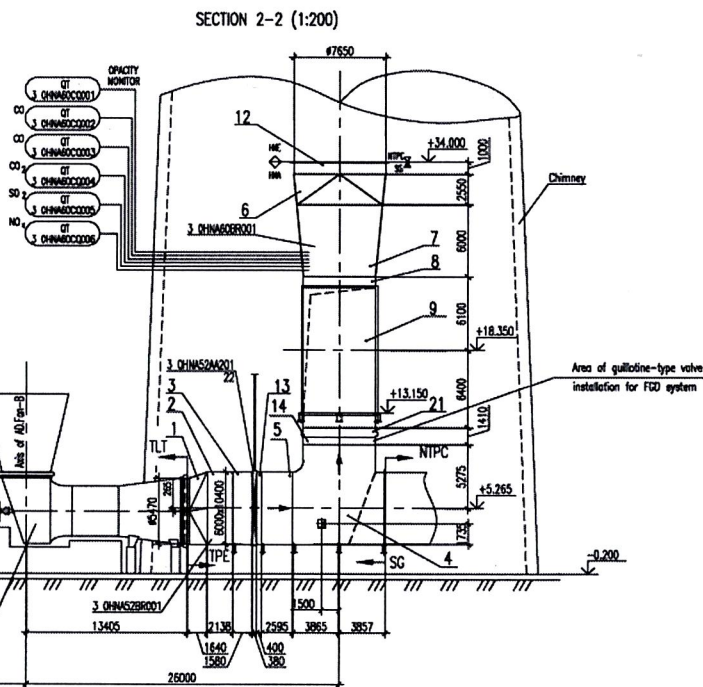
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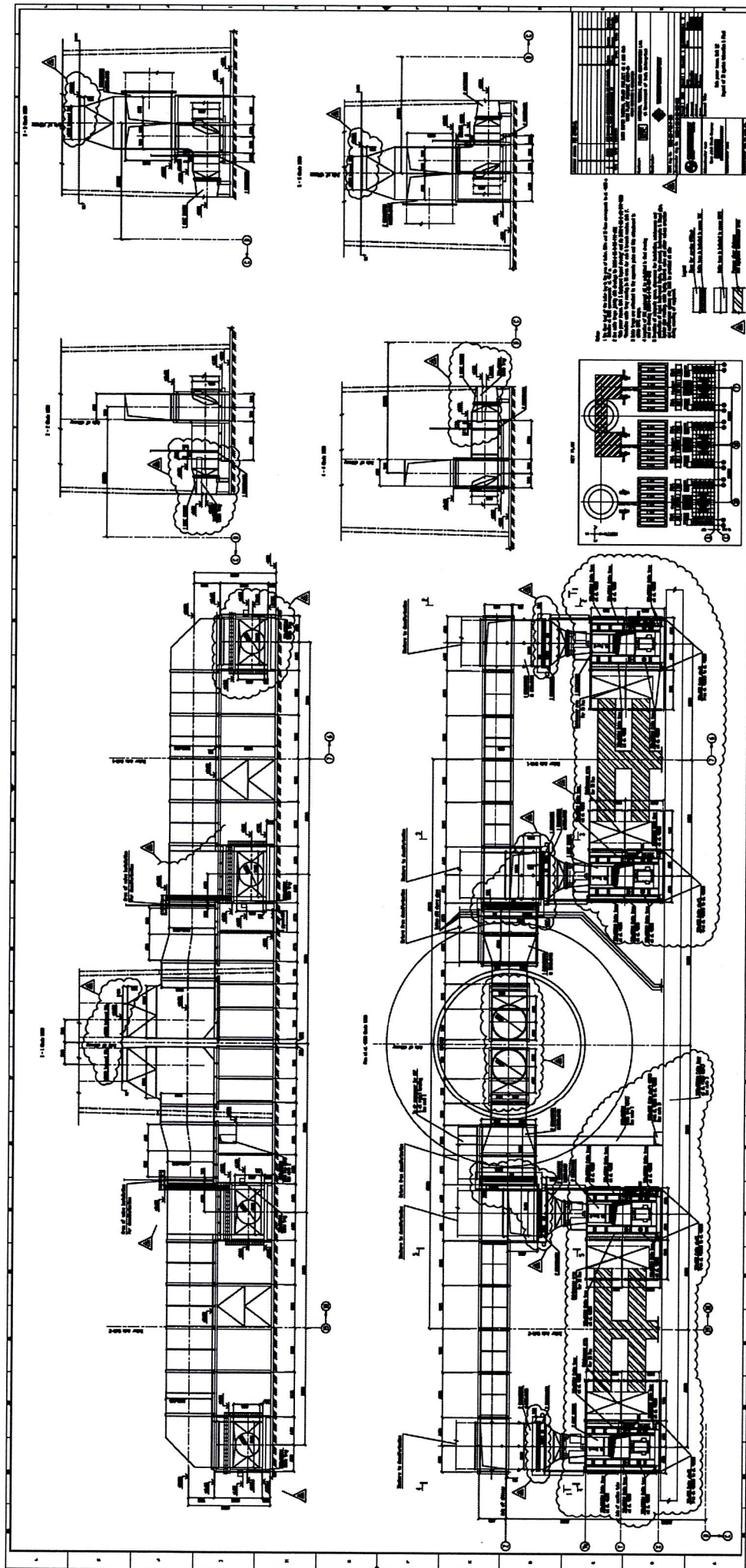
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TENDER NO – PSER:PUR:PMX:373(II):049:(ENQ:19:PP:0015:PUR:62)		
VOLUME–1F-TS-2, R-0	TECHNICAL SPECIFICATION FOR WET STACK FLOW MODEL STUDY	PAGE 1 OF 7

