Bharat Heavy Electricals Limited
Heavy Plates & Vessels Plant
Visakhapatnam – 530 012
Andhra Pradesh, INDIA

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INVITATION TO TENDER

::1::

Ref: OS/WC/2025-26/149/96 **Date: 28.01.2026**

Sub: Contract for Mechanical works of Erection and pre-commissioning / start-up, commissioning assistance and performance guarantee test, closure activities of Fired Heater Packages and interconnection systems, handing over of the Facilities along with Spares for DCU HEATER at IOCL DIGBOI REFINERY and Revamping of existing Ind-Coker Primary Furnace (07-FF-00-001) against S.O 8118 - Reg.

Tenders are invited under **two-part bid system**, Techno-Commercial Bid (Part-I) and Price Bid (Part-II) from reputed and experienced contractors with sound technical and financial capability for the subject work.

IMPORTANT INFORMATION:

1	**Notice Inviting Tender (NIT)**	**OS/WC/2025-26/149/96, Date: 28.01.2026** **Two Part Bid:**
2	Last Date of Receipt of Tender	**07.02.2026,14.00 Hrs thru GeP NIC Portal**
3	Tender Opening	**07.02.2026, 15.00 Hrs thru GeP NIC Portal.**
3	Contract Period	**6 months from the date of issue of First consignment of free issue materials or 12 weeks from the date of issue of Last consignment of materials, whichever is later**
4	EMD	**₹2,00,000.00**
5	Security Deposit	**5% of the Contract value.**
6	Reverse Auction	**Applicable**

1. ELIGIBILITY CRITERIA:

I) Average annual turnover of the contractor during the last 3 years ending **31st March 25** should be **₹138.30 Lakhs**). In case annual turnover for FY 2024-25 is not finalized or ITR is not submitted by the contractor, Avg. annual turnover during the last 3 years ending 31st March 2024 shall be considered.

Tenderer should enclose EPF, ESI, PAN, GSTIN New registration no., Income tax returns for last three years (AY- 2023-24, 2024-25 & 2025-26/ 2022-23), Profit & Loss account and Balance Sheet certified by the Practicing Chartered Accountant for the last 3 years.

II) The Contractor should have experience of completing similar works during the last 7 years ending **31st Dec 2025** as given below: -

(a) Three similar completed works costing not less than the amount **₹184.40** Lakh each.

OR

(b) Two similar completed works costing not less than the amount **₹230.50** Lakh each.

OR

(c) One similar completed work costing not less than the amount **₹368.80** Lakh.

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Notes :

i) Similar Works means Erection of Equipment like Heaters / Columns / Vessels / Heavy Equipments which include NDT, PWHT, Hydrotest, etc. for any jobs in Oil & Gas sector.

ii) The works executed in the own name of the tenderer will only be considered for eligibility criteria.

iii) Work orders & Job Completion Certificates from the customer shall be enclosed in support of successful and satisfactory completion of the orders.

2. SCOPE OF THE WORK:

The detailed scope of work is as given at Annexure-I, Annexure-III, SOQR, IOCL Special conditions of contract , Drawings, Standards & Specifications enclosed to the NIT.

3. LOCATION OF SITE:

IOCL DIGBOI Site . Bidders are advised to visit the site before submission of their offer for assessment of the entry permissions, work permits, safety requirements, site conditions, labour regulations, local conditions, etc. No deviations will be entertained after submission of offers.

4. EARNEST MONEY DEPOSIT:

I. The tenderer shall submit EMD for **₹2,00,000/- (Rupees Two Lakh only)** in the following forms only:
   a) Cash Deposit as permissible under the extant Income Tax Act (before tender opening).
   b) Electronic Fund Transfer credited in BHEL account (before tender opening).
   c) Banker's Cheque/ Pay Order/ Demand Draft, in favour of BHEL, Visakhapatnam (along with offer)
   d) Fixed Deposit Receipt (FDR) issued by Scheduled Banks/ Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL)
   e) Insurance Surety Bonds

   In addition to above, the EMD amount in excess of ₹Two lakh may also be accepted in the form of Bank Guarantee from scheduled bank. The Bank Guarantee in such cases shall be valid for at least six months

II. EMD by the tenderer will be forfeited as per NIT conditions, if:
   a) After opening the tender and within the offer validity period, the tenderer revokes his tender or makes any modification in his tender which is not acceptable to BHEL.
   b) The contractor fails to deposit the required security deposit or commence the work within the period as per LOI/ Contract.
   c) EMD by the tenderer shall be withheld in case any action on the tenderer is envisaged under the provisions of extant "Guidelines on Suspension of business dealings with suppliers/ contractors" and forfeited/ released based on the action as determined under these guidelines.

III. EMD given by all unsuccessful tenderers shall be refunded normally within 15 days of award of work.

IV. EMD shall not carry any interest.

V. EMD of successful tenderer will be retained as part of Security Deposit.

Note: Micro & Small Enterprises (MSEs) are eligible for exemption of EMD as given below:

MSE suppliers can avail the intended benefits only if they submit **valid UDYAM Registration** for **Micro / Small** category along with the offer. Non-submission of such documents will lead to consideration of their bid at par with other bidders. No benefits shall be applicable for this enquiry if any deficiency in the above required documents is not submitted before price bid opening.

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5. CONTRACT PERIOD:

The subject work is to be completed in all respects including handing over to the Customer, M/s IOCL -Digboi within **6 months from the date of issue of First consignment of free issue materials or 12 weeks from the date of issue of Last consignment of materials, whichever is later**. The delivery period includes the time involved in collection of all raw materials, cutting plan approval (if applicable), handing over of finished items**.**

Notes:

For intermediate operations of Refractory contractor, wherever applicable, the time period from the date of handing over to the refractory / insulation contractor to the date of taking over will be excluded from the delivery period for the purpose of computation of LD. But it is the responsibility of the contractor to record the same and get certified by BHEL Site In-charge.

6. DEFECT LIABILITY PERIOD :

Defect liability period will be **18 (Eighteen) months** from the date of mechanical completion or **12 (Twelve) months** from the date of commissioning, whichever is earlier.

7. SITE MOBILISATION :

Successful bidder shall have to complete site mobilization within 15 days from the date of receipt of order or from the date of intimation for the same by BHEL, whichever is later. Any delay in mobilization beyond 15 days will attract LD.

8. LIQUIDATED DAMAGES:

In the event of delay in completion of work or part thereof as per the contractual completion period due to the reasons attributable to the contractor, BHEL-HPVP shall have the right to impose Liquidated Damages at the rate of 0.5% of the contract value for every complete week of delay or part thereof subject to a maximum of 10% of contract value

9. OVER RUN COMPENSATION (ORC) / IDLE CHARGES:

The contractor shall not be entitled to claim and the company shall not be liable to pay any amount on account of overrun compensation and idle charges, the overrun/ idling may be for whatsoever reasons.

10. PRICE VARIATION COMPENSATION (PVC):

The contractor shall be paid at the contract rates for the actual quantities of work executed only and the contractor shall **not be entitled to claim or receive any extra amount on account of any price escalation either in materials, labour, taxes** / **duties etc.**, or for any reasons whatsoever and the contract rates are firm and fixed till the completion of the work in all respects.

11. SECURITY DEPOSIT:

Security Deposit shall be collected from the successful tenderer **@5%** Contract Value.

