REQUEST FOR QUOTATION

MMI:PU:RF:003

BHARAT HEAVY ELECTRICALS LIMITED
Electronics Division
PB No. 2606, Mysore Road Bangalore - 560026
INDIA

RFQ NUMBER: SGKNIC0045

RFQ DATE : 12.10.2023

Due Date/Day: 31.10.2023 TUE
Time : 13:00 HRS
Tender Box : Reception Area
Opening Venue:
NEW ENGG. BLDG

(address for communication) :

(for all correspondence)
Purchase Executive : SUYASH KUMAR
Phone : 080 26998395
Fax :
E-mail: suyash@bhel.in

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
1	PR0190000333 T/C K type threaded thermowell IBR * HSN/SAC : 9025 Test Certificate T/C K type Thermocouple for Steam and water threaded thermowells and IBR	135	NO	25 110	15.06.2024 15.12.2023
2	PR0190000341 T/C K type flanged thermowell * HSN/SAC : 9025 Test Certificate T/C K type Thermocouple for Primary Air Temperature with flanged thermowell	53	NO	46 7	15.12.2023 08.06.2024
3	PR0190000368 T/C K TYPE WITH FLEXIBLE MI EXTEN CABLE * HSN/SAC : 7318 Test Certificate T/C K type Thermocouple for Super heater / Reheater area with threaded thermowell and flexible extention cable	47	NO	41 6	15.12.2023 15.06.2024
4	PR0190000376 T/C K type Metal temperature 30 MT * HSN/SAC : 9025 Test Certificate T/C K type Thermocouple Metal temperatur 30 Meter long	35	NO	5 30	15.06.2024 15.12.2023
5	PR0190000384 T/C K type Tungsten carbide thermowell * HSN/SAC : 8539 Test Certificate T/C K type Thermocouple for Coal Air mixture with Tungsten carbide thermowell	38	NO	5 33	15.06.2024 15.12.2023
6	PR0190000392 T/C K type Flanged incoloy thermowell * HSN/SAC : 3926 Test Certificate T/C K type Thermocouple with flanged thermowell	33	NO	28 5	15.12.2023 15.06.2024
7	PR0190000406 T/C K type Thermocouple for Metal casing * HSN/SAC : 8544 Test Certificate T/C K type Thermocouple for Metal casing without thermowell	69	NO	9 60	15.06.2024 15.06.2024

TWO PART BID - SUBMIT TECHNICAL AND PRICE BID IN SEPARATE SEALED COVERS

NOTES:
1. This RFQ is governed by:
a) INSTRUCTIONS TO BIDDERS/SELLERS and GENERAL CONDITIONS OF CONTRACT FOR PURCHASE available at **http://edn.bhel.com (RFQ-PO Terms & Conditions)**
b) Any other specific Terms and Conditions mentioned.
2. Bidders / Representatives who would like to be present during opening of offers are required to furnish authorization letter for the same.
* The HSN/SAC no mentioned against the line items in the RFQ are indicative only.

For and On behalf of BHEL.

SUYASH KUMAR
Control Equipment

REQUEST FOR QUOTATION

MMI:PU:RF:003

BHARAT HEAVY ELECTRICALS LIMITED
Electronics Division
PB No. 2606, Mysore Road Bangalore - 560026
INDIA

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Purchase Executive : SUYASH KUMAR
Phone : 080 26998395
Fax :
E-mail: suyash@bhel.in

Sl No.	Description	Qty	Unit	Delivery qty	Delivery Date
8	PR0200000330 RTD with threaded thermowell * HSN/SAC : 9025 Test Certificate RTD for water/steam with threaded thermowells	123	NO	101 22	15.12.2023 15.06.2024
9	PR0200000349 RTD with flanged thermowell * HSN/SAC : 9025 Test Certificate RTD for Flue Gas with Flanged thermowells	28	NO	24 4	15.12.2023 15.06.2024
10	PR0200000365 RTD threaded thermowell IBR * HSN/SAC : 9025 Test Certificate RTD for water/steam with threaded thermowells and IBR	44	NO	8 36	15.06.2024 15.12.2023
11	PR0200000373 RTD Flanged incoloy thermowell * HSN/SAC : 9030 Test Certificate RTD for Primary air and Secondary air	14	NO	2 12	15.06.2024 15.12.2023
12	PR0200000381 RTD Bearing temperature * HSN/SAC : 9025 Test Certificate RTD Bearing temperature	93	NO	74 1 10 8	15.06.2024 15.06.2024 15.06.2024 15.06.2024
13	PR0200000420 RTD - 30 Mtrs * HSN/SAC : 3926 Test Certificate Metal Temperature Type RTD with 30 Mtrs Length.	3	NO	1 2	15.12.2023 15.06.2024
14	PR0200000462 THERMOCOUPL N-TYP WITH FLANGD THERMOWELL * HSN/SAC : 7610 Test Certificate N TYPE THERMOCOUPLE WITH FLANGED THERMOWELL	10	NO	8 2	15.12.2023 15.06.2024

Total Number of Items - 14

TWO PART BID - SUBMIT TECHNICAL AND PRICE BID IN SEPARATE SEALED COVERS

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For and On behalf of BHEL.

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Control Equipment

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1.
2.

TWO PART BID - SUBMIT TECHNICAL AND PRICE BID IN SEPARATE SEALED COVERS

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1. This RFQ is governed by:
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b) Any other specific Terms and Conditions mentioned.
2. Bidders / Representatives who would like to be present during opening of offers are required to furnish authorization letter for the same.
* The HSN/SAC no mentioned against the line items in the RFQ are indicative only.

For and On behalf of BHEL.

SUYASH KUMAR
Control Equipment

ಭಾರತ್ ಹೆವಿ ಎಲೆಕ್ಟ್ರಿಕಲ್ಸ್ ಲಿಮಿಟೆಡ್
भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division
PB 2606 , Mysore Road Bangalore , 560026 INDIA

CE: PR: 003- Rev 02

SPECIAL COMMERCIAL CONDITIONS OF CONTRACT

Reference is brought to BHEL's Instructions to Bidders (Document Ref: CE: PR: 001- Rev 04) and General Commercial Conditions for Contract (Document Ref: CE: PR: 002- Rev 03).

These two documents along with Special Conditions of Contract annexed to this RFQ will form an integral part of the contract as and when the RFQ culminates into a Purchase Order / Contract.

RFQ No. : **SGKNIC0045**
RFQ Date : As per e-procurement portal
RFQ Due Date : As per e-procurement portal
Customer/Project : **SAGARDIGHI TPS**

Scope Description : **TEMPERATURE ELEMENT**

Kindly submit your quotation as ~~**single/**~~**two/**~~**three**~~ **part bid** (PQR & Techno-Commercial bid-1st part & Price bid-2nd Part) in E-Procurement System portal: https://eprocurebhel.co.in within the Due- Date before 13.00 hours IST and note that tenders will be opened on the same day at As per e-procurement portal hours IST.

Purchase Executives: Clarifications with regard to the tender shall be addressed to purchase officers whose e-mail IDs are given below:
suyash@bhel.in or rk.pandey@bhel.in

Splitting of tendered quantity to MSE vendors: The tendered quantity will not be split to MSE vendor/s subject to submission of relevant document/s by vendors. Refer clause:I of Instructions to Bidders for conditions applicable and for information on document/s to be submitted. *(Strike off, if not applicable)*

Destination: For Indigenous scope of supply, items are to be directly despatched to BHEL site office/stores located at Sagardighi site in W.B state, India. Detailed Consignee details will be issued by BHEL along with Despatch Clearance.

Terms of Delivery:

- **Indigenous scope of supply:** Ex-works, <indicate station of dispatch> (including Packing & Forwarding charges but excluding Taxes).

- ~~**Imported scope of supply:**~~
  ~~F.C.A. (for air consignments) < indicate international port of dispatch > / C.I.F. (for sea consignments) < ICD, Bangalore > (including Packing, Forwarding, Handling, Ancillary charges like processing of Sight Draft/ Letter of Credit, negotiation of bank documents, Export declaration, Country of Origin etc.).~~
  ~~Kindly indicate the approximate weight of the total imported consignment, which is required for calculating air freight charges:~~

Under-mentioned details shall be provided against indigenous supplies & services:

a. GSTIN of place of supply : _____

b. HSN (Harmonized System of Nomenclature) code : _____
Applicable tax and Rate : _____&_____

c. GSTIN of place of supply of service :

~~d. SAC (Service Accounting Code) :_____~~
~~Applicable tax and Rate : _____&_____~~

I. Bidders to mandatorily provide confirmation/compliance for the under-mentioned terms:

SL NO.	TERMS	BHEL ACCEPTABLE TERM	BIDDER'S CONFIRMATION	REMARKS,if any
01	**Reverse Auction (RA)** *(strike off, if not applicable)*	BHEL shall be resorting to Reverse Auction (Guidelines as available on http://www.bhel.com/index.php/vender) for this tender. RA shall be conducted among all the techno-commercially qualified bidders. Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered as initial bids of bidders in RA. In case any bidder(s) do(es) not participate in online Reverse Auction, their sealed envelope price bid along with applicable loading, if any, shall be considered for ranking.	AGREE	
02	~~**Parting of license for imported raw materials**~~ ~~*(strike off, if not applicable)*~~	~~In case of projects where Basic Custom Duty is NIL and vendor is importing any raw materials / components for the enquired item, same are eligible for Zero Customs duty. As per EXIM policy, BHEL will part the import licence with the vendors to obtain import licence by themselves and custom clear the raw materials/ components by availing zero customs duty. Hence, please furnish list of raw materials / components to be imported by you with Quantity and CIF value (for which BHEL has to share import licence). The benefit due to the above shall be passed on to BHEL and confirmed in the quotation.~~ ~~If there are no imported raw materials/ components, same shall be confirmed in the offer.~~	~~AGREE~~ ~~CIF value ……..~~ ~~Yes, benefit passed-on to BHEL in the priced quotation.~~ ~~(or)~~ ~~We confirm that there are no imported components~~	
03	**Delivery Period**	Within _12_ weeks from the date of issue of Manufacturing clearance along with approved document. Delay in contractual delivery will attract Penalty as per GCC Clause no.:04.b. Manufacturing clearance will be provided as per latest site delivery schedule. Present tentative delivery schedule is indicated as below: Delivery schedule for Main Supply: 30th December 2023 Delivery schedule for Mandatory Spares: 30th June 2024	AGREE …… weeks	

04	**Terms of Payment at the time of material supply** *(strike off, whichever is not applicable)*	Refer Clause "F" of Instructions to Bidder for BHEL standard Payment terms and loading factors applicable for non-compliance against payment terms: **Indigenous Scope :** ~~**a)Supply with Service(s)**~~ b**)Supply only** ~~**Imported Scope :**~~ ~~c)Supply with Service(s)~~ ~~d)Supply only~~ ~~High-Sea sales :~~ ~~e)Supply with Service(s)~~ ~~f)Supply only~~ ~~**Spares :**~~ ~~b) and/or d)/f) depending upon the scope~~	AGREE	
05	**Declaration of local content :** The 'Class-I local supplier'/'Class-II local supplier' shall be required to indicate percentage of local content and provide self-certification that the item offered meets the local content requirement for 'Class-I local supplier'/'Class-II local supplier', as the case may be.	'Local content' means the amount of value added in India which shall, unless otherwise prescribed by the Nodal Ministry, be the total value of the item procured (excluding net domestic indirect taxes) minus the value of imported content in the item (including all customs duties) as a proportion of the total value, in percent. {'Class-I local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, has local content equal to or more than 50%, as defined under Public procurement order no.P-45021/2/2017-PP (BE-II) dt: 16.09.2020. 'Class-II local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, has local content more than 20% but less than 50%, as defined under Public procurement order no.P-45021/2/2017-PP (BE-II) dt: 16.09.2020. In the event of any Nodal Ministry prescribing higher or lower margin of purchase preference and/or higher or lower percentage of local content in respect of this procurement, same shall be applicable}.' (Refer Clause 'A' Sl. No. 12 of Instructions to Bidders).	Percentage of local content : _____% Details of the Location(s) at which the local value addition is made : _____	
06	Declaration as a compliance to Rule 144(xi) of GFR, 2017 amendment dt 23.07.2020 issued by Ministry of Finance, Govt. of India.	The below declaration is to be submitted on Company Letter head duly signed and sealed by authorised signatory, for ascertaining the eligibility of offer in the tender. "I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; I certify that our firm is not from such a country or, if from such a country, has been registered with the Competent Authority. I hereby certify that our firm fulfils all		

		requirements in this regard and is eligible to be considered." (Refer Clause 'A' Sl. No. 13 of Instructions to Bidders).		

II. **Bidder to note that Deviations shall not be permitted for the below mentioned terms and are deemed to be complied. In case of non-compliance/deviation, offer shall be liable for rejection:**

(1) ~~**Submission of documents post PO viz., drawings /data sheet etc. as indicated in Cl: 04 of GCC:** Within 02 weeks from the date of receipt of Purchase Order. Delay in submission of complete set of specified documents in NIT, will attract Penalty as per GCC Clause no.:04.a.~~

(2) **Validity:** The offer will be valid for a period of 90 days from the date of part-I bid opening and in case of Negotiation/ Counter-offer/RA, price validity will apply afresh for a period of 60 days from the date of according final price by bidder (or) up to original validity period, whichever is later.

(3) **Warranty:** 24 months from the date of dispatch.

(4) ~~**Performance Bank Guarantee (PBG):** PBG will be applicable for a period of __ months from the date of dispatch of goods + claim period of 03 months, for a value equal to 10% of the basic value of purchase order. It shall however be noted that PBG is not applicable against supply of Mandatory Spares.~~

~~Refer Clause "H" of Instructions to Bidders. Also note that PBG should be in the format specified in Annexure VII of ITB and no deviation to this format will be allowed.~~

~~Note: In case PBG is not furnished, the 10% basic amount will be withheld from the supply invoice. This withheld amount will be paid either against submission of supplementary invoice & Original PBG (or) against supplementary invoice without PBG after expiry of Warranty period.~~

(5) **Despatch Documents:** Complete set of despatch documents (original + 1 photocopy set) as per Purchase Order shall be forwarded to Purchase Executive/BHEL directly. Depending upon the project/customer demands, Despatch documents may include one (or) more documents from the following:

Invoice (01 original and 01 copy with original sign & seal / digitally signed invoice), Lorry Receipt (L/R), Packing List, NIL Short-Shipment Certificate, insurance intimation letter, E-way bill, original Performance Bank Guarantee (directly from issuing bank to BHEL),Country of Origin certificate and original POD (Proof of Delivery) on L/R.

The precise list of despatch documents needed for the project will be specified in the Purchase Order.

One set of Invoice, Packing List, Lorry Receipt (or) AWB/BOL shall be e-mailed immediately to BHEL-EDN at the time of despatch.

Note: Detailed Packing List should indicate package-wise content details and also Net & Gross weight of each package.

(6) **Freight Charges (for indigenous scope of supply):** Freight charges shall be to vendor's account. Bidder to quote reasonable Freight charges along with applicable tax, in price bid.

(7) **Evaluation criteria to determine L1 bidder**:

(a) ~~Item-wise evaluation of tendered item.~~

(or)

(b) Items will not be split on item-wise lowest offer. Evaluation of the lowest bidder will be done as a combined package basis.

~~(8) **Erection and Commissioning charges:** *(strike off, if not applicable)*~~

~~In case the quoted total E&C value is less than 10 % of the main supply value, BHEL shall evaluate Bidders Price deducting differential amount from main supply price and apportioning towards E&C charges.~~
~~Refer Sl. no. 'g' under Clause 'F' of Instructions to Bidders for Payment terms of E&C charges.~~

~~(9) **Erection Supervision and Commissioning charges:** *(strike off, if not applicable)*~~

~~In case the quoted total Erection Supervision & Commissioning value is less than 5% of the main supply value, BHEL shall evaluate Bidders Price deducting differential amount from main supply price and apportioning towards Erection Supervision & Commissioning charges.~~
~~Refer Sl. no. 'h' under Clause 'F' of Instructions to Bidders for Payment terms of Erection Supervision & Commissioning charges.~~

~~**(10) Comprehensive Annual Maintenance Contract:** *(strike off, if not applicable)*~~

~~CAMC will be applicable for a period of __ years from the date of expiry of warranty period (or) from the date of completion of commissioning of equipment, whichever is later.~~

~~In case the quoted total CAMC value is less than __% of the main supply value, BHEL shall evaluate Bidders Price deducting differential amount from main supply price and apportioning towards CAMC charges. It shall also be noted that year-wise quote/ charges for CAMC should be either uniform (or) in increasing trend.~~
~~Refer Sl. no. 'i' under Clause 'F' of Instructions to Bidders for Payment terms of CAMC.~~

~~**(11) Integrity Pact:** *(strike off, if not applicable)*~~

~~Execution of Integrity Pact is applicable for this tender (Refer clause "K" of Instructions to Bidders). The IP as enclosed with the tender is to be submitted (duly signed by authorized signatory who signs in the offer) along with techno-commercial bid (Part I, 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.~~

With this, we hereby confirm that all the terms & conditions as indicated in Instructions to Bidders (Document Ref: CE: PR: 001- Rev 04) & General Commercial Conditions for Contract (Document Ref: CE: PR: 002- Rev 03) are accepted without any deviation.

Vendor's Signature with Seal

On Bidder Letter Head

Date:

To,

M/s Bharat Heavy Electricals Ltd.
Electronics Division, Mysore Road,'
Bangalore – 560026

Sub: Model Clause / Certificate as per clause 9 (a) of Revised Public Procurement (Preference to Make in India Order, 2017 of DPIIT dated 13.06.2020.

Ref: BHEL Tender / RFQ / NIT Number ……

I (authorized signatory for M/s ……..) a 'Class-I Local Supplier' / 'Class-II Local Supplier' at the time of tender, bidding or solicitation hereby confirm that the item meets the Local Content requirement for 'Class-I Local Supplier' / 'Class-II Local Supplier' (Tick appropriate option & cut the other one) and the Local Content percentage is ……..

The address is as below, where the local content / value addition is made:

[Factory Address]

For M/s ……

Authorized Signatory
(with company seal & Name)

On Bidder Letter Head

Date:

To,

M/s Bharat Heavy Electricals Ltd.
Electronics Division, Mysore Road,'
Bangalore – 560026

Sub: Model Clause / Certificate as per Annex-III (Tenders) of Restrictions Under Rule 144 (xi) of the General Financial Rules (GFRs) 2017, Dated 23.07.2020.

Ref: BHEL Tender / RFQ / NIT Number ……

I (authorized signatory for M/s ……..) have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India , we certify that this bidder M/s ……..[Vendor Name & address] is not from such a country or , if from such a country , has been registered with the competent authority . We hereby certify that we fulfill all requirements in this regard and is eligible to be considered [attach evidence of valid registration certificate with competent authority].

For M/s ……

Authorized Signatory
(with company seal & Name)

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भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division
PB 2606 , Mysore Road Bangalore , 560026 INDIA

CE: PR: 002- Rev 03

GENERAL COMMERCIAL CONDITIONS FOR CONTRACT

These 'General Commercial Conditions for Contract for Purchase' herein after referred to as GCC apply to all enquiries, tenders, requests for quotations, orders, contracts and agreements concerning the supply of goods and the rendering of related services (hereinafter referred to as "deliveries") to Bharat Heavy Electricals Limited and any of its units, regions or divisions (hereinafter referred to as "BHEL" or the Purchaser) or its projects/ customers.

Any deviations from or additions to these GCC require BHEL's express written consent. The general terms of business or sale of the vendor shall not apply to BHEL. Acceptance, receipt of shipments or services or effecting payment shall not mean that the general terms of business or sale of the vendor have been accepted.

Orders, agreements and amendments thereto shall be binding if made or confirmed by BHEL in writing. Only the Purchasing department of BHEL is authorized to issue the Purchase Order or any amendment thereof.

Definitions: Throughout these conditions and in the specifications, the following terms shall have the meanings assigned to them, unless the subject matter or the context requires otherwise.

a) 'The Purchaser' means Bharat Heavy Electricals Limited, Electronics division, Mysore road, Bangalore 560 026, a Unit of Bharat Heavy Electricals Limited (A Govt. of India Undertaking) incorporated under the Companies Act having its registered office at BHEL House, Siri Fort, New Delhi-110049, India and shall be deemed to include its successors and assigns. It may also be referred to as BHEL.
b) 'The vendor' means the person, firm, company or organization on whom the Purchase Order is placed and shall be deemed to include the vendor's successors, representative heirs, executors and administrator as the case may be. It may also be referred to as Seller, Contractor or Supplier.
c) 'Contract' shall mean and include the Purchase Order incorporating various agreements, viz. tender/ RFQ, offer, letter of intent/acceptance/ award, the General Conditions of Contract and Special Conditions of Contract for Purchase, Specifications, Inspection/ Quality Plan, Schedule of Prices and Quantities, Drawings, if any enclosed or to be provided by BHEL or his authorized nominee and the samples or patterns if any to be provided under the provisions of the contract.
d) 'Parties to the Contract' shall mean the 'The Vendor' and the Purchaser as named in the main body of the Purchase Order.

Order of Precedence:

In case of any inconsistency or contradiction between any of the documents, the order of precedence shall be Purchase Order, LOI / LOA, Special Conditions of Contract and General Conditions of Contract for commercial conditions; and specific agreement on technical conditions, RFQ/offer and specification for Technical Conditions.

Interpretation:

In the contract, except where the context requires otherwise:

a) words indicating one gender include all genders;
b) words indicating the singular also include the plural and words indicating the plural also include the singular;

c) provisions including the word "agree", "agreed" or "agreement" require the agreement to be recorded in writing, and
d) "Written" or "in writing" means hand-written, type-written, printed or electronically made, and resulting in a permanent record.

Applicable Conditions:

1. Price Basis: All prices shall be firm until the purchase order is executed / completed in all respects. No price variations / escalation shall be permitted.

2. Ordering and confirmation of Order:Vendor shall send the order acceptance on their company letter head/ through e-mail within a week from the date of receipt of Purchase Order or such other period as specified/ agreed by BHEL. BHEL reserves the right to revoke the order placed if the order confirmation differs from the original order placed. The acceptance of goods/services/supplies by BHEL as well as payments made in this regard shall not imply acceptance of any deviations.
   The purchase order will be deemed to have been accepted if no communication to the contrary is received within one week (or the time limit as specified/agreed by BHEL) from the date of receipt of the purchase order.

3. Documentation:After receipt of Purchase Order, vendor should submit necessary documents(if & as applicable) like drawings specified, bill of materials, datasheets, catalogues, quality plan, test procedure, type test report , O & M Manuals and/or any other relevant documents as per Specification/Purchase Order, as and when required by BHEL/Customer.
   At any stage within the contract period, the vendor shall notify of any error, fault or other defect found in BHEL's documents /specifications or any other items for reference. If and to the extent that (taking account of cost and time) any vendor exercising due care would have discovered the error, fault or other defect when examining the documents/specifications before submitting the tender, the time for completion shall not be extended. However if errors, omissions, ambiguities, inconsistencies, inadequacies or other defects are found in the vendor's documents, they shall be corrected at his cost, notwithstanding any consent or approval.

4. Penalty:
   a. For delay in documentation: In the event of delay in submission of complete set of specified documents ((like drawings, bill of materials, datasheets, catalogues, quality plan etc. as called in tender specifications including soft copies wherever applicable) in required sets beyond two(02) weeks (or as agreed/indicated in the SCC/Purchase Order) from the date of receipt of Purchase Order(by email), penalty at 0.5% (half percent) per week or part thereof, limited to a maximum of 5% (five percent) of the basic material value of the Purchase Order will be applicable.

      Penalty for delayed documentation if applicable, shall be deducted at the time of first supply payment. If penalty is applicable for duration of less than a week, penalty @ 0.5% (half percent) of the basic material value will be deducted. GST as applicable will be recovered along with penalty amount.

   b. For delay in delivery: In the event of delay in agreed contractual delivery as per Purchase Order, penalty @ 0.5 % (half percent) per week or part thereof but limited to a max of 10% (ten percent) value of undelivered portion (basic material cost) will be applicable. Delivery will commence from the date of issue of Manufacturing clearance along with approved document. The date for which Inspection call is issued by vendor along with test certificates / test reports /Certificate of Conformance / calibration reports, as proof of completion of manufacturing will be treated as date of deemed delivery for penalty calculation. In the absence of furnishing such document indicated above as proof of completion of manufacturing along with inspection call, actual date of inspection will be considered as date of deemed delivery and BHEL will not be responsible for delay in actual date of inspection.

Penalty for delayed delivery if applicable, shall be deducted at the time of first supply payment. If penalty is applicable for duration of less than a week, penalty @ 0.5% (half percent) of the basic material value will be deducted. GST as applicable will be recovered along with penalty amount.

5. Contract variations (Increase or decrease in the scope of supply): BHEL may vary the contracted scope as per requirements at site. If vendor is of the opinion that the variation has an effect on the agreed price or delivery period, BHEL shall be informed of this immediately in writing along with technical details. Where unit rates are available in the Contract, the same shall be the basis for such additional work. Vendor shall not perform additional work before BHEL has issued written instructions/ amendment to the Purchase Order to that effect. The work which the vendor should have or could have anticipated in terms of delivering the service(s) and functionality (i.e.) as described in this agreement, or which is considered to be the result of an attributable error on the vendor's part, shall not be considered additional work.

6. Inspection: Prior written notice of at least 10 days shall be given along with internal test certificates/COC and applicable test certificates. Materials will be inspected by BHEL-EDN-QS/CQS or BHEL nominated Third Party Inspection Agency (TPIA) or BHEL authorized Inspection Agency or Customer / Consultant or jointly by BHEL & Customer / consultant. All tests have to be conducted as applicable in line with approved Quality plan or QA Checklist or Purchase specification and original reports shall be furnished to BHEL-EDN, Bangalore for verification/acceptance for issue of dispatch clearance. BHEL reserves the right for conducting repeat test, if required.
   All costs related to inspections & re-inspections shall be borne by vendor. Whether the Contract provides for tests on the premises of the vendor or any of his Sub-contractor/s, vendor shall be responsible to provide such assistance, labour, materials, electricity, fuels, stores, apparatus, instruments as may be required and as may be reasonably demanded to carry out such tests efficiently. Cost of any type test or such other special tests shall be borne by BHEL only if specifically agreed to in the purchase order.

7. Transit Insurance: Transit insurance coverage between vendor's works and project site shall be to the account of BHEL, unless specifically agreed otherwise. However, vendor shall send intimation directly to insurance agency (as mentioned in dispatch instructions issued by BHEL) through fax/courier/e-mail, immediately on dispatch of goods for covering insurance. A copy of such intimation sent by vendor to insurance agency shall be given to BHEL along with dispatch documents. Dispatch documents will be treated as incomplete without such intimation copy. BHEL shall not be responsible for sending intimations to insurance agency on behalf of the vendor.

8. Mode of dispatch:
   Indigenous Scope: By road on Door Delivery Consignee Copy attached basis through your approved transporter (unless otherwise indicated in Dispatch Instructions), only on receipt of Despatch Clearance from BHEL.
   Imported Scope: By Air/Sea through BHEL approved Freight Forwarder/supplier approved Consolidator respectively as per agreed contractual terms, only on receipt of Dispatch Clearance from BHEL.

9. Changes in Statutory levies:
   If any rates of Tax are increased or decreased, a new Tax is introduced, an existing Tax is abolished, or any change in interpretation or application of any Tax occurs in the course of the execution of Contract, which was or will be assessed on the bidder in connection with performance of the Contract, an equitable adjustment of the Contract Price shall be made to fully take into account any such change by addition to the Contract Price or deduction there from, as the case may be. However, these adjustments would be restricted to direct transactions between BHEL and the bidder /agent of foreign bidder (if applicable). These adjustments shall not be applicable on procurement of raw materials, intermediary components etc. by the bidder /agent.

10. Availing duty/tax exemption benefits by bidder, wherever applicable: BHEL shall issue the required Certificate/s, as per relevant policies of the Govt. of India, to facilitate the bidders to avail any such benefits under the Contract. In case of failure of the bidders to receive the benefits partly or fully from the Govt. of India and/or in case of any delay in receipt of such benefits, BHEL shall neither be liable nor responsible in any manner whatsoever.

11. Taxes against sub-vendor dispatches: All taxes/levies, as applicable in respect of all components, equipments and material to be despatched directly from the sub-vendor's works to Site irrespective of the fact whether such taxes and levies are assessable and chargeable on Vendor or the BHEL, shall be to the vendor's account and no separate claim in this regard will be entertained by BHEL.

12. High Sea Sales (HSS): Customs clearance of the consignment landed on Indian Sea/Air ports will be done by BHEL based on the original HSS documents provided by vendors.
    Any delay in submission of complete/correct HSS documents to BHEL may incur demurrage charges. All demurrage charges on account of incomplete /incorrect HSS documents submission by vendor will be to vendor's account and all such charges will be recovered from any of the available vendor bills with BHEL.

13. Packaging and dispatch:The Seller shall package the goods safely and carefully and pack them suitably in all respects considering the peculiarity of the material for normal safe transport by Sea/ Air / Rail/ Road to its destination suitably protected against loss, damage, corrosion in transit and the effect of tropical salt laden atmosphere. The packages shall be provided with fixtures/ hooks and sling marks as may be required for easy and safe handling. If any consignment needs special handling instruction, the same shall be clearly marked with standard symbols / instructions. Hazardous material should be notified as such and their packing, transportation and other protection must conform to relevant regulations.
    The packing, shipping, storage and processing of the goods must comply with the prevailing legislation and regulations concerning safety, the environment and working conditions. Any Imported/Physical Exports items packed with raw/ solid wood packing material should be treated as per ISPM – 15 (fumigation) and accompanied by Phytosanitory/ Fumigation certificate. If safety information sheets (MSDS – Material Safety Data Sheet) exist for an item or the packaging, vendor must provide this information without fail along with the consignment.
    Each package must be marked with Consignee name, Purchase order number, Package number, Gross weight and net weight, dimensions (LxBxH) and Seller's name. Packing list of goods inside each package with PO item number and quantity must also be fixed securely outside the box to indicate the contents of each box. Total number of packages in the consignment must also be indicated in the packing list.
    Separate packing & identification of items should be as follows.
    1. Main Scope - All items must be tagged with part no. & item description.
    2. Commissioning accessories/spares - All items must be tagged with part no. & item description.
    3. Mandatory spares - All items must be tagged with part no. & item description.
    Nevertheless, vendor shall adhere to dispatch & packing instructions issued by BHEL at the time of dispatch.

14. Assignment of Rights & Obligations; Subcontracting: Vendor is not permitted to subcontract the delivery or any part thereof to third party or to assign the rights and obligations resulting from this agreement in whole or in part to third parties without prior written permission from BHEL. Any permission or approval given by the BHEL shall, however, not absolve the vendor of the responsibility of his obligations under the Contract.

15. Progress report: Vendor shall render such report as to the progress of work and in such form as may be called for by the concerned purchase officer from time to time. The submission and acceptance of such reports shall not prejudice the rights of BHEL in any manner.

16. Non-disclosure and Information Obligations: Vendor shall provide with all necessary information pertaining to the goods as it could be of importance to BHEL. Vendor shall not reveal any specified confidential information that may be divulged by BHEL to Vendor's employees not involved with the tender/ contract & its execution and delivery or to third parties, unless BHEL has agreed to this in writing beforehand. Vendor shall not be entitled to use the BHEL name in advertisements and other commercial publications without prior written permission from BHEL.

17. Cancellation /Termination of contract: BHEL shall have the right to completely or partially terminate the agreement by means of written notice to that effect. Termination of the Contract, for whatever reason, shall be without prejudice to the rights of the parties accrued under the Contract up to the time of termination.
    BHEL shall have the right to cancel/foreclose the Order/ Contract, wholly or in part, in case it is constrained to do so on account of any decline, diminution, curtailment or stoppage of the business.