CONTENTS

CLAUSE NO	DESCRIPTION
1.0	INTENT OF SPECIFICATION:
2.0	SCOPE OF WORK
3.0	SUGGESTIVE DRAWINGS/ DOCUMENTS SUBMISSION
4.0	OTHER TERMS OF CONTRACT
5.0	DOCUMENTS TO BE SUBMITTED WITH BID
6.0	ANNEXURE

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME–1F-TS-2, R-0	TECHNICAL SPECIFICATION FOR WET STACK FLOW MODEL STUDY	PAGE 2 OF 7

This volume shall be construed as part of tender document and shall be read along-with other volumes of tender. Unless otherwise specified, in case of any confusion of any clause/ provision of this volume or any conflict/ inconsistency of any clause/ provision of this volume with that of other volumes, the same shall be brought out by the bidder in writing to BHEL for clarification or during pre-bid discussions, if applicable, failing which most stringent interpretation in favour of BHEL shall be adopted and the same shall be binding to the bidder. Unless otherwise specified, all terms & conditions shall be applicable for entire scope and for each part/ package of tender. This volume is common for both supply & service parts.

CLAUSE NO	DESCRIPTION
1.0	INTENT OF SPECIFICATION The intent of this enquiry/ specification is to carry out the Wet stack flow model study of 3X660 MW NTPC BARH STPP STAGE I (FGD System Package) project for complete duct system from absorber outlet to the top of the stack, design and optimization of gas flow and liquid collection system to mitigate stack liquid discharge (SLD) and shell corrosion, Preparation of final report and recommendations, preparation of drawings/ documents for execution of collection system, obtaining approval on documents from BHEL/ Customer/ customer's consultant, Preparation of BOQ, preparation of bought out item specification, procurement assistance for specialized items, site visit as specified later in the specification & as necessary for completeness in all respects and for efficient & trouble free operation of chimney and liquid collection system for project.
2.0	SCOPE OF WORK
2.1	Wet stack model study shall consist of the following:
2.1.1	Condensation calculations & design of condensate collection system
2.1.2	A scale physical flow model for liquid collector system (LCS) design.
2.1.3	A computational flow model for plume downwash analysis.
2.1.4	A physical or computational flow model for CEMS elevation flow performance.
2.1.5	Design of optimum choke geometry if required.
2.1.6	Review & Approval of liquid collector system construction drawings
2.1.7	Site inspection & supervision for 7 days to verify and evaluate LCS system performance prior to commissioning.
2.2	Wet stack study shall be performed for each unit with a wet stack installation where there does not exist an identical or mirror image installation. The objective of the wet stack study shall be to maximize liquid collection downstream of the mist eliminators and to preclude ground level rainout from the stack by recommending experimentally developed, tested, and optimized liquid collection devices and drainage systems to return collected liquid to the absorber with minimum re-entrainment. Liquid collector shall be designed and developed experimentally using a physical model. The model shall begin at outlet of absorber mist eliminator(s), include the absorber outlet and ducting, the stack breaching duct and a minimum of three (3) diameters of the stack liner above the top of the stack breaching duct. Physical model shall include any internal devices that may affect the gas flow, such as structural members, flow controls and expansion joints. Liquid collector shall be located where needed in the absorber outlet, the ductwork between the absorber outlet and the chimney liner, in the chimney liner and in the exit nozzle. These collector shall collect liquid from surfaces ,prevent re-entrainment, and guide the liquid the locations where it can be drained out of the system and prevent the discharge of droplets from the top of the stack that are large enough to rain out to the ground before evaporation.