A. Security deposit means the security provided by the contractor towards fulfilment of any obligations in terms of the provisions of the contract.

B. The total amount of the security deposit will be **5% of the contract value**. EMD of the successful tenderer shall be converted and adjusted towards the required amount of Security deposit.

C. **Modes of Deposit:**

The balance amount to make up the required Security Deposit of **5%** of the contract value may be accepted in the following forms:

a) Cash (as permissible under the extant Income Tax Act)

b) Local Cheques of Scheduled Banks (subject to realization)/ Pay Order/ Demand Draft/ Electronic Fund Transfer in favour of BHEL.

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c) Bank Guarantee from Scheduled Banks/ Public Financial Institutions as defined in the company's act. The bank guarantee format should have the approval of BHEL.

d) Fixed Deposit Receipt issued by Scheduled Banks/ Public Financial Institutions as defined in the company's act (FDR should be in the name of the contractor, a/c BHEL.

e) Insurance Surety Bonds

(**Note:** BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith)

D. **Collection of Security deposit**:

At least 50% of the required Security Deposit, including the EMD, should be collected before start of the work. Balance of the Security Deposit can be collected by deducting 10% of the gross amount progressively from each of the running bills of the Contractor till the total amount of the required Security Deposit is collected.

In case of delay in submission of performance security, enhanced performance security which would include interest (Repo rate + 4%) for the delayed period, shall be submitted by the bidder.

If the value of work done at any time exceeds the contract value, the amount of Security Deposit shall be correspondingly enhanced and the additional Security Deposit shall be immediately deposited by the Contractor or recovered from payment/s due to the Contractor.

The recoveries made from running bills (cash deduction towards balance SD amount) can be released against submission of equivalent Bank Guarantee in acceptable form, but only once, before completion of work, with the approval of the authority competent to award the work.

Note: In case of (a) small value contracts not exceeding Rs. 20 lakhs or (b) SAS jobs, work can be started before the required Security Deposit is collected. However, payment can be released only after collection/ recovery of initial 50% Security Deposit.

E. **Refund of Security Deposit:**

i. The security deposit shall be refunded after successful completion of the Workmanship Guarantee as per agreement and subject to deduction of any amount due to BHEL.

ii. Security deposit shall not be refunded to the Contractor except in accordance with the terms of the Contract.

iii. The successful tenderers shall furnish Security Deposit within 15 days from the date of Work Order / Letter of Intent. The Security Deposit shall be furnished by the successful tenderers before commencement of work by them.

iv. The security deposit shall not carry any interest.

Note: Acceptance of Security Deposit against Sl. No. (d) and (e) above will be subject to hypothecation or endorsement on the documents in favour of BHEL. However, BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith).

F. Security Deposit / Bank Guarantee will be released after the maintenance **period of 2 months** or **on closure of contract whichever is later**.

12. INCOME TAX:

Income tax as per statutory requirement will be deducted on each payment made to the contractor and TDS certificate will be issued to this effect.

13. TDS ON GST:

TDS on GST amount as per statutory requirement as applicable will be deducted on each payment made to the contractor. Present TDS on GST is 2%.

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14. LAW GOVERNING CONTRACT AND COURT JURISDICTION:

The contract shall be governed by the law in force in the Republic of India. The Civil court having original civil jurisdiction at Visakhapatnam for HPVP shall alone have exclusive jurisdiction in regard to all claims in respect of the contract. No other civil court shall have jurisdiction in case of any dispute under this contract.

15. TERMS OF PAYMENT:

- **80%** progressive payment against monthly RA bills based on work completed within 45 days from Date of submission of RA Bill.
- 5% against final painting on submission of bill after acceptance by consultant/customer
- 5% against mechanical completion & acceptance by Consultant / Customer on submission of bill.
- Balance **10 %** on total completion & final acceptance of the work and after submission of final bill along with all supporting documents as per contract terms and after expiry of Workmanship Guarantee period / Defect Liability Period. However, this 10% retention amount will be released on submission of **Performance Bank Guarantee for an equivalent amount valid up to completion of Defect Liability Period plus a claim period of 3 months.**

16. MODE OF PAYMENT:

Payment will be released only through RTGS / NEFT and all documents required for the same are to be submitted by the contractor along with the bill.

FINAL BILL

Final bill shall be submitted after completion of all works and material reconciliation along with following documents as specified in General Conditions of contract.

a. Work Completion Certificate by BHEL Site in- charge.
b. No Dues Certificate by BHEL Site in- charge
c. No Claim certificate by the Contractor.
d. Clearance Certificates wherever applicable viz. site Clearance Certificates from Customer, various Statutory authorities like Labour Department, PF authorities, etc.
e. Indemnity Bond as per prescribed format

17. PRICE SCHEDULE, TAXES & DUTIES:

a. Prices shall be quoted in the price schedule attached to the tender for the complete scope of work.
b. The quoted prices shall be exclusive of **GST**. GST as applicable shall be payable by the contractor and the same will be reimbursed as per Annexure-GST on submission of proof of GST payment.
c. In addition to existing taxes, any new taxes imposed by Central / State Govt. shall be payable by the contractor and same shall be reimbursed on submission of relevant documents/proof of payment.
d. Any new tax is imposed by Central / State Govt. or there is any variation in taxes after expiry of delivery / contract period, the same shall be borne by contractor only.
e. All terms & conditions of the contract in respect of taxes & duties are subject to new taxation laws introduced time to time by Govt. and terms & conditions will deemed to be modified in accordance with the provisions of New Laws (i.e., GST).
f. The quoted prices shall be fixed & firm without any escalation during the entire period of contract and till completion of the work.
g. Building and Other Construction Workers' Welfare CSS Act, 1996 and the rules framed there under shall be applicable for the job and the CONTRACTOR shall be responsible to comply with all provisions of the same. The Cess as per the Act shall be deducted at source from the Bills of the CONTRACTOR by the Owner/ Engineerin-Charge as per the prevailing rate. The Cess collected

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shall be remitted to the"Secretary, Building and Other Construction Workers Welfare Board" of the concerned State. The CONTRACTOR shall be responsible to submit final Assessment Return of the Cess amount to the Assessing Officer after adjusting the Cess deducted at source. BOCW Cess will be deducted at applicable rate and deposited with appropriate authorities as per Statutory Provisions as may be applicable.

The BOCW cess shall be deducted at the applicable rates on the total cost of construction.

18. REVERSE AUCTION:

A. BHEL shall be resorting to Reverse Auction (RA) (**Guidelines as available on https://www.bhel.com/guidelines-reverse-auction-2024)** 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."

This will be decided after techno-commercial evaluation. Bidders have to give their acceptance with the offer for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA. Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit 'Process compliance form' (to the designated service provider).

B. PROCEDURE OF REVERSE AUCTIONING:

1) Price bids of all techno-commercially qualified bidders shall be opened.
2) Reverse Auction: The 'bid decrement' will be decided by BHEL.
3) The lowest bidder in sealed envelope price bid shall be shown as current L1 automatically by the system and no acceptance of that price is required. System shall have the provision to indicate this bid as current L1.
4) Bidders by offering a minimum bid decrement or the multiples thereof can displace a standing lowest bid and become "L1" and this continues as an iterative process. However, no bidder shall be allowed to lower its bid below the current L1 by more than 5 decrements at one go.
5) After the completion of the reverse auction, the Closing Price shall be available for further processing.
6) Wherever the evaluation is done on total cost basis, after Reverse Auction, prices of individual line items shall be reduced on pro-rata basis.