18. Risk Purchase Clause: In case of failure of supplier, BHEL at its discretion may make purchase of the materials / services not supplied / rendered in time at the RISK & COST of the supplier. Under such situation, the supplier who fails to supply the goods in time shall be wholly liable to make good to BHEL any loss due to risk purchase.
    In case of items demanding services at site like erection and commissioning, vendor should send his servicemen/representatives within 7 days from the service call. In case a vendor fails to attend to the service call, BHEL at its discretion may also make arrangements to attend such service by other parties at the **RISK & COST** of the supplier. Under such situation the supplier who fails to attend the service shall be wholly liable to make good to BHEL any loss due to risk purchase/service including additional handling charges due to the change.

19. Shortages: In the event of shortage on receipt of goods and/or on opening of packages at site, all such shortages, caused by supplier's act or omission, shall be made good at free of cost within a reasonable time that BHEL may allow from such intimation.
    Transit Damages: In the event of receipt of goods in damaged condition or having found them so upon opening of packages at site, supplier shall make good of all such damages within a reasonable time from such intimation by BHEL. In case BHEL raises an insurance claim, the cost of material limited to insurance settled amount less handling charges will be reimbursed to supplier.

20. Remedial work: Notwithstanding any previous test or certification, BHEL may instruct the vendor to remove and replace materials/goods or remove and re-execute works/services which are not in accordance with the purchase order. Similarly BHEL may ask the vendor to supply materials or to execute any services which are urgently required for any safety reasons, whether arising out of or because of an accident, unforeseeable event or otherwise. In such an event, Vendor shall provide such services within a reasonable time as specified by BHEL.

21. Indemnity Clause: Vendor shall comply with all applicable safety regulations and take care for the safety of all persons involved. Vendor is fully responsible for the safety of its personnel or that of his subcontractor's men / property, during execution of the Purchase Order and related services. All statutory payments including PF, ESI or other related charges have to be borne by the vendor. Vendor is fully responsible for ensuring that all legal compliances are followed in course of such employment. Vendor shall fully indemnify and keep indemnified BHEL against all claims of whatsoever nature arising during the course and out of execution of this Order/Contract.

22. Product Information, Drawings and Documents: All specified drawings, technical documents or other technical information received by Vendor from BHEL or vice versa shall not, without the consent of the other party, be used for any other purpose than that for which they were provided. They may not, without the consent of the Disclosing party, otherwise be used or copied, reproduced, transmitted or communicated to third parties. All information and data contained in general product documentation, whether in electronic or any other form, are binding only to the extent that they are by reference expressly included in the contract.
    Vendor, as per agreed date/s but not later than the date of delivery, provide free of charge information and drawings which are necessary to permit and enable BHEL to erect, commission, operate and maintain the product. Such information and drawings shall be supplied in as many numbers of copies as may be agreed upon.
    All intellectual properties, including designs, drawings and product information etc. exchanged during the formation and execution of the Contract shall continue to be the property of the disclosing party.

23. Intellectual Property Rights, Licenses: If any Patent, design, Trade mark or any other intellectual property rights apply to the delivery (goods/related service) or accompanying documentation shall be the exclusive property of the Vendor and BHEL shall be entitled to the legal use thereof free of charge by means of a non-exclusive, worldwide, perpetual license. All intellectual property rights that arise during the execution of the Purchase Order/ contract for delivery by vendor and/or by its employees or third parties involved by the vendor for performance of the agreement shall belong to BHEL. Vendor shall perform everything necessary to obtain or establish the above mentioned rights. The Vendor guarantees that the delivery does not infringe on any of the intellectual property rights of third parties. The Vendor shall do everything

necessary to obtain or establish the alternate acceptable arrangement pending resolution of any (alleged) claims by third parties. The Vendor shall indemnify BHEL against any (alleged) claims by third parties in this regard and shall reimburse BHEL for any damages suffered as a result thereof.

24. Force Majeure: Notwithstanding anything contained in the purchase order or any other document relevant thereto, neither party shall be liable for any failure or delay in performance to the extent said failures or delays are caused by the "Act of God" and occurring without its fault or negligence, provided that, force majeure will apply only if the failure to perform could not be avoided by the exercise of due care and vendor doing everything reasonably possible to resume its performance.
    A party affected by an event of force majeure which may include fire, tempest, floods, earthquake, riot, war, damage by aircraft etc., shall give the other party written notice, with full details as soon as possible and in any event not later than seven (7) calendar days of the occurrence of the cause relied upon. If force majeure applies, dates by which performance obligations are scheduled to be met will be extended for a period of time equal to the time lost due to any delay so caused.

    Notwithstanding above provisions, in an event of Force Majeure, BHEL reserves for itself the right to cancel the order/ contract, wholly or partly, in order to meet the overall project schedule and make alternative arrangements for completion of deliveries and other schedules.

25. Warranty:
    Wherever required, and so provided in the specifications/ Purchaser Order, the Seller shall ensure that the goods supplied shall comply with the specifications laid down, for materials, workmanship and performance.
    Unless otherwise specified in SCC, warranty period shall be applicable for a period of 24 months from the date of delivery of goods or 18 months from the date of commissioning of goods, whichever is earlier.
    The warranty period as described above shall apply afresh to replaced, repaired or re-executed parts of a delivery. Unless otherwise specifically provided in the Purchase Order, Vendor's liability shall be co terminus with the expiration of the applicable warranty period.

26. Limitation of Liability: Vendor's liability towards this contract is limited to a maximum of 100% of the contract value and consequential damages are excluded. However the limits of liability will have no effect in cases of criminal negligence or wilful misconduct.
    The total liability of Vendor for all claims arising out of or relating to the performance or breach of the Contract or use of any Products or Services or any order shall not exceed the total Contract price.

27. Liability during warranty: Vendor shall arrange replacement / repair of all the defective materials / services under its obligation during the warranty period. The rejected goods shall be taken away by vendor and replaced / repaired. In the event of the vendor's failure to comply, BHEL may take appropriate action including disposal of rejections and replenishment by any other sources at the cost and risk of the vendor.
    In case, defects attributable to vendor are detected during Warranty period or where the commissioning call is issued within the warranty period, vendor shall be responsible for replacement/ repair of the goods as required by BHEL at vendor's cost even after expiry of warranty period.
    Further if the equipment or any part thereof cannot be used by reason of such defect and/or making good of such defect, the warranty period of the equipment or such part, as the case may be, shall be extended by a period equal to the period during which the equipment or such part cannot be used by BHEL because of any of the aforesaid reasons. Upon correction of the defects in the facilities or any part thereof by repair/replacement, such repair/replacement shall have the warranty period for a period of twelve (12) months from the time such replacement/repair of the equipment or any part thereof has been completed.

28. Liability after warranty period: At the end of the warranty, the Vendor's liability ceases except for latent defects. For the purpose of this clause, latent defects shall be the defects inherently lying within the material or arising out of design deficiency which do not manifest themselves during the warranty Period, but later. The Contractor's liability for latent defects warranty for the equipment including spares shall be limited to a period of six months from the end of the warranty period of the respective equipment including spares or first time commissioning, whichever is later but not later than one (01) year from the date of expiry of warranty period.

29. Compliance with Laws: Vendor shall, in performing the contract, comply with all applicable laws. The vendor shall make all remittances, give all notices, pay all taxes, duties and fees, and obtain all permits, licences and approvals, as required by the laws in relation to the execution and completion of the contract and for remedying of any defects; and the Contractor shall indemnify and hold BHEL harmless against and from the consequences of any failure to do so.

30. Settlement of Disputes:Except as otherwise specifically provided in the Purchase Order, decision of BHEL shall be binding on the vendor with respect to all questions relating to the interpretation or meaning of the terms and conditions and instructions herein before mentioned and as to the completion of supplies/work/services, other questions, claim, right, matter or things whatsoever in any way arising out of or relating to the contract, instructions, orders or these conditions or otherwise concerning the supply or the execution or failure to execute the order, whether arising during the schedule of supply/work or after the completion or abandonment thereof. Any disputes or differences among the parties shall to the extent possible be settled amicably between the parties thereto, failing which the disputed issues shall be settled through arbitration. Vendor shall continue to perform the contract, pending settlement of dispute(s).

31. Arbitration Clause in case of Contract with vendors other than Public Sector Enterprise (PSE) or a Government Department:

    Arbitration & Conciliation:

    The parties shall attempt to settle any disputes 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, or in connection with this contract through friendly discussions. In case no amicable settlement can be reached between the parties through such discussions, in respect of any dispute; then, either Party may, by a notice in writing to the other Party refer such dispute or difference to the sole arbitration of an arbitrator appointed by Head of the BHEL–EDN. Such Sole Arbitrator appointed, shall conduct the arbitration in English language.
    The Arbitrator shall pass a reasoned award and the award of the Arbitration shall be final and binding upon the Parties.
    Subject as aforesaid, the provisions of Arbitration and Conciliation Act 1996 (India) or statutory modifications or re-enactments thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceedings under this clause. The seat of arbitration shall be Bangalore.
    The cost of arbitration shall be borne as decided by the Arbitrator upon him entering the reference.
    Subject to the Arbitration Clause as above, the Courts at Bangalore alone shall have exclusive jurisdiction over any matter arising out of or in connection with this Contract.
    Notwithstanding the existence or any dispute or differences and/or reference for the arbitration, the parties shall proceed with and continue without hindrance the performance of its obligations under this Contract with due diligence and efficiency in a professional manner except where the Contract has been terminated by either Party in terms of this Contract.

    Arbitration Clause in case of Contract with a Public Sector Enterprise (PSE) or a Government Department:

    In the event of any dispute or difference relating to the interpretation and application of the provisions of the Contract, such dispute or difference shall be referred by either party for Arbitration to the Sole Arbitrator in the Department of Public Enterprises to be nominated by the Secretary to the Government of India in-charge of the Department of Public Enterprises. The Arbitration and Conciliation Act, 1996 shall not be applicable to arbitration under this clause. The award of the Arbitrator shall be binding upon the parties to the dispute, provided, however, any Party aggrieved by such Award may make further reference for setting aside or revision of the Award to the Law Secretary, Department of Legal Affairs, Ministry of Law and Justice, Government of India. Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary or Additional Secretary when so authorized by the Law Secretary, whose decision shall bind the Parties hereto finally and conclusively. The Parties to the dispute will share equally the cost of arbitration as intimated by the Arbitrator.'

32. Applicable Laws and Jurisdiction of Courts: Prevailing Indian laws both substantive and procedural, including modifications thereto, shall govern the Contract. Subject to the conditions as aforesaid, the competent courts in Bangalore alone shall have jurisdiction to consider over any matters touching upon this contract.

33. General Terms: That any non-exercise, forbearance or omission of any of the powers conferred on BHEL and /or any of its authorities will not in any manner constitute waiver of the conditions hereto contained in these presents.
    That the headings used in this agreement are for convenience of reference only.
    That all notices etc., to be given under the Purchase order shall be in writing, type script or printed and if sent by registered post or by courier service to the address given in this document shall be deemed to have been served on the date when in the ordinary course, they would have been delivered to the addressee.

ಭಾರತ್ ಹೆವಿ ಎಲೆಕ್ಟ್ರಿಕಲ್ಸ್ ಲಿಮಿಟೆಡ್
भारत हेवी इलेक्ट्रिकल्स लिमिटेड
Bharat Heavy Electricals Ltd.,
(A Government of India undertaking)
Electronics Division
PB 2606 , Mysore Road Bangalore , 560026 INDIA

CE:PR:001- Rev 04

INSTRUCTIONS TO BIDDERS

Bidder is requested to read the instructions carefully and submit their quotation taking into consideration of all the points:

A. GENERAL INSTRUCTIONS:

1. Any Purchase Order resulting from this enquiry shall be governed by the Instructions to Bidders (document reference: CE: PR: 001 – Rev 03), General Conditions of Contract (document reference: CE: PR: 002 - Rev 02) and Special Conditions of Contract, if any, of the enquiry.
2. Any deviations from or additions to the "General Conditions of Contract"or "Special Conditions of Contract" require BHEL's express written consent. The general terms of business or sale of the bidder shall not apply to this tender.
3. Regret letter (either through post or by mail or by EPS) indicating reasons for not quoting must be submitted without fail, in case of non-participation in this tender.

   Supplier shall be liable for removal as a registered vendor of BHEL when the supplier fails to quote against four consecutive tender enquiries for the same item or all enquiries in last two years for the same item, whichever is earlier.
4. Procurement directly from the manufacturers is preferred. However, if the OEM/ Principal insist on engaging the services of an agent, such agent shall not be allowed to represent more than one manufacturer/ supplier in the same tender.

   Moreover, either the agent could bid on behalf of the manufacturer/ supplier or the manufacturer/ supplier could bid directly but not both. Agent/Representative authorized by the OEM/Principal in turn cannot further sub authorize any other firm for submitting the offer or for placement of order.

   In case bids are received from the manufacturer/ supplier and his agent, bid received from the agent shall be ignored.
5. Consultant / firm (and any of its affiliates) shall not be eligible to participate in the tender/s for the related goods for the same project if they were engaged for consultancy services for the same project.
6. If an Indian representative/associate/liaison office quotes on behalf of a foreign based bidder, such representative shall furnish the following documents:
   a. Authorization letter to quote and negotiate on behalf of such foreign-based bidder.
   b. Undertaking from such foreign based bidder that such contract will be honored and executed according to agreed scope of supply and commercial terms and conditions.
   c. Undertaking shall be furnished by the Indian representative stating that the co-ordination and smooth execution of the contract and settlement of shortages/damages/replacement/repair of imported scope

till the equipment is commissioned and handed over to customer will be the sole responsibility of the Indian representative/associates/agent/liaison office.

d. Refer **Annexure I** on "Guidelines for Indian Agents".

7. In case of imported scope of supply, customs clearance & customs duty payment will be to BHEL account after the consignment is received at Indian Airport /Seaport. Bidders must provide all original documents required for completing the customs clearance along with the shipment.

   Warehousing charges due to incomplete or missing documentation will be to supplier's account. All offers for imported scope of supply by air, must be made from any of the gateway ports (within the country) indicated **(Refer Annexure II).**

8. The offers of the bidders who are on the banned list and also the offers of the bidders, who engage the services of the banned firms, shall be rejected. The list of the banned firms is available on BHEL website: http://www.bhel.com/vender_registration/vender.php

9. Business dealings with bidders will be suspended if they are found to have indulged in any malpractices/misconduct which are contrary to business ethics like bribery, corruption, fraud, pilferage, cartel formation, submission of fake/false/forged documents, certificates, information to BHEL or if they tamper with tendering procedure affecting the ordering process or fail to execute a contract, or rejection of 3 consecutive supplies or if their firms / works are under strike/lockout for a long period. Bidder may refer "Guidelines for Suspension of Business Dealings with Suppliers/ Contractors" available on www.bhel.com for more details.

   The Bidder declares that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s). 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. In case, the Bidder is found having indulged in above activities, suitable action shall be taken by BHEL as per extant policies / guidelines.

10. 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 your notice.

11. Offer is to be submitted in English language only.

12. For this procurement, the local content to categorize a supplier as a Class-I local supplier/ Class-II local supplier/ Non-local supplier and purchase preference to Class-I local supplier, is as defined in Public procurement (Preference to Make in India), Order 2017 dated 16.09.2020 issued by DPIIT.

    In case of subsequent Orders issued by the Nodal Ministry, changing the definition of local content for the items of the NIT, the same shall be applicable even if issued after issue of this NIT, but before opening of price bids against this NIT. Default margin of purchase preference shall be 20% for Class-I local supplier only.

13. The Bidder shall mandatorily submit Declaration as mentioned under Rule 144(xi) of General Financial Rules, 2017 amendment dt 23.07.2020 issued by Ministry of Finance, Govt. of India. Where applicable, evidence of valid registration by the Competent Authority shall be attached.

    The Competent Authority for the purpose of registration under this Order shall be the Registration Committee constituted by the Department for Promotion of Industry and Internal Trade (DPIIT). Refer Annexure-X for 'Restrictions under Rule 144(Xi) of General Financial Rules,2017 amendment dt: 23.07.2020'.

B. GUIDELINES FOR PREPARATION OF OFFER:

1. Quotation shall be submitted in Single Part Bid, Two Part Bid or Three Part Bid, as called for in the tender:

   - **SINGLE PART BID**: Technical and Commercial Bid with prices along with price summary & filled in BHEL Standard Commercial terms and conditions in a single sealed envelope.

   - **TWO PART BID**: Unpriced offer i.e. "Techno-commercial Bid" with filled in BHEL Standard Commercial terms and conditions in a sealed envelope **along with the copy of the "Price Bid"without the prices** should be enclosed in one cover and the cover must be super scribed **"Techno-commercial offer)** and Priced offer i.e. "Price Bid"containing price summary in a separate sealed envelope and must be super scribed **"Price Bid"**.

     Both these envelopes shall be enclosed in a single sealed envelope superscribed with enquiry number, due date of tender and any other details as called for in the tender document.

   - **THREE PART BID**: Pre-qualification Bid (Part-I), Techno Commercial Bid with filled in BHEL Standard Commercial terms and conditions (Part-II), and Price Bid (Part-III). All three envelopes shall be enclosed in a single sealed envelope superscribed with enquiry number, due date of tender and any other details as called for in the tender document.

   If any of the offers (Part I, Part II or Part III) are not submitted before the due date and time of submission (or) if any part of the offer is incomplete, the entire offer of the bidder is liable for rejection.

2. Supplier shall ensure to superscribe each envelope with RFQ number, RFQ Date, RFQ Due date and time, Item Description and Project clearly & boldly. Also mention on the envelope whether it is "Techno Commercial Bid" or "Price Bid" or "Pre-Qualification Bid".

   Please ensure complete address, department name and purchase executive name is mentioned on the envelope (before dropping in the tender box or handing over) so that the tender is available in time for bid opening.

3. BHEL standard Commercial Terms and Conditions (duly filled, signed & stamped) must accompany Technical-Commercial offer without fail and should be submitted in original only.

   The above indicated submission of Offers in "sealed envelope/hard copy" as mentioned in points B.1-B.3 is applicable for tenders that are not floated through E-Procurement System (EPS).

4. Validity: Unless otherwise specified in SCC (special commercial conditions of contract), the offer will be valid for a period of 90 days from the date of part-I bid opening and in case of Negotiation/Counter-offer/Reverse Auction, price validity will apply afresh for a period of 60 days from the date of according final price by bidder (or) up to original validity period, whichever is later.

5. Any of the terms and conditions not acceptable to supplier, shall be explicitly mentioned in the Techno-Commercial Bid.

   If no deviations are brought out in the offer it will be treated as if all terms and conditions of this enquiry are accepted by the supplier without deviation.

6. Deviation to this specification/item description, if any, shall be brought out clearly indicating "DEVIATION TO BHEL SPECIFICATION" without fail, as a part of Techno-Commercial Bid.

   If no deviations are brought out in the offer it will be treated as if the entire specification of this enquiry is accepted without deviation.

7. Suppliers shall submit one set of original catalogue, datasheets, bill of materials, dimensional drawings, mounting details and/or any other relevant documents called in purchase specification as part of Technical Bid.
8. "Price Bid" shall be complete in all respects containing price break-up of all components along with all applicable taxes and duties, freight charges (if applicable) etc. Once submitted no modification / addition / deletion will be allowed in the "Price Bid." Bidders are advised to thoroughly check the unit price, total price to avoid any discrepancy.
9. In addition, bidder shall also quote for erection & commissioning charges/erection supervision & commissioning charges (E&C service charges), documentation charges, testing Charges (type & routine), training charges etc. if & as applicable along with corresponding tax. The price summary must indicate all the elements clearly.
10. Wherever applicable, bidders should indicate "lumpsum" Erection and Commissioning (or) Erection Supervision and Commissioning charges, as applicable (including To & Fro Fare, Boarding, Lodging, Local Conveyance etc.) for carrying out E&C activity and further handing over to customer.

    The quotation shall clearly indicate scope of work, likely duration of commissioning, pre-commissioning checklist (if any).
11. Wherever bidders require PAC (Project Authority Certificate)/applicable certificates for import of raw materials, components required for DECC,EPCG Power Projects, Export Projects or other similar projects wherein supplies are eligible for customs duty benefits, lists and quantities of such items and their values (CIF) has to be mentioned in the offer. Prices must be quoted taking into account of such benefits.
12. Prices should be indicated in both figures & words**.** 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.

    Any typographical error, totalling mistakes, currency mistake, multiplication mistake, summing mistakes etc. observed in the price bids will be evaluated as per **Annexure III** "Guidelines for dealing with Discrepancy in Words & Figures – quoted in price bid" and BHEL decision will be final.
13. Documents submitted with the offer shall be signed and stamped in each page by authorized representative of the bidder. However, this requirement is not mandatory for offers uploaded through E-Procurement System (EPS).

C. <u>GUIDELINES FOR OFFER SUBMISSION:</u>

The under-mentioned clauses 1, 2&3 will not be applicable for EPS tenders.

1. Offers / Quotations must be dropped in tender box before 13.00 Hrs. on or before due date mentioned in RFQ.The offers are to be dropped in the proper slot of the Tender Box kept in our reception area with caption "CE, SC&PV, DEFENCE".

   Tenders are opened on 3 days in a week (Monday/Wednesday/Friday). Tender must be deposited in the slot corresponding to the day (Monday - Box no.4/Wednesday - Box no. 6 /Friday - Box no.8) while depositing the offer.

2. E-Mail/ Internet/EDI offers received in time shall be considered only when such offers are complete in all respects. In case of offers received through E-mail, please send the offer to the email ID specified in the SCC document of the tender.

3. Offers of Vendors who already have a valid Technical/Commercial MOU with BHEL-EDN for the items of the RFQ shall mention the relevant MOU reference no. and give only such other details not covered in the MOU.

4. In cases where tender documents are bulky, or due to some reasons tender documents are required to be submitted by hand or through posts/couriers, the offers are to be handed over either of the two purchase officers whose names are mentioned in the SCC document of tender RFQ.
5. Tenders will be opened on due date, time and venue as indicated in the RFQ in the presence of bidders at the venue indicated in the RFQ. For EPS tenders, e-mail notifications will be automatically generated and forwarded to registered e-mail ID/s of bidders during opening of tenders.
6. Bidder will be solely responsible:
   a. For submission of offers before due date and time. Offers submitted after due date and time will be treated as "Late offers" and will be rejected.

   b. For submission of offers in the correct compartment of the tender box based on the day of due date (Monday/Wednesday/Friday). Please check before dropping your offer in the correct tender box.

   c. For depositing offers in proper sealed condition in the tender box. If the bidder drops the tender in the wrong tender box (or) if the tender document is handed over to the wrong person, BHEL will not be responsible for any such delays.

   d. For offers received through email etc., suppliers are fully responsible for lack of secrecy on information and ensuring timely receipt of such offers in the tender box before due date & time (This clause will not be applicable for EPS tenders).

   The above indicated submission of Offers as mentioned in points 6.a-6.d is applicable for tenders that are not floated through EPS.

   e. In case of e-tender, all required documents should be uploaded before due date and time. Availability of power, internet connections, system/software requirements etc. will be the sole responsibility of the bidder.

      Wherever assistance is needed for submission of e-tenders, help-line numbers as available in the web-site of service provider of BHEL may be contacted.

      Purchase Executive/ BHEL shall not be responsible for any of the activities relating to submission of offer.

D. <u>PROCESSING OF OFFERS RECEIVED:</u>

1. Any discount/ revised offer submitted by the supplier on its own shall be accepted provided it is received on or before the due date and time of offer submission (i.e. Part-I bid).

   The discount shall be applied on pro-rata basis to all items unless specified otherwise by the bidder.
2. Changes in offers or Revised offers given after Part-I bid opening shall not be considered as a part of the original offer unless such changes/revisions are requested by BHEL.

   In case of withdrawal of any Technical/Commercial deviation(s) by the bidder before opening of price bids/conducting the Reverse Auction, revision of price/impact bid will not be accepted.
3. In case there is no change in the technical scope and/ or specifications and/ or commercial terms & conditions, the supplier will not be allowed to change any of their bids after Technical bids are opened (after the due date and time of tender opening).

4. In case of changes in scope and/ or technical specifications and/ or commercial terms & conditions by BHEL and it accounts for price implications from bidders, all techno-commercially acceptable bidders shall be asked by BHEL (after freezing the scope, technical specifications and commercial terms & conditions) to submit the impact of such changes on their price bid.

   Impact price will be applicable only for changes in technical specification / commercial conditions by BHEL. The impact price must be submitted on or before the cut-off date specified by BHEL and the original price bid and the price impact bid will be opened together at the time of price bid opening.

5. Un-opened bids (including price bids) will be returned to the respective bidders after release of Purchase order.

   Regarding Offers for EPS tenders that get rejected on PQC/ techno-commercial grounds, the bids for the subsequent parts will not be opened i.e., both technical bid and price bid (Parts-II & III)will not be opened in case of rejection on PQC ground and price bid (Part-II/Part-III, as applicable) will not be opened in case of rejection on techno-commercial ground.

6. After receipt of Purchase Order, supplier should submit required documents viz.,specified drawings, bill of materials, datasheets, catalogues, quality plan, test procedure, type test report , O & M Manuals and/or any other relevant documents as per Specification/Purchase Order, as and when required by BHEL/Customer.

7. Any deviation to the terms and conditions not mentioned in the quotation by supplier in response to this enquiry will not be considered, if put forth subsequently or after issue of Purchase Order, unless clarification is sought for by BHEL and agreed upon in the Purchase Order.

8. Evaluation shall be on the basis of delivered cost (i.e. “Total Cost to BHEL").

   “Total Cost to BHEL” shall include total basic cost, packing & forwarding charges, taxes and/or duties(as applicable), freight charges, taxes on Services, customs clearance charges for imported items, any other cost indicated by bidder for execution of the contract and loading factors (for non-compliance to BHEL Standard Commercial Terms & Conditions).

   Benefits arising out of Nil Import Duty on DEEC, EPCG, DFIA Projects, Physical Exports or such 100% exemptions (statutory benefits), project imports, customer reimbursements of statutory duties (like Basic Customs Duty and cess on customs duty), Input tax credits as applicable will also be taken into account for arriving at the Total cost to BHEL (wherever applicable and as indicated in SCC document of tender).

   For EPS tenders, it shall be noted that the prices (including discounts) vis-a-vis currency quoted in EPS portal only will be considered as Final for the purpose of evaluation of the lowest bidder.

   Bidder shall ensure to indicate the applicable taxes against each line item in online portal, failing to which the same will be considered as inclusive/NIL.

   In the course of evaluation, if more than one bidder happens to occupy L-1 status, effective L-1 will be decided by soliciting discounts from the respective L-1 bidders.

   Incase more than one bidder happens to occupy the L-1 status even after soliciting discounts, the L-1 bidder shall be decided by a toss/draw of lots, in the presence of the respective L-1 bidder(s) or their representative(s).

   Ranking will be done accordingly. BHEL’s decision in such situations shall be final and binding.

9. The evaluation currency for this tender shall be INR. For evaluation of offers in foreign currency, the exchange rate (TT selling rate of SBI) shall be taken as under:

   Single part bids: Date of tender opening

   Two/three part bids: Date of Part-I bid opening

   Reverse Auction: Date of Part-I bid opening

   In case of Performance Bank Guarantee (PBG) also, exchange rate will be considered as mentioned above for converting foreign currency to Indian currency and vice versa.

   If the relevant day happens to be a bank holiday, then the exchange rate as on the previous working day of the bank (SBI) shall be taken.

10. Ranking (L-1, L-2 etc.) shall be done only for the techno-commercially acceptable offers.
11. GeM Seller ID shall be mandatory before placement of order/award of contract for goods and services to the successful bidder(s), for orders exceeding Rs.25 lakhs (including all taxes etc.).

    Department of Expenditure (DoE) OM no.6/9/2020-PPD dated: 24.08.2020 may be referred in this regard.

E. <u>INFORMATION ON PAYMENT TERMS:</u>

1. All payments will be through Electronic Fund transfer (EFT). Vendor has to furnish necessary details as per BHEL standard format **(Refer Annexure IV)** for receiving all payments through NEFT.(Applicable for Indian vendors only).
2. In case of High Sea Sales transaction, customs clearance of the consignment landed on Indian Sea/Air ports will be done by BHEL based on the original HSS documents provided by vendors.

   All warehousing charges due to delay in submission of complete and or correct HSS documents to BHEL will be to supplier's account only. Such recovery will be made out of any of the available bills **(Refer Annexure V)**.
3. Statutory deductions, if any, will be made and the deduction certificate shall be issued.

   A. In case vendor does not provide PAN details, the TDS deduction shall be at the maximum percentage stipulated as per the provisions of Income Tax Act.

   In addition to the above, Foreign vendors shall also submit relevant details of their bankers like Swift Code, Banker's Name &Address etc.

   B. TDS deduction as per section 51 of CGST Act,2017 shall be applicable as per Gazette Notification No. 50/2018-Central Tax, Dated: 13th September 2018. TDS deduction is also applicable on purchase of goods as per the latest notification under section 194Q, and subsequent notification(s) as and when released by Govt. authorities.
4. Procurement of Goods/ Works/ Services/ Consultancy Services [under clause relating to "Income Tax and Corporate Tax" or "TDS" of Model ITBs]

   a) Provision w.r.t. TDS on Purchase of Goods under section 194Q of Income Tax Act applicable from 01.07.2021 is as under:

      i. TDS as applicable will be deducted by BHEL under section 194Q of the Income Tax Act, 1961 on Purchases exceeds, the amount of Rupees. 50 Lakhs or limit defined therein from time to time during the financial year under the Indian Income Tax act 1961.

      ii. Since BHEL is liable to deduct Income Tax TDS under section 194Q, the provision of TCS as per section 206C(1H) of the Income Tax Act, 1961 shall not be applicable.

b) Higher rate of TDS for non-filers of ITR as per Section 206AB of Income Tax Act, 1961, in case of any vendor who does not filed their Income Tax Return for both of the two previous years preceding to current year and aggregate amount of TDS is more than or equal to Rs. 50,000/- in each of those previous two years (or limit defined by Govt. from time to time), then TDS will be deducted at the higher of following rates:

(i) Twice the rate mentioned in relevant TDS section.

(ii) Twice the rate or rates in force

(iii) 5%

5. Incomplete documentation will not be accepted. Delayed submission of invoice / documents may result in corresponding delay in payment. In this connection, request to also refer clause: G about invoicing & payment formalities under GST regime.

   Applicable documents shall be submitted to the purchaser at the time of execution of supplies/services for availing GST input credits.

F. STANDARD PAYMENT TERMS OF BHEL-EDN:

PURCHASE ORDERS FOR:	**SUPPLY WITH SERVICE(S)**	**SUPPLY ONLY**
INDIGENOUS PROCUREMENT	a. 100% of basic value with taxes and freight will be paid in 45 days from the date of dispatch or 15 days from the date of submission of complete set of documentation, whichever is later. Note: In case PBG is not furnished, only 90% payment will be released against 100% claim without the consent of Vendor. This 10% basic amount withheld towards PBG will be paid either against submission of supplementary invoice & Original PBG (or) against supplementary invoice without PBG after expiry of Warranty period.	b. 100% of PO value with taxes and freight will be paid in 45 days from the date of dispatch or 15 days from the date of submission of complete set of documentation, whichever is later.
IMPORT PROCUREMENT	c. 100% of basic value will be paid against usance draft of 45 days from the date of AWB/BOL on submission of complete set of documents. Note: In case PBG is not furnished, only 90% payment will be released against 100% claim without the consent of Vendor. This 10% basic amount withheld towards PBG will be paid either against submission of supplementary invoice & Original PBG (or) against supplementary invoice without PBG after expiry of Warranty period.	d. 100% of PO value will be paid against usance draft of 45 days from the date of AWB/BOL on submission of complete set of documents.