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME–1F-TS-2, R-0	TECHNICAL SPECIFICATION FOR WET STACK FLOW MODEL STUDY	PAGE 3 OF 7

2.3	The following codes and standard shall be followed for the conductance of this study
2.3.1	Revised wet stack design guidelines, 2012 by EPRI
2.3.2	ACI 307 (American concrete institute code requirement for RC chimney)
2.3.3	EPRI report CS-2520 Entrainment in wet stack 1982
2.3.4	EPRI report TR 107099 Wet stack design guide 1996
2.3.5	EPRI report TR-109380 guidelines for fluid dynamic design of power plant ducts, 1998
2.3.6	EPRI report GS-6984 FGD mist eliminator system design and specification guide
2.3.7	CICIND, ICAC, US EPA and other international and other latest codes and standards.
2.4	The study shall be carried out by design methods and tools:
2.4.1	Preliminary design review based on experience
2.4.2	Laboratory flow modelling -3-D
2.4.3	Computer flow modelling -3-D
2.4.4	Computer program calculations – 2-D
2.5	Preliminary design review based on experience Based on the inputs furnished as per enclosed Annexure with this specification for the duct work and stack, preliminary design review need to be carried out to estimate the liquid collection requirements, predict the condensation rate in the duct & stack and perform the preliminary system design.
2.6	Condensation calculations using analytical / numerical tools
2.6.1	Gas flow study should include the calculation for the condensate formed and / or condensate carry over. The condensate flow study should include condensate quantity formed due to:
2.6.1.1	Thermal condensation on the liners
2.6.1.2	Adiabatic condensation
2.6.1.3	Turbulence of flue gas flow near entry of the stack
2.6.1.4	At the outlet duct from absorber mist eliminator outlet
2.6.1.5	Contribution from mist eliminator carryover in case of normal wash cycle or mist eliminator become fouled with time.
2.6.2	Detailed calculations along with the design basis for condensation rate in the duct from absorber outlet to the top of the chimney for the worst operating case, minimum boiler load and design conditions shall be furnished as a function of ambient air temperature, wind velocity and liner design variables in the report with an accuracy of $\pm 10\%$.
2.7	Design of Condensate collection & drainage system
2.7.1	Size of gutter(s) along with inner surface of Chimney flue can and inlet duct from absorber outlet to inlet of chimney flue can, such that condensate is collected efficiently and drained off with a drainage system till its terminal point at ground outside the duct & Chimney shell.
2.7.2	As the gutter shall be made of Titanium/C-276 as compatible with inner surface, suitable shape, size and thickness is to be recommended so that gas flow occurs efficiently.
2.7.3	The size, thickness, location and material of condensate drainage pipe shall be included in recommendation. It is envisaged that pipe from gutter to outside of Chimney liner shall be of Titanium/C-276 and thereafter the drainage pipe shall be of FRP up to the collection pit. Routing of the drain pipes shall be provided.
2.7.4	After the flow-model study is performed, accordingly design of liquid-collection devices for the full scale Wet Stack is to be carried out and detailed drawings, design basis and calculations shall be submitted.
2.8	Computational 3-D fluid-dynamic-model study (CFD Analysis)