C. REVERSE AUCTION PROCESS:

1) Reverse Auction will be conducted if two or more bidders are techno-commercially qualified.
2) The techno-commercially qualified H1 will not be allowed to participate in RA. In case more than one H1 bidder quote the same rate, the Price Offer received last, as per the time log of the Portal, shall be removed first, on the principle of last in, first out by the system.
3) However, H1 will be allowed to participate in RA in the following cases:
   a) If number of techno-commercially qualified bidders are only 2 or 3.
   b) In case Primary product of only one OEM is left in contention for participation in RA on elimination of H1.
   c) For cases where there are more than 3 techno-commercially qualified bidders, if lowest bidder in sealed price bid is non-MSE and H-1 is eligible MSE and H-1 price is coming within price band of 15% of Non-MSE lowest bidder.

   d) For cases where there are more than 3 techno-commercially qualified bidders, if lowest bidder in sealed price bid is non-MII and H-1 is eligible MII and H-1 price is coming within price band of 20% of Non-MII lowest bidder.
4) Price bids of all techno-commercially qualified bidders shall be opened and same shall be considered for RA. In case any bidder(s) do(es) not participate in online Reverse Auction, their sealed price bid along with applicable loading, if any, shall be considered for ranking.

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5) Start price for RA shall be lowest of sealed envelope price bid.
6) If the start price is lower than the lowest sealed envelope price bid, on acceptance of such start price by any bidder this bid would be indicated as current L1 for further bidding. However, if no bidder accepts the start price, RA shall be treated as cancelled for the respective line item(s) and the tender shall be processed accordingly.
7) In case of no further bidding, RA will be deemed to have been successful with current L1 bidder. During RA, all bidders will see their rank and current L1 price on the screen. Once the RA is done, the ranking status would be based on the last quoted price of the bidder(s) irrespective of the quote received in RA or sealed envelope price bid.

For detailed Guidelines visit our website*:* https://www.bhel.com/guidelines-reverse-auction-2024

19. VALIDITY OF OFFER:

The offer shall be valid for a period of **3 months** from the last date for tender submission.

20. COMPENSATION IN CASES OF DEATH / PERMANENT INCAPACITATION OF PERSON DUE TO UNINTENDED / UNFORESEEN OCCURRENCES DURING MANUFACTURING / OPERATION AND WORK AT BHEL PROJECT SITES / OFFICES:

BHEL shall recover the amount of compensation paid to victim(s) by BHEL towards loss of life / permanent disability due to an accident which is attributable to the negligence of contractor, agency or firm or any of its employees as detailed below.

a) **Victim:** Any person who suffers permanent disability or dies in an accident as defined below.

b) **Accident:** Any death or permanent disability resulting solely and directly from any unintended and unforeseen injurious occurrence caused during the manufacturing / operation and works incidental thereto at BHEL Project Sites / offices and precincts thereof, project execution, erection and commissioning, services, repairs and maintenance, trouble shooting, servicing, overhaul, renovation and retrofitting, trail operation, performance guarantee testing undertaken by company or during any works/during working at BHEL project Sites/offices and premises.

c) Compensation in respect of each of the victims:

(i) In the event of death or permanent disability resulting from Loss of both limbs**:₹10,00,000/-** (Rupees Ten Lakhs)

(ii) In the event of other Permanent disability: **₹7,00,000/-** (Rupees Seven Lakhs)

d) Permanent Displacement: A displacement that is classified as a permanent total disablement under the provision to Section 2(I) of the Employees Compensation Act, 1923".

21. RISK PURCHASE:

In case the contractor fails to execute the work due to any reason, BHEL reserves the right to get the same completed through some other party at the risk & cost of the contractor and any additional expenditure incurred due to the same shall be charged to the contractor. Risk & Cost will be implemented as per STANDARD OPERATINGPROCEDURE FOIMPLEMENTATION OF RISK & COST of BHEL

22. GENERAL:

22.1 **Bidders shall confirm their acceptance to all the terms & conditions of the tender enquiry.**

Deviations to the tender conditions are not acceptable and BHEL-HPVP reserves the right to reject such offers which do not meet Technical / Commercial requirements without any / further correspondence.

Bids not accompanied with requisite EMD, , incomplete / conditional offers, bids not conforming to the terms & conditions specified in the tender documents are liable for rejection.

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22.2 BHEL reserves the right to modify or cancel or short close the tender at any stage at its discretion without assigning any reason thereof.

22.3 The bidders shall study the Tender documents and all other relevant documents in detail for understanding the scope of work involved in various items before submission of offers.

For any clarifications required on this tender document, scope of work etc., the bidders shall depute their authorized representatives to HPVP, Visakhapatnam with prior intimation to get clarifications from concerned authorities.

22.4 AGM **(E&C)** shall be the Engineer-in-charge for herein after referred to as such in the tender.

22.5 **Lowest** offer need not be the rate acceptable to BHEL-HPVP. BHEL-HPVP reserves the right for negotiation with the L1 bidders as per applicable guidelines.

22.6 The following documents (enclosed) shall form part of the contract including this Notice Inviting Tender:

Sl. No.	Description of Documents	Documents/ Drawing/ Standard/ Specifications
1	Scope of Work	Annexure- I
2	General Conditions of Contract (Works / Services)	Annexure- II
3	Special Conditions of the Contract	Annexure- III
4	Acceptance to the Tender terms & Conditions	Annexure – IV
5	Contractor Information	Annexure- V
6	Check List	Annexure-VI
7	Manpower Deployment schedule	Annexure-VII
8	Construction Machineries deployment schedule	Annexure- VIII
9	No Deviation Certificate	Annexure- IX
10	Price Bid (SOQR)	Annexure-X

23. TENDER SUBMISSION:

The tender completed in all respects **shall be submitted** in two parts through online e-procurement portal **https://eprocurebhel.co.in latest by 14.00 Hrs**. **on 07.02.2026:**

Submission of offer by a tenderer implies that all the tender documents were read by the tenderer and the tenderer is aware of the scope and specifications of the work, site condition, local conditions and rates at which stores, tools and plant, free / chargeable materials etc., will be issued to him by BHEL - HPVP and other factors having bearing on the execution of the work.

24. OPENING OF TENDERS:

Bid will be opened on **07.02.2026 at 15.00 Hrs. in online e-procurement portal**.
If bids are not accompanied by requisite EMD or Valid UDYAM (Micro / Small) along with part– i (Techno commercial bid), then Part-ii (Price bid) will not be considered for opening.

25. INTEGRITY PACT:

a) INTEGRITY PACT (IP) is a tool to ensure that activities and transactions between the Company and its Bidders/ Contractors are handled in a fair, transparent and corruption free manner.

A panel of Independent External Monitors (IEMs) have been appointed to oversee implementation of IP in BHEL.

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. Only those Bidders who have entered to such an IP with BHEL would be competent to participate in the bidding. In other words, entering to this Pact would be a preliminary qualification.

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E-MAIL Details of IEM for this tender is furnished below:

Sl.	IEM	E-MAIL
1	Dr. Sarat Kumar Acharya, Ex-CMD, NLC	iem1@bhel.in,
2	Shri R. Mukundan, IRPS (Retd.)	iem2@bhel.in
3	Shri Madan Lal Meena, IAS (Retd.)	iem3@bhel.in

b) Please refer Section-8 of IP for Role and Responsibilities of IEMs. In case of any complaint arising out of the tendering process, the matter may be referred to any of the above IEMs.