HIGH-SEA SALES PROCUREMENT	e. 100% of basic value will be paid in 45 days from the date of signing of High Sea Sale agreement or 15 days from the date of submission of complete set of documentation, whichever is later Note: In case PBG is not furnished, only 90% payment will be released against 100% claim without the consent of Vendor. This 10% basic amount withheld towards PBG will be paid either against submission of supplementary invoice & Original PBG (or) against supplementary invoice without PBG after expiry of Warranty period.	f. 100% of basic value will be paid in 45 days from the date of signing of High Sea Sale agreement or 15 days from the date of submission of complete set of documentation, whichever is later.

g. Erection and Commissioning:

Evaluation methodology: Unless and otherwise specified in SCC, E&C charges should not be less than 10% of the main supply value. In case the quoted total E&C value is less than 10% of the main supply value, BHEL shall evaluate Bidders Price deducting differential amount from main supply price proportionally from all items and apportioning towards E&C charges.
Payment term: 100% E&C charges along with tax as applicable, will be paid in 15 days from the date of submission of supplementary invoice/documents against proof of completion of E&C.

h. Erection Supervision and Commissioning:

Evaluation methodology: Unless and otherwise specified in SCC, E&C charges should not be less than 5% of the main supply value. In case the quoted total E&C value is less than 5% of the main supply value, BHEL shall evaluate Bidders Price deducting differential amount from main supply price proportionally from all items and apportioning towards E&C charges.
Payment term: 100% E&C charges along with tax as applicable, will be paid in 15 days from the date of submission of supplementary invoice/documents against proof of completion of E&C.

i. Comprehensive Annual Maintenance Contract:

Evaluation methodology: Unless and otherwise specified in SCC, CAMC will be applicable for a period of 04 years from the date of expiry of warranty period (or) from the date of completion of commissioning of equipment, whichever is later and the total CAMC value should not be less than 20% of the main supply value. In case the quoted total CAMC value is less than 20% of the main supply value, BHEL shall evaluate Bidders Price deducting differential amount from main supply price proportionally from all items and apportioning towards CAMC charges.

Payment terms: 100% CAMC charges along with tax as applicable, will be paid in 15 days from the date of submission of supplementary invoice/documents against proof of completion of CAMC on yearly basis.

j. Terms of Payment for Training: 100% payment will be made in 45 days from the date of completion of Training or 15 days from the date of submission of complete set of invoice along with documentary evidence, whichever is later.

LOADING FACTORS FOR DEVIATION IN PAYMENT TERMS (APPLICABLE FOR IMPORT PROCUREMENT ONLY):

1) For offers received with Sight draft payment term in place of Usance draft, loading applicable will be 1.0% of basic value.

2) For offers received with Letter of Credit payment term with Usance of 45 days, loading applicable will be 2.5% of basic value.
Additional loading of 2% will be applicable for payment term as Letter of Credit at Sight.

k. Any payment term with credit period of less than 45 days for indigenous supply/HSS and any other variation of payment terms are liable for rejection.

l. Standard payment terms indicated in Clauses: F (a), (b), (c), (d), (e), (f), (g), (h), (i) & (j) will not attract any loading.

Note 1: Basic value of Purchase Order mentioned above will include all components of the purchase order and will exclude only taxes, duties, freight, training charges, E&C and AMC charges (wherever applicable). Wherever the Purchase Order is split into import portion and indigenous portion of supply, minimum % to be quoted for Services, wherever mentioned, will be of both purchase order values put together.

Note 2: In case of multiple packages/units in a power plant, payment of E&C charges will be processed on pro-rata basis.

Note 3: No deviation will be permitted from the duration of Guarantee/Warranty and/or Comprehensive Annual Maintenance Contract period specified in SCC.

G. Terms & Conditions to be complied under GST regime:

1. All invoices to contain BHEL-EDN (buyer) GSTIN number: 29AAACB4146P1ZB. However for CGST +SGST/UGST billing outside the state of Karnataka, invoice has to be generated with BHEL's Nodal Agency GSTIN number. Address of Nodal Agency along with GSTIN number will be provided by BHEL at the time of issuing dispatch clearance.

2. The Bidder shall mention Bidder's GSTIN number in all quotations and Invoices submitted.

3. The Bidder shall also mention HSN (Harmonized System of Nomenclature) / SAC (Services Accounting Code) mandatorily in all quotations and invoices submitted.

4. Invoice submitted should be in the format as specified under GST Laws viz., all details as mentioned in Invoice Rules like GST registration number(GSTIN), invoice number with date of issue, quantity, rate, value, taxes with nomenclature – CGST, SGST, UGST,IGST mentioned separately, HSN Code / SAC Code etc. Invoice should be submitted in original for buyer plus duplicate for credit availment.

5. Payment of GST to Vendor will be made only if it is matching with data uploaded by the Vendor in GST portal.

6. For invoices paid on Reverse charge basis – "Tax payable on reverse charge basis" to be mentioned on the invoice.

7. In case GST credit is delayed/denied to BHEL due to non/delayed receipt of goods and/or tax invoice or expiry of timeline prescribed in GST law for availing such ITC, or any other reasons not attributable to BHEL, GST amount will be recoverable from vendor along with interest levied/ leviable on BHEL.

8. In case vendor delays declaring such invoice in his 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 will be recoverable from vendor/contractor along with interest levied/ leviable on BHEL.

9. Vendor should intimate BHEL immediately on the same date of invoicing without any delay.

10. In case of discrepancy in the data uploaded by supplier in the GSTN portal or in case of any shortages or rejection in the supply, then BHEL will not be able to avail the tax credit and will notify the supplier of the same. Supplier has to rectify the data discrepancy in the GSTN portal or issue credit note (details to be uploaded in GSTN portal) for the shortages or rejections in the supplies, within the calendar month notified by BHEL.

11. Bidders to note that Rules & Regulations pertaining to E-way bill system are to be strictly adhered to, as and when notified by Govt. authorities.

12. As per Notification 88/2020-Central Tax dated 10th November 2020 (applicable w.e.f. 01 January 2021), the turnover for applicability of E-invoicing provisions has been reduced from 500 crores to 100 crores. In other words, registered person [other than a SEZ unit and those referred in Rule 54(2), 54(3), 54(4) and 54(4A) of the CGST Rules], whose aggregate turnover in any preceding financial year from 2017-18 onwards exceeds 100 crores, is required to comply with the requirement of IRN and QR code in respect of supply of goods or services or both to a registered person or for exports.

H. <u>Performance bank guarantee (PBG):</u>

Performance bank guarantee (PBG) will be applicable as called in the tender documents. Unless otherwise specified in the SCC, the PBG against performance of the contract shall be valid for a period of 24 months from the date of dispatch of goods + claim period of 03 months, for a value equal to 10 % of the basic value of the purchase order which will include all components of the purchase order and will exclude only taxes, duties, freight, training charges, E&C and AMC charges (wherever applicable).

1. The BG issued in Indian Rupees by Banks in India is to be executed on Non-Judicial Stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the State(s) where the BG is submitted or is to be acted upon or the rate prevailing in the State where the BG was executed, whichever is higher. The Stamp Paper/e-stamp paper shall be purchased in the name of Vendor/Bank issuing the guarantee.
2. No deviation for the duration and value of PBG will be permitted.
3. PBG shall be from any of the BHEL consortium of bankers **(refer Annexure VI)**.
4. PBGs from nationalized banks are also acceptable.
5. PBG should be sent directly by the bank to the dealing executive mentioned in the purchase order located at the address mentioned in the purchase order.
6. PBG should be in the format specified **(refer Annexure VII)**. No deviation to this format will be allowed. However in case BHEL changes the PBG format, bidder shall honor the same.
7. Bank Guarantee should be enforceable in Bangalore.
8. 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 Bangalore.
   b. From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)

   b.1 Please note 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's (BHEL's Consortium Bank) branch in India.

PROJECT: SAGARDIGHI U-5 1X660 MW

CUSTOMER: M/S. WBPDCL

CONSULTANT: DCPL

CONTRACTOR: M/S. BHEL

PURCHASE SPECIFICATIONS FOR TEMPERATURE ELEMENTS

REVISION : 00

APPROVED

(PV)

PREPARED	ISSUED	DATE
(PRK)	416	07/09/2023

Pre-Qualification Requirements (PQR) of Bidders for Temperature Elements:

"Bidder shall have successfully completed design, engineering, manufacturing, testing and supply of Temperature Elements including Thermocouple, RTD and Thermowells in Coal Fired Thermal Powerplants of unit size not less than 660 MW and supplied element should be operating for at least two years. To qualify to this point, Bidders shall furnish details of supplies made. Details should include PO copies/Datasheet and Supply documents.

Feedbacks from end user (if available) can also furnished.

SUPPLY REQUIREMENTS: Vendor shall quote for the following items indicated below. Without this, the offer shall be treated as incomplete and shall be rejected. All the Elements below shall be provided with CERAMIC Terminal Blocks and Nickel Plated Brass Screw type with Silver coated and spring loaded Connectors.

Two Electrical Connections shall be provided, one with ½" NPT Cable Gland and other Entry shall be with Blind Plug.

1.0 PROJECT REQUIREMENT :

A) SCOPE: The offer for the following items shall be as per Instrument Schedule & related Tapping point Drgs.

SL. NO	Material Code	Description	Unit Main 1 Qty	Minimum mandatory spares Qty	Grand Total Qty
1	PR0190000333	T/C K type threaded Barstock thermowell with IBR	110	25	135
2	PR0190000341	T/C K type with flanged thermowell	46	7	53
3	PR0190000368	T/C K Type with 30mtr Flexible MI extension cable and Barstock Thermowell	41	6	47
4	PR0190000376	T/C K type Metal Temperature Measurement 30 Mtr MI cable.	30	5	35
5	PR0190000384	T/C K type with Tungsten carbide thermowell	33	5	38
6	PR0190000392	T/C K type with flanged Inconel 600 thermowell	28	5	33
7	PR0200000330	RTD with threaded Barstock thermowell	101	22	123
8	PR0200000349	RTD with flanged thermowell	24	4	28
9	PR0200000365	RTD with threaded Barstock thermowell IBR	36	8	44
10	PR0200000373	RTD with flanged Inconel 600 thermowell	12	2	14
11	PR0200000420	RTD Metal Temperature Measurement 30 Mtr MI cable.	1	2	3
12	PR0200000462	T/C N type with flanged Inconel 600 thermowell	8	2	10
13	PR0190000406	T/C K type Metal Casing	60	9	69
14	PR0200000381	RTD Bearing Temperature	8	1	9
15	PR0200000381	RTD Bearing Temperature	74	10	84
		Total Qty (Nos)	612	113	725

B) Mandatory Spares:

*Minimum mandatory spares qty indicated in the table above, Actual Qty shall be as indicated below.
Mandatory spares shall be 15% of Total Qty for each type, Each Process Connection Size and Each Thermowell size(IL&EL) OR Minimum 2 Number of each type, Each Process Connection Size and Each Thermowell size(IL&EL) whichever is higher shall be included as mandatory spares.

Note: It is responsibility of bidder to calculate mandatory spares correctly, vendor can chose the length of IL and EL to optimize the mandatory spares qty without affecting the specification requirement. No commercial implication will be allowed for change in mandatory spares quantity due to calculation of WFC. During datasheets submission if BHEL finds that Thermowell length has to be corrected as per ASME PTC 19.3 2016 and if it results in change of qty in mandatory spares then no commercial implication will be allowed. However, if change of IL is due to inputs such as Operating and design parameters furnished by BHEL, then commercial implications due to those changes will be allowed.
Note: Verification of WFC(Includes Thermowell Insertion and Extension Lengths) will be done as per ASME PTC 19.3 2016 only after PO placement.

Vendors shall submit Mandatory spares list for reference in excel copy.

Vendors shall submit Quality Plan for RTD, Thermocouple and Thermowell along with datasheets for approval.

Instrument Schedule & Tapping Point Drg. References.

1. Instrument Sch. Ref. CE/416/SAGARDIGHI/TE/SCH

2. Tapping Point Drgs Ref:
   3-55-335-02053
   VESSEL-TEMP-STEAM-01
   PE-DG-445-145-I101
   4-97-288-94345
   4-97-288-94347
   4-97-288-94351
   4-97-288-94354
   SAGARDIGHI-TEMP-METAL-01

2.0 Technical Requirements :

Tag number shall be engraved on thermowell, service engraved in stainless steel tag plate and tied to Temperature Element with SS chain.

2.1 **RTD (PT-100)**

Requirement	Description
Type of RTD	Duplex - Ungrounded elements, Four wire 100 Ohm platinum at 0 DegC and shall Conform to DIN-43760
Accuracy	+/-0.5% of span as per IEC-60751 or Class A accuracy as per DIN 43760

Housing/Head	Terminal Head shall be IP-65 or better universal screw type. Terminal head cover shall be provided with gaskets and SS 316 captive chain. Terminal head shall be of Die cast aluminium or better.
Terminal Block	Terminal block shall be constructed of High Temperature ceramic. Head shall be designed for positive connection and for a terminal temperature Difference of not more than 0.05 deg.C.
Sheath	Sheathing of RTD's shall be 8 mm OD SS 316 seamless tubes with Magnesium oxide (MgO) (Purity 99.4%) insulation.
Element size	Element lead size shall be 18 AWG
Insulation resistance	The insulation resistance at 540 deg.C. shall not be less than 5 mega ohms.
Electrical connection	Two Electrical Connections shall be provided, one with ½" NPT Cable Gland and other Entry shall be with Blind Plug.
Neck Extention length	150mm SS304 Nipple union Nipple shall be provided with ½" Sch 80 pipe with ½" NPT(M) connection size for all Barstok Thermowells.
Characteristic	Characteristics shall be linear with respect to temperature within +/-0.5% of top range.
Response Time	Response time shall be 1-2 Sec bare & 30 Sec. With protective sheath/thermowell.

2.2 **Thermocouples**

Requirement	Description
Type of Thermocouple	Dual / Duplex Ungrounded elements, 16 AWG wire for Chromel - Alumel (Type K and N)
Calibration and accuracy	As per IEC-751/ANSI-MC-96.1(special limits of Error)
Sheath	Sheathing of K-Type Thermocouple shall be 8 mm OD SS 316 seamless tubes with magnesium oxide packing for insulation. N-Type thermocouple, sheathing shall be 8mm OD of Inconel 600 with magnesium oxide packing for insulation (purity 99.4% above).
Insulation resistance	The insulation resistance at 540 deg.C. shall not be less than 5 mega ohms.
Housing/Head	Terminal Head shall be IP-65 or better universal screw type. Terminal head cover shall be provided with gaskets and SS 316 captive chain. Terminal head shall be of Die cast aluminium or better.
Terminal Block	Terminal block shall be constructed of High Temperature ceramic base with Brass screw type terminals, spring loaded Mineral insulated thermocouples. Thermocouple Head shall be designed for positive connection and for a

	terminal Temperature Difference of not more than 0.05 DegC
Electrical connection	Two Electrical Connections shall be provided, one with ½" NPT Cable Gland and other Entry shall be with Blind Plug.
Neck Extention length	150mm SS304 Nipple union Nipple shall be provided with ½" Sch 80 pipe with ½" NPT(M) connection size for all Barstok Thermowells.
Characteristic	Characteristics shall be linear with respect to temperature within +/-0.5% of top range.
Response Time	Response time shall be 2-6 Sec bare & 30 Sec. With protective sheath/thermowell.

2.3 **Metal temperature Thermocouples** shall be provided as per the following specification:-

Requirement	Description
Measuring medium:	Metal
Material of thermocouple element:	Chromel - Alumel- Type K
Insulation Packing	Mineral insulation of magnesium oxide
Thermocouple wire gauge	16 AWG
Protective sheath	SS321
Protective sheath dia	8 mm O.D and 30Mtr Length
Characteristics of thermocouple	Special limits of error as in ANSI MC 96.1
Mounting accessories	½" BSP SS sliding end connector weld pad welded on clamping of heat resistance SS310
Cold end sealing	SS pot seal with colour coded PTFE headed sleeve insulated flexible tails. Sealing Component Epoxy Resin
Minimum bending radius	30 mm

2.4 Thermowell for above shall conform to following requirements:

2.4.1 Threaded themowell shall be Single piece SS316/SS316H material (As identified in Ins. Sch) material, tapered, drilled from Barstock threaded Thermowells shall have 25 mm Tip Dia.
For Barstock Thermowell, Extension Length shall be Minimum 25mm above the Insulation on pipe and Minimum 30 mm when there is no insulation on pipe.

Thermowell Design shall conform to Standard per ASME PTC 19.3-2016 or latest. IBR certification shall be furnished for thermowells, as applicable.
Bore Concentricity +5% of wall thickness
Vendor shall quote IL and EL lengths in multiple of 5mm only.
Maximum Insertion Length of the Threaded Barstock Thermowell shall not exceed 400mm.

Vendor shall explain the criteria to accept / select "Insertion length" as per ASME PTC 19.3, 2016 & shall have the software to size the Thermowell as per ASME PTC 19.3 2016

or latest, along with the offer vendor has to submit the correct calculations for Reynolds number, Strouhal number, Vortex Frequency Shredding, Resonance Frequency, Inline Resonance Velocity, Cyclic Stress, Steady state Stress (LHS & RHS), Dynamic Stress (LHS & RHS), Pressure Limit etc.

Note: Verification of Wake Frequency calculation (Includes Thermowell Insertion and Extension Lengths) will be done as per ASME PTC 19.3 2016 only after PO placement. If any changes in the Length of Thermowell due to WFC calculation as per standard same shall be accepted without any price implications. However, if Thermowell length changes due to Operating Parameters or Stub drg price implication will be allowed.

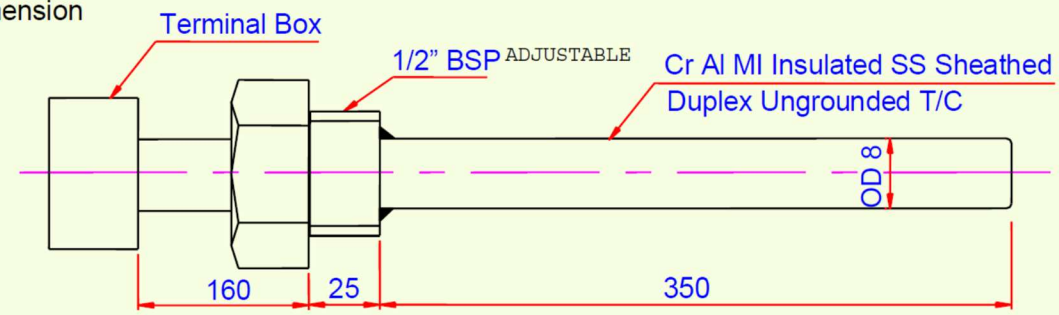
2.4.2 For Mill classifier outlet (i.e. Medium is Coal/Air mixture), long life Solid Sintered Tungsten Carbide material of high abrasion resistance shall be provided Tungsten Carbide Thermowell size= 24mm OD x 9mm ID. Insertion length 160 mm, Extension Length 160mm.

2.4.3 For Air/Flue gas services, SS316/ Inconel 600 Thermowell protection tube of Tip Diameter of 26.7 mm with welded cap at the end (of 100 mm min. length from tip) shall be fabricated from 3/4" Sch 80 Seamless Pipes as identified in the Instrument schedule.

2.4.4 For Furnace zone(N Type T/C), Adjustable SS316 flange, Inconel 600 Thermowell with additional overprotection by Tungsten carbide coating. Inconel 600 tube shall be fabricated from 3/4” Sch 80 seamless pipe with welded cap at the end (of 100 mm min. length from tip). This construction would ensure thermowell should not break due to any shock.

For flanged connections (In Air/Fluegas services); Adjustable SS316 flange, Studs, nuts and gaskets of suitable material with Cadmium plated shall be provided. Flanges shall be as per ANSI-B 16.5.

2.4.5 APH FIRE SENSING K TYPE THERMOCOUPLE (Material Code - PR0190000406)

Application	Used in the Air Preheater Fire Detection System.
Type	K Type, Chromel Alumel, Duplex, ungrounded Hot Junction, SS sheathed, Wire Dia 1.00 mm.
Normal Working Temperature	0 to 500°C
Insulation	Mineral insulated
Characteristic of Thermocouple	As per ANSI MC 96.1 - 1975
Process Connection	Threaded to ½" BSP (M)
Dimension 	
Materials a) T/C Sheath : SS Sheath as per AISI 304, OD 8 mm. b) Adapter : SS as per AISI 304 c) Terminal box : Aluminum / Carbon steel	
Terminal Box a) Terminal Block : spring loaded ceramic terminal block b) Degree of protection : IP55 as per IS 13947 part - 1 c) Conduit connection : ¾" NPT(F) with double compression gland	

2.4.5 APH GUIDE/SUPPORT BEARING RTDS LUBRICANT (PR0200000381):

Application	Used to detect Oil Temperature Rise in Bearing Housings of Regenerative Air Preheaters.
Ambient Temperature	50°C.
Surroundings	Dusty, humid & corrosive atmosphere of a coal / oil fired boiler.
Element	
a) Type	Ceramo mineral Insulated, Spring loaded.
b) Temperature Range	- 50°C to + 500°C
c) Sensor	Pt 100, Duplex, 4 Wire
d) Nominal Resistance	100 ± 0.1 ohms at 0°C
e) Inner Leads	Silver
f) Sheath Material	**SS 304**
g) Sheath OD	6 mm
h) Immersion Length	To suit Thermowell
i) Accuracy	**Class A as per DIN 43760**
Head	
a) Type	Screwed on cover with Neoprene gasket and captive chain to prevent loss.
b) Degree of protection	IP 65 as per **IS 13947 Part 1**
c) Material	Cast Aluminium, stove enameled black finish
d) Terminal block	Ceramic with exproof terminals suitable for min. 1.5 mm^2 Cables
e) Nipple size	½" NPT Male (both ends).
f) Nipple material	**SS 304**
g) Nipple Connection	70 mm approximately including thread length.
h) Conduit connection	¾" N.P.T Conduit hole

Thermowell	
a) Type	Screwed, solid bar stock.
b) Material	**SS 304**
c) Process Connection	R 1 (BSP 1" ext.) as per **IS 554**
d) Inner Connection	1/2" NPT Female
e) Bore Diameter	7 mm
f) Stem OD	16 mm (minimum) at bottom.
g) Tip Thickness	4 mm minimum.
h) Immersion Length	100 mm (including Thread Length)
i) Boss	Across flat 36mm, height 25 mm max.

3.0 Documents to be furnished in the event of Tendering stage:

3.1 Technical offer

3.2 Point wise compliance to Purchase specification with company seal and signature on Purchase specification.

3.3 Technical Literature / Catalogues.

3.4 Engineering Checklist to be fill and submitted with seal and signature.

3.5 Mandatory spares list as per specification.

3.6 Vendor to submit credentials as indicated in PQR above. This will be submitted to Customer for vendor approval in this project. Please note that BHEL will wait 20 days for vendor approval from the date of submission, if the same is not received from customer within this period your offer will not be acceptable.

4.0 Documents to be furnished, for Approval by BHEL / Owner or End-User, in the event of order:

4.1 Datasheets / Assembly Drawings

4.2 Technical Literature / Catalogues

4.3 Quality Plan ** for Thermocouples, RTD's and Thermowells

4.4 Thermowell Design Calculations as per ASME PTC 19.3-2016 or latest.

Above documents shall be submitted in Soft copy as one PDF file and 6 sets of Hardcopies for approval.

4.5 Test Certificates / Reports as per approved Quality plan.

4.6 Copy of Approved Data sheet (Two sets with supply to Site + 1 Copy to BHEL- EDN)

** NOTE: The Quality Plan shall include the following as minimum in addition to tests called by relevant standards (ANSI 96.1 & DIN 43760); Dimension Check, Process/Electrical connections Checks, Calibration Tests (100 % by Vendor & 10 % by BHEL / Owner), Ultrasonic/Radiography Test for bore concentricity of Thermowell, Insulation Resistance Tests, IBR Certificates (as Applicable), Hydro tests, all Material Test Certificates etc.

Inspection shall be carried out based on the Approved Quality plan.

Important Note:

Mandatory Spares shall be sent in pre-decided lots in secure boxes distinctly marked in Red colour with boldly written "S" mark on each face of the secure boxes.

PROJECT: SAGARDIGHI 1X660 MW
CUSTOMER: M/s WBPDCL
CONTRACTOR: M/s BHEL
Ref: CE/416/SAGARDIGHI/TE/SCH

SL NO	PID_NO	PID_NAME	KKS_TAG	DESCRIPTION	SENSR_ TYPE	MEDIUM	OP_ PRESS	DGN_ PRESS	Unit of Pressure	OP_ TEMP (Deg.C)	DGN_ TEMP (Deg.C)	PIPE SIZE (Dia.x Thk) (mms.)	VELOCITY (Meter/Sec)	INSULN. THICK (mms.)	RANGE (Deg.C)	IBR Required for Thermowell	STUB DETAIL / PROCESS CONNECTION / THERMOWELL DRG REF	PROCESS CONNECTION SIZE	Stub Hieght (mm)	REMARKS	SS304 Nipple Union Nipple Length (mm)	Qty	Input unit	MATERIAL CODE
1	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBA01CT011	MS TEMP AT SH O/L-L	Cr-Al	STEAM	278	294.8	kg/cm²(a)	593	601	ID 340*100	39.04	345	0-800	Yes	PE-DG-445-145-I101	R1.5"	45	Solid Barstock Thermowell Material Shall be SS316H		1	PEM	PR0190000333
2	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBA01CT012	MS TEMP AT SH O/L-L	Cr-Al	STEAM	278	294.8	kg/cm²(a)	593	601	ID 340*100	39.04	345	0-800	Yes	PE-DG-445-145-I101	R1.5"	45	Solid Barstock Thermowell Material Shall be SS316H		1	PEM	PR0190000333
3	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBA01CT013	MS TEMP AT SH O/L-L	Cr-Al	STEAM	278	294.8	kg/cm²(a)	593	601	ID 340*100	39.04	345	0-800	Yes	PE-DG-445-145-I101	R1.5"	45	Solid Barstock Thermowell Material Shall be SS316H		1	PEM	PR0190000333
4	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBA01CT014	MS TEMP AT SH O/L-L	Cr-Al	METAL	247	294.8	kg/cm²(a)	593	601	60.3 x 14		NA	0-800		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	PEM	PR0190000376
5	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBA02CT011	MS TEMP AT SH O/L-R	Cr-Al	STEAM	278	294.8	kg/cm²(a)	593	601	ID 340*100	39.04	345	0-800	Yes	PE-DG-445-145-I101	R1.5"	45	Solid Barstock Thermowell Material Shall be SS316H		1	PEM	PR0190000333
6	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBA02CT012	MS TEMP AT SH O/L-R	Cr-Al	STEAM	278	294.8	kg/cm²(a)	593	601	ID 340*100	39.04	345	0-800	Yes	PE-DG-445-145-I101	R1.5"	45	Solid Barstock Thermowell Material Shall be SS316H		1	PEM	PR0190000333
7	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBA02CT013	MS TEMP AT SH O/L-R	Cr-Al	STEAM	278	294.8	kg/cm²(a)	593	601	ID 340*100	39.04	345	0-800	Yes	PE-DG-445-145-I101	R1.5"	45	Solid Barstock Thermowell Material Shall be SS316H		1	PEM	PR0190000333
8	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBA02CT014	MS TEMP AT SH O/L-R	Cr-Al	METAL	247	294.8	kg/cm²(a)	593	601	60.3 x 14		NA	0-800		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	PEM	PR0190000376
9	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBA11CT011	MS HDR TEMP-L	Cr-Al	STEAM	247	294.8	kg/cm²(a)	565	601	ID 340 x 100	39.04	345	0-700	Yes	PE-DG-445-145-I101	R1.5"	45	Solid Barstock Thermowell Material Shall be SS316H		1	PEM	PR0190000333
10	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBA11CT012	MS HDR TEMP-L	Cr-Al	STEAM	247	294.8	kg/cm²(a)	565	601	ID 340 x 100	39.04	345	0-700	Yes	PE-DG-445-145-I101	R1.5"	45	Solid Barstock Thermowell Material Shall be SS316H		1	PEM	PR0190000333
11	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBA12CT011	MS HDR TEMP-R	Cr-Al	STEAM	247	294.8	kg/cm²(a)	565	601	ID 340 x 100	39.04	345	0-700	Yes	PE-DG-445-145-I101	R1.5"	45	Solid Barstock Thermowell Material Shall be SS316H		1	PEM	PR0190000333
12	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBA12CT012	MS HDR TEMP-R	Cr-Al	STEAM	247	294.8	kg/cm²(a)	565	601	ID 340 x 100	39.04	345	0-700	Yes	PE-DG-445-145-I101	R1.5"	45	Solid Barstock Thermowell Material Shall be SS316H		1	PEM	PR0190000333
13	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBB01CT011	HRH STM TEMP AT RH O/L - L	Cr-Al	STEAM	60.62	68.5	kg/cm²(a)	593	601	ID 600*34	52.53	360	0-800	Yes	PE-DG-445-145-I101	R1.5"	45	Solid Barstock Thermowell Material Shall be SS316H		1	PEM	PR0190000333
14	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBB01CT012	HRH STM TEMP AT RH O/L - L	Cr-Al	STEAM	60.62	68.5	kg/cm²(a)	593	601	ID 600*34	52.53	360	0-800	Yes	PE-DG-445-145-I101	R1.5"	45	Solid Barstock Thermowell Material Shall be SS316H		1	PEM	PR0190000333
15	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBB01CT013	HRH STM TEMP AT RH O/L - L	Cr-Al	STEAM	60.62	68.5	kg/cm²(a)	593	601	ID 600*34	52.53	360	0-800	Yes	PE-DG-445-145-I101	R1.5"	45	Solid Barstock Thermowell Material Shall be SS316H		1	PEM	PR0190000333
16	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBB02CT011	HRH STM TEMP AT RH O/L - R	Cr-Al	STEAM	60.62	68.5	kg/cm²(a)	593	601	ID 600*34	52.53	360	0-800	Yes	PE-DG-445-145-I101	R1.5"	45	Solid Barstock Thermowell Material Shall be SS316H		1	PEM	PR0190000333
17	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBB02CT012	HRH STM TEMP AT RH O/L - R	Cr-Al	STEAM	60.62	68.5	kg/cm²(a)	593	601	ID 600*34	52.53	360	0-800	Yes	PE-DG-445-145-I101	R1.5"	45	Solid Barstock Thermowell Material Shall be SS316H		1	PEM	PR0190000333
18	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBB02CT013	HRH STM TEMP AT RH O/L - R	Cr-Al	STEAM	60.62	68.5	kg/cm²(a)	593	601	ID 600*34	52.53	360	0-800	Yes	PE-DG-445-145-I101	R1.5"	45	Solid Barstock Thermowell Material Shall be SS316H		1	PEM	PR0190000333
19	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBC01CT011	CRH STM TEMP AT RH I/L-L	Cr-Al	STEAM	65.44	74.2	kg/cm²(a)	365.8	370	660*23	31.3	180	0-500	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
20	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBC02CT011	CRH STM TEMP AT RH I/L-R	Cr-Al	STEAM	65.44	74.2	kg/cm²(a)	365.8	370	660*23	31.3	180	0-500	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
21	PE-DG-445-100-N101	P&ID MS, HRH & CRH SYSTEM	LBC10CT011	CRH STM HDR TEMP AFT NRV	Cr-Al	STEAM	65.44	74.2	kg/cm²(a)	365.8	370	965*37	34.04	185	0-500	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
22	PE-DG-445-100-N102	P&ID HP/LP BYPASS SYSTEM	LBF11CT011	HPBP-1 D/S TEMP	Cr-Al	STEAM	37.89	74.2	kg/cm²(a)	344	380	508*25	85.75	155	0-500	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
23	PE-DG-445-100-N102	P&ID HP/LP BYPASS SYSTEM	LBF11CT012	HPBP-1 D/S TEMP	Cr-Al	STEAM	37.89	74.2	kg/cm²(a)	344	380	508*25	85.75	155	0-500	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
24	PE-DG-445-100-N102	P&ID HP/LP BYPASS SYSTEM	LBF11CT013	HPBP-1 D/S TEMP	Cr-Al	STEAM	37.89	74.2	kg/cm²(a)	344	380	508*25	85.75	155	0-500	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
25	PE-DG-445-100-N102	P&ID HP/LP BYPASS SYSTEM	LBF21CT011	HPBP-2 D/S TEMP	Cr-Al	STEAM	37.89	74.2	kg/cm²(a)	344	380	508*25	85.75	155	0-500	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
26	PE-DG-445-100-N102	P&ID HP/LP BYPASS SYSTEM	LBF21CT012	HPBP-2 D/S TEMP	Cr-Al	STEAM	37.89	74.2	kg/cm²(a)	344	380	508*25	85.75	155	0-500	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
27	PE-DG-445-100-N102	P&ID HP/LP BYPASS SYSTEM	LBF21CT013	HPBP-2 D/S TEMP	Cr-Al	STEAM	37.89	74.2	kg/cm²(a)	344	380	508*25	85.75	155	0-500	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
28	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBQ71CT011	EXT TEMP FRM IPT TO HPH-7A DES HTR	Cr-Al	STEAM	27.23	32	kg/cm²(a)	464.3	475	273*9.27	35.51	210	0-600	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
29	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBQ71CT011A	EXT TEMP FRM IPT TO HPH-7A DES HTR (SHELL TEMP)	Cr-Al	STEAM	27.23	32	kg/cm²(a)	464.3	475	273*9.27	35.51		0-600	Yes	VESSEL-TEMP-STEAM-01	1.5"NPT	75	IL=150mm AND EL=150mm		1	PEM	PR0190000333
30	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBQ72CT011	EXT TEMP FRM IPT TO HPH-7B DES HTR	Cr-Al	STEAM	27.23	32	kg/cm²(a)	464.3	475	273*9.27	35.51	210	0-600	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
31	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBQ72CT011A	EXT TEMP FRM IPT TO HPH-7B DES HTR (SHELL TEMP)	Cr-Al	STEAM	27.23	32	kg/cm²(a)	464.3	475	273*9.27	35.51		0-600	Yes	VESSEL-TEMP-STEAM-01	1.5"NPT	75	IL=150mm AND EL=150mm		1	PEM	PR0190000333