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME–1F-TS-2, R-0	TECHNICAL SPECIFICATION FOR WET STACK FLOW MODEL STUDY	PAGE 4 OF 7

2.8.1	Performance of a computational 3-D fluid-dynamic-model study of the minimum upper one third of the stack liner and shell to evaluate downwash of the wet plume. CFD model shall include the surrounding structure which are significant to wind/plume flow patterns preferably minishell, external handrails and floor at the stack outlet. A computational model of the stack shell and liner(s) shall be constructed for the plume downwash study. The plume downwash study shall include analysis of the local wind/temperature data to identify the occurrence of critical wind and temperature conditions. The plume downwash study shall identify the stack velocity and ambient wind conditions that produce downwash and the maximum extent of expected downwash throughout the year for shell corrosion protection. For sites where ambient temperatures reach freezing, a “winter” period shall be simulated to evaluate icing potential on the stack. Depending on the results of the downwash study, there may be a need to develop an optimum choke geometry, if required, to minimize the plume downwash & liquid impingement of the shell. This includes evaluation of liquid collectors and drains to prevent re-entrainment and discharge of large droplets from the top of the choke. Bidder to use the latest software for the CFD modelling and shall submit the model along with results in form of contours and vector plots of velocity, pressure, concentration and temperature at various test locations and summarized in tabular format. The model shall be tested with various simulated operating, minimum and design flow conditions, maximum wind speed, wind orientations, to evaluate the potential of the downwash. The Bidder shall review Minishell details (Liner extension above roof) enclosed as an Annexure and confirm the liner-extension design with their recommendation. In case of the excessive downwash or reversed flow at stack exit or liquid exiting the stack liner and forming on the top of the concrete shell, bidder to provide the corrective actions, design modifications and evaluate the modified geometry.
2.9	Physical model of the system
2.9.1	An experimental gas-flow-model study to design and develop collectors for the duct and stack downstream of the mist eliminator that will collect and drain liquid from the walls to prevent re-entrainment.
2.9.2	Laboratory Physical model study shall include the following details for wet stack design
2.9.2.1	Estimation of the total liquid load on the liner surface as a result of thermal and adiabatic condensation. This estimate shall be based on the liner and shell geometry, thickness, materials of construction and the flue gas–flow rate and properties over a range of expected plant-operating conditions and worst-case ambient weather conditions considering the mist eliminator fouling / wash cycles.
2.9.2.2	Design and optimization of liquid collectors in the absorber-outlet hood, absorber outlet ducts, stack-liner entrance region and stack liner outlet to prevent SLD. The collectors will collect liquid from surfaces, re-entrainment, and guide the liquid to locations where it can be drained out of the system. This development work shall be conducted on a scale model of the wet duct and stack system, from the outlet of each absorber's mist eliminator include the absorber outlet and ducting, the stack breaching duct and a minimum of three (3) diameters of the stack liner above the top of the stack breaching duct. Model scales shall be minimum 1:12 and to be selected to ensure accurate modelling results for all tested parameters. The same shall be finalized after the award of the contract. The design should be of integrated complete system of liquid collectors from absorber outlet to chimney top for each unit.

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME–1F-TS-2, R-0	TECHNICAL SPECIFICATION FOR WET STACK FLOW MODEL STUDY	PAGE 5 OF 7