26. For this procurement, Public Procurement (Preference to Make in India), Order 2017 dated 15.06.2017 & 28.05.2018 and subsequent orders issued by the respective Nodal Ministry shall be applicable even if issued after issue of this NIT but before finalization of contract / PO/WO against this NIT

In the event of any Nodal Ministry prescribing higher or lower percentage of purchase preference and / or local content in respect of this procurement, same shall be applicable.

27. The Bidder shall declare 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.

Yours Faithfully,
For BHARAT HEAVY ELECTRICALS LIMITED,

(D Gowri Sankar)
Sr Manager (OS)

ANNEXURE- I

Ref: OS/WC/2025-26/149/96 **Date: 28.01.2026**

SCOPE OF WORK

:: 1 ::

1.0 Mechanical works of Erection and pre-commissioning / start-up, commissioning assistance and performance guarantee test, closure activities of Fired Heater Packages and interconnection systems, handing over of the Facilities along with Spares for DCU HEATER at IOCL DIGBOI REFINERY and Revamping of existing Ind-Coker Primary Furnace (07-FF-00-001) against S.O 8118Erection & Installation of various equipment and Bought Out Components, Providing assistance during Pre-commissioning and Commissioning of the DCU HEATER AT IOCL DIGBOI REFINERY and Revamping of existing Ind-Coker Primary Furnace (07-FF-00-001).

DCU Fired Heater consists of Radiant Section, Radiant Arch, Radiant Floor, Radiant Coils, Convection Modules along with End Tube Sheets & Intermediate Tube Sheets and Convection Coils, Header Boxes, Off-take Ducts, Hot Flue Gas Ducts, Cold Flue Gas Ducts, Cold Air Ducts, Hot Air Ducts, Bypass Ducts, Stack, Decoking Drum, BOC components like Burners, Air Preheaters, FD Fans, ID Fan, Dampers, Expansion Bellows, CS / AS / SS / IBR Piping, Steam Tracing, Supporting structures, Stair Towers with Landings, Platforms, Staircase, Ladders, Handrails, Gratings, etc., as per the Drawings, Specifications & Standards, QAP, WPS, Modularization Philosophy etc.

2.0 **Contractor's scope of work includes the following activities but is not limited to the same**:

2.1 Receipt of fully / partly fabricated equipment / structure dispatched from BHEL - HPVP, Visakhapatnam and Bought Out Components received from the vendors including co-ordination with concerned officials and obtaining entry permission at Main Security Gate of M/s IOCL, Digboi.

2.2 Unloading of all the incoming materials at BHEL Stores / Erection Site including arranging suitable cranes, handling facilities and manpower for safe unloading of the materials

- Heavy Structure / equipments / modules may require to be unloaded directly at Project / Erection Site as per the directions of the BHEL Site In-charge.
- Stacking of the unloaded materials properly inside the covered stores or in the open fenced storage area as per the directions of BHEL Site In-charge and providing wooden sleepers as supports, wherever required.
- Shifting of all the items from stores / storage yard to erection site for erection / installation after issue by BHEL Stores and after necessary documentation.
- All activities required for physical verification & certification of the materials by M/s TEN including preparation of documentation like IMIR, etc.
- A log book is to be maintained by the contractor and Weekly reports is to be submitted on the status of materials received and consumed at site
- Development of Covered Storage shed for small materials and open fenced storage yard for all other materials in the area allocated to BHEL by M/s IOCL for Office & Stores

2.3 **Radiant Section:**

- Radiant Section supplied in **Modules**: Radiant Side Walls along with Main columns & stiffeners in modules, Roof and Floor walls in modular form as pre-fabricated DUs (Dispatch Units) as per the modularization philosophy and erection of the same has to be carried out at site to form the Radiant Section.
- Erection, Assembly, fit-up, welding including NDT of pre-fabricated modules / segments of Radiant Wall, Roof and Floor, Tube Support Hangers, Supporting Structure, Stiffeners, SS Retainer plates for refractory / insulation, etc., as per the approved drawings, QAP and Specifications and Modularization philosophy.
- Erection of fabricated Radiant Coils in Banjos, Cross over & Jump over coils (which are received at site in Pre-fabricated condition & as Loose spools), Assembly, Fit Up & Welding, NDT and Hydrotesting, etc. as per the approved drawings, QAP and Specifications.
- Assembly, fit-up, welding and NDT of auxiliary connections, spigots, packing with Gaskets / CF Blankets, etc., as per the drawings.

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SCOPE OF WORK

:: 2 ::

- Erection, Assembly, Fit-up with Radiant Section as per drawings, Welding and NDT of pre-fabricated Tapping Sub-assemblies, Pipe Fittings, Sleeves, Nozzles, Instrument nozzles, etc., which are received in loose condition from BHEL – HPVP, Visakhapatnam.
- Erection, Assembly, Fit up, Welding and NDT of Pre-fabricated Peep Hole Assemblies, Access doors, Explosion Doors, Sight doors, Tube Pulling Doors, etc. as per drawings.
- Making of openings on the Radiant section for the above sub-assemblies as per drawings and modification of the same, if required, to suit at site.
- Necessary coordination with the Refractory Contractor engaged by BHEL for smooth handing over of Radiant section to carry out Refractory lining / Insulation works as per working sequence.

2.4 **Convection Section** :

- Convection Section is supplied in **Two Modules** with Convection casing in Fabricated condition along with ETS, ITS and fabricated Convection Coils in installed condition and with Refractory lining inside the modules.
- Tentative dimensions and tentative weights are as follows :

  Module – I : Total Erection Weight of 30 MT - 2 M (O/S) width, 3.2 M height and 9 M length

  Module - II : Total Erection Weight of 15 MT - 2 M (O/S) width, 2.3 M height and 9 M length
- Convection Modules will be trial assembled and duly inspected at BHEL, Visakhapatnam before dispatch to site. However, if any mis-matches are observed during erection, the same shall be rectified at site by the erection contractor.
- Erection, Assembly, fit up, welding & NDT or bolting & fixing of Convection Modules – I & II including Access doors, Breeching Door, Observation doors, Pressure Relief doors, etc. with Convection Modules as per the drawings, QAP & specifications.
- Assembly, Fit up & welding of in-situ joints of **Convection Cross-over & Jump-over Coils** (including NDT like Radiography, PWHT and Hydrotest as per approved drawings & QAP.
- Erection, Assembly, fit up & welding / bolting & fixing of refractory lined Convection Header Boxes (which are received as loose panels from BHEL-HPVP, Visakhapatnam) with Convection Modules after erection and Hydrotest of Coils.

2.5 **Stack & Ducting** :

- Stack shall be supplied in **Three modules** and tentative dimensions and tentative weights including refractory lining are as follows :

  Module–I : Total Erection Weight of **25 MT** - OD 2.9 M, 11.25 M Length

  Module-II : Total Erection Weight of **12.5 M**T - OD 1.45 M, 14 M Length

  Module-III : Total Erection Weight of **12.5 MT** – OD 1.45 M, 14 M Length

- Erection of Stack in three modules, assembly, fit up & welding of in-situ flange joint of Stack modules I, II & III including NDT as per the drawings & QAP.
- Assembly of observation / access doors, etc., bolting & Fixing / Welding & NDT as per drawings & specifications
- Erection, assembly, fit up & welding of the following Pre-fabricated Ducts as per drawings, QAP & specifications :
  (a) Refractory lined Hot Flue Gas Ducts, Cold Flue Gas Ducts
  (b) Cold Air Ducts, Hot Air Ducts, Bypass Ducts.