PROJECT: SAGARDIGHI 1X660 MW
CUSTOMER: M/s WBPDCL
CONTRACTOR: M/s BHEL
Ref: CE/416/SAGARDIGHI/TE/SCH

SL NO	PID_NO	PID_NAME	KKS_TAG	DESCRIPTION	SENSR_ TYPE	MEDIUM	OP_ PRESS	DGN_ PRESS	Unit of Pressure	OP_ TEMP (Deg.C)	DGN_ TEMP (Deg.C)	PIPE SIZE (Dia.x Thk) (mms.)	VELOCITY (Meter/Sec)	INSULN. THICK (mms.)	RANGE (Deg.C)	IBR Required for Thermowell	STUB DETAIL / PROCESS CONNECTION / THERMOWELL DRG REF	PROCESS CONNECTION SIZE	Stub Hieght (mm)	REMARKS	SS304 Nipple Union Nipple Length (mm)	Qty	Input unit	MATERIAL CODE
32	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBQ73CT011	EXT STM TEMP AT HPH-7A I/L	Cr-Al	STEAM	27.23	32	kg/cm²(a)	316.9	320	273*9.27	27.36	120	0-500	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0190000333
33	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBQ73CT011A	EXT STM TEMP AT HPH-7A I/L (SHELL TEMP)	Cr-Al	STEAM	27.23	32	kg/cm²(a)	316.9	320	273*9.27	27.36		0-500	Yes	VESSEL-TEMP-STEAM-01	1.5"NPT	75	IL=150mm AND EL=150mm		1	PEM	PR0190000333
34	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBQ74CT011	EXT STM TEMP AT HPH-7B I/L	Cr-Al	STEAM	27.23	32	kg/cm²(a)	316.9	320	273*9.27	27.36	120	0-500	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0190000333
35	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBQ74CT011A	EXT STM TEMP AT HPH-7B I/L (SHELL TEMP)	Cr-Al	STEAM	27.23	32	kg/cm²(a)	316.9	320	273*9.27	27.36		0-500	Yes	VESSEL-TEMP-STEAM-01	1.5"NPT	75	IL=150mm AND EL=150mm		1	PEM	PR0190000333
36	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBQ81CT011	EXT STM TEMP AT HPH-8A I/L	Cr-Al	STEAM	63.36	74.2	kg/cm²(a)	364.9	370	273*12.7	27.24	150	0-500	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
37	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBQ81CT011A	EXT STM TEMP AT HPH-8A I/L (SHELL TEMP)	Cr-Al	STEAM	63.36	74.2	kg/cm²(a)	364.9	370	273*12.7	27.24		0-500	Yes	VESSEL-TEMP-STEAM-01	1.5"NPT	75	IL=150mm AND EL=150mm		1	PEM	PR0190000333
38	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBQ82CT011	EXT STM TEMP AT HPH-8B I/L	Cr-Al	STEAM	63.36	74.2	kg/cm²(a)	364.9	370	273*12.7	27.24	150	0-500	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
39	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBQ82CT011A	EXT STM TEMP AT HPH-8B I/L (SHELL TEMP)	Cr-Al	STEAM	63.36	74.2	kg/cm²(a)	364.9	370	273*12.7	27.24		0-500	Yes	VESSEL-TEMP-STEAM-01	1.5"NPT	75	IL=150mm AND EL=150mm		1	PEM	PR0190000333
40	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBQ91CT011	EXT STM TEMP AT HPH-9A I/L	Cr-Al	STEAM	95.53	110	kg/cm²(a)	421.8	430	168.3*10.97	34.34	165	0-550	Yes	PE-DG-445-145-I101	R1.5"	64			1	PEM	PR0190000333
41	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBQ91CT011A	EXT STM TEMP AT HPH-9A I/L (SHELL TEMP)	Cr-Al	STEAM	95.53	110	kg/cm²(a)	421.8	430	168.3*10.97	34.34	165	0-550	Yes	PE-DG-445-145-I101	R1.5"	64			1	PEM	PR0190000333
42	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBQ92CT011	EXT STM TEMP AT HPH-9B I/L	Cr-Al	STEAM	95.53	110	kg/cm²(a)	421.8	430	168.3*10.97	34.34	165	0-550	Yes	PE-DG-445-145-I101	R1.5"	64			1	PEM	PR0190000333
43	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBQ92CT011A	EXT STM TEMP AT HPH-9B I/L (SHELL TEMP)	Cr-Al	STEAM	95.53	110	kg/cm²(a)	421.8	430	168.3*10.97	34.34	165	0-550	Yes	PE-DG-445-145-I101	R1.5"	64			1	PEM	PR0190000333
44	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBS30CT011	EXT STM TEMP AT LPH-3 I/L	PRT-100	STEAM	1.46	3.5	kg/cm²(a)	120.6	130	813*10	52.41	40	0-150	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000365
45	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBS30CT011A	EXT STM TEMP AT LPH-3 I/L (SHELL TEMP)	PRT-100	STEAM	1.46	3.5	kg/cm²(a)	120.6	130	813*10	52.41		0-150	Yes	VESSEL-TEMP-STEAM-01	1.5"NPT	75	IL=150mm AND EL=150mm		1	PEM	PR0200000365
46	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBS40CT011	EXT STM TEMP AT LPH-4 I/L	PRT-100	STEAM	3.27	3.5	kg/cm²(a)	194.6	210	559*10	52.29	75	0-300	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000365
47	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBS40CT011A	EXT STM TEMP AT LPH-4 I/L (SHELL TEMP)	PRT-100	STEAM	3.27	3.5	kg/cm²(a)	194.6	210	559*10	52.29		0-300	Yes	VESSEL-TEMP-STEAM-01	1.5"NPT	75	IL=150mm AND EL=150mm		1	PEM	PR0200000365
48	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBS50CT011	EXT STM TEMP AT LPH-5 I/L	Cr-Al	STEAM	5.77	7	kg/cm²(a)	256.4	270	457*9.53	46.2	100	0-350	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0190000333
49	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBS50CT011A	EXT STM TEMP AT LPH-5 I/L (SHELL TEMP)	Cr-Al	STEAM	5.77	7	kg/cm²(a)	256.4	270	457*9.53	46.2		0-350	Yes	VESSEL-TEMP-STEAM-01	1.5"NPT	75	IL=150mm AND EL=150mm		1	PEM	PR0190000333
50	PE-DG-445-100-N103	P&ID EXTN STEAM FOR HEATERS	LBS60CT011	EXT STM TEMP TO DEA	Cr-Al	STEAM	13.22	15	kg/cm²(a)	358.9	375	406.4*9.53	43.75	160	0-500	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0190000333
51	PE-DG-445-100-N104	P&ID HEATER DRAINS & VENT SYSTEM	LCH10CT011	HPH-7A DRN TO DEA TEMP	PRT-100	COND	26.76	32	kg/cm²(a)	200.3	200	273*9.27	1.48	60	0-250	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000365
52	PE-DG-445-100-N104	P&ID HEATER DRAINS & VENT SYSTEM	LCH20CT011	HPH-7B DRN TO DEA TEMP	PRT-100	COND	26.76	32	kg/cm²(a)	200.3	200	273*9.27	1.48	60	0-250	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000365
53	PE-DG-445-100-N104	P&ID HEATER DRAINS & VENT SYSTEM	LCH30CT011	HPH 8A DRN TEMP TO HPH 7A	PRT-100	COND	63.36	74.2	kg/cm²(a)	230.1	235	273*12.7	1.27	75	0-300	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000365
54	PE-DG-445-100-N104	P&ID HEATER DRAINS & VENT SYSTEM	LCH40CT011	HPH 8B DRN TEMP TO HPH 7B	PRT-100	COND	63.36	74.2	kg/cm²(a)	230.1	235	273*12.7	1.27	75	0-300	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000365
55	PE-DG-445-100-N104	P&ID HEATER DRAINS & VENT SYSTEM	LCH50CT011	HPH 9A DRN TEMP TO HPH 8A	Cr-Al	COND	93.77	110	kg/cm²(a)	286	290	168.3*10.97	1.53	165	0-400	Yes	PE-DG-445-145-I101	R1.5"	64			1	PEM	PR0190000333
56	PE-DG-445-100-N104	P&ID HEATER DRAINS & VENT SYSTEM	LCH60CT011	HPH 9B DRN TEMP TO HPH 8B	Cr-Al	COND	93.77	110	kg/cm²(a)	286	290	168.3*10.97	1.53	165	0-400	Yes	PE-DG-445-145-I101	R1.5"	64			1	PEM	PR0190000333
57	PE-DG-445-100-N104	P&ID HEATER DRAINS & VENT SYSTEM	LCJ10CT011	LPH 2 DRN TEMP TO LPH 1	PRT-100	COND	0.43	3.5	kg/cm²(a)	77	80	168.3*7.11	0.66	25	0-120		PE-DG-445-145-I101	R1"	64			1	PEM	PR0200000330
58	PE-DG-445-100-N104	P&ID HEATER DRAINS & VENT SYSTEM	LCJ20CT011	LPH 3 DRN TEMP TO DRIP PMP	PRT-100	COND	1.41	3.5	kg/cm²(a)	108.9	110	273*6.35	1.08	25	0-150		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
59	PE-DG-445-100-N104	P&ID HEATER DRAINS & VENT SYSTEM	LCJ25CT011	LPH 1 DRN TEMP TO DRAIN COOLER	PRT-100	COND	0.1983	3.5	kg/cm²(a)	59.4	65	219.1*6.35	0.62	NA	0-100		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
60	PE-DG-445-100-N104	P&ID HEATER DRAINS & VENT SYSTEM	LCJ26CT011	DRN CLR O/L TEMP TO F/T-A	PRT-100	COND	0.1983	3.5	kg/cm²(a)	59.5	65	219.1*6.35	0.62	NA	0-100		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
61	PE-DG-445-100-N104	P&ID HEATER DRAINS & VENT SYSTEM	LCJ30CT011	LPH 4 DRN TEMP TO LPH 3 (U/S OF CV)	PRT-100	COND	3.16	7	kg/cm²(a)	111.4	115	219.1*6.35	1.08	25	0-150		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
62	PE-DG-445-100-N104	P&ID HEATER DRAINS & VENT SYSTEM	LCJ40CT011	LPH 5 DRN TEMP TO LPH 4 (U/S OF CV)	PRT-100	COND	5.77	7	kg/cm²(a)	137.1	140	168.3*7.11	0.95	40	0-200		PE-DG-445-145-I101	R1"	64			1	PEM	PR0200000330
63	PE-DG-445-100-N104	P&ID HEATER DRAINS & VENT SYSTEM	LCM40CT001	FLASH TNK-A SHELL TEMP	PRT-100	COND	0.1	3.5	kg/cm²(a)	46	210	NA		NA	0-80	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000365

PROJECT: SAGARDIGHI 1X660 MW
CUSTOMER: M/s WBPDCL
CONTRACTOR: M/s BHEL
Ref: CE/416/SAGARDIGHI/TE/SCH

SL NO	PID_NO	PID_NAME	KKS_TAG	DESCRIPTION	SENSR_ TYPE	MEDIUM	OP_ PRESS	DGN_ PRESS	Unit of Pressure	OP_ TEMP (Deg.C)	DGN_ TEMP (Deg.C)	PIPE SIZE (Dia.x Thk) (mms.)	VELOCITY (Meter/Sec)	INSULN. THICK (mms.)	RANGE (Deg.C)	IBR Required for Thermowell	STUB DETAIL / PROCESS CONNECTION / THERMOWELL DRG REF	PROCESS CONNECTION SIZE	Stub Hieght (mm)	REMARKS	SS304 Nipple Union Nipple Length (mm)	Qty	Input unit	MATERIAL CODE
64	PE-DG-445-100-N104	P&ID HEATER DRAINS & VENT SYSTEM	LCM40CT002	FLASH TNK-A SHELL TEMP	PRT-100	COND	0.1	3.5	kg/cm²(a)	46	210	NA		NA	0-80	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000365
65	PE-DG-445-100-N104	P&ID HEATER DRAINS & VENT SYSTEM	LCM50CT001	FLASH TNK-B SHELL TEMP	PRT-100	COND	0.1	3.5	kg/cm²(a)	46	210	NA		NA	0-80	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000365
66	PE-DG-445-100-N104	P&ID HEATER DRAINS & VENT SYSTEM	LCM50CT002	FLASH TNK-B SHELL TEMP	PRT-100	COND	0.1	3.5	kg/cm²(a)	46	210	NA		NA	0-80	Yes	PE-DG-445-145-I101	R1"	45	IL=150mm AND EL=150mm		1	PEM	PR0200000365
67	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB10CT011	TDBFP-A BP SUC TEMP	PRT-100	FW	12.61	20	kg/cm²(a)	188.8	200	406.4*9.53	2.72	NA	0-250	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000365
68	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB10CT012	TDBFP-A BP SUC TEMP	PRT-100	FW	12.61	20	kg/cm²(a)	188.8	200	406.4*9.53	2.72	NA	0-250	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000365
69	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB10CT013	TDBFP-A BP DISCH TEMP	PRT-100	FW	25	40	kg/cm²(a)	188.8	200	406.4*12.7	2.82	NA	0-250	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000365
70	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB10CT014	TDBFP-A DISCH TEMP	PRT-100	FW	332.78	510	kg/cm²(a)	195.1	200	457*85	4.88	NA	0-250	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000365
71	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB20CT011	TDBFP BP-B SUC TEMP	PRT-100	FW	12.61	20	kg/cm²(a)	188.8	200	406.4*9.53	2.72	NA	0-250	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000365
72	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB20CT012	TDBFP BP-B SUC TEMP	PRT-100	FW	12.61	20	kg/cm²(a)	188.8	200	406.4*9.53	2.72	NA	0-250	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000365
73	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB20CT013	TDBFP-B BP DISCH TEMP	PRT-100	FW	25	40	kg/cm²(a)	188.8	200	406.4*12.7	2.82	NA	0-250	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000365
74	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB20CT014	TDBFP-B DISCH TEMP	PRT-100	FW	332.78	510	kg/cm²(a)	195.1	200	457*85	4.88	NA	0-250	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000365
75	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB30CT011	MDBFP-C BP SUC TEMP	PRT-100	FW	12.61	20	kg/cm²(a)	188.8	200	406.4*9.53	2.72	NA	0-250	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000365
76	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB30CT012	MDBFP-C BP SUC TEMP	PRT-100	FW	12.61	20	kg/cm²(a)	188.8	200	406.4*9.53	2.72	NA	0-250	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000365
77	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB30CT013	MDBFP-C BP DISCH TEMP	PRT-100	FW	332.78	510	kg/cm²(a)	195.1	200	406.4*12.7	2.82	NA	0-250	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000365
78	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB30CT014	MDBFP-C DISCH TEMP	PRT-100	FW	332.78	510	kg/cm²(a)	195.1	200	457*85	4.88	NA	0-250	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000365
79	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB50CT011	BFP DISCH HDR TEMP	PRT-100	FW	332.78	510	kg/cm²(a)	195.1	200	610*114	5.51	NA	0-250	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000365
80	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB50CT014	BFP DISCH HDR TEMP AFT FCS	PRT-100	FW	332.78	355	kg/cm²(a)	195.1	200	508*70	5.94	NA	0-250	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000365
81	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB50CT015	BFP DISCH HDR TEMP AFT FCS	PRT-100	FW	332.78	355	kg/cm²(a)	195.1	200	508*70	5.94	NA	0-250	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000365
82	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB50CT016	BFP DISCH HDR TEMP AFT FCS	PRT-100	FW	332.78	355	kg/cm²(a)	195.1	200	508*70	5.94	NA	0-250	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000365
83	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB61CT011	FW TEMP AT HPH-7A I/L	PRT-100	FW	332.78	355	kg/cm²(a)	195.1	200	368 x 50	5.61	NA	0-250	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000365
84	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB62CT011	FW TEMP AT HPH-8A I/L	PRT-100	FW	332.78	355	kg/cm²(a)	226.9	230	368 x 50	5.86	NA	0-300	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000365
85	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB63CT011	FW TEMP AT HPH-9A I/L	Cr-Al	FW	332.78	355	kg/cm²(a)	280.5	290	406.4 x 60	5.56	NA	0-350	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
86	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB64CT011	FW TEMP BEF HPH-7A DES HTR	Cr-Al	FW	332.78	355	kg/cm²(a)	306.6	315	406.4 x 60	5.91	NA	0-400	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
87	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB65CT011	FW TEMP AFT HPH-7A DES HTR	Cr-Al	FW	332.78	355	kg/cm²(a)	310	315	406.4 x 60	5.91	NA	0-400	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
88	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB71CT011	FW TEMP AT HPH-7B I/L	PRT-100	FW	332.78	355	kg/cm²(a)	195.1	200	406.4 x 60	5.91	NA	0-250	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000365
89	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB72CT011	FW TEMP AT HPH-8B I/L	PRT-100	FW	332.78	355	kg/cm²(a)	226.9	230	406.4 x 60	5.91	NA	0-300	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000365
90	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB73CT011	FW TEMP AT HPH-9B I/L	Cr-Al	FW	332.78	355	kg/cm²(a)	280.5	290	406.4 x 60	5.91	NA	0-350	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
91	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB74CT011	FW TEMP BEF HPH-7B DES HTR	Cr-Al	FW	332.78	355	kg/cm²(a)	306.6	315	406.4 x 60	5.91	NA	0-400	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
92	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB75CT011	FW TEMP AFT HPH-7B DES HTR	Cr-Al	FW	332.78	355	kg/cm²(a)	310	315	273 x 40	5.25	NA	0-400	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
93	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB80CT011	FW TEMP TO ECO	Cr-Al	FW	332.78	355	kg/cm²(a)	310	320	559 x 77	5.96	NA	0-400	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333
94	PE-DG-445-100-N105	P&ID FEED WATER SYSTEM	LAB80CT012	FW TEMP TO ECO	Cr-Al	FW	332.78	355	kg/cm²(a)	310	320	559 x 77	5.96	NA	0-400	Yes	PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0190000333

PROJECT: SAGARDIGHI 1X660 MW
CUSTOMER: M/s WBPDCL
CONTRACTOR: M/s BHEL
Ref: CE/416/SAGARDIGHI/TE/SCH

SL NO	PID_NO	PID_NAME	KKS_TAG	DESCRIPTION	SENSR_ TYPE	MEDIUM	OP_ PRESS	DGN_ PRESS	Unit of Pressure	OP_ TEMP (Deg.C)	DGN_ TEMP (Deg.C)	PIPE SIZE (Dia.x Thk) (mms.)	VELOCITY (Meter/Sec)	INSULN. THICK (mms.)	RANGE (Deg.C)	IBR Required for Thermowell	STUB DETAIL / PROCESS CONNECTION / THERMOWELL DRG REF	PROCESS CONNECTION SIZE	Stub Hieght (mm)	REMARKS	SS304 Nipple Union Nipple Length (mm)	Qty	Input unit	MATERIAL CODE
95	PE-DG-445-100-N106	P&ID CONDENSATE SYSTEM	LAA01CT011	DEA TEMP	PRT-100	COND	12.5	15	kg/cm²(a)	188.4	200	NA		NA	0-250	Yes	PE-DG-445-145-I101	R1"	45	IL=150mm AND EL=150mm		1	PEM	PR0200000365
96	PE-DG-445-100-N106	P&ID CONDENSATE SYSTEM	LAA01CT012	DEA TEMP	PRT-100	COND	12.5	15	kg/cm²(a)	188.4	200	NA		NA	0-250	Yes	PE-DG-445-145-I101	R1"	45	IL=150mm AND EL=150mm		1	PEM	PR0200000365
97	PE-DG-445-100-N106	P&ID CONDENSATE SYSTEM	LCA00CT011	COND DISCH HDR TEMP	PRT-100	COND	0.092	1.1	kg/cm²(a)	41.6	60	660 x 10	1.1	180	0-80		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
98	PE-DG-445-100-N106	P&ID CONDENSATE SYSTEM	LCA20CT011	GSC I/L COND TEMP	PRT-100	COND	30.62	47	kg/cm²(a)	42.6	60	406.4 x 12.7	3.2	NA	0-80		PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000330
99	PE-DG-445-100-N106	P&ID CONDENSATE SYSTEM	LCA20CT012	GSC O/L COND TEMP	PRT-100	COND	30.62	47	kg/cm²(a)	43.1	60	406.4 x 12.7	3.2	NA	0-80		PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000330
100	PE-DG-445-100-N106	P&ID CONDENSATE SYSTEM	LCA50CT011	COND TEMP AT CPU O/L	PRT-100	COND	30.62	47	kg/cm²(a)	43.1	60	355.6 x 12.7	4.2	NA	0-80		PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000330
101	PE-DG-445-100-N106	P&ID CONDENSATE SYSTEM	LCA60CT011	DRAIN CLR I/L TEMP	PRT-100	COND	30.62	47	kg/cm²(a)	43.1	60	355.6 x 12.7	4.2	NA	0-80		PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000330
102	PE-DG-445-100-N106	P&ID CONDENSATE SYSTEM	LCA63CT011	LPH-1 O/L COND TEMP	PRT-100	COND	30.62	47	kg/cm²(a)	43.1	90	355.6 x 12.7	4.2	NA	0-80		PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000330
103	PE-DG-445-100-N106	P&ID CONDENSATE SYSTEM	LCA70CT011	LPH-3 I/L COND TEMP	PRT-100	COND	30.62	47	kg/cm²(a)	74.2	60	355.6 x 12.7	4.2	25	0-120		PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000330
104	PE-DG-445-100-N106	P&ID CONDENSATE SYSTEM	LCA80CT011	LPH-3 O/L COND TEMP	PRT-100	COND	30.62	47	kg/cm²(a)	74.2	130	355.6 x 12.7	4.4	25	0-120		PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000330
105	PE-DG-445-100-N106	P&ID CONDENSATE SYSTEM	LCA80CT012	LPH-4 I/L COND TEMP	PRT-100	COND	30.62	47	kg/cm²(a)	106.3	130	355.6 x 12.7	5	25	0-150		PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000330
106	PE-DG-445-100-N106	P&ID CONDENSATE SYSTEM	LCA90CT011	LPH-5 I/L COND TEMP	PRT-100	COND	30.62	47	kg/cm²(a)	132	160	355.6 x 12.7	5.1	40	0-200		PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000330
107	PE-DG-445-100-N106	P&ID CONDENSATE SYSTEM	LCA95CT012	LPH-5 O/L COND TEMP	PRT-100	COND	30.62	47	kg/cm²(a)	132	160	355.6 x 12.7	5.2	50	0-200		PE-DG-445-145-I101	R1.5"	45			1	PEM	PR0200000330
108	PE-DG-445-100-N107	P&ID AUXILIARY STEAM SYSTEM	LBG10CT011	MAIN STM TEMP TO APRDS	Cr-Al	STEAM	270	294.8	kg/cm²(a)	593	601	219.1*45	27.7	285	0-700	Yes	PE-DG-445-145-I101	R1.5"	45	Solid Barstock Thermowell Material Shall be SS316H		1	PEM	PR0190000333
109	PE-DG-445-100-N107	P&ID AUXILIARY STEAM SYSTEM	LBG20CT011	CRH STM TEMP TO APRDS	Cr-Al	STEAM	65.44	74.2	kg/cm²(a)	365.8	370	114.3*6.02	55.08	120	0-500	Yes	PE-DG-445-145-I101	R1.5"	64			1	PEM	PR0190000333
110	PE-DG-445-100-N107	P&ID AUXILIARY STEAM SYSTEM	LBG30CT011	AUX STM HDR TEMP	Cr-Al	STEAM	16	20	kg/cm²(a)	290	350	457*9.53	35.72	120	0-400	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0190000333
111	PE-DG-445-100-N107	P&ID AUXILIARY STEAM SYSTEM	LBG30CT012	AUX STM HDR TEMP	Cr-Al	STEAM	16	20	kg/cm²(a)	290	350	457*9.53	35.72	120	0-400	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0190000333
112	PE-DG-445-100-N107	P&ID AUXILIARY STEAM SYSTEM	LBG30CT013	AUX STM HDR TEMP	Cr-Al	STEAM	16	20	kg/cm²(a)	290	350	457*9.53	35.72	120	0-400	Yes	PE-DG-445-145-I101	R1"	45			1	PEM	PR0190000333
113	PE-DG-445-100-N111	P&ID STEAM DRAIN SYSTEM	LBG10CT011'	MS LINE TO AUX STM DRN TO UFT MTL TEMP	Cr-Al	METAL	1	7	kg/cm²(a)	250	460	60.3*14		NA	0-500		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	PEM	PR0190000376
114	PE-DG-445-100-N111	P&ID STEAM DRAIN SYSTEM	LBG20CT011'	CRH LINE TO AUX STM DRN TO UFT MTL TEMP	Cr-Al	METAL	1	3.5	kg/cm²(a)	250	580	60.3*14		NA	0-600		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	PEM	PR0190000376
115	PE-DG-445-100-N111	P&ID STEAM DRAIN SYSTEM	LCM10CT015	UNIT FLASH TNK TEMP	PRT-100	METAL	1	3.5	kg/cm²(a)	100	210	NA		NA	0-300		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	PEM	PR0200000420
116	PE-DG-445-100-N111	P&ID STEAM DRAIN SYSTEM	LCM10CT011	MS W/U LN DRN TO UFT MTL TEMP	Cr-Al	METAL	3.5	3.5	kg/cm²(a)	540	540	60.3*14		NA	0-600		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	PEM	PR0190000376
117	PE-DG-445-100-N111	P&ID STEAM DRAIN SYSTEM	LCM10CT012	MS W/U LN DRN TO UFT MTL TEMP	Cr-Al	METAL	3.5	3.5	kg/cm²(a)	540	540	60.3*14		NA	0-600		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	PEM	PR0190000376
118	PE-DG-445-100-N111	P&ID STEAM DRAIN SYSTEM	LCM10CT013	HPT STOP VLV LINE DRN TO UFT MTL TEMP	Cr-Al	METAL	3.5	3.5	kg/cm²(a)	540	540	60.3*14		NA	0-600		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	PEM	PR0190000376
119	PE-DG-445-100-N111	P&ID STEAM DRAIN SYSTEM	LCM10CT014	HPT STOP VLV LINE DRN TO UFT MTL TEMP	Cr-Al	METAL	3.5	3.5	kg/cm²(a)	540	540	60.3*14		NA	0-600		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	PEM	PR0190000376
120	PE-DG-445-100-N111	P&ID STEAM DRAIN SYSTEM	LCM30CT011	HRH LN DRN TO FT-B MTL TEMP	Cr-Al	METAL	3.5	3.5	kg/cm²(a)	395	395	60.3*14		NA	0-500		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	PEM	PR0190000376
121	PE-DG-445-100-N111	P&ID STEAM DRAIN SYSTEM	LCM30CT012	HRH LN DRN TO FT-B MTL TEMP	Cr-Al	METAL	3.5	3.5	kg/cm²(a)	395	395	60.3*14		NA	0-500		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	PEM	PR0190000376
122	PE-DG-445-100-N111	P&ID STEAM DRAIN SYSTEM	LCM30CT013	IP SV W/U LN DRN TO FT-B MTL TEMP	Cr-Al	METAL	3.5	3.5	kg/cm²(a)	395	395	60.3*14		NA	0-500		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	PEM	PR0190000376
123	PE-DG-445-100-N111	P&ID STEAM DRAIN SYSTEM	LCM30CT014	IP SV W/U LN DRN TO FT-B MTL TEMP	Cr-Al	METAL	3.5	3.5	kg/cm²(a)	395	395	60.3*14		NA	0-500		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	PEM	PR0190000376
124	PE-DG-445-100-N111	P&ID STEAM DRAIN SYSTEM	LCM30CT015	CRH LN DRN TO FT-B MTL TEMP	Cr-Al	METAL	3.5	3.5	kg/cm²(a)	395	395	60.3*14		NA	0-500		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	PEM	PR0190000376
125	PE-DG-445-100-N111	P&ID STEAM DRAIN SYSTEM	LCM40CT011	EXT TO LPH-5 LINE DRN TEMP	Cr-Al	METAL	3.5	3.5	kg/cm²(a)	395	395	60.3*14		NA	0-500		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	PEM	PR0190000376
126	PE-DG-445-100-N111	P&ID STEAM DRAIN SYSTEM	LCM40CT012	EXT TO HPH-9A/9B DRN MTL TEMP	Cr-Al	METAL	3.5	3.5	kg/cm²(a)	395	395	60.3*14		NA	0-500		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	PEM	PR0190000376
127	PE-DG-445-100-N111	P&ID STEAM DRAIN SYSTEM	LCM40CT013	EXT TO HPH-7A/B DESUP LN DRN MTL TEMP	Cr-Al	METAL	3.5	3.5	kg/cm²(a)	395	395	60.3*14		NA	0-500		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	PEM	PR0190000376
128	PE-DG-445-179-N001	P&ID DM COOLING WTR SYSTEM	PGC10CT011	TG DMCW PUMP DISCH HDR TEMP	PRT-100	DMCW	6.5	10	kg/cm²(g)	46	60	711x6.35	2.5	--	0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
129	PE-DG-445-179-N001	P&ID DM COOLING WTR SYSTEM	PGC11CT011	DMCW TEMP AT TG ECW PHE-A O/L	PRT-100	DMCW	5.8	10	kg/cm²(g)	39	60	508x5.54	2.5	--	0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
130	PE-DG-445-179-N001	P&ID DM COOLING WTR SYSTEM	PGC12CT011	DMCW TEMP AT TG ECW PHE-B O/L	PRT-100	DMCW	5.8	10	kg/cm²(g)	39	60	508x5.54	2.5	--	0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
131	PE-DG-445-179-N001	P&ID DM COOLING WTR SYSTEM	PGC13CT011	DMCW TEMP AT TG ECW PHE-C O/L	PRT-100	DMCW	5.8	10	kg/cm²(g)	39	60	508x5.54	2.5	--	0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
132	PE-DG-445-179-N001	P&ID DM COOLING WTR SYSTEM	PGC15CT011	TG DMCW TEMP AT TGPHE DISCH HDR	PRT-100	DMCW	5.8	10	kg/cm²(g)	39	60	711x6.35	2.5	--	0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
133	PE-DG-445-179-N001	P&ID DM COOLING WTR SYSTEM	PGC40CT011	SG DMCW PMP DISH HDR TEMP	PRT-100	DMCW	7.5	10	kg/cm²(g)	42.3	60	323.9x4.57	2.5	--	0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
134	PE-DG-445-179-N001	P&ID DM COOLING WTR SYSTEM	PGC41CT011	DMCW TEMP AT PHE-A(SG) O/L	PRT-100	DMCW	6.5	10	kg/cm²(g)	39	60	323.9x4.57	2.5	--	0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330