2.9.2.3	The laboratory test includes details of liquid re-entrainment and drainage behaviour over the expected range of unit operating conditions and confirm the stack-liner design velocity.
2.9.2.4	Physical model shall include any internal devices larger than 3 inches in diameter/protrusion that may affect the flow, such as structural members, internal dampers, flow controls, and expansion joints. The model shall be mainly constructed from transparent acrylic or plastic, sheet metal, or coated rigid tubing such that it is suitable for wet testing. Modeled flow control and liquid collection devices may be constructed with sheet metal, or other suitable construction materials, so long as the scaled liquid flow performance is not adversely modified.
2.9.2.5	The physical model shall be tested for pressure and velocity profiles at selected cross sections through the ducts and liner. A velocity traverse shall be conducted within the modeled liner to ensure that the cyclonic flow levels are within the U.S. EPA Method 1 recommended limitations for CEMS operation. In the event testing indicates that cyclonic flow could be a concern at the continuous emissions monitoring system (CEMS) elevation, a simulation, either by extension to the physical model or using a computational fluid dynamic model, shall be performed to evaluate this flow at the CEMS level. If needed, corrective devices shall be designed and tested to reduce stack swirl at the CEMS elevation.
2.9.2.5	The physical model shall be tested by introducing liquid in a size and quantity such that the model shall approximately match the two-phase flow modelling requirements for droplet trajectory and loading. This testing shall be used to locate and design the liquid collection devices and drains.
2.9.2.6	Evaluation of re-entrainment at liner-expansion joints in the laboratory test rig and development of a unit-specific liquid-collector geometry to collect and drain the liquid from the liner-expansion joints.
2.9.2.7	Using this model effective internal liquid collection devices shall be developed and optimized to improve the droplet deposition and liquid collection in the stack as well as to prevent the re-entrainment of droplets from liquid pools and films.
2.9.2.8	Bidder shall submit the detailed standard procedure for carrying out the physical model study at vendor lab for customer information / approval before the conductance of physical model study at lab.
2.9.3	Site inspection & supervision
2.9.3.1	Bidder to perform an onsite inspection as per the EPRI Revised Wet Stack Design Guideline, 2012. Site visit should occur for 7 days time during the construction phase, when liquid collection system is nearing completion, to inspect the liquid collection system as installed to ensure that the designed flow controls, liquid collectors, drains, and drain protection are installed properly and shall perform as intended. Bidder to provide the site inspection report to validate the design and installation.
2.9.3.2	The onsite inspection should confirm that the liquid-collection system has been fabricated and installed correctly and to identify any deviations to the recommended design as a result of field modifications made to ease installation. The bidder shall also ensure the liquid collection system is installed properly.
2.10	The key deliverables from this study are
2.10.1	Bidder to furnish the total quantity of condensate formed from absorber mist eliminator outlet to top of the stack.
2.10.2	Bidder to furnish the number, sizing and location of required various liquid collectors/ gutters, their shape, design of its evacuation piping from inside the chimney to outside and their Influence on the flow in the chimney liner.
2.10.3	Flow model study shall minimize system pressure losses and optimize collection and drainage and provide expected field wet stack system pressure loss across expected load range.
2.10.4	Bidder to achieve minimum stack liquid discharge. In case of excessive stack liquid discharge, possible means of modification to duct and stack geometry need to be proposed by bidder for improvement.
2.10.5	Bidder to ensure the design of effective liquid collection system for various plant load

TENDER NO – PSER: PUR: PMX: 373(II): 049: (ENQ: 19: PP: 0015: PUR: 62)		
VOLUME–1F-TS-2, R-0	TECHNICAL SPECIFICATION FOR WET STACK FLOW MODEL STUDY	PAGE 6 OF 7