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(c) The above Ducts will be trial assembled and duly inspected at BHEL, Visakhapatnam before dispatch to site. However, if any mis-matches are observed during erection, the same shall be rectified at site by the erection contractor.

(d) Small concrete pedastals are required for duct / piping supports as per the drawing are to be made by contractor

2.6 Structure & Platforms :

(a) Erection, assembly, bolting & fixing, welding of Heater & Stack supporting structures, Stair Tower with Landings, Platforms, Staircase, Ladders, Handrails, Gratings, etc., as per the drawings.

(b) Alignment of the columns and Grouting of the base plate along with supply of all consumables like grouting materials from BHEL / IOCL approved vendors and including manpower, tools & tackles, etc.

(c) DPT of the above wherever required as per drawings & QAP

2.7 Bought Out Components :

(a) Replacement/ Rectification of equipment like APH, Fans, Burners, Dampers, Expansion bellows, soot blowers, etc are also to be carried out as scope of work in Revamping of existing Ind-Coker Primary Furnace (07-FF-00-001)

(b) Erection, assembly, bolting & fixing or Welding & NDT of various BOC items like Cast Air Pre-Heater, Steam CAPH, FD Fans, ID Fan, Burners, Dampers, Expansion Bellows, Valves, Skin Thermocouples, Sight Doors, etc., as per the drawings, ,QAP & specifications.

(c) Alignment & Grouting of CAPH, SCAPH, FD Fans, ID Fan, etc., as per drawings & specifications including procurement of Grouting materials from BHEL / TEN approved vendors, manpower, tools & tackles, etc.

(d) FD Fans / ID Fan, making the foundations ready for erection / installation including minor modification & levelling, supplying & fixing of packing plates, Erection of Fans & Motors on foundations, Initial alignment and Grouting including supply of grouting materials from BHEL / IOCL approved vendors, Alignment of motor & shaft, Trial Run, Idle Run & Load Run, Commissioning, etc. complete in all respects under the supervision of Fan Vendor.

2.8 Piping (CS / AS / SS / IBR) :

Site Fabrication of CS / AS / SS / IBR Piping as per the drawings, QAP & Specifications using the raw materials issued at site.

Erection of piping at all heights as per drawings including erection / installation and fixing / welding of Valves. Pipe supports as per drawings / site conditions are to be fabricated at site including procurement of required raw materials from BHEL / TEN approved vendors.

Providing and Laying of RCC foundations for Pipe and duct Supports including procurement of required tor steel, insert plates, etc. as per site requirement is also to be carried out by the erection contractor.

100% PMI shall be carried out for weldments of Alloy steel and Stainless steel materials as per approved QAP & Specifications. All these materials shall be stencilled with PMI OK after satisfactory PMI check as per specifications. PMI machine to be arranged by vendor. PMI and hardness to be checked and recorded for all LAS welds done at site. Vendor to arrange for Hardness machine

For IBR Piping, co-ordination with local IBR authority, obtaining necessary approval of drawings & stage wise and final inspection clearances as per approved QAP is also included in the contractor's scope**.**

. **Steam Tracing is to be carried out complete in all respects as per the drawings, specifications.**

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SCOPE OF WORK

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2.9 Painting :

After completion of erection works in all respects, Touch-up painting including surface cleaning and Finish coat Painting are to be carried out as per the approved Painting Schedule, Specifications & Standards for all the erected equipments, structure, ducts, etc. which are received from BHEL, Visakhapatnam duly painted with Primer & Intermediate Coats. **Procurement of all applicable Paints as per Painting Schedule from BHEL / IOCL approved manufacturers / vendors is also covered in Contractor's scope and** the Manufacturer's Test Certificates for the procured paints shall be submitted to BHEL / TEN before application of paints. Vendor to arrange DFT meter for measuring DFT.

For Piping, Surface Cleaning and Painting of all coats as per the drawings and approved painting schedule.

2.10 NDT :

DPT, MPT, Radiography, UT, PWHT etc., shall be carried out as per approved drawings, QAP, Specifications & standards. The contractor shall have to obtain approval of the NDT agency deployed by them from BHEL / TEN before deployment.

2.11 Assistance for Pre-commissioning, Commissioning of Heater by deploying suitable manpower

2.12 Erection Plan & Scheme is to be submitted to M/s BHEL / TECHNIP for approval before taking up erection of heavy lifts like Radiant modules, Convection Modules, Stack modules, CAPH, SCAPH, FD Fans ID Fan, etc. at site.

2.13 The work is to be executed as per the latest approved Drawings, QAP, WPS, Standards & Specifications etc. issued to the contractor from time to time.

2.14 All indirect materials, consumables like electrodes, gases, grinding wheels etc., required for fabrication are in Contractor's scope. The electrodes / filler wire to be procured shall be of BHEL / TECHNIP approved makes only and the contractor shall submit the Batch Test Certificates to BHEL / TEN for verification before using the same on job.

2.15 **Cranes of suitable capacity including all consumables, higher capacity slings for heavy lifts, tools & tackles and manpower required for handling the jobs during various stages of unloading, loading / shifting and erection shall be provided by the contractor. All the above equipments must be under working condition and relevant documents for the same (like Load Test Certificates, Calibration certificates, etc.,) are to be made available for verification by M/s BHEL / TEN / IOCL.**

It may be noted that suitable **Higher capacity cranes** are required to deployed for the erection of the heater components. No delay in mobilization of crane by the Contractor will be acceptable and in case of any delay, BHEL reserves the right to deploy the required cranes at the risk & cost of the contractor. Hard stand, wherever required for movement of the crane, is to be provided by the contractor.

2.16 Assistance for Refractory Lining works at Site like arranging necessary scaffolding, handling / shifting of Modules / Sections/ Ducts with suitable cranes to specified locations, rotation to facilitate application / repair of refractory, etc. to be carried out by the erection contractor.

2.17 All the Scaffolding materials like Pipes, Clamps, Jallies etc., for temporary platform works required during the complete course of the fabrication are to be arranged by the Vendor. All the Temporary materials & Bed materials required for fabrication are to be arranged by the vendor at their cost.

2.18 Contractors shall have to return the excess / balance materials including off-cuts and total scrap available with them exclusive of process allowance & invisible wastage to BHEL Site Stores after material reconciliation but before submission of their final bill. In case the same are not returned by the contractors, Recovery shall be made as per the BHEL Rates / MSTC rates plus applicable taxes, prevailing at the time of processing of the final bills.

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SCOPE OF WORK

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2.19 Contractor should deploy **qualified** & **experienced Site- In charge, Planning Engineer, Field Execution Engineers & Supervisors** (as per the requirements specified by BHEL / TEN) during the entire period of contract for execution of the project and approval for the same is to be obtained from BHEL / TEN before deployment. Non-deployment will attract penalty as per standard BHEL / TEN / IOCL tender terms.

2.20 Contractor should deploy **qualified** & **experienced QC personnel** for carrying out the inspection activities in coordination with QC inspector of BHEL / TPIA / TEN / IOCL. Non-deployment will attract penalty as per standard BHEL / TEN / IOCL tender terms.