PROJECT: SAGARDIGHI 1X660 MW
CUSTOMER: M/s WBPDCL
CONTRACTOR: M/s BHEL
Ref: CE/416/SAGARDIGHI/TE/SCH

SL NO	PID_NO	PID_NAME	KKS_TAG	DESCRIPTION	SENSR_ TYPE	MEDIUM	OP_ PRESS	DGN_ PRESS	Unit of Pressure	OP_ TEMP (Deg.C)	DGN_ TEMP (Deg.C)	PIPE SIZE (Dia.x Thk) (mms.)	VELOCITY (Meter/Sec)	INSULN. THICK (mms.)	RANGE (Deg.C)	IBR Required for Thermowell	STUB DETAIL / PROCESS CONNECTION / THERMOWELL DRG REF	PROCESS CONNECTION SIZE	Stub Hieght (mm)	REMARKS	SS304 Nipple Union Nipple Length (mm)	Qty	Input unit	MATERIAL CODE
135	PE-DG-445-179-N001	P&ID DM COOLING WTR SYSTEM	PGC42CT012	DMCW TEMP AT PHE-B(SG) O/L	PRT-100	DMCW	6.5	10	kg/cm²(g)	39	60	323.9x4.57	2.5	--	0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
136	PE-DG-445-179-N001	P&ID DM COOLING WTR SYSTEM	PGC45CT011	SG AUX PHE's DISCH TEMP TO DMCW SG AUX	PRT-100	DMCW	6.5	10	kg/cm²(g)	39	60	323.9x4.57	2.5	--	0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
137	PE-DG-445-179-N001	P&ID DM COOLING WTR SYSTEM	PGL41CT011	DMCW TEMP AT CEP-A BRG O/L	PRT-100	DMCW	4.9	10	kg/cm²(g)	43	60	33.4x3.38	2.5	--	0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
138	PE-DG-445-179-N001	P&ID DM COOLING WTR SYSTEM	PGL42CT011	DMCW TEMP AT CEP-B BRG O/L	PRT-100	DMCW	4.9	10	kg/cm²(g)	43	60	33.4x3.38	2.5	--	0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
139	PE-DG-445-179-N001	P&ID DM COOLING WTR SYSTEM	PGL43CT011	DMCW TEMP AT CEP-C BRG O/L	PRT-100	DMCW	4.9	10	kg/cm²(g)	43	60	33.4x3.38	2.5	--	0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
140	PE-DG-445-179-N001	P&ID DM COOLING WTR SYSTEM	PGM40CT011	DMCW TEMP AT SEAL OIL CLR O/L	PRT-100	DMCW	4.6	10	kg/cm²	42	60	114.3*3.05	2.5	--	0-60		PE-DG-445-145-I101	R1"	64			1	PEM	PR0200000330
141	PE-DG-445-179-N001	P&ID DM COOLING WTR SYSTEM	PGQ30CT011	SG DMCW TEMP AT SWAS FOR CHILLER SYS I/L	PRT-100	DMCW	5.1	10	kg/cm²(g)	39	60	60.3x3.91	2.5	--	0-60		PE-DG-445-145-I101	R1"	64			1	PEM	PR0200000330
142	PE-DG-445-179-N001	P&ID DM COOLING WTR SYSTEM	PGQ30CT012	SG DMCW TEMP AT SWAS FOR CHILLER SYS O/L	PRT-100	DMCW	4.6	10	kg/cm²(g)	45.5	60	60.3x3.91	2.5	--	0-60		PE-DG-445-145-I101	R1"	64			1	PEM	PR0200000330
143	TP-DG-445-CNI-I019_Rev.04	SCHEME OF PULVERISER SYSTEM	HFE71-78 / CT/ 001-003	MIXED AIR BEFORE MILL: A-H TEMPERATURE	Cr-Al	HOT PY. AIR	831	1161	mmWC	290	300	1450 mm x 1450 mm	16		0-400		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material SS316.		24	Trichy	PR0190000341
144	TP-DG-445-CNI-I019_Rev.04	SCHEME OF PULVERISER SYSTEM	HFC01-08 /CT/ 015-018	MILL A-H OUTLET TEMPERATURE	Cr-Al	COAL + AIR	394	530	mmWC	88	100				0-500		4-97-288-94354	R1.5"	76	Sintered Tungsten Carbide Thermowell size= 24mm OD x 9mm ID. Insertion length 160 mm, Extension Length 160mm.	150	33	Trichy	PR0190000384
145	TP-DG-445-CNI-I020_Rev.05	SCHEME OF AIR & FLUE GAS SYSTEM	HLB10&15 /CT/ 001	FD FAN-A&B SUCTION CHAMBER TEMPERATURE	PRT-100	SEC. AIR	-17	-25	mmWC	27	50	--	--	--	0-80		3-55-335-02053	As per Drg	330	Total Thermowell Length below head 1500mm, Thermowell material SS316.		2	Trichy	PR0200000349
146	TP-DG-445-CNI-I020_Rev.05	SCHEME OF AIR & FLUE GAS SYSTEM	HLA10&15 /CT/ 001	FD FAN-A&B OUTLET TEMPERATURE	PRT-100	SEC. AIR	277	414	mmWC	30	53	4300 X 3800	16	200	0-100		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material SS316.		2	Trichy	PR0200000349
147	TP-DG-445-CNI-I020_Rev.05	SCHEME OF AIR & FLUE GAS SYSTEM	HLA20&25 /CT/ 001-004	AH-A&B SEC. AIR INLET TEMPERATURE	PRT-100	SEC. AIR	254	371	mmWC	30	53	4300 X 3800	16	200	0-100		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material SS316.		8	Trichy	PR0200000349
148	TP-DG-445-CNI-I020_Rev.05	SCHEME OF AIR & FLUE GAS SYSTEM	HLA30&35 /CT/ 001-004	AH-A&B SEC. AIR OUTLET TEMPERATURE	Cr-Al	SEC. AIR	181	262	mmWC	329	400	5150 X 5150	16	150	0-500		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material SS316.		8	Trichy	PR0190000341
149	TP-DG-445-CNI-I020_Rev.05	SCHEME OF AIR & FLUE GAS SYSTEM	HHL10&15 /CT/ 001-003	HOT SEC. AIR TEMPERATURE - LEFT & RIGHT	Cr-Al	SEC. AIR	147	169	mmWC	329	400	5150 X 5150	16	150	0-500		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material SS316.		6	Trichy	PR0190000341
150	TP-DG-445-CNI-I020_Rev.05	SCHEME OF AIR & FLUE GAS SYSTEM	HFE10&15 /CT/ 001 & 030	PA FAN-A&B SUCTION CHAMBER TEMPERATURE	PRT-100	PY. AIR	-10	-25	mmWC	27	50	--	--	--	0-80		3-55-335-02053	As per Drg	330	Total Thermowell Length below head 1500mm, Thermowell material SS316.		4	Trichy	PR0200000349
151	TP-DG-445-CNI-I020_Rev.05	SCHEME OF AIR & FLUE GAS SYSTEM	HFE20&25 /CT/ 001	PA FAN-A&B OUTLET TEMPERATURE	PRT-100	PY. AIR	1125	1447	mmWC	35	58	3800 X 3000	16	200	0-100		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material SS316.		2	Trichy	PR0200000349
152	TP-DG-445-CNI-I020_Rev.05	SCHEME OF AIR & FLUE GAS SYSTEM	HFE30&35 /CT/ 001-003	AH-A&B PY. AIR INLET TEMPERATURE	PRT-100	PY. AIR	1103	1395	mmWC	35	58	3000 X 3800	16	200	0-100		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material SS316.		6	Trichy	PR0200000349
153	TP-DG-445-CNI-I020_Rev.05	SCHEME OF AIR & FLUE GAS SYSTEM	HFE40&45 /CT/ 001-004	AH-A&B PY. AIR OUTLET TEMPERATURE	Cr-Al	PY. AIR	1044	1301	mmWC	326	400	3500 X 3600	16	150	0-500		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material SS316.		8	Trichy	PR0190000341
154	TP-DG-445-CNI-I020_Rev.05	SCHEME OF AIR & FLUE GAS SYSTEM	HBK20&25 /CT/ 001	PLATEN SH OUTLET TEMPERATURE - LEFT & RIGHT	Ni-Nisil	FLUE GAS	-8	-16	mmWC	993	1200	--	12	240	0-1600		4-97-288-94345	As per Drg	500	Total Thermowell Length below Head 1500mm, Thermowell Material Inconel 600 with Tungsten Carbide Coating on Thermowell		2	Trichy	PR0200000462
155	TP-DG-445-CNI-I020_Rev.05	SCHEME OF AIR & FLUE GAS SYSTEM	HBK30&35 /CT/ 001	FINISH RH OUTLET TEMPERATURE - LEFT & RIGHT	Ni-Nisil	FLUE GAS	-9	-17	mmWC	905	1100	--	12	240	0-1600		4-97-288-94345	As per Drg	500	Total Thermowell Length below Head 1500mm, Thermowell Material Inconel 600 with Tungsten Carbide Coating on Thermowell		2	Trichy	PR0200000462
156	TP-DG-445-CNI-I020_Rev.05	SCHEME OF AIR & FLUE GAS SYSTEM	HBK40&45 /CT/ 001	FINISH SH OUTLET TEMPERATURE - LEFT & RIGHT	Ni-Nisil	FLUE GAS	-17	-32	mmWC	685	900	--	12	240	0-1200		4-97-288-94345	As per Drg	500	Total Thermowell Length below Head 1500mm, Thermowell Material Inconel 600 with Tungsten Carbide Coating on Thermowell		2	Trichy	PR0200000462
157	TP-DG-445-CNI-I020_Rev.05	SCHEME OF AIR & FLUE GAS SYSTEM	HBK50&55 /CT/ 001	LTRH OUTLET (ECONOMISER INLET) TEMPERATURE - LEFT & RIGHT	Ni-Nisil	FLUE GAS	-49	-79	mmWC	495	700	--	12	240	0-900		4-97-288-94345	As per Drg	500	Total Thermowell Length below Head 1500mm, Thermowell Material Inconel 600 with Tungsten Carbide Coating on Thermowell		2	Trichy	PR0200000462
158	TP-DG-445-CNI-I020_Rev.05	SCHEME OF AIR & FLUE GAS SYSTEM	HNA15&25 /CT/001-004	ECONOMISER OUTLET TEMPERATURE - LEFT & RIGHT	Cr-Al	FLUE GAS	-102	-170	mmWC	352	400	6900 X 10000	13	170	0-500		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material Inconel 600.		8	Trichy	PR0190000392
159	TP-DG-445-CNI-I020_Rev.05	SCHEME OF AIR & FLUE GAS SYSTEM	HNA27&28 /CT/ 001-004	AIR HEATER-A & B FLUE GAS INLET TEMPERATURE	Cr-Al	FLUE GAS	-190	-313	mmWC	352	400	4700 X 14668	13	170	0-500		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material Inconel 600.		8	Trichy	PR0190000392
160	TP-DG-445-CNI-I020_Rev.05	SCHEME OF AIR & FLUE GAS SYSTEM	HNA30&35 /CT/ 001-004	AIR HEATER-A & B FLUE GAS OUTLET TEMPERATURE	PRT-100	FLUE GAS	-292	-477	mmWC	133	150	5850 X 8600	13	40	0-200		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material Inconel 600.		8	Trichy	PR0200000373
161	TP-DG-445-CNI-I020_Rev.05	SCHEME OF AIR & FLUE GAS SYSTEM	HNC10&15 /CT/ 029	ID FAN-A&B INLET SUCTION CHAMBER TEMPERATURE	PRT-100	FLUE GAS	-436	-714	mmWC	133	150	--	--	--	0-200		3-55-335-02053	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material Inconel 600.		2	Trichy	PR0200000373
162	TP-DG-445-CNI-I020_Rev.05	SCHEME OF AIR & FLUE GAS SYSTEM	HNA70&75 /CT/ 001	ID FAN-A&B OUTLET TEMPERATURE	PRT-100	FLUE GAS	481	720	mmWC	133	150	6450 x 6450	15	40	0-200		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material Inconel 600.		2	Trichy	PR0200000373
163	TP-DG-445-FOS-A033_Rev.04	SCHEME OF FUEL OIL SYSTEM-BOILER FRONT	HJF59 CT 001	TEMPERATRE BEFORE OP. FLOOR STRAINER	PRT-100	HFO	22.5	30	kg/cm²	120		D114.3mm X 6.02 mm	3	50			M33 x 2 (F), STUB LENGTH FROM PIPE CENTER 160mm.	M33X2		IL=150mm AND EL=150mm		1	Trichy	PR0200000330
164	TP-DG-445-FOS-A033_Rev.04	SCHEME OF FUEL OIL SYSTEM-BOILER FRONT	HJF59 CT 002	TEMPERATURE AFTER FLOW METER	PRT-100	HFO	22.5	30	kg/cm²	120		D114.3mm X 6.02 mm	3	50			M33 x 2 (F), STUB LENGTH FROM PIPE CENTER 160mm.	M33X2		IL=150mm AND EL=150mm		1	Trichy	PR0200000330
165	TP-DG-445-FOS-A033_Rev.04	SCHEME OF FUEL OIL SYSTEM-BOILER FRONT	HJF59 CT 003	HFO HEADER TEMPERATURE	PRT-100	HFO	5.5	15	kg/cm²	120		D114.3mm X 6.02 mm	3	50	0-200		M33 x 2 (F), STUB LENGTH FROM PIPE CENTER 160mm.	M33X2		IL=150mm AND EL=150mm		1	Trichy	PR0200000330
166	TP-DG-445-FOS-A033_Rev.04	SCHEME OF FUEL OIL SYSTEM-BOILER FRONT	HJF59 /CT/ 004-006	HFO HEADER TEMPERATURE	PRT-100	HFO	5.5	15	kg/cm²	120		D114.3mm X 6.02 mm	3	50			M33 x 2 (F), STUB LENGTH FROM PIPE CENTER 160mm.	M33X2		IL=150mm AND EL=150mm		3	Trichy	PR0200000330
167	TP-DG-445-FOS-A033_Rev.04	SCHEME OF FUEL OIL SYSTEM-BOILER FRONT	HJF73 CT 001	DRAIN OIL PUMP INLET TEMPERATURE	PRT-100	HFO	0		kg/cm²	55		D60.32mm x 3.91mm					M33 x 2 (F), STUB LENGTH FROM PIPE CENTER 160mm.	M33X2		IL=150mm AND EL=150mm		1	Trichy	PR0200000330
168	TP-DG-445-BMG-A005_Rev.07	P&ID- ECONOMIZER SYSTEM	HAC10 CT 001	ECO. INLET LINK TEMPERATURE BEFORE FLOW NOZZLE	Cr-Al	WATER	323.3	344.2	kg/cm²	309.7	347	D558.8mm X 80mm	10	110	0-500	Yes	4-97-288-94347	M33 x 2 (M)	65			1	Trichy	PR0190000333
169	TP-DG-445-BMG-A005_Rev.07	P&ID- ECONOMIZER SYSTEM	HAC10 CT 003	ECO. INLET DRAIN LINE TEMPERATURE	Cr-Al	METAL	--	--	kg/cm²	309.7	347	D33.4mm X 6.35mm	--	--	0-500		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	Trichy	PR0190000376
170	TP-DG-445-BMG-A005_Rev.07	P&ID- ECONOMIZER SYSTEM	HAC10 CT 002	ECO. INLET LINK TEMPERATURE AFTER FLOW NOZZLE	Cr-Al	WATER	323.3	344.2	kg/cm²	309.7	347	D558.8mm X 80mm	10	110	0-500	Yes	4-97-288-94347	M33 x 2 (M)	65			1	Trichy	PR0190000333
171	TP-DG-445-BMG-A005_Rev.07	P&ID- ECONOMIZER SYSTEM	HAC20 /CT/ 001-002	ECO. OUTLET LINK TEMPERATURE	Cr-Al	WATER	313.4	343.4	kg/cm²	355	358	D457mm X 65mm	10	130	0-600	Yes	4-97-288-94347	M33 x 2 (M)	65	BARSTOCK THERMOWELL MATERIAL SHALL BE SS316. Thermocouple with Flexible Minseral Insulated extension Cable 25 mtr length With Head and Thermowell shall be Provided		2	Trichy	PR0190000368
172	TP-DG-445-BMG-A005_Rev.07	P&ID- ECONOMIZER SYSTEM	HAC20 CT 003	ECO. OUTLET LINK TEMPERATURE - COMMON LINE	Cr-Al	WATER	316.4	343.4	kg/cm²	355	358	D660mm X 90mm	10	140	0-600	Yes	4-97-288-94347	M33 x 2 (M)	65	BARSTOCK THERMOWELL MATERIAL SHALL BE SS316. Thermocouple with Flexible Minseral Insulated extension Cable 25 mtr length With Head and Thermowell shall be Provided		1	Trichy	PR0190000368
173	TP-DG-445-BMG-A006_Rev.06	P&ID- EVAPORATOR SYSTEM	HAD03 CT 001	FURNACE LOWER FRONT INLET HEADER DRAIN TEMPERATURE	Cr-Al	METAL	--	--	kg/cm²	355	358	D114.3mm X 20mm	--	--	0-600		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	Trichy	PR0190000376
174	TP-DG-445-BMG-A006_Rev.06	P&ID- EVAPORATOR SYSTEM	HAD10 CT 037	LEFT FURNACE INTERIM HEADER DRAIN TEMPERATURE	Cr-Al	METAL	--	--	kg/cm²	<90	<158	D73.0mm X 14.02mm	--	--	0-750		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	Trichy	PR0190000376
175	TP-DG-445-BMG-A006_Rev.06	P&ID- EVAPORATOR SYSTEM	HAD20 CT 037	FRONT FURNACE INTERIM HEADER DRAIN TEMPERATURE	Cr-Al	METAL	--	--	kg/cm²	<90	<158	D73.0mm X 14.02mm	--	--	0-750		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	Trichy	PR0190000376
176	TP-DG-445-BMG-A006_Rev.06	P&ID- EVAPORATOR SYSTEM	HAD30 CT 037	REAR FURNACE INTERIM HEADER DRAIN TEMPERATURE	Cr-Al	METAL	--	--	kg/cm²	<90	<158	D73.0mm X 14.02mm	--	--	0-750		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	Trichy	PR0190000376
177	TP-DG-445-BMG-A006_Rev.06	P&ID- EVAPORATOR SYSTEM	HAD40 CT 037	RIGHT FURNACE INTERIM HEADER DRAIN TEMPERATURE	Cr-Al	METAL	--	--	kg/cm²	<90	<158	D73.0mm X 14.02mm	--	--	0-750		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	Trichy	PR0190000376

PROJECT: SAGARDIGHI 1X660 MW
CUSTOMER: M/s WBPDCL
CONTRACTOR: M/s BHEL
Ref: CE/416/SAGARDIGHI/TE/SCH

SL NO	PID_NO	PID_NAME	KKS_TAG	DESCRIPTION	SENSR_ TYPE	MEDIUM	OP_ PRESS	DGN_ PRESS	Unit of Pressure	OP_ TEMP (Deg.C)	DGN_ TEMP (Deg.C)	PIPE SIZE (Dia.x Thk) (mms.)	VELOCITY (Meter/Sec)	INSULN. THICK (mms.)	RANGE (Deg.C)	IBR Required for Thermowell	STUB DETAIL / PROCESS CONNECTION / THERMOWELL DRG REF	PROCESS CONNECTION SIZE	Stub Hieght (mm)	REMARKS	SS304 Nipple Union Nipple Length (mm)	Qty	Input unit	MATERIAL CODE
178	TP-DG-445-BMG-A007_Rev.03	P&ID- WATER SEPARATOR SYSTEM	HAH01 /CT/ 001-002	WATER SEPERATOR 'A' OUTLET TEMPERATURE	Cr-Al	STEAM	303.9	324.7	kg/cm²	438	477	D273.1mm X 50mm	25		0-700	Yes	4-97-288-94347	M33 x 2 (M)	65			2	Trichy	PR0190000333
179	TP-DG-445-BMG-A007_Rev.03	P&ID- WATER SEPARATOR SYSTEM	HAH02 /CT/ 001-002	WATER SEPERATOR 'B' OUTLET TEMPERATURE	Cr-Al	STEAM	303.9	324.7	kg/cm²	438	477	D273.1mm X 50mm	25		0-700	Yes	4-97-288-94347	M33 x 2 (M)	65			2	Trichy	PR0190000333
180	TP-DG-445-BMG-A007_Rev.03	P&ID- WATER SEPARATOR SYSTEM	HAH03 /CT/ 001-002	WATER SEPERATOR 'C' OUTLET TEMPERATURE	Cr-Al	STEAM	303.9	324.7	kg/cm²	438	477	D273.1mm X 50mm	25		0-700	Yes	4-97-288-94347	M33 x 2 (M)	65			2	Trichy	PR0190000333
181	TP-DG-445-BMG-A007_Rev.03	P&ID- WATER SEPARATOR SYSTEM	HAH04 /CT/ 001-002	WATER SEPERATOR 'D' OUTLET TEMPERATURE	Cr-Al	STEAM	303.9	324.7	kg/cm²	438	477	D273.1mm X 50mm	25		0-700	Yes	4-97-288-94347	M33 x 2 (M)	65			2	Trichy	PR0190000333
182	TP-DG-445-BMG-A003_Rev.05	P&ID- HP STARTUP & WARMUP SYSTEM	HAG15 CT 001	WATER STORAGE DOWNCOMER TEMPERATURE	Cr-Al	WATER	306.6	330.5	kg/cm²	346	374	D457mm X 65 mm	5	130	0-500	Yes	4-97-288-94347	M33 x 2 (M)	65			1	Trichy	PR0190000333
183	TP-DG-445-BMG-A003_Rev.05	P&ID- HP STARTUP & WARMUP SYSTEM	HAG15 CT 004	WATER STORAGE DOWNCOMER TEMPERATURE	Cr-Al	WATER	313.4	344.5	kg/cm²	346	374	D457mm X 65mm	5	130	0-500	Yes	4-97-288-94347	M33 x 2 (M)	65			1	Trichy	PR0190000333
184	TP-DG-445-BMG-A003_Rev.05	P&ID- HP STARTUP & WARMUP SYSTEM	HAG15 CT 002	FLASH TANK INLET TEMPERATURE	Cr-Al	WATER	313.4	344.5	kg/cm²	346	374	D457mm X 65mm	5	130	0-500	Yes	4-97-288-94347	M33 x 2 (M)	65			1	Trichy	PR0190000333
185	TP-DG-445-BMG-A003_Rev.05	P&ID- HP STARTUP & WARMUP SYSTEM	HAG15 CT 003	FLASH TANK INLET TEMPERATURE	Cr-Al	WATER	313.4	344.5	kg/cm²	346	374	D457mm X 65mm	5	130	0-500	Yes	4-97-288-94347	M33 x 2 (M)	65			1	Trichy	PR0190000333
186	TP-DG-445-BMG-A003_Rev.05	P&ID- HP STARTUP & WARMUP SYSTEM	HAG15 CT 005	BWCP INLET TEMPERATURE.	Cr-Al	WATER	324.6	350.1	kg/cm²	309.7	348	D457mm X 65mm	5	110	0-500	Yes	4-97-288-94347	M33 x 2 (M)	65			1	Trichy	PR0190000333
187	TP-DG-445-BMG-A003_Rev.05	P&ID- HP STARTUP & WARMUP SYSTEM	HAG15 CT 007	BWCP OUTLET DRAIN LINE TEMPERATURE	Cr-Al	METAL	--	--	kg/cm²	--	374	D168.3mm X 26.0mm	--	--	0-500		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	Trichy	PR0190000376
188	TP-DG-445-BMG-A003_Rev.05	P&ID- HP STARTUP & WARMUP SYSTEM	HAG15 CT 008	WARM UP LINE DRAIN TEMPERATURE	Cr-Al	METAL	--	--	kg/cm²	--	347	D33.4mm X 6.35mm	--	--	0-500		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	Trichy	PR0190000376
189	TP-DG-445-BMG-A003_Rev.05	P&ID- HP STARTUP & WARMUP SYSTEM	HAG15 CT 009	FLASH TANK INLET DRAIN LINE TEMPERATURE	Cr-Al	METAL	--	--	kg/cm²	--	374	D88.9mm X 15.24mm	--	--	0-500		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	Trichy	PR0190000376
190	TP-DG-445-BMG-A003_Rev.05	P&ID- HP STARTUP & WARMUP SYSTEM	HAG15 CT 010	BWCP INLET DRAIN LINE TEMPERATURE	Cr-Al	METAL	--	--	kg/cm²	--	374	D73.0mm X 14.02mm	--	--	0-500		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	Trichy	PR0190000376
191			LAB91 CT 001	FEED WATER DRAIN LINE TEMPERATURE.	Cr-Al	METAL	--	--	kg/cm²	--	347	D60.3mm X 11.07mm	--	--	0-500		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	Trichy	PR0190000376
192	TP-DG-445-BMG-A004_Rev.04	P&ID- BOILER CIRCULATION PUMP	HAG27 CT 001	BCP COOLING WATER LINE TEMPERATURE	PRT-100	WATER	6	--	kg/cm²	39	--	D88.9mm X 5.49mm	8		0-100		4-97-288-94347	M33 x 2 (M)	130			1	Trichy	PR0200000330
193	TP-DG-445-BMG-A004_Rev.04	P&ID- BOILER CIRCULATION PUMP	HAG27 CT 002	BCP MOTOR COOLING WATER RETURN LINE TEMPERATURE	PRT-100	WATER	6	--	kg/cm²	45	--	D88.9mm X 5.49mm	8		0-100		4-97-288-94347	M33 x 2 (M)	130			1	Trichy	PR0200000330
194	TP-DG-445-BMG-A008_Rev.05	P&ID- SUPER HEATER SYSTEM (SH 1 OF 4)	HAH05 CT 001	SH FURN ROOF INLET HEADER DRAIN	Cr-Al	METAL	--	--	kg/cm²	--	477	D73.0mm X 14.02mm	--	--	0-700		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	Trichy	PR0190000376
195	TP-DG-445-BMG-A008_Rev.05	P&ID- SUPER HEATER SYSTEM (SH 1 OF 4)	HAH14 CT 001	BP LOWER REAR HEADER DRAIN	Cr-Al	METAL	--	--	kg/cm²	--	477	D88.9mm X 20mm	--	--	0-700		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	Trichy	PR0190000376
196	TP-DG-445-BMG-A008_Rev.05	P&ID- SUPER HEATER SYSTEM (SH 1 OF 4)	HAH14 CT 002	BP LOWER FRONT HEADER DRAIN	Cr-Al	METAL	--	--	kg/cm²	--	477	D88.9mm X 20mm	--	--	0-700		SAGARDIGHI-TEMP-METAL-01	MTM T/C		Metal Temperature Measurement Thermocouple with 30 mtr MI cable		1	Trichy	PR0190000376
197	TP-DG-445-BMG-A009_Rev.05	P&ID- SUPER HEATER SYSTEM (SH 2 OF 4)	HAH26 /CT/ 001-002	LINK TO SH FRONT PLATEN INLET HDR-LEFT & RIGHT	Cr-Al	STEAM	297.9	316.2	kg/cm²	456	478	D457.2mm X 80mm	35		0-700	Yes	4-97-288-94347	M33 x 2 (M)	65	BARSTOCK THERMOWELL MATERIAL SHALL BE SS316. Thermocouple with Flexible Minseral Insulated extension Cable 25 mtr length With Head and Thermowell shall be Provided		2	Trichy	PR0190000368
198	TP-DG-445-BMG-A009_Rev.05	P&ID- SUPER HEATER SYSTEM (SH 2 OF 4)	HAH71 /CT/ 001-006	SH FRONT PLATEN TO SH DSH-1 INLET-A TEMPERATURE	Cr-Al	STEAM	293	309.7	kg/cm²	496	522	D508mm X 80mm	30	100	0-700	Yes	4-97-288-94347	M33 x 2 (M)	65	BARSTOCK THERMOWELL MATERIAL SHALL BE SS316. Thermocouple with Flexible Minseral Insulated extension Cable 25 mtr length With Head and Thermowell shall be Provided		6	Trichy	PR0190000368
199	TP-DG-445-BMG-A009_Rev.05	P&ID- SUPER HEATER SYSTEM (SH 2 OF 4)	HAH72 /CT/ 001-006	SH FRONT PLATEN TO SH DSH-1 INLET-B TEMPERATURE	Cr-Al	STEAM	293	309.7	kg/cm²	496	522	D508mm X 80mm	30	100	0-700	Yes	4-97-288-94347	M33 x 2 (M)	65	BARSTOCK THERMOWELL MATERIAL SHALL BE SS316. Thermocouple with Flexible Minseral Insulated extension Cable 25 mtr length With Head and Thermowell shall be Provided		6	Trichy	PR0190000368
200	TP-DG-445-BMG-A009_Rev.05	P&ID- SUPER HEATER SYSTEM (SH 2 OF 4)	HAH71 /CT/ 004-006	SH DSH-1 OUTLET-A TEMPERATURE	Cr-Al	STEAM	292.2	309.7	kg/cm²	485	511	D508mm X 80mm	35	100	0-700	Yes	4-97-288-94347	M33 x 2 (M)	65			3	Trichy	PR0190000333
201	TP-DG-445-BMG-A009_Rev.05	P&ID- SUPER HEATER SYSTEM (SH 2 OF 4)	HAH72 /CT/ 004-006	SH DSH-1 OUTLET-B TEMPERATURE	Cr-Al	STEAM	292.2	309.7	kg/cm²	485	511	D508mm X 80mm	35	100	0-700	Yes	4-97-288-94347	M33 x 2 (M)	65			3	Trichy	PR0190000333
202			LAE71 CT 001	SH DSH-1 SIDE-A SPRAY WATER TEMPERATURE AFTER CONTROL VALVE	Cr-Al	WATER	293	309.7	kg/cm²	310	496	D114.3mm X 17.12mm	10	200	0 - 700	Yes	4-97-288-94347	M33 x 2 (M)	130			1	Trichy	PR0190000333
203			LAE72 CT 001	SH DSH-1 SIDE-B SPRAY WATER TEMPERATURE AFTER CONTROL VALVE	Cr-Al	WATER	293	309.7	kg/cm²	310	496	D114.3mm X 17.12mm	10	200	0 - 700	Yes	4-97-288-94347	M33 x 2 (M)	130			1	Trichy	PR0190000333
204	TP-DG-445-BMG-A010_Rev.06	P&ID- SUPER HEATER SYSTEM (SH 3 OF 4)	HAH91 /CT/ 001-003	SH REAR PLATEN TO SH DSH-2 INLET-A TEMPERATURE	Cr-Al	STEAM	285.4	302	kg/cm²	533	553	D558.8mm X 80mm	30	100	0-800	Yes	4-97-288-94347	M33 x 2 (M)	65	BARSTOCK THERMOWELL MATERIAL SHALL BE SS316. Thermocouple with Flexible Minseral Insulated extension Cable 25 mtr length With Head and Thermowell shall be Provided		3	Trichy	PR0190000368
205	TP-DG-445-BMG-A010_Rev.06	P&ID- SUPER HEATER SYSTEM (SH 3 OF 4)	HAH92 /CT/ 001-003	SH REAR PLATEN TO SH DSH-2 INLET-B TEMPERATURE	Cr-Al	STEAM	285.4	302	kg/cm²	533	553	D558.8mm X 80mm	30	100	0-800	Yes	4-97-288-94347	M33 x 2 (M)	65	BARSTOCK THERMOWELL MATERIAL SHALL BE SS316. Thermocouple with Flexible Minseral Insulated extension Cable 25 mtr length With Head and Thermowell shall be Provided		3	Trichy	PR0190000368
206	TP-DG-445-BMG-A010_Rev.06	P&ID- SUPER HEATER SYSTEM (SH 3 OF 4)	HAH91 /CT/ 004-006	SH DSH-2 OUTLET-A TEMPERATURE	Cr-Al	STEAM	284.4	302	kg/cm²	525	541	D558.8mm X 80mm	25	100	0-800	Yes	4-97-288-94347	M33 x 2 (M)	65	BARSTOCK THERMOWELL MATERIAL SHALL BE SS316. Thermocouple with Flexible Minseral Insulated extension Cable 25 mtr length With Head and Thermowell shall be Provided		3	Trichy	PR0190000368
207	TP-DG-445-BMG-A010_Rev.06	P&ID- SUPER HEATER SYSTEM (SH 3 OF 4)	HAH92/CT/ 004-006	SH DSH-2 OUTLET-B TEMPERATURE	Cr-Al	STEAM	284.4	302	kg/cm²	525	541	D558.8mm X 80mm	25	100	0-800	Yes	4-97-288-94347	M33 x 2 (M)	65	BARSTOCK THERMOWELL MATERIAL SHALL BE SS316. Thermocouple with Flexible Minseral Insulated extension Cable 25 mtr length With Head and Thermowell shall be Provided		3	Trichy	PR0190000368
208			LAE91 CT 001	SH DSH-2 SIDE-A SPRAY WATER TEMPERATURE AFTER CONTROL VALVE	Cr-Al	WATER	285.7	302	kg/cm²	310	533	D88.9mm X 15.24mm	10	200	0 - 700	Yes	4-97-288-94347	M33 x 2 (M)	130			1	Trichy	PR0190000333
209			LAE92 CT 001	SH DSH-2 SIDE-B SPRAY WATER TEMPERATURE AFTER CONTROL VALVE	Cr-Al	WATER	285.7	302	kg/cm²	310	533	D88.9mm X 15.24mm	10	200	0 - 700	Yes	4-97-288-94347	M33 x 2 (M)	130			1	Trichy	PR0190000333
210	TP-DG-445-BMG-A012_Rev.05	P&ID- REHEATER SYSTEM (SH 1 OF 2)	HAJ21 /CT/ 001-003	RH/DSH INLET-A TEMPERATURE	Cr-Al	STEAM	62.9	72	kg/cm²	567	578	D660.4mm X 35mm	50	100	0-800	Yes	4-97-288-94347	M33 x 2 (M)	65	BARSTOCK THERMOWELL MATERIAL SHALL BE SS316H. Thermocouple with Flexible Minseral Insulated extension Cable 25 mtr length With Head and Thermowell shall be Provided		3	Trichy	PR0190000368
211	TP-DG-445-BMG-A012_Rev.05	P&ID- REHEATER SYSTEM (SH 1 OF 2)	HAJ22 /CT/ 001-003	RH/DSH INLET-B TEMPERATURE	Cr-Al	STEAM	62.9	72	kg/cm²	567	578	D660.4mm X 35mm	50	100	0-800	Yes	4-97-288-94347	M33 x 2 (M)	65	BARSTOCK THERMOWELL MATERIAL SHALL BE SS316H. Thermocouple with Flexible Minseral Insulated extension Cable 25 mtr length With Head and Thermowell shall be Provided		3	Trichy	PR0190000368
212	TP-DG-445-BMG-A012_Rev.05	P&ID- REHEATER SYSTEM (SH 1 OF 2)	HAJ21 /CT/ 004-006	RH/DSH OUTLET-A TEMPERATURE	Cr-Al	STEAM	62.7	72	kg/cm²	538	548	D660.4mm X 35mm	50	100	0-800	Yes	4-97-288-94347	M33 x 2 (M)	65	BARSTOCK THERMOWELL MATERIAL SHALL BE SS316. Thermocouple with Flexible Minseral Insulated extension Cable 25 mtr length With Head and Thermowell shall be Provided		3	Trichy	PR0190000368
213	TP-DG-445-BMG-A012_Rev.05	P&ID- REHEATER SYSTEM (SH 1 OF 2)	HAJ22 /CT/ 004-006	RH/DSH OUTLET-B TEMPERATURE	Cr-Al	STEAM	62.7	72	kg/cm²	538	548	D660.4mm X 35mm	50	100	0-800	Yes	4-97-288-94347	M33 x 2 (M)	65	BARSTOCK THERMOWELL MATERIAL SHALL BE SS316. Thermocouple with Flexible Minseral Insulated extension Cable 25 mtr length With Head and Thermowell shall be Provided		3	Trichy	PR0190000368
214	TP-DG-445-BMG-A012_Rev.05	P&ID- REHEATER SYSTEM (SH 1 OF 2)	LAE21 CT 001	RH/DSH SPRAY WATER TEMPERATURE AFTER CONTROL VALVE -A	PRT-100	WATER	141	155.6	kg/cm²	188.9	191	D88.9mm X 15.24mm	10	200		Yes	4-97-288-94347	M33 x 2 (M)	130			1	Trichy	PR0200000365
215	TP-DG-445-BMG-A012_Rev.05	P&ID- REHEATER SYSTEM (SH 1 OF 2)	LAE22 CT 001	RH/DSH SPRAY WATER TEMPERATURE AFTER CONTROL VALVE -B	PRT-100	WATER	141	155.6	kg/cm²	188.9	191	D88.9mm X 15.24mm	10	200		Yes	4-97-288-94347	M33 x 2 (M)	130			1	Trichy	PR0200000365
216			HCB01 CT 001	SB STEAM TEMPERATURE AFTER SBPRV	Cr-Al	STEAM	40	50	kg/cm²	452	500	D127mm X 12.5mm		120	0-700	Yes	4-97-288-94347	M33 x 2 (M)	130			1	Trichy	PR0190000333