	operating conditions and absorber combinations.
2.10.6	Bidder to furnish the comparison of the experimental and computer modelling.
2.10.7	Bidder to recommend modifications to prevent the chimney liquid discharge issues and to make the geometry more favorable for liquid collection.
2.10.8	Bidder to furnish the fabrication/installation drawings after the completion of model study for fabrication.
2.10.9	Bidder to identify appropriate liner system and gas inlet geometries (including flow control devices) to ensure homogeneous gas flow conditions and achieve cyclonic free flow distribution at the CEMS location.
2.10.10	Bidder to provide recommendations and design for sealing drain piping/ seal pots to inhibit backflow.
2.10.11	Bidder to recommend drain protection devices to minimize pluggage occurrences an flow and recommend method for monitoring liquid collection drainage flow in case of liquid collection system pluggage and SLD problems.
2.10.12	Bidder to provide stack outlet modifications, such as liner extensions or chokes, to minimize stack icing occurrences and to provide Stack shell coating requirements to protect concrete shells from corrosion due to plume downwash.
2.10.13	Bidder to evaluate the plume downwash and recommend modifications to minimize downwash using CFD model preferably at reduced unit load operation and high wind speed conditions.
2.10.14	Bidder to provide the drawings/documents for the necessary provisions in Chimney during the course of this study, if applicable, to carry out the performance test for wet stack at site in future.
2.11	Customer Specific Technical Requirements
2.11.1	GENERAL
2.11.1.1	Bidder to furnish the detailed Master drawing list for wet stack flow model study for BHEL and customer approval.
2.11.1.2	Bidder to provide technical advice/ recommendations/ assistance & solutions regarding site related construction problems related to condensate collection and drainage system in the duct and chimney as and when required including site visits, participation in meetings through VC/WEB with BHEL/ customer/ customer's consultant.
2.11.1.3	The physical model study may be witnessed by BHEL / Plant Owner for approximately 3 days. Intimation for the witnessing shall be provided by the bidder 4 weeks prior to conductance of physical model test at vendor lab. Video streaming facility shall also be provided for witnessing the physical model test from India. In addition, complete physical model test including the flow patterns and droplets trajectory shall be recorded on video CD which shall be provided after the physical model study.
2.11.1.4	The physical model shall be stored at the vendor lab at no cost for a period of 1 year after the submission of final report and completion of the study. Thereafter its further disposal or storage shall be decided after the award of the contract on the cost basis. Optional prices may be quoted for the same and this shall not be considered for the evaluation of bid.
2.11.1.5	The bidder is advised to take care all information that may be necessary for preparing the bid and entering into the contract. Claims of any kind due to variation or ignorance of site conditions and environmental conditions after award of works will not be entertained.
2.11.1.6	All revisions/changes required as per BHEL/ Project owners, comments/ requirements, site requirement etc. shall be carried out by the bidder.
2.11.1.7	Three hard copies of approved reports/documents/drawings shall be submitted by the bidder. Electronic copies of the CFD model, analysis and report shall be submitted in primary original format as well as in printable non-proprietary formats (e.g. .pdf).
2.11.1.8	Change in recommendation / design after the analysis shall be taken care by bidder without any commercial implication in this contract value.

TENDER NO – PSER:PUR:PMX:373(II):049:(ENQ:19:PP:0015:PUR:62)		
VOLUME–1F-TS-2, R-0	TECHNICAL SPECIFICATION FOR WET STACK FLOW MODEL STUDY	PAGE 7 OF 7

2.11.1.9	Bidder shall furnish detailed activity schedule, report generation schedule and list of inputs required for successful execution of Wet stack flow model study.
2.11.1.10	The Purchaser/ Customer however also reserve the rights to check the detailed calculations in the event of order and their interpretation shall be final in the event of any conflict.
2.11.1.11	Bidder shall furnish all the documents in English and SI units shall also be followed in the calculations and reports wherever used.
3.0	SUGGESTIVE DRAWINGS/ DOCUMENTS SUBMISSION
3.1	Following Basic drawings/documents to be submitted within 2 weeks from LOI date.
3.1.1	MASTER DRAWING /DOCUMENT LIST.(to be finalized after order)
3.1.2	WET STACK STUDY SCHEDULE, PLANNING AND MILESTONES
3.1.3	LIST OF CODES AND STANDARDS TO BE FOLLOWED.
3.1.4	DETAILED STANDARD PROCEDURE FOR PHYSICAL MODEL & CFD STUDY, DRAWINGS & DOCUMENTS SUBMISSION.
3.1.5	DESIGN DRAWINGS OF CONDENSATE COLLECTION AND DRAINAGE SYSTEM
3.1.6	THERMAL AND ADIABATIC CONDENSATION CALCULATIONS WITH DESIGN BASIS
3.2	Following Basic drawings/documents to be submitted and duly approved within 12 weeks from LOI date. This is not an exhaustive list of drawings/ documents for WET STACK STUDY. Bidder shall furnish all applicable drawings /documents other than as mentioned below which is/are required for successful execution of condensate collection and drainage system after the absorber outlet to stack outlet.
3.2.1	TECHNICAL DATASHEETS
3.2.2	BILL OF QUANTITIES
3.2.3	WET STACK STUDY REPORT WITH RECOMMENDATIONS
3.2.4	CFD MODEL, ANALYSIS AND RESULTS
3.3	Subsequent revisions of above drgs/docs to be submitted within 7 days of comments received from BHEL/ CUSTOMER.
3.4	Drawings submitted shall be complete in all respects with revised drawing submitted incorporating all comments. Any incomplete drawing submitted shall be treated as non-submission with delays to bidder's account.
4.0	OTHER TERMS OF CONTRACT
	The reports / design and drawings prepared by the bidder may be required to be revised / modified due to various reasons including site condition, engineering inputs, layout changes and CUSTOMER's requirement. The quoted rate shall be inclusive of additional effort to take care of such revisions.
5.0	DOCUMENTS TO BE SUBMITTED ALONG WITH BID
5.1	Detailed procedure adopted for the conductance of the study.
5.2	Wet stack study planning and scheduling.
5.3	Computer program to be used for the 3D modelling and analysis.
5.4	Mathematical tools & codes / programs used for the analytical calculations.
5.5	Technical deviation schedule (if reqd.) (enclosed herein)
6.0	ANNEXURE
6.1	Annexure-1(Parameters for wet stack & Data for Chimney design)