2.21 Contractor should deploy **qualified** & **experienced Safety Engineer and Safety supervisor** (as per the specific requirements of BHEL / TEN / IOCL) during the entire period of contract for execution of the project and approval for the same is to be obtained from BHEL / TEN / IOCL before deployment. Non-deployment will attract penalty as per standard BHEL / TEN / IOCL tender terms. Safety Engineer should take care of all safety precautions of their workmen as per the prevailing norms & practices being followed in Digboi Refinery.

2.22 Contractor should deploy **qualified** & **experienced NDT personnel (Level III** / **Level II)** at site for carrying out the NDT inspection activities in coordination with BHEL QC–NDT / TPIA. Non-deployment will attract penalty as per standard BHEL / TEN / IOCL tender terms.

2.23 **Welding is to be carried out by qualified welders only**. **Qualification of welders shall be carried out by the Contractor at Site in presence of BHEL / TEN / IOCL at contractor's cost along with all Test Coupons & Consumables.**

2.24 Contractor shall engage sufficient man power & resources required to meet BHEL delivery schedules and take necessary action for augmentation of manpower as & when required as per the instructions of BHEL Site In-charge to meet intermediate time lines. In case the contractor fails to take necessary action for meeting the schedules as per the dates mutually discussed & agreed, then BHEL will exercise the right to engage required manpower at the risk & cost of the contractor.

2.25 Any modification work due to revision of the drawings during execution of the job and transit damages are to be carried out by the contractor without any additional cost.

2.26 Adequate facilities like welding equipments, baking ovens, holding ovens, Portable ovens, handling facilities like felt slings, metal slings, D-shackles etc., and measuring instruments duly calibrated must be available with the contractor. All the above equipments must be under working condition and relevant documents for the same (like Load Test Certificates, Calibration certificates, etc.,) are to be made available for verification by M/s BHEL / TEN / IOCL.

2.27 All the measuring instruments used for inspection and testing shall have valid calibration certificates from NABL Laboratory or traceable to national / international standards.

2.28 Contractor shall arrange necessary Gate pass / Permission for the entry of Materials, Cranes, Trailers, Contractor's Manpower and BHEL Staff, etc., inside the premises of M/s IOCL-Digboi.

2.29 The contractor shall obtain necessary Hot work permits / Height work permits including Sundays & Holidays and for Night Shift from M/s TEN / IOCL on day to day basis as per the prevailing practice at IOCL - Digboi Site.

2.30 Sufficient Area lighting at the work place shall be arranged by the contractor at their cost.

2.31 Contractor shall abide by all the rules & statutory regulations in force from time to time as per the Factories Act & customer requirement. It is their responsibility to ensure the safety of their workmen and fulfill the requirements of ESI, PF, Group Insurance and other relevant statutory regulations.

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SCOPE OF WORK

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2.32 Necessary Labour license to be obtained by the contractor on the Contractor's name before start of the work at site.

2.33 Licensed Electrical Engineer / Supervisor to be deployed at the time of Power connection from the main feeder and all necessary statutory formalities prevailing in IOCL, Digboi Site should be strictly adhered to. Licensed Electricians shall be deployed continuously during the entire period of execution of contract.

2.34 Carrying out Performance Guarantee Test including supply of required manpower, tools, tackles & etc. as required.

2.35 Material coding of Mandatory Spares in IOCL portal Handing over of Spares to IOCL: All activities including identifying each spares item then to be marked / painted / tagged / stencilled; creating the material code as per IOCL system; hand over to IOCL at their designated place & get the acknowledgement

2.36 Site **Office**: Providing Air-conditioned Office Space (Suitable Size Container) for BHEL Staff at IOCL, Digboi site, furnished with 6 Sets of Table & Chairs, 4 Guest Chairs, 3 Set of Personal Computers along with 1 Printer Cum Scanner Cum Xerox M/c., File Cabinets, etc. including maintenance of Air Conditioners for the entire period of the contract or till completion of the project, whichever is later.

2.37 **Office Assistance**: An Office boy shall be deployed by the contractor exclusively to take care of BHEL office during the entire period of the contract or till completion of the project, whichever is later.

2.38 Though not mentioned specifically, any activity which is required for completion of the work is deemed to be included in the scope of work of contractor.

2.39 Bidder to confirm the deployment schedule of Manpower as per Annexure-VII and Construction machinery as per Annexure-VIII.

2.40 **Housekeeping of working and surrounding area in scope of vendor**

3.0 BHEL SCOPE:

The following shall be provided by BHEL at Digboi Site as free issue :

3.1 Supply of Drawings, GMS, QAP, NDE Procedures, WPS, Painting Schedule, etc.

3.2 Fabricated Structures, Fabricated Radiant Segments in modules, Refractory lined equipments & ducts, Bought Out Components, etc., as detailed above.

3.3 Area required for office and stores will be provided by BHEL / TEN / IOCL on chargeable basis. All other arrangements for site enabling including Jungle Clearance, Ground Levelling, etc., Security for safe custody of free issue materials shall be taken care by the contractor.

3.4 Water shall be provided on chargeable basis at one point allocated by IOCL but further distribution to the work location is to be carried out by the contractor. DM water, if required for Hydrotesting of Coils shall be arranged by the contractor.

3.5 Power will be provided on chargeable basis at one point allocated by M/s TEN / IOCL. Power Distribution Board with suitable capacity Switch Fuse unit as incomer, all outgoings with necessary safe trips like MCB, ELCB etc., as per the industrial safety norms and their installation, all outgoing cables from Distribution Board, termination at the distribution board, cabling for the distribution of Power & Working Area Lighting shall be arranged by the contractor.

In case of power failure, the contractor shall have to make their own alternate arrangement for smooth functioning of the work without any extra cost to BHEL.

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SCOPE OF WORK

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4.0 INSPECTION :

4.1 Inspection shall be carried out by M/s. BHEL–HPVP / BHEL Authorized Inspection Agency / TEN / IOCL as per approved QAP. Contractor shall have to offer for Stage wise and Final inspection as per approved QAP and obtain necessary stage wise & final clearances before proceeding for further operations.

4.2 Erection Contractor shall be solely responsible for preparation and submission of all Inspection Reports & documents duly certified by the Inspection Authority for all the erected items.

4.3 All the documentation related to inspection clearance of M/s BHEL / TPIA / TEN / IOCL, Generation of Inspection Reports, Preparation of Final Documents as per BHEL / TEN standard formats, etc., are to be carried out by the contractor and scanned copy as well as hard copy of the same are to be submitted to BHEL-QA.

Note :

QAP enclosed with the tender document is tentative only and may be subject to revision due to incorporation of comments of the approving authority. Hence, the approved QAP issued to the contractor after ordering shall only be followed for execution and inspection of the job during execution.

SIGNATURE OF THE TENDERER WITH SEAL

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CHAPTER -1

1. GENERAL INSTRUCTION TO TENDERERS

1.1. DESPATCH INSTRUCTION

i) The General Conditions of Contract form part of the Tender specifications. **For this tender, bidders shall use electronic Signature viz Digital Signature Certificate while uploading the tender documents on the e-procurement portal.** The information furnished shall be complete by itself. The tenderer is required to furnish all the details and other documents as required in the following pages.

ii) Tenderers are advised to study all the tender documents carefully. Any submission of tender by the tenderer shall be deemed to have been done after careful study and examination of the tender documents and with the full understanding of the implications thereof. Should the tenderers have any doubt about the meaning of any portion of the Tender Specification or find discrepancies or omissions in the drawings or the tender documents issued are incomplete or shall require clarification on any of the technical aspect, the scope of work etc., he shall at once, contact the authority inviting the tender well in time (so as not to affect last date of submission) for clarification before the submission of the tender. Tenderer's request for clarifications shall be with reference to Sections and Clause numbers given in the tender documents. The specifications and terms and conditions shall be deemed to have been accepted by the tenderer in his offer. Non-compliance with any of the requirements and instructions of the tender enquiry may result in the rejection of the tender.

iii) Integrity pact (IP) shall be applicable for all tenders / contracts if indicated in NIT. This IP shall be issued as part of the Tender documents and shall be submitted by the bidder along with Techno-commercial bid duly filled, signed and stamped by the authorized signatory who signs the bid. . Entering into this pact shall be a preliminary qualification.

1.2. SUBMISSION OF TENDERS

1.2.1. The tenderers must submit their tenders to Officer inviting tender as per instructions in the NIT.

1.2.2. Tenders shall be submitted through E-Procurement portal as per instruction in NIT. Tenderers to upload offers well in advance in order to avoid last minute congestion in e-procurement website. However, after submission of the tender, the tenderer can re-submit revised tender but before due date and time of submission of tender as notified.

1.2.3. Tenders shall be opened by Officer of BHEL at the time and date as specified in the NIT. For this tender, bidders may attend through online mode, if provisions are available in e-procurement portal.

1.2.4. Tenderers whose bids are found techno commercially qualified shall be notified through e-procurement system about the date and time of opening of the Price Bids. BHEL's decision in this regard shall be final and binding.

1.2.5. The information given in the tender documents is for general guidance and shall not be construed as contractually binding on BHEL/ Owner. All relevant site data/ information as may be necessary for bidding shall have to be obtained/ collected by the Tenderer.

1.2.6. The Tenderers are advised to physically visit the site to acquaint and satisfy themselves about the weather conditions, working culture in the area, socio-political environment, safety & security aspects, law & order situation, law of the land, transportation routes, various distances, surroundings of plant/ project premises together with all statutory, obligatory, mandatory requirements of various authorities and obtain for themselves all necessary information as to the risks, contingencies and all other circumstances, which may influence or affect the discharge of various obligations under the Contract during contract period including extended period (if any).

1.2.7. The submission of bid will tantamount to due diligence having been done and it shall be deemed that:

a) the Tenderer has obtained all necessary information as to risks, contingencies and other circumstances which may influence or affect the Works

b) the Tenderer accepts total responsibility for having foreseen all difficulties and costs of successfully completing the Works

c) the Tenderer accepts that, the Contract Price shall not be adjusted to take account of any unforeseeable or unforeseen difficulties or costs and the Tenderer shall not raise any claims/ disputes against BHEL and/ or Owner at later date in any manner whatsoever.

1.2.8. The Tenderer shall mandatorily be required to submit "Site Visit Confirmation Declaration" along with the Technical Bid.

1.3. LANGUAGE

1.3.1 The tenderer shall quote the rates in English language and international numerals. These rates shall be entered in figures as well as in words. Tenderers are requested to refer the clauses of NIT/ Vol-II "Price Bid" for more details. For the purpose of the tenders, the metric system of units shall be used.

1.3.2 All entries in the tender shall either be typed or written legibly in ink. Erasing and over-writing is not permitted and may render such tenders liable for rejection. All cancellations and insertions shall be duly attested by the tenderer.

1.4 PRICE DISCREPANCY:

1.4.1 **Price Bid opening**: During opening of price bids, if there is any difference between the amount in figures and in words, the amount quoted by the bidder in words shall be taken as correct.

1.4.2 **Reverse Auction**: In case of Reverse Auction, the successful bidder shall undertake to execute the work as per overall price offered by him during the Reverse Auction process. (Guidelines as available on www.bhel.com on "**supplier registration page**".).

1.5 QUALIFICATION OF TENDERERS

i) Only tenderers who have previous experience in the work of the nature and description detailed in the Notice Inviting Tender and/or tender specification are expected to quote for this work duly detailing their experience along with offer.

ii) Offers from tenderers who do not have proven and established experience in the field shall not be considered.

iii) The offers of the bidders who are on the debarred list shall be rejected. Further, offer of the bidders, who engage the services of the debarred firms or associated with the debarred firm, for present bid, shall also be rejected. The list of debarred firms is available on BHEL web site www.bhel.com. (Refer clause 28.0 of NIT).

iv) Offers from tenderers who do not comply with the latest guidelines of Ministry/Commissions of Govt. of India shall not be considered.

1.6. EVALUATION OF BIDS

i) Technical Bids submitted by the tenderer will be opened first and evaluated for fulfilling the Pre-Qualification criteria and other conditions in NIT/Tender documents, based on documentary evidences submitted along with the offer.

ii) In case the same qualifying experience is claimed by more than one agency, then:

a. The agency who has executed the work as per documentary evidence submitted shall only be qualified. Scope of qualifying work should be totally with the agency who has executed and in case it is only labour and consumables without T&P, then the credentials of execution is assigned to the first agency and not to the agency who has executed only as labour supply contractor. Further, BHEL reserves the right to ask for any other proof for the said job.

b. However, if the same is on account of subletting, part of scope by one agency to another agency in a project of BHEL, experience of both the agencies may be considered for the sublet portion of the work provided subletting has been done with the approval of BHEL.

iii) In case the qualifying experience is claimed by bidder is based on 'Work Order' and 'Experience Certificates' from any organization other than BHEL (main agency), then it shall be the responsibility of the bidder to submit (in addition to the experience certificate from main agency) relevant certificate regarding qualifying experience from the end Customer or the Turnkey-Contractor (if any) who has awarded the work to main agency, as a proof for having executed subject qualifying work. BHEL reserves the right to ask for any other proof for the said job.

iv) Assessing Bidder's Capacity for executing the current tender shall be as per Notice Inviting Tender.

v) Price Bids of shortlisted bidders shall only be opened through the electronic price bid opening with/without Reverse Auction, at the discretion of BHEL. Unless specified otherwise in the tender, the L1 bidder amongst all the shortlisted bidders shall be considered for award. However, the L1 bidder shall have no claim on the award & BHEL reserves the right to award the tender at its sole discretion.

vi) Price Bids of unqualified bidders shall not be opened. Reasons for rejection shall be intimated in due course either through system generated e-mail or through letter/e-mail after award to successful bidder.

vii) Bidders are advised to also refer to clause no 2.9.4 regarding evaluation of their performance in ongoing projects.

1.7. <u>DATA TO BE ENCLOSED</u>

Full information shall be given by the tenderer in respect of the following. Non submission of this information may lead to rejection of the offer.

i) INCOME TAX PERMANENT ACCOUNT NUMBER

Certified copies of Permanent Account Numbers as allotted by Income Tax Department for the Company/Firm/Individual Partners etc. shall be furnished along with tender.

ii) ORGANIZATION CHART

The organization chart of the tenderer's organization, including the names, addresses and contact information of the Directors/Partners shall be furnished along with the offer.

iii) An attested copy of the Power of Attorney, in case the tender is signed by an individual other than the sole proprietor.

iv) IN CASE OF INDIVIDUAL TENDERER:

His / her full name, address, PAN and place & nature of business.

v) IN CASE OF PARTNERSHIP FIRM:

The names of all the partners and their addresses, copy of the partnership deed/instrument of partnership dully certified by the Notary Public shall be enclosed.

vi) IN CASE OF COMPANIES:

a) Date and place of registration including date of commencement certificate in case of Public Companies (certified copies of Memorandum and articles of Association are also to be furnished).

b) Nature of business carried on by the Company and the provisions of the Memorandum relating thereof.

1.8 AUTHORIZATION AND ATTESTATION

Tenders shall be signed by a person duly authorized/empowered to do so, for which a Power of Attorney is to be submitted along with the tender offer. For company, a Power of Attorney (as per format in Volume-I D) shall be submitted.

1.9 EARNEST MONEY DEPOSIT

1.9.1 Every tender must be accompanied by the prescribed amount of Earnest Money Deposit (EMD) in the manner described herein.

i) EMD shall be furnished before tender opening / along with the offer in full as per the amount indicated in the NIT.

ii) **The EMD up to an amount of Rs. 2 Lakh** is to be paid only in the following forms:

a) Cash deposit as permissible under the extant Income Tax Act (before tender opening).

b) Electronic Fund Transfer credited in BHEL account (before tender opening).

c) Banker's cheque / Pay order / Demand draft, in favour of 'Bharat Heavy Electricals Limited' and payable at Regional HQ issuing the tender (along with offer).

d) Fixed Deposit Receipt (FDR) issued by Scheduled Banks/ Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL) duly marking lien in favour for BHEL (along with offer). The Fixed Deposit in such cases shall be valid for at least six months from the due date of tender submission.

e) Insurance Surety Bonds

f) **In case EMD amount is more than Rs. Two Lakhs**, Tenderer has the option to submit the amount in excess of Rs. Two lakhs in the forms described above in clause no. 1.9.1. ii) (a) to (e) or in the form of Bank Guarantee from Scheduled Bank (along with the Offer). The Bank Guarantee in such cases shall be valid for at least six months from the due date of tender submission. The Bank Guarantee format for EMD shall be in the prescribed formats.

iii) No other form of EMD remittance shall be acceptable to BHEL.

iv) Proof of EMD: Bidder shall upload the scanned copy of EMD along with bid submission through BHEL e-procurement Portal. However, for the purpose of realization, the bidder shall send the demand draft/ banker's cheque/ pay order/ Bank Guarantee/ FDR/ Insurance Surety Bonds, in original, to the designated officer through post/courier or by hand within reasonable time.

1.9.2 EMD by the Tenderer will be forfeited as per NIT conditions, if:

i) After opening the tender and within the offer validity period, the tenderer revokes his tender or makes any modification in his tender which is not acceptable to BHEL.OR

ii) The successful Contractor, on whom the work has been awarded, fails to deposit the required Security deposit or commence the work within the period as per LOI/ LOA/ Contract or refuse to accept the LIO/LOA/Contract.

EMD by the tenderer shall be withheld in case any action on the tenderer is envisaged under the provisions of extant "Guidelines on Suspension of business dealings with suppliers/ contractors" of BHEL and forfeited/ released based on the action as determined under these guidelines.

1.9.3 EMD shall not carry any interest.

1.9.4 EMD given by all unsuccessful tenderers shall be refunded normally within fifteen days of award of work.

1.9.5 Cash portion of EMD of successful tenderer will be retained as part of Security Deposit. EMD submitted in the form of Bank Guarantee/ FDR shall be retained by BHEL until the receipt of the Security Deposit.

1.10 SECURITY DEPOSIT

1.10.1 Upon acceptance of Tender, the successful bidder shall be required to deposit the 5% of the contract value as Security Deposit towards fulfilment of any obligations in terms of the provisions of the contract.

1.10.2 The Security Deposit shall be furnished before start of the work by the contractor.

1.10.3 The required Security Deposit may be accepted in the following forms.

i) Cash (as permissible under the extant Income Tax Act).

ii) Local cheques of Scheduled Banks (subject to realization)/ Pay Order/ Demand Draft/ Electronic Fund Transfer in favour of BHEL.

iii) Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (held in the name of Contractor furnishing the security and duly endorsed/ hypothecated/ pledged, as applicable, in favour of BHEL).

iv) Bank Guarantee from Scheduled Banks/ Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format for Security Deposit shall be in the prescribed formats.

v) Fixed Deposit Receipt issued by Scheduled Banks/ Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL). Specific lien in favour of BHEL on the FDR shall be marked and letter from the Bank having created such lien in the format shall be submitted along with FDR.

vi) Insurance Surety Bonds.

Note:

i. BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith.

ii. In case of delay in submission of Security Deposit, enhanced security deposit which would include interest (Repo rate + 4%) for the delayed period, shall be submitted by the bidder before submission of first bill

1.10.4 The Security Deposit shall not carry any interest.

1.10.5 In case the value of work exceeds the awarded / accepted value, the Security Deposit shall be correspondingly enhanced as given below:

i) The enhanced part of the Security Deposit shall be immediately deposited by the Contractor or adjusted against payments due to the Contractor.

ii) Contract value for the purpose of operating the increased value of Security Deposit due to Quantity Variation, shall be exclusive of Price Variation Clause, Over Run Compensation and Extra works done on man-day rates.

iii) The recoveries made from running bills can be released against submission of equivalent Bank Guarantee in acceptable form, but only once, before completion of work, with the approval of competent authority of BHEL.

1.10.6. The validity of Bank Guarantees towards Security Deposit shall be valid till actual completion of work + Guarantee Period + 3 months,.

1.10.7 BHEL reserves the right of forfeiture of Security Deposit in addition to other claims, damages and remedies in the event of the Contractor's failure to fulfill any of the contractual obligations or in the event of termination of contract as per terms and conditions of contract. BHEL reserves the right to set off the Security Deposit against any claims of other contracts with BHEL by giving prior notice to the contractor.

1.11 RETURN OF SECURITY DEPOSIT

Security Deposit shall be released to the contractor upon fulfilment of contractual obligations as per terms of the contract including completion of Guarantee Period after deducting all expenses / other amounts due to BHEL under the contract.

1.12 BANK GUARANTEES

Where ever Bank Guarantees are to be furnished/submitted by the contractor, the following shall be complied with

i) Bank Guarantees shall be from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. Bank Guarantees issued by Co-Operative Banks/ Financial Institutions shall not be accepted.

ii) The Bank Guarantees shall be as per prescribed formats.

iii) It is the responsibility of the bidder to get the Bank Guarantees revalidated/extended for the required period as per the advice of BHEL Site Engineer / Construction Manager. BHEL shall not be liable for issue of any reminders regarding expiry of the Bank Guarantees.

iv) In case extension/further extensions of any Bank Guarantees are not required, the bidders shall ensure that the same is explicitly endorsed by the Construction Manager and submitted to the Regional HQ issuing the LOI/LOA.

v) In case the Bank Guarantees are not extended before the expiry date, BHEL reserves the right to invoke the same by informing the concerned Bank in writing, without any advance notice/communication to the concerned bidder.

vi) Bidders to note that any corrections to Bank Guarantees shall be done by the issuing Bank, only through an amendment in an appropriate non judicial stamp paper.

vii) The Original Bank Guarantee shall be submitted to