PROJECT: SAGARDIGHI 1X660 MW
CUSTOMER: M/s WBPDCL
CONTRACTOR: M/s BHEL
Ref: CE/416/SAGARDIGHI/TE/SCH

SL NO	PID_NO	PID_NAME	KKS_TAG	DESCRIPTION	SENSR_ TYPE	MEDIUM	OP_ PRESS	DGN_ PRESS	Unit of Pressure	OP_ TEMP (Deg.C)	DGN_ TEMP (Deg.C)	PIPE SIZE (Dia.x Thk) (mms.)	VELOCITY (Meter/Sec)	INSULN. THICK (mms.)	RANGE (Deg.C)	IBR Required for Thermowell	STUB DETAIL / PROCESS CONNECTION / THERMOWELL DRG REF	PROCESS CONNECTION SIZE	Stub Hieght (mm)	REMARKS	SS304 Nipple Union Nipple Length (mm)	Qty	Input unit	MATERIAL CODE
217			HCB30 /CT/ 001-002	LR BLOWER DRAIN TEMPERATURE-RIGHT	Cr-Al	WATER	40	50	kg/cm²	452	500	D60.3mm X 5.54mm	140	120		Yes	4-97-288-94347	M33 x 2 (M)	130			2	Trichy	PR0190000333
218			HCB40 /CT/ 001-002	WALL BLOWER DRAIN TEMPERATURE-RIGHT & REAR	Cr-Al	WATER	40	50	kg/cm²	452	500	D60.3mm X 5.54mm	140	120		Yes	4-97-288-94347	M33 x 2 (M)	130			2	Trichy	PR0190000333
219			HCB03 /CT/ 001-002	AH-A SB DRAIN TEMPERATURE	Cr-Al	WATER	40	50	kg/cm²	452	500	D60.3mm X 5.54mm	140	120		Yes	4-97-288-94347	M33 x 2 (M)	130			2	Trichy	PR0190000333
220			HCB03 /CT/ 003-004	AH-B SB DRAIN TEMPERATURE	Cr-Al	WATER	40	50	kg/cm²	452	500	D60.3mm X 5.54mm	140	120		Yes	4-97-288-94347	M33 x 2 (M)	130			2	Trichy	PR0190000333
221			HCB20 /CT/ 001-002	WALL BLOWER DRAIN TEMPERATURE- LEFT & FRONT	Cr-Al	WATER	40	50	kg/cm²	452	500	D60.3mm X 5.54mm	140	120		Yes	4-97-288-94347	M33 x 2 (M)	130			2	Trichy	PR0190000333
222			HCB10 /CT/ 001-002	LR BLOWER DRAIN TEMPERATURE-LEFT	Cr-Al	WATER	40	50	kg/cm²	452	500	D60.3mm X 5.54mm	140	120		Yes	4-97-288-94347	M33 x 2 (M)	130			2	Trichy	PR0190000333
223	PE-DG-445-165-N001_Rev.08	P&ID CW & ACW SYSTEM	PAB11CT011	CONDNSR-1 I/L TEMP-L	PRT-100	CW	2.9	5.5	kg/cm²(g)	33	60	2245.0*18	2.5		0-60		PE-DG-445-145-I101	R1"	45	IL=400mm		1	PEM	PR0200000330
224	PE-DG-445-165-N001_Rev.08	P&ID CW & ACW SYSTEM	PAB11CT012	CONDNSR-2 I/L TEMP-L	PRT-100	CW	2.6	5.5	kg/cm²(g)	37.5	60	2245.0*18	2.5		0-60		PE-DG-445-145-I101	R1"	45	IL=400mm		1	PEM	PR0200000330
225	PE-DG-445-165-N001_Rev.08	P&ID CW & ACW SYSTEM	PAB11CT013	CONDNSR-2 O/L TEMP-L	PRT-100	CW	2.5	5.5	kg/cm²(g)	42	60	2245.0*18	2.5		0-60		PE-DG-445-145-I101	R1"	45	IL=400mm		1	PEM	PR0200000330
226	PE-DG-445-165-N001_Rev.08	P&ID CW & ACW SYSTEM	PAB21CT011	CONDNSR-1 I/L TEMP-R	PRT-100	CW	2.9	5.5	kg/cm²(g)	33	60	2245.0*18	2.5		0-60		PE-DG-445-145-I101	R1"	45	IL=400mm		1	PEM	PR0200000330
227	PE-DG-445-165-N001_Rev.08	P&ID CW & ACW SYSTEM	PAB21CT012	CONDNSR-2 I/L TEMP-R	PRT-100	CW	2.6	5.5	kg/cm²(g)	37.5	60	2245.0*18	2.5		0-60		PE-DG-445-145-I101	R1"	45	IL=400mm		1	PEM	PR0200000330
228	PE-DG-445-165-N001_Rev.08	P&ID CW & ACW SYSTEM	PAB21CT013	CONDNSR-2 O/L TEMP-R	PRT-100	CW	2.5	5.5	kg/cm²(g)	42	60	2245.0*18	2.5		0-60		PE-DG-445-145-I101	R1"	45	IL=400mm		1	PEM	PR0200000330
229	PE-DG-445-165-N001_Rev.08	P&ID CW & ACW SYSTEM	PCB12CT011	ACW TEMP AFT SCS	PRT-100	ACW	*	7.5	kg/cm²(g)	39	60	813*10	2.5		0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
230	PE-DG-445-165-N001_Rev.08	P&ID CW & ACW SYSTEM	PCB12CT012	ACW TEMP AFT SCS	PRT-100	ACW	*	7.5	kg/cm²(g)	39	60	813*10	2.5		0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
231	PE-DG-445-165-N001_Rev.08	P&ID CW & ACW SYSTEM	PCB12CT013	ACW TEMP AFT SCS	PRT-100	ACW	*	7.5	kg/cm²(g)	39	60	813*10	2.5		0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
232	PE-DG-445-165-N001_Rev.08	P&ID CW & ACW SYSTEM	PCB41CT011	TG PHE-A DISCH TEMP	PRT-100	ACW	3.2	7.5	kg/cm²(g)	44	60	508.0*10	2.5		0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
233	PE-DG-445-165-N001_Rev.08	P&ID CW & ACW SYSTEM	PCB42CT011	TG PHE-B DISCH TEMP	PRT-100	ACW	3.2	7.5	kg/cm²(g)	44	60	508.0*10	2.5		0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
234	PE-DG-445-165-N001_Rev.08	P&ID CW & ACW SYSTEM	PCB43CT011	TG PHE-C DISCH TEMP	PRT-100	ACW	3.2	7.5	kg/cm²(g)	44	60	508.0*10	2.5		0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
235	PE-DG-445-165-N001_Rev.08	P&ID CW & ACW SYSTEM	PCB45CT011	SG PHE-A DISCH TEMP	PRT-100	ACW	3.2	7.5	kg/cm²(g)	42.5	60	323.9*6.0	2.5		0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
236	PE-DG-445-165-N001_Rev.08	P&ID CW & ACW SYSTEM	PCB46CT011	SG PHE-B DISCH TEMP	PRT-100	ACW	3.2	7.5	kg/cm²(g)	42.5	60	323.9*6.0	2.5		0-60		PE-DG-445-145-I101	R1"	45			1	PEM	PR0200000330
237	PE-DG-445-165-N001_Rev.08	P&ID CW & ACW SYSTEM	PCB61CT012	VAC PMP-1 HE O/L TEMP	PRT-100	ACW	2.6	7.5	kg/cm²(g)	35	60	140.8*5.4	2.5		0-60		PE-DG-445-145-I101	R1"	64			1	PEM	PR0200000330
238	PE-DG-445-165-N001_Rev.08	P&ID CW & ACW SYSTEM	PCB62CT012	VAC PMP-2 HE O/L TEMP	PRT-100	ACW	2.6	7.5	kg/cm²(g)	35	60	140.8*5.4	2.5		0-60		PE-DG-445-145-I101	R1"	64			1	PEM	PR0200000330
239	PE-DG-445-165-N001_Rev.08	P&ID CW & ACW SYSTEM	PCB63CT012	VAC PMP-3 HE O/L TEMP	PRT-100	ACW	2.6	7.5	kg/cm²(g)	35	60	140.8*5.4	2.5		0-60		PE-DG-445-145-I101	R1"	64			1	PEM	PR0200000330
240	PE-DG-445-165-N001_Rev.08	P&ID CW & ACW SYSTEM	PCB64CT012	VAC PMP-4 HE O/L TEMP	PRT-100	ACW	2.6	7.5	kg/cm²(g)	35	60	140.8*5.4	2.5		0-60		PE-DG-445-145-I101	R1"	64			1	PEM	PR0200000330
241	TP-DG-445-CNI-I167_Rev.04	P&ID OF SCR REACTOR	HSA11CT001	SCR REACTOR A INLET DUCT TEMPERATURE	Cr-Al	FLUE GAS	-137	-150	mmWC	351	427	3300 X 16772			0-650		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material Inconel 600.	Not Applicable	1	T	PR0190000392
242	TP-DG-445-CNI-I167_Rev.04	P&ID OF SCR REACTOR	HSA11CT002	SCR REACTOR A INLET DUCT TEMPERATURE	Cr-Al	FLUE GAS	-137	-150	mmWC	351	427	3300 X 16772			0-650		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material Inconel 600.	Not Applicable	1	T	PR0190000392
243	TP-DG-445-CNI-I167_Rev.04	P&ID OF SCR REACTOR	HSA11CT003	SCR REACTOR A INLET DUCT TEMPERATURE	Cr-Al	FLUE GAS	-137	-150	mmWC	351	427	3300 X 16772			0-650		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material Inconel 600.	Not Applicable	1	T	PR0190000392
244	TP-DG-445-CNI-I167_Rev.04	P&ID OF SCR REACTOR	HSA11CT006	SCR REACTOR A OUTLET DUCT TEMPERATURE	Cr-Al	FLUE GAS	-163	-200	mmWC	351	427	4700 X 11820			0-650		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material Inconel 600.	Not Applicable	1	T	PR0190000392
245	TP-DG-445-CNI-I167_Rev.04	P&ID OF SCR REACTOR	HSA11CT007	SCR REACTOR A OUTLET DUCT TEMPERATURE	Cr-Al	FLUE GAS	-163	-200	mmWC	351	427	4700 X 11820			0-650		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material Inconel 600.	Not Applicable	1	T	PR0190000392
246	TP-DG-445-CNI-I167_Rev.04	P&ID OF SCR REACTOR	HSA11CT008	SCR REACTOR A OUTLET DUCT TEMPERATURE	Cr-Al	FLUE GAS	-163	-200	mmWC	351	427	4700 X 11820			0-650		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material Inconel 600.	Not Applicable	1	T	PR0190000392
247	TP-DG-445-CNI-I167_Rev.04	P&ID OF SCR REACTOR	HSA21CT001	SCR REACTOR B INLET DUCT TEMPERATURE	Cr-Al	FLUE GAS	-137	-150	mmWC	351	427	3300 X 16772			0-650		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material Inconel 600.	Not Applicable	1	T	PR0190000392
248	TP-DG-445-CNI-I167_Rev.04	P&ID OF SCR REACTOR	HSA21CT002	SCR REACTOR B INLET DUCT TEMPERATURE	Cr-Al	FLUE GAS	-137	-150	mmWC	351	427	3300 X 16772			0-650		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material Inconel 600.	Not Applicable	1	T	PR0190000392
249	TP-DG-445-CNI-I167_Rev.04	P&ID OF SCR REACTOR	HSA21CT003	SCR REACTOR B INLET DUCT TEMPERATURE	Cr-Al	FLUE GAS	-137	-150	mmWC	351	427	3300 X 16772			0-650		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material Inconel 600.	Not Applicable	1	T	PR0190000392
250	TP-DG-445-CNI-I167_Rev.04	P&ID OF SCR REACTOR	HSA21CT006	SCR REACTOR B OUTLET DUCT TEMPERATURE	Cr-Al	FLUE GAS	-163	-200	mmWC	351	427	4700 X 11820			0-650		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material Inconel 600.	Not Applicable	1	T	PR0190000392
251	TP-DG-445-CNI-I167_Rev.04	P&ID OF SCR REACTOR	HSA21CT007	SCR REACTOR B OUTLET DUCT TEMPERATURE	Cr-Al	FLUE GAS	-163	-200	mmWC	351	427	4700 X 11820			0-650		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material Inconel 600.	Not Applicable	1	T	PR0190000392
252	TP-DG-445-CNI-I167_Rev.04	P&ID OF SCR REACTOR	HSA21CT008	SCR REACTOR B OUTLET DUCT TEMPERATURE	Cr-Al	FLUE GAS	-163	-200	mmWC	351	427	4700 X 11820			0-650		4-97-288-94351	As per Drg	330	Total Thermowell Length below head 1000mm, Thermowell material Inconel 600.	Not Applicable	1	T	PR0190000392
253			QHX10 CT001	COOLING WATER SUPPLY HEADER TEMPERATURE	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 300	2		0-100°C		M33X2	M33X2	45		150	1	PC	PR0200000330
254			QHX11 CT001	COOLING WATER RETURN HEADER TEMPERATURE	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 300	2		0-100°C		M33X2	M33X2	45		150	1	PC	PR0200000330
255			QHX18 CT001	CW SUPPLY HEADER TEMPERATURE AT BCW(S) AT MILLS A,B,C,D	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 250	2		0-100°C		M33X2	M33X2	45		150	1	PC	PR0200000330
256			QHX19 CT001	CW SUPPLY HEADER TEMPERATURE AT BCW(S) AT MILLS E,F,G,H	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 150	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
257			QHX28CT001	CW TEMPERATURE AT ID FAN -A INLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 150	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
258			QHX28CT002	CW TEMPERATURE AT ID FAN -A FOLS COOLER OUTLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 50	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
259			QHX28CT003	CW TEMPERATURE AT ID FAN -A FOLS COOLER OUTLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 80	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
260			QHX28CT004	CW TEMPERATURE AT ID FAN -A MOTOR STATOR COOLER OUTLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 65	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330

PROJECT: SAGARDIGHI 1X660 MW
CUSTOMER: M/s WBPDCL
CONTRACTOR: M/s BHEL
Ref: CE/416/SAGARDIGHI/TE/SCH

SL NO	PID_NO	PID_NAME	KKS_TAG	DESCRIPTION	SENSR_ TYPE	MEDIUM	OP_ PRESS	DGN_ PRESS	Unit of Pressure	OP_ TEMP (Deg.C)	DGN_ TEMP (Deg.C)	PIPE SIZE (Dia.x Thk) (mms.)	VELOCITY (Meter/Sec)	INSULN. THICK (mms.)	RANGE (Deg.C)	IBR Required for Thermowell	STUB DETAIL / PROCESS CONNECTION / THERMOWELL DRG REF	PROCESS CONNECTION SIZE	Stub Hieght (mm)	REMARKS	SS304 Nipple Union Nipple Length (mm)	Qty	Input unit	MATERIAL CODE
261			QHX27CT001	CW TEMPERATURE AT ID FAN -B INLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 150	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
262			QHX27CT002	CW TEMPERATURE AT ID FAN -B FOLS COOLER OUTLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 50	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
263			QHX27CT003	CW TEMPERATURE AT ID FAN -B FOLS COOLER OUTLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 80	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
264			QHX27CT004	CW TEMPERATURE AT ID FAN -B MOTOR STATOR COOLER OUTLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 65	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
265			QHX24CT001	CW TEMPERATURE AT PA FAN -A INLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 100	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
266			QHX24CT002	CW TEMPERATURE AT PA FAN -A FOLS COOLER OUTLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 40	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
267			QHX24CT003	CW TEMPERATURE AT PA FAN -A FOLS COOLER OUTLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 80	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
268			QHX23CT001	CW TEMPERATURE AT PA FAN -B INLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 100	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
269			QHX23CT002	CW TEMPERATURE AT PA FAN -B FOLS COOLER	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 40	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
270			QHX23CT003	CW TEMPERATURE AT PA FAN -B FOLS COOLER	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 80	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
271			QHX26CT001	CW TEMPERATURE AT FD FAN -A INLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 40	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
272			QHX26CT002	CW TEMPERATURE AT FD FAN -A FOLS COOLER OUTLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 40	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
273			QHX25CT001	CW TEMPERATURE AT FD FAN -B INLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 40	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
274			QHX25CT002	CW TEMPERATURE AT FD FAN -B FOLS COOLER OUTLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 40	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
275			QHX22CT001	CW TEMPERATURE AT TRI-SECTOR AH-A COMMON I/L	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 25	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
276			QHX22CT002	CW TEMPERATURE AT TRI-SECTOR AH-A GUIDE BEARING OUTLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 25	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
277			QHX22CT003	CW TEMPERATURE AT TRI-SECTOR AH-A SUPPORT BEARING OUTLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 25	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
278			QHX22CT004	CW PRESSURE AT TRI-SECTOR AH-A OIL CARRY OVER PROBE OUTLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 25	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
279			QHX21CT001	CW TEMPERATURE AT TRI-SECTOR AH-B COMMON I/L	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 25	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
280			QHX21CT002	CW TEMPERATURE AT TRI-SECTOR AH-B GUIDE BEARING OUTLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 25	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
281			QHX21CT003	CW TEMPERATURE AT TRI-SECTOR AH-B SUPPORT BEARING OUTLET	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 25	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
282			QHX21CT004	CW TEMPERATURE AT TRI-SECTOR AH-B OIL CARRY OVER PROBE	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 25	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
283			QHX30CT001	CW TEMPERATURE AT MILL A COMMON O/L	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 80	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
284			QHX31CT001	CW TEMPERATURE AT MILL B COMMON O/L	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 80	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
285			QHX32CT001	CW TEMPERATURE AT MILL C COMMON O/L	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 80	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
286			QHX33CT001	CW TEMPERATURE AT MILL D COMMON O/L	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 80	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
287			QHX34CT001	CW TEMPERATURE AT MILL E COMMON O/L	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 80	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
288			QHX35CT001	CW TEMPERATURE AT MILL F COMMON O/L	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 80	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
289			QHX36CT001	CW TEMPERATURE AT MILL G COMMON O/L	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 80	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
290			QHX37CT001	CW TEMPERATURE AT MILL H COMMON O/L	PRT-100	WATER	6	10	kg/cm²(g)	39	60	NB 80	2		0-100°C		M33X2	M33X2	64		150	1	PC	PR0200000330
291			LCL10 CT001	FLASH TANK TEMPERATURE	PRT-100	WATER	1.1	7	kg/cm²(g)	110	177	Tank Size : OD 3440X22 mm	-	50	0-200°C		M33X2	M33X2	45	IL=400mm	150	1	PC	PR0200000330
292			LCL10 CT003	FLASH TANK DRAIN TANK TEMPERATURE	PRT-100	WATER	1.1	7	kg/cm²(g)	110	177	Tank Size : OD 2743X16 mm	-	50	0-200°C		M33X2	M33X2	45	IL=400mm	150	1	PC	PR0200000330
293			LCL20 CT001	FLASH TANK DRAIN TANK OUTLET TEMPERATURE	PRT-100	WATER	1.1	7	kg/cm²(g)	110	177	355.6X9.53	2.5	50	0-200°C		M33X2	M33X2	45		150	1	PC	PR0200000330
294			LCL20 CT002	FLASH TANK DRAIN TANK OUTLET TEMPERATURE	PRT-100	WATER	1.1	7	kg/cm²(g)	110	177	355.6X9.53	2.5	50	0-200°C		M33X2	M33X2	45		150	1	PC	PR0200000330
295			LBG80 CT001	TEMPERATURE OF AUX STEAM TO MILL A	Cr-Al	STEAM	16	20	kg/cm²(g)	290	350	219.1X8.18	49.53	115	0-400°C	Yes	M33X2	M33X2	45		150	1	PC	PR0190000333
296			LBG80 CT002	TEMPERATURE OF AUX STEAM TO MILL B	Cr-Al	STEAM	16	20	kg/cm²(g)	290	350	219.1X8.18	49.53	115	0-400°C	Yes	M33X2	M33X2	45		150	1	PC	PR0190000333
297			LBG80 CT003	TEMPERATURE OF AUX STEAM TO MILL C	Cr-Al	STEAM	16	20	kg/cm²(g)	290	350	219.1X8.18	49.53	115	0-400°C	Yes	M33X2	M33X2	45		150	1	PC	PR0190000333
298			LBG80 CT004	TEMPERATURE OF AUX STEAM TO MILL D	Cr-Al	STEAM	16	20	kg/cm²(g)	290	350	219.1X8.18	49.53	115	0-400°C	Yes	M33X2	M33X2	45		150	1	PC	PR0190000333
299			LBG80 CT005	TEMPERATURE OF AUX STEAM TO MILL E	Cr-Al	STEAM	16	20	kg/cm²(g)	290	350	219.1X8.18	49.53	115	0-400°C	Yes	M33X2	M33X2	45		150	1	PC	PR0190000333
300			LBG80 CT006	TEMPERATURE OF AUX STEAM TO MILL F	Cr-Al	STEAM	16	20	kg/cm²(g)	290	350	219.1X8.18	49.53	115	0-400°C	Yes	M33X2	M33X2	45		150	1	PC	PR0190000333
301			LBG80 CT007	TEMPERATURE OF AUX STEAM TO MILL G	Cr-Al	STEAM	16	20	kg/cm²(g)	290	350	219.1X8.18	49.53	115	0-400°C	Yes	M33X2	M33X2	45		150	1	PC	PR0190000333
302			LBG80 CT008	TEMPERATURE OF AUX STEAM TO MILL H	Cr-Al	STEAM	16	20	kg/cm²(g)	290	350	219.1X8.18	49.53	115	0-400°C	Yes	M33X2	M33X2	45		150	1	PC	PR0190000333
303			LBG80 CT009	TEMPERATURE AT MILL INERTING COMMON HEADER	Cr-Al	STEAM	16	20	kg/cm²(g)	290	350	355.6X9.53	49.53	125	0-400°C	Yes	M33X2	M33X2	45		150	1	PC	PR0190000333
304			LBG70 CT001	TEMPERATURE OF AUX STEAM TO SCAPH	Cr-Al	STEAM	16	20	kg/cm²(g)	290	350	273X6.35	39.25	120	0-400°C	Yes	M33X2	M33X2	45		150	1	PC	PR0190000333

PROJECT: SAGARDIGHI 1X660 MW
CUSTOMER: M/s WBPDCL
CONTRACTOR: M/s BHEL
Ref: CE/416/SAGARDIGHI/TE/SCH

SL NO	PID_NO	PID_NAME	KKS_TAG	DESCRIPTION	SENSR_ TYPE	MEDIUM	OP_ PRESS	DGN_ PRESS	Unit of Pressure	OP_ TEMP (Deg.C)	DGN_ TEMP (Deg.C)	PIPE SIZE (Dia.x Thk) (mms.)	VELOCITY (Meter/Sec)	INSULN. THICK (mms.)	RANGE (Deg.C)	IBR Required for Thermowell	STUB DETAIL / PROCESS CONNECTION / THERMOWELL DRG REF	PROCESS CONNECTION SIZE	Stub Hieght (mm)	REMARKS	SS304 Nipple Union Nipple Length (mm)	Qty	Input unit	MATERIAL CODE
305			LBG73 CT001	TEMPERATURE OF SCAPH-A DRAIN TO FLASH TANK	Cr-Al	STEAM	16	20	kg/cm²(g)	290	350	88.9X5.49	1.72	75	0-400°C	Yes	M33X2	M33X2	64		150	1	PC	PR0190000333
306			LBG74 CT001	TEMPERATURE OF SCAPH-B DRAIN TO FLASH TANK	Cr-Al	STEAM	16	20	kg/cm²(g)	290	350	88.9X5.49	1.72	75	0-400°C	Yes	M33X2	M33X2	64		150	1	PC	PR0190000333
307			LBG78 CT001	TEMPERATURE AT SCAPH DRAIN TO FLASH TANK	Cr-Al	STEAM	16	20	kg/cm²(g)	290	350	114.3X6.02	2	80	0-400°C	Yes	M33X2	M33X2	64		150	1	PC	PR0190000333
308				APH - fire sensing K-Type thermocouples	Cr-Al	Bearing									0-500					All dimensions are as per Specification with Material Code No. PR0190000406		60	BAP	PR0190000406
309			10HLD01CT001	APH A - Support Bearing RTD1	PRT-100	LUBRICANT									0-150					All dimensions are as per Specification with Material Code No. PR0200000381 FOR LUBRICANTS		1	BAP	PR0200000381
310			10HLD01CT002	APH A - Support Bearing RTD2	PRT-100	LUBRICANT									0-150					All dimensions are as per Specification with Material Code No. PR0200000381 FOR LUBRICANTS		1	BAP	PR0200000381
311			10HLD01CT003	APH A - Guide Bearing RTD1	PRT-100	LUBRICANT									0-150					All dimensions are as per Specification with Material Code No. PR0200000381 FOR LUBRICANTS		1	BAP	PR0200000381
312			10HLD01CT004	APH A - Guide Bearing RTD2	PRT-100	LUBRICANT									0-150					All dimensions are as per Specification with Material Code No. PR0200000381 FOR LUBRICANTS		1	BAP	PR0200000381
313			10HLD02CT001	APH B - Support Bearing RTD1	PRT-100	LUBRICANT									0-150					All dimensions are as per Specification with Material Code No. PR0200000381 FOR LUBRICANTS		1	BAP	PR0200000381
314			10HLD02CT002	APH B - Guide Bearing RTD1	PRT-100	LUBRICANT									0-150					All dimensions are as per Specification with Material Code No. PR0200000381 FOR LUBRICANTS		1	BAP	PR0200000381
315			10HLD02CT003	APH B - Support Bearing RTD2	PRT-100	LUBRICANT									0-150					All dimensions are as per Specification with Material Code No. PR0200000381 FOR LUBRICANTS		1	BAP	PR0200000381
316			10HLD02CT004	APH B - Guide Bearing RTD2	PRT-100	LUBRICANT									0-150					All dimensions are as per Specification with Material Code No. PR0200000381 FOR LUBRICANTS		1	BAP	PR0200000381
317			10HLB10CT016-CT021 10HLB20CT016-CT021	FD Fan A Bearing RTDs FD Fan B Bearing RTDs	PRT-100	Bearing									0-150					Stem Dia-8mm, Stem Length-200 mm, RTD Shall be given with adjustable sliding adapter (M18X1, L 20) with ferrule to fix suitably for the required length.5 Mtr SS aroumoured Flexible Extn cable		12	BAP	PR0200000381
318			10HLB10CT022-CT024 10HLB20CT022-CT024	FD Fan A Bearing RTDs FD Fan B Bearing RTDs	PRT-100	Bearing									0-150					Stem Dia-8mm, Stem Length-170 mm, RTD Shall be given with adjustable sliding adapter (M18X1, L 20) with ferrule to fix suitably for the required length.5 Mtr SS aroumoured Flexible Extn cable		6	BAP	PR0200000381
319			10HNC10CT015-CT020 10HNC20CT015-CT020	ID Fan A Bearing RTDs ID Fan B Bearing RTDs	PRT-100	Bearing									0-150					Stem Dia-8mm, Stem Length-220 mm, RTD Shall be given with adjustable sliding adapter (M18X1, L 20) with ferrule to fix suitably for the required length.5 Mtr SS aroumoured Flexible Extn cable		12	BAP	PR0200000381
320			10HNC10CT021-CT026 10HNC20CT021-CT026	ID Fan A Bearing RTDs ID Fan B Bearing RTDs	PRT-100	Bearing									0-150					Stem Dia-8mm, Stem Length-180 mm, RTD Shall be given with adjustable sliding adapter (M18X1, L 20) with ferrule to fix suitably for the required length.5 Mtr SS aroumoured Flexible Extn cable		12	BAP	PR0200000381
321			10HNC10CT027 10HNC20CT027	ID Fan A HAD Room RTDs ID Fan B HAD Room RTDs	PRT-100	Bearing									0-150					Stem Dia-8mm, Stem Length- 80 mm, RTD Shall be given with adjustable sliding adapter (M18X1, L 20) with ferrule to fix suitably for the required length.5 Mtr SS aroumoured Flexible Extn cable		2	BAP	PR0200000381
322			10HNC10CT028 10HNC20CT028	ID Fan A Bearing Room RTDs ID Fan B Bearing Room RTDs	PRT-100	Bearing									0-150					Stem Dia-8mm, Stem Length- 80 mm, RTD Shall be given with adjustable sliding adapter (M18X1, L 20) with ferrule to fix suitably for the required length.5 Mtr SS aroumoured Flexible Extn cable		2	BAP	PR0200000381
323			10HFE10CT016-CT021 10HFE20CT016-CT021	PA Fan A Bearing RTDs PA Fan B Bearing RTDs	PRT-100	Bearing									0-150					Stem Dia-8mm, Stem Length-200 mm, RTD Shall be given with adjustable sliding adapter (M18X1, L 20) with ferrule to fix suitably for the required length.5 Mtr SS aroumoured Flexible Extn cable		12	BAP	PR0200000381
324			10HFE10CT022-CT027 10HFE20CT022-CT027	PA Fan A Bearing RTDs PA Fan B Bearing RTDs	PRT-100	Bearing									0-150					Stem Dia-8mm, Stem Length-160 mm, RTD Shall be given with adjustable sliding adapter (M18X1, L 20) with ferrule to fix suitably for the required length.5 Mtr SS aroumoured Flexible Extn cable		12	BAP	PR0200000381
325			10HFW11CT003-CT004 10HFW12CT003-CT004	SA Fan A Bearing RTDs SA Fan B Bearing RTDs	PRT-100	Bearing									0-150					Stem Dia-8mm, Stem Length-150 mm, RTD Shall be given with adjustable sliding adapter (M18X1, L 20) with ferrule to fix suitably for the required length.5 Mtr SS aroumoured Flexible Extn cable		4	BAP	PR0200000381

Total Main Qty	612
Minimum Spares Qty (Refer Note 2)	113
Minimum Total Qty	725

Notes :

1.0	For Barstock Thermowell, Extension Length shall be Minimum 30mm above the Insulation on pipe and Minimum 25 mm when there is no insulation on pipe.
2.0	Mandatory spares shall be 15% of Total Qty for each type, Each Process Connection Size and Each Thermowell size(IL&EL) OR Minimum 2 Number of each type, Each Process Connection Size and Each Thermowell size(IL&EL) whichever is higher shall be included as mandatory spares. Note: It is responsibility of bidder to calculate mandatory spares correctly, vendor can chose the length of IL and EL to optimize the mandatory spares qty without affecting the specification requirement. No commercial implication will be allowed for change in mandatory spares quantity due to calculation of WFC. During datasheets submission if BHEL finds that Thermowell length has to be corrected as per ASME PTC 19.3 2010 and if it results in change of qty in mandatory spares then no commercial implication will be allowed. However, if change of IL is due to inputs such as Operating and design parameters furnished by BHEL, then commercial implications due to those changes will be allowed.

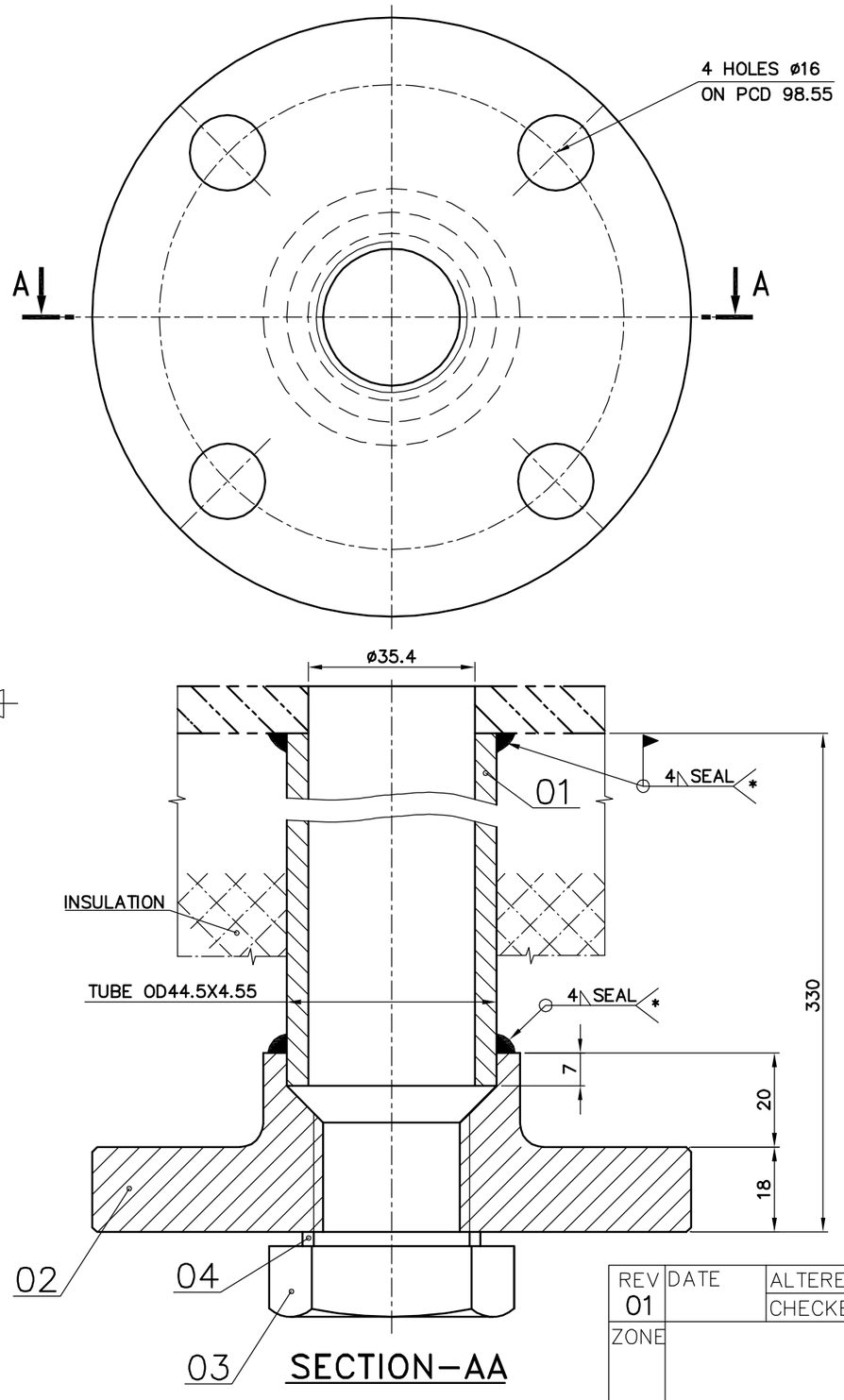
DRAWING NO. 3-55-335-02053

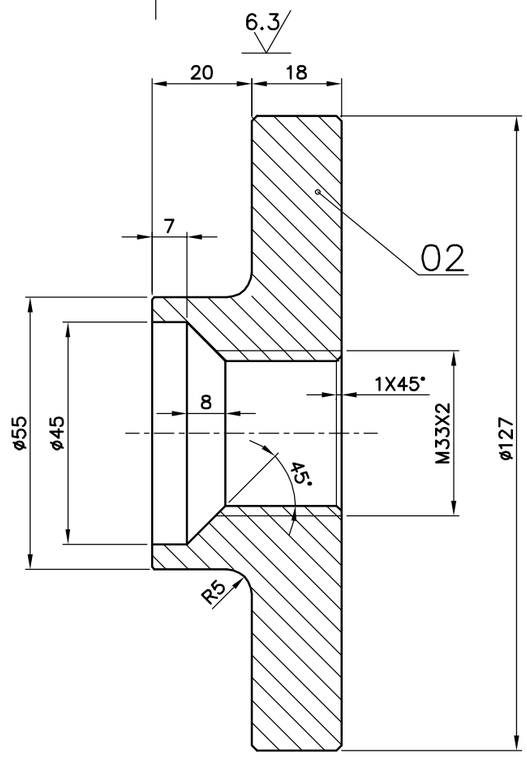
ALL DIMENSIONS ARE IN MILLIMETRES

FOR PRODUCTION

REF. PR:QA:590 FOR PAINTING
REF. PR:QA:500 FOR UNTOL. DIMNS.
REF. APPLICABLE GMS FOR MATCODE&SPEC.

~ 6.3





NOTES:

01. * MARKED WELDS ARE TO BE CHECKED BY LPI OR MPI
02. SHARP EDGES ARE TO BE CHAMFERED BY 0.5X45°

VAR NO	ITEM NO	DESCRIPTION	CAT	DRAWING No.	ITEM NO / VAR NO	MATL CODE / MATL SPECN	APC	UNIT / DI	UNIT WT / QTY	GS	ZONE
	04	CU FLAT SEALING RING 33X39	S			220208350000			0.006		
									1		
	03	SCREW PLUG M33X2				971620640000			0.200		
									1		
	02	PL 45XD135				150111090000			1.900		
						IS 2062GRB			1		
	01	TUBE D44.5X4.55;L–299				150860630000			1.340		
						ASTM A210 GRA1			1		

REV	DATE	ALTERED
01		CHECKED
ZONE		

TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT

BHARAT HEAVY ELECTRICALS LTD.,
UNIT: BOILER AUXILIARIES PLANT,
RANIPET – 632 406.

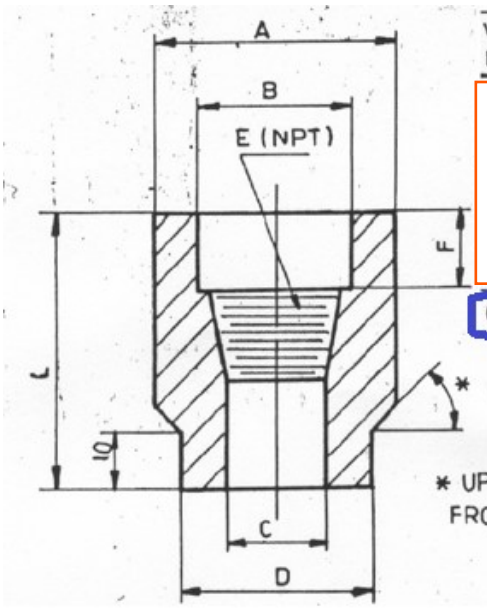
	NAME	SIGN	DATE	NO.OF VAR.
DRN	A.M.REDDY	Sd/–	28.02.15	
CHD	A.M.REDDY	Sd/–	28.02.15	
APPD	A.V.N	Sd/–	28.02.15	

DEPT	GRADE OF UNTOL.DIM	SCALE	WEIGHT (KG).	REF. TO ASSY/OLD DRG.	ITEM NO.	NO. OF ITEMS
FANS	PR:QA:500	N.T.S	3.446			
CODE 864						

TITLE	CARD CODE	DRAWING NO.	REV
STUDS FOR TEMP. SENSOR	U 01	3–55–335–02053	

Size A3

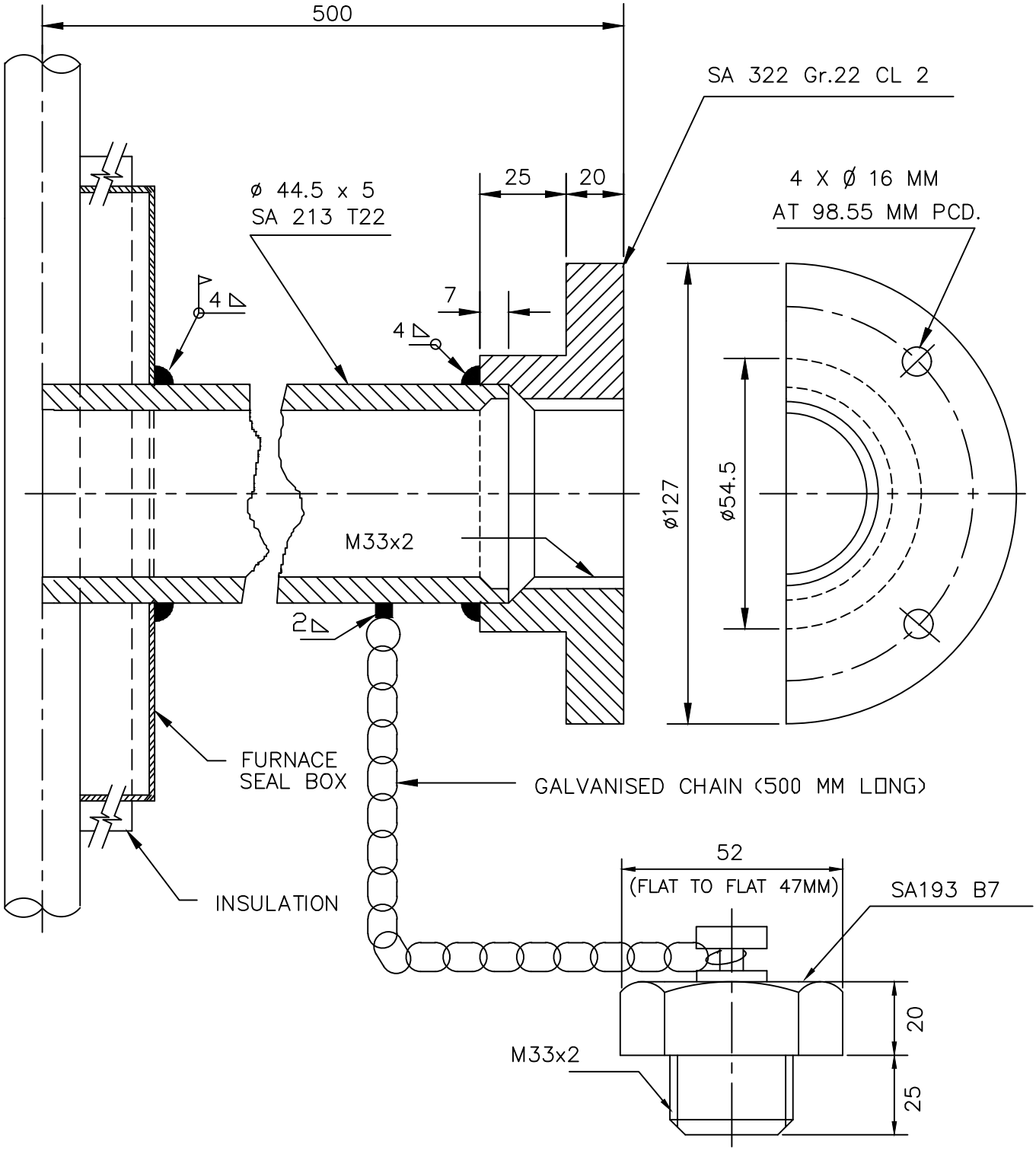
VESSEL TEMPERATURE MEASUREMENT **Ref: VESSEL-TEMP-STEAM-01**



VAR No.	NOM SIZE COUPLING	OD 'A'	ID 'B'	DRILLED HOLE 'C'	DIA 'D'	SIZE NPT 'E'	STD DEPTH 'F'	LENGTH 'L'
06	2"	92	61.1	43	75	1 1/2"	23	75

PROJECT : SAGARDIGHI–UNIT #5– 1x660 MW

TITLE : TEMPERATURE MEASUREMENT IN FURNACE



NOTES :

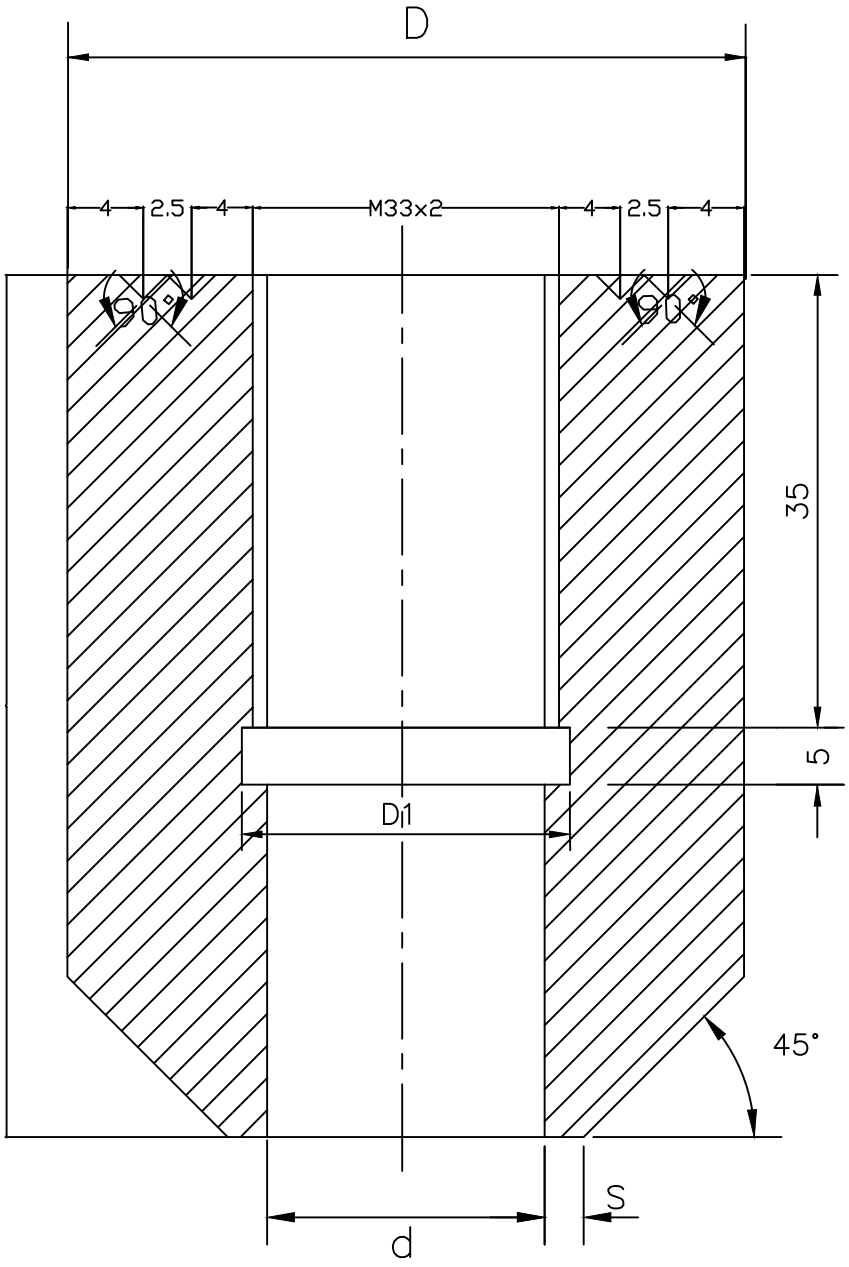
1. FURNACE SEAL BOX DEPTH (~150MM) SHALL BE TAKEN CARE WHILE DECIDING THERMOCOUPLE LENGTH.
2. FLANGE DIMENSIONS EXCEPT BORE ARE AS PER ANSI B16.5 CLASS 150 NPS 1–1/2 INCH.
3. TOLERANCE FOR ALL MEASUREMENT(LINEAR AND ANGULAR): ISO 2768–C.
4. TOLERANCE FOR TUBE THICKNESS AS PER A450 OF ASTM.

ALL DIMENSIONS ARE IN MM

PREPARED	KV	APPROVED	DR	DRG. NO.	REV.
CHECKED	SN	DATE	29–06–2020	4–97–288–94345	00

PROJECT : SAGARDIGHI–UNIT #5– 1x660 MW

TITLE : TEMPERATURE STUB FOR PRESSURE PARTS



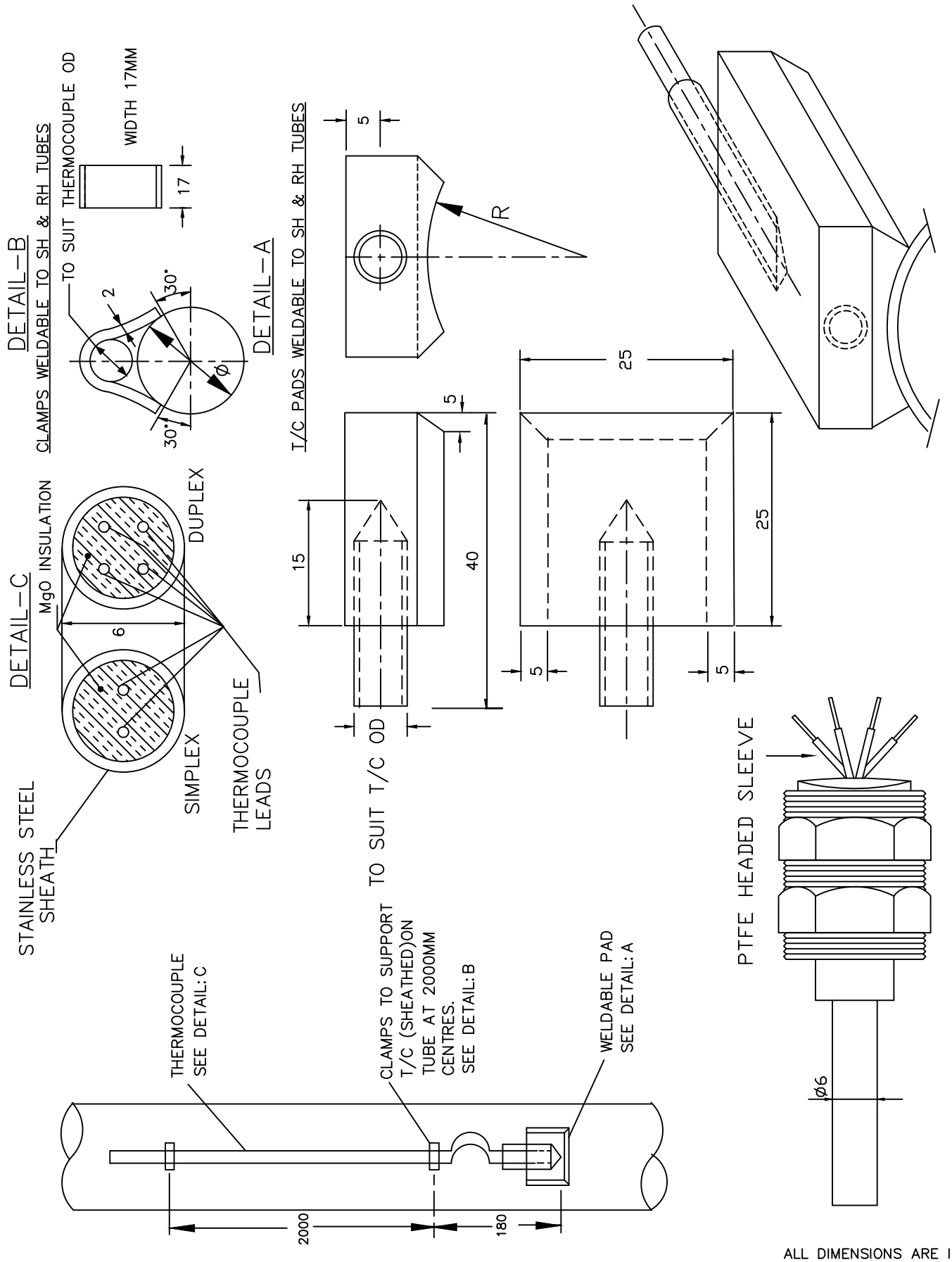
BELOW NB 150	29	86	33.5	1.5	130
NB 150 & ABOVE	29	86	33.5	1.5	65
MAIN PIPE SIZES	d	D	D1	S	L

ALL DIMENSIONS ARE IN MM

PREPARED	KV	APPROVED	DR	DRG. NO. 4–97–288–94347	REV. 00
CHECKED	SN	DATE	29–06–2020		

PROJECT : SAGARDIGHI–UNIT #5– 1x660 MW

TITLE : SH–RH MTM PEENING POINT DETAILS

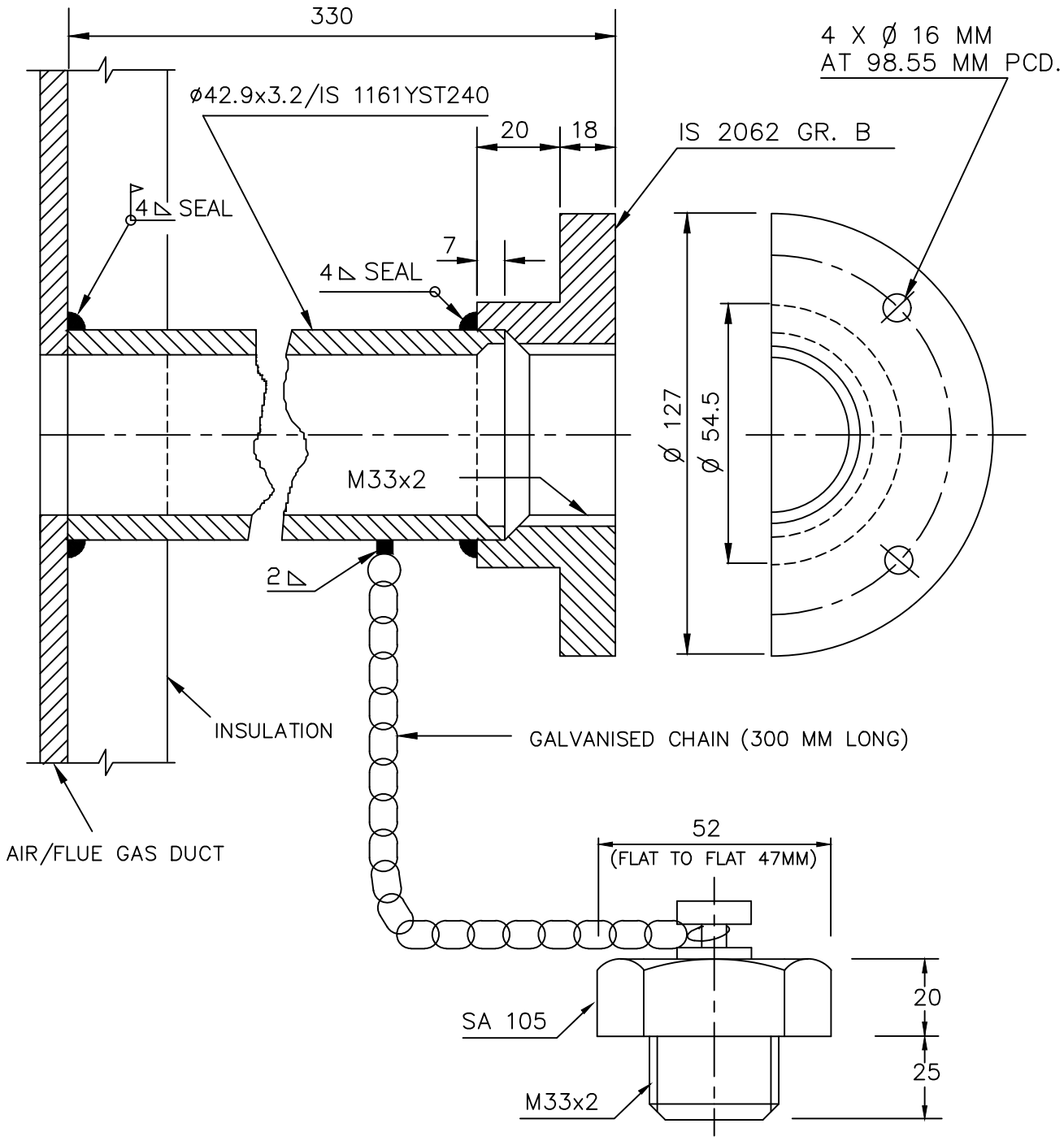


ALL DIMENSIONS ARE IN MM

PREPARED	KV	APPROVED	DR	DRG. NO.	REV.
CHECKED	SN	DATE	29–06–2020	4–97–288–94349	00

PROJECT : SAGARDIGHI–UNIT #5– 1x660 MW

TITLE : TEMP. MEASUREMENT IN AIR & FLUE GAS DUCT



NOTES :

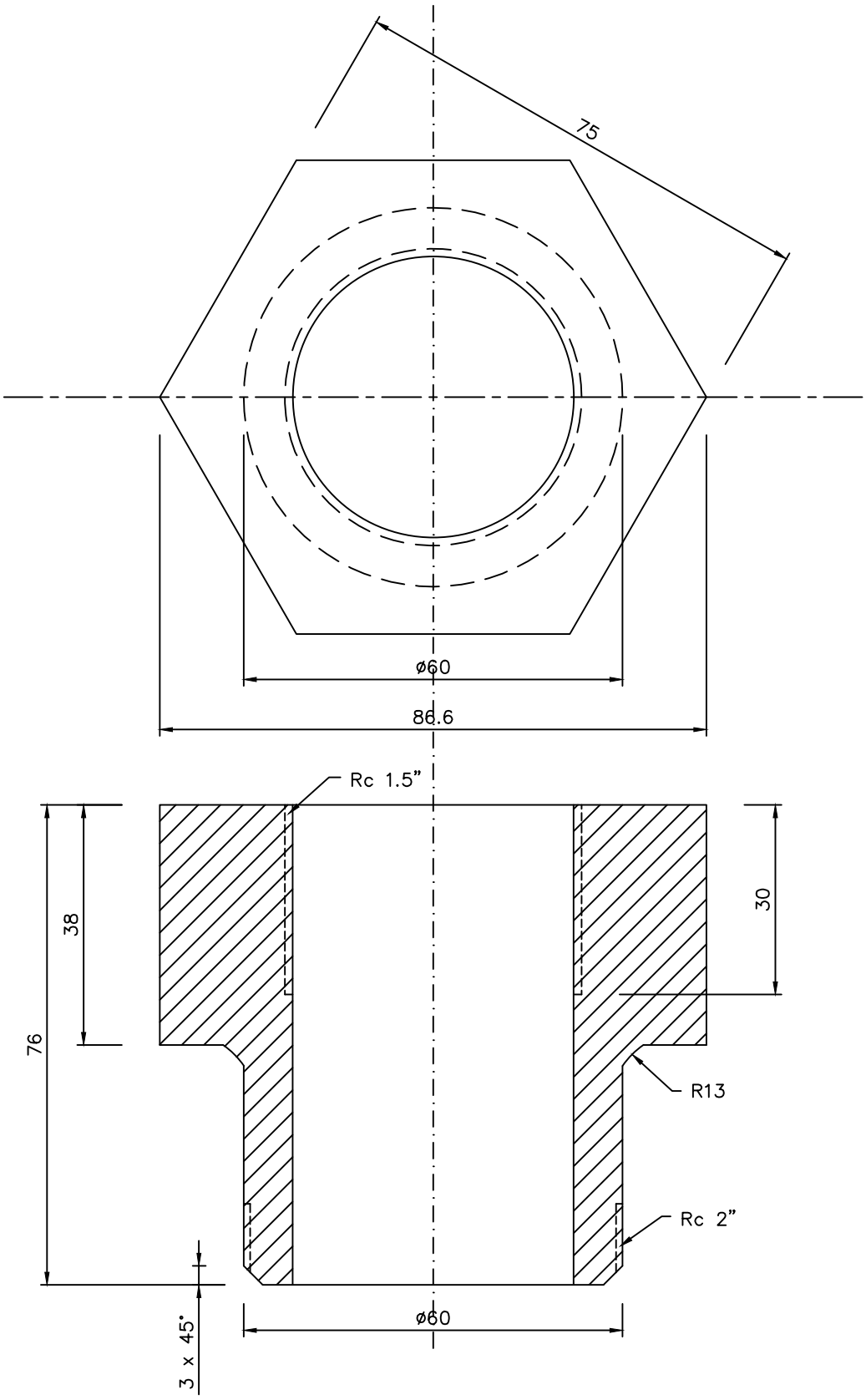
1. FLANGE DIMENSIONS EXCEPT BORE AS PER ANSI B16.5, CLASS 150 NPS 1–1/2 INCH.
2. TOLERANCE FOR ALL MEASUREMENT: COARSE CLASS AS PER IS 2102.
3. TOLERANCE FOR LIGHT PIPE THICKNESS AS PER IS 1161 STEEL TUBES.

ALL DIMENSIONS ARE IN MM

PREPARED	KV	APPROVED	DR	DRG. NO.	REV.
CHECKED	SN	DATE	29–06–2020	4–97–288–94351	00

PROJECT : SAGARDIGHI–UNIT #5– 1x660 MW

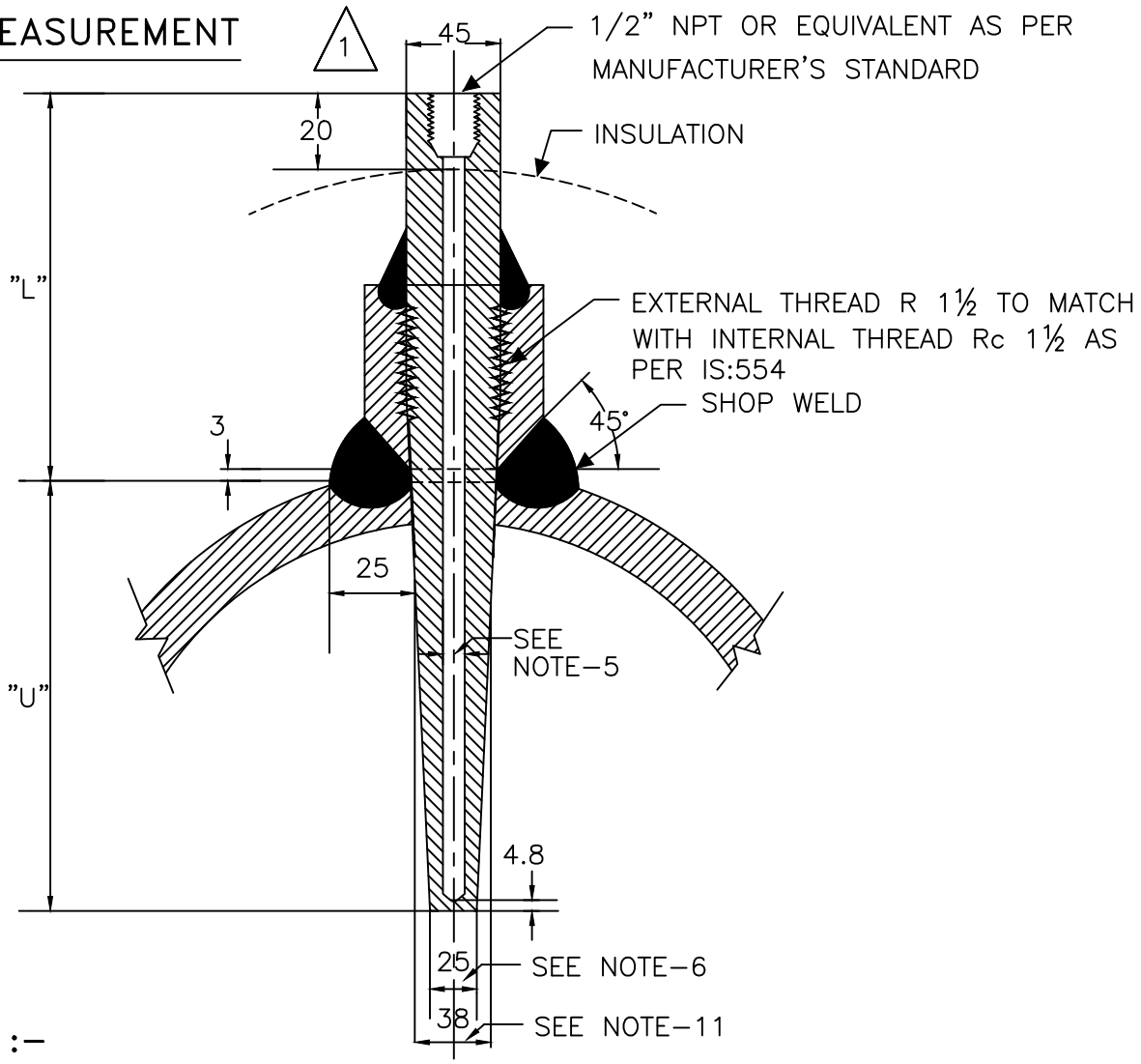
TITLE : MILL COAL AIR TEMPERATURE MEASUREMENT STUB



ALL DIMENSIONS ARE IN MM

PREPARED	KV	APPROVED	DR	DRG. NO.	REV.
CHECKED	SN	DATE	29–06–2020	4–97–288–94354	00

TEMP. MEASUREMENT



NOTES :–

1. THIS TYPE OF TEMPERATURE BOSS SHALL BE USED FOR THE DESIGN PRESS EQUAL/ ABOVE 40 KG/CM2(g) AND FOR DESIGN TEMP EQUAL/ABOVE 400 DegC EVEN IF THE DESIGN PRESSURE IS LESS THAN 40 Kg/Cm2(g)
2. THE MATERIAL OF THE BOSS SHALL BE SIMILAR TO PIPING MATERIAL.
3. MATERIAL OF THE THERMOWELL SHALL BE OF 316SS.
4. THERMOWELL SHALL BE DRILLED BAR STOCK TYPE.
5. INTERNAL BORE OF THE THERMOWELL SHOULD BE SELECTED BASED ON THE NORMAL SIZE OF THE SENSING ELEMENT AS PER ASME PTC–19.3.
6. THE BOTTOM DIAMETER OF THE THERMOWELL TYPICALLY SHOWN HERE SHALL BE SUBJECT TO VARIATION BASED ON THE INTERNAL BORE OF THERMOWELL AND THICKNESS OF THERMOWELL MATERIAL TO WITHSTAND THE PROCESS PRESS AND TEMP AS PER ASME PTC–19.3.
7. THE 'U' & 'L' DIMENSIONS SHALL BE SELECTED BASED ON PARTICULAR APPLICATION.
8. ORIENTATION OF STUB ON VERTICAL/ HORIZONTAL PIPES SHALL BE 90° TO THE CENTRE LINE OF THE PIPES, FOR PIPE SIZE LARGER THAN 4". HEIGHT OF STUB SHALL BE 64mm FOR PIPE OD < 200Nb AND 45mm FOR PIPE OD ⩾ 200Nb.
9. STUB SHALL HAVE IBR CERTIFICATION, AS APPLICABLE, ACCORDING TO PROCESS DATA. 1
10. BOSS OD SHALL BE DEPENDENT ON PROCESS PRESS, TEMP & PIPE DIAMETER.
11. THERMOWELL SHALL BE SUITABLE TO MATCH THE STUB DIMENSIONS AS PER Rc 1½.
12. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE INDICATED.

BHEL

TITLE :

INSTRUMENT STUB DETAILS FOR TEMPERATURE MEASUREMENT

(APPLICABLE FOR PIPE SIZE ABOVE 4")

[(i) DESIGN PRESS =/> 40 Kg/Cm2(g) OR (ii) DESIGN TEMP =/>400 DegC]

1

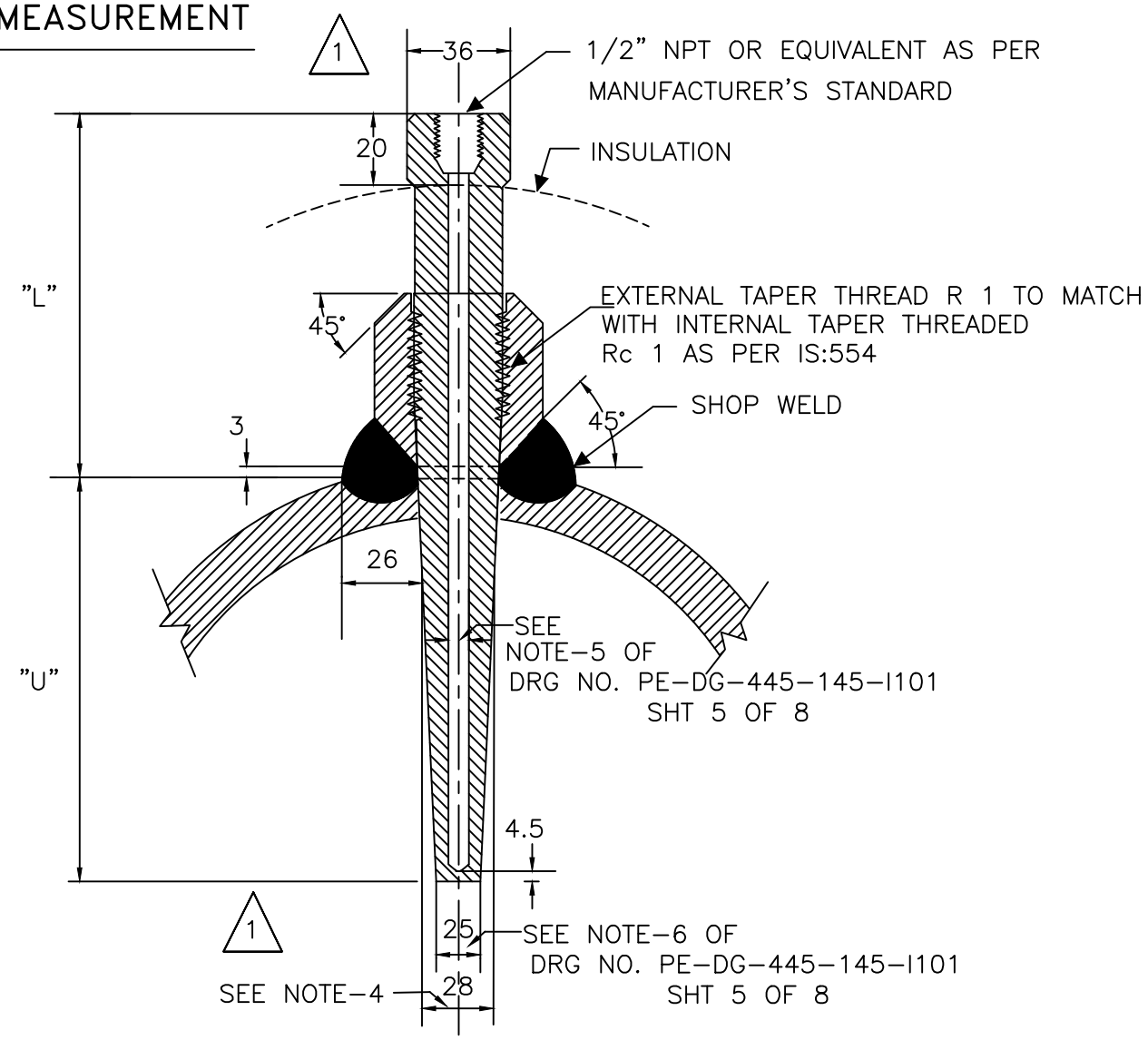
DRG. NO.

PE–DG–445–145–I101

REV. 01

SH. 5 OF 8 SHS.

TEMP. MEASUREMENT



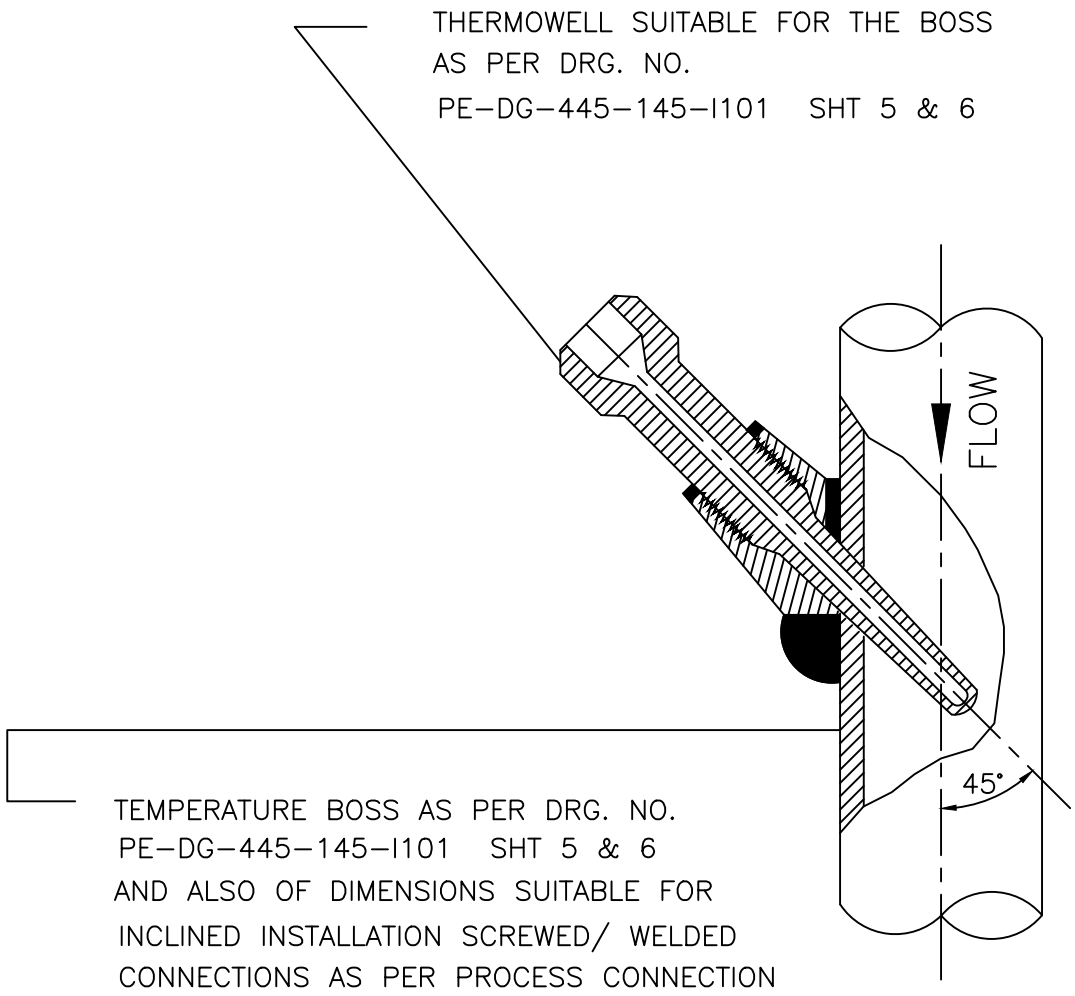
NOTES :-

1. THIS TYPE OF TEMPERATURE BOSS IS APPLICABLE FOR THE DESIGN PRESS/ TEMP BELOW 40 KG/CM2(g)/400°C.
2. FOR PRESS. TIGHT JOINTS THE BOSS SHOULD HAVE INTERNAL TAPERED PIPE THREAD Rc 1 AS PER IS:554. THE LENGTH OF THREAD ENGAGEMENT SHOULD BE AS PER ABOVE STANDARD.
3. SEE NOTES-2 TO 10 IN SHT. 5 OF 8 OF THIS DRG. (1)
4. THERMOWELL SHALL BE SUITABLE TO MATCH THE STUB DIMENSIONS AS PER Rc 1.
5. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE INDICATED.

BHEL

TITLE :
INSTRUMENT STUB DETAILS
FOR TEMPERATURE MEASUREMENT
(APPLICABLE FOR PIPE SIZE ABOVE 4")
[DESIGN PRESS < 40 Kg/Cm2 (g) & DESIGN TEMP < 400 C]

DRG. NO.
PE-DG-445-145-I101
REV. 01
SH. 6 OF 8 SHS.



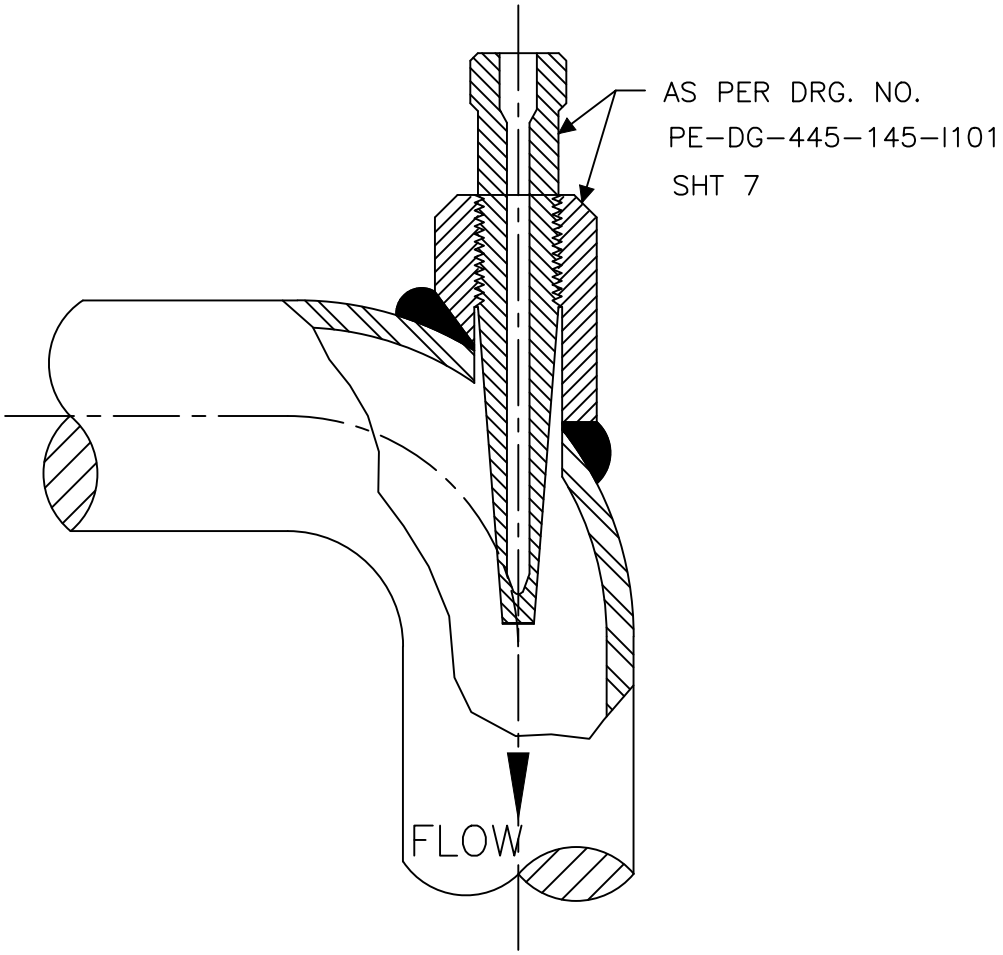
NOTES :–

1. INCLINED INSTALLATION OF THERMOWELL SHALL BE APPLICABLE FOR 4" AND SMALLER LINE SIZE BUT LIMITED TO MIN. 3" LINE SIZE.
2. FOR 2" AND SMALLER LINE SIZE NECESSARY EXPANDER OF MIN. 3" SIZE OF MAIN PIPING SPECIFICATION SHALL BE USED.
3. THIS TYPE OF INSTALLATION IS APPLICABLE FOR HORIZONTAL AND VERTICAL PIPE SECTION.
4. FOR STEAM SERVICES EXPANDER SECTION TO BE USED ONLY IN VERTICAL RUN.
5. THE EXPANDER SECTION SHALL BE OF ADEQUATE LENGTH (AT LEAST 3–4 TIMES DIA OF THE MAIN PROCESS PIPE AT BOTH SIDES OF THE INSTALLED THERMOWELL).

बीएचईएल BHEL

TITLE :
INSTRUMENT STUB DETAILS
FOR TEMPERATURE MEASUREMENT
THERMOWELL INSTALLATION

DRG. NO.
PE–DG–445–145–I101
REV. 01
SH. 7 OF 8 SHS.



NOTES :–

1. THIS INSTALLATION OF THERMOWELL SHALL BE APPLICABLE FOR 4" AND SMALLER LINE SIZE BUT LIMITED TO MINIMUM 3" LINE SIZE. THIS DETAIL IS APPLICABLE FOR THERMOWELL INSTALLATION IN BEND PIPES. △1
2. FOR 2" AND SMALLER LINE SIZE NECESSARY EXPANDER OF ELBOW FORM (AS SHOWN) OF MINIMUM 3" SIZE SHALL BE USED.
3. ELBOW EXPANDER SECTION IN HORIZONTAL PLANE TO BE USED FOR LIQUID SERVICE. FOR STEAM SERVICES EXPANDER SECTION TO BE USED IN VERTICAL PLANE.

बीएचईएल
BHEL

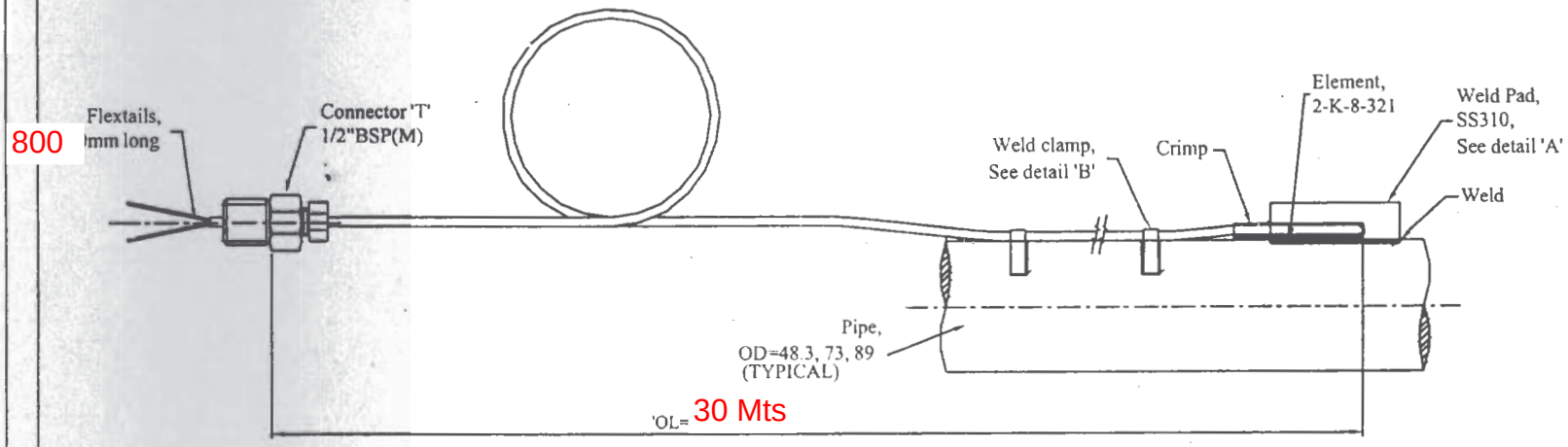
TITLE :
INSTRUMENT STUB DETAILS
FOR TEMPERATURE MEASUREMENT THERMOWELL INSTALLATION

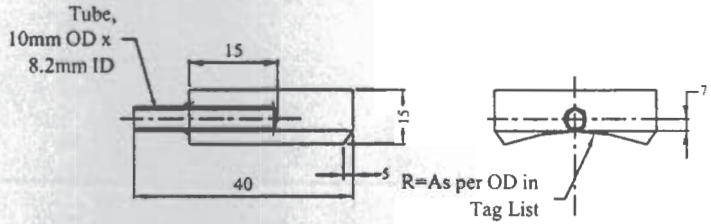
DRG. NO.
PE–DG–445–145–I101
REV. 01
SH. 8 OF 8 SHS.

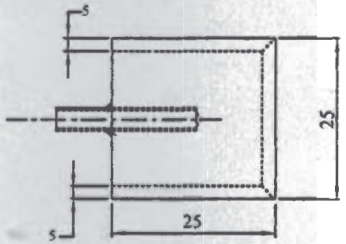
TYPICAL DIAGRAM

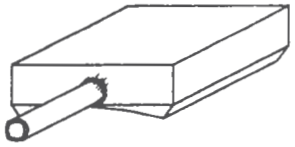
THERMOCOUPLE INSTALLATION DIAGRAM

SAGARDIGHI-TEMP-METAL-01

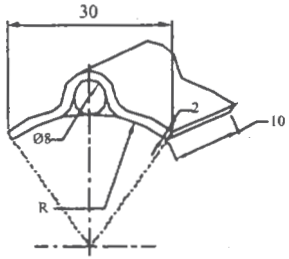








DETAIL 'A' - WELD PAD DETAILS



Detail 'B'
Weld clamp, SS310,
Width=10, Length=30

All dimension are in mm

81

ENGINEERING CHECKLIST
PROJECT: SAGARDIGHI 1X660 MW
Temperature Elements
Important Note: Bidders to Mandatorily fill the below checklist (with Company seal and Signature) otherwise offers shall be rejected.

Sl. No.	DESCRIPTION	CONFIRMED (If applicable Please Tick Mark 'v')	Not CONFIRMED (If applicable Please Tick Mark 'v')
1	Bidder shall have successfully completed design, engineering, manufacturing, testing and supply of Temperature Elements including Thermocouple, RTD and Thermowells in Coal Fired Thermal Powerplants of unit size not less than 200 MW. To qualify to this point, Bidders shall furnish details of supplies made. Details should include PO copies/Datasheet and Supply documents. Feedbacks from end user (if available) can also furnished.		
2	All the Elements below shall be provided with CERAMIC Terminal Blocks and Nickel Plated Brass Screw type with Silver coated and spring loaded Connectors. Two Electrical Connections shall be provided, one with ½" NPT Cable Gland and other Entry shall be with Blind Plug.		
3	*Minimum mandatory spares qty indicated in the table above, Actual Qty shall be as indicated below. Mandatory spares shall be 15% of Total Qty for each type, Each Process Connection Size and Each Thermowell size(IL&EL) OR Minimum 2 Number of each type, Each Process Connection Size and Each Thermowell size(IL&EL) whichever is higher shall be included as mandatory spares. Note: It is responsibility of bidder to calculate mandatory spares correctly, vendor can chose the length of IL and EL to optimize the mandatory spares qty without affecting the specification requirement. No commercial implication will be allowed for change in mandatory spares quantity due to calculation of WFC. During datasheets submission if BHEL finds that Thermowell length has to be corrected as per ASME PTC 19.3 2010 and if it results in change of qty in mandatory spares then no commercial implication will be allowed. However, if change of IL is due to inputs such as Operating and design parameters furnished by BHEL, then commercial implications due to those changes will be allowed.		
4	Thermocouple and RTD shall be Duplex Type		
5	RTD shall be 4 wired		
6	Element size for RTD shall be 18 AWG		
7	Element size for K Type Thermocouple shall be 16 AWG		
8	For Thermocouple with Barstock Thermowell, Wherever Design Temperature is More than 573 DegC. Barstock Thermowell Material shall be SS316H		
9	150mm SS304 Nipple union Nipple shall be provided with ½" Sch 80 pipe with ½" NPT(M) connection size for all Barstock Threaded and Tunsten carbide Thermowells.		
10	Head of Temperature Elements shall be Die Cat Aluminium or better.		
11	Sheath Material for N Type Thrmocouple shall be Inconel 600		
12	K Type Thermcouple, N Type Thermocouple and RTD shall be Mgo Mineral Insulated (Purity 99.4%)		
13	For Steam and Water related mediums Thermowell shall be made from Solid Barstock.		
14	For Coal+Air Mixture Services, Solid Sintered Tungsten Carbide Thermowell shall be Offered.		
15	For Barstock Thermowell, Extension Length shall be Minimum 30mm above the Insulation on pipe and Minimum 25 mm when there is no insulation on pipe.		
16	For Material Code PR0190000368, K Type Thermocouple shall be with 25Mtr Flexible MI Extension cable along with Mounting plate for Head.		
17	For N Type Thermocouple, Inconel 600 Thermowell with additional overprotection by Tungsten carbide. Inconel 600 tube shall be fabricated from 3/4"" Sch 80 seamless pipe with welded Barstock cap at the end (of 100 mm min. length from tip). This construction would ensure thermowell should not break due to any shock.		
18	For flanged connections; Studs, nuts and gaskets of suitable material with Cadmium plated shall be provided. Flanges shall be as per ANSI-B 16.5.		
19	Mandatory Spares shall be sent in pre-decided lots in secure boxes distinctly marked in Red colour with boldly written "S" mark on each face of the secure boxes.		
20	Pl. confirm that There is no deviation w.r.t Purchase Spcifications.		
21	At later stage if it is found that vendor offer is not in line with tender specification then vendor to supply material in line with tender specification without any price impact to BHEL.		
22	Vendor to submit credentials as indicated in PQR above. This will be submitted to Customer for vendor approval in this project. Please note that BHEL will wait 20 days for vendor approval from the date of submission, if the same is not received from customer within this period your offer will not be acceptable.		
23	Wake Frequency calculation will be checked only during Detailed Engg after PO Placement, If IL and EL Changes based on ASME PTC 19.3 2016 same to be done at without cost implication to BHEL.		
24	Mandatory spares list to be submitted as per specification.		

(Company seal and Signature)