PARAMETERS FOR WET STACK (FOR FLUE VELOCITY ETC)

Parameter	Units	Guarantee Point (660 MW)	Design point (VWO)
Flue gas quantity per boiler	T/Hr	3303	3604
Temp. of flue gas at stack inlet	°C	58.2	62
Flue gas density at stack inlet	Kg/m ³	1.02845	1.00227
Volumetric flow per boiler	M ³ /s	892	999
Flue Arrangement	-	As Existing	As Existing
Stack Height (As per existing Chimney)	M	275	275
Ambient air temp.	°C	27	45
Relative Humidity	%	60	60
Internal flue dia as per existing Chimney (excluding liner thickness)	M	7.65	7.65



352 - 286 A

DATA FOR CHIMNEY DESIGN

GENERAL DATA				
Project Name		Barh 13x660 MW		
Boiler Application		Utility	No. of Chimneys	By PEM (Existing Chimney)
Boiler Capacity		660 MW	Type of Chimney	By PEM (Existing Chimney)
No. of Boilers / No. of Absorbers		Three (03) / Three(03)	Chimney Arrangement	By PEM (Existing Chimney)
Fuels Fired		Coal	Height of Chimney	By PEM (Existing Chimney)
OPERATING CONDITIONS (Per Boiler)				
Boiler Load		Guarantee point		Design point
		660 MW		VWO
Type of Coal		-----		-----
At absorber outlet				
Flue Gas Flow	:	TPH	3303	3604
Flue Gas Volume	:	m ³ / s (wet)	892	999
Flue Gas Temperature	:	°C	58.2	62.0
Flue Gas Density	:	kg /m ³	1.02845	1.00227
FGD OUTLET-FLUE GAS COMPOSITION % BY Volume – (WET BASIS)				
CO ₂	:	%	9.35	8.97
N ₂	:	%	66.81	64.07
O ₂	:	%	5.89	5.65
SO ₂	:	%	0.0021	0.0020
H ₂ O	:	%	17.95	21.31
*DUST SIZE DISTRIBUTION AT CHIMNEY INLET - % MICRONS				
Below 3		94.3	Between 10 - 15	22.19
Between 3 - 5		45.79	Between 15 - 20	15.0
Between 5 - 10		28.8	> 20	10.69
OTHER DATA				
Elevation of Breeching Line of the Duct			NA (Existing Chimney)	
Duct Opening Size			NA (Existing Chimney)	
Chimney Shell Opening Dimensions			NA (Existing Chimney)	
Flue Gas Pressure at Chimney Entry Level			mm WC	PEM Chimney designer to decide
REMARKS: Above mentioned parameters are for one boiler only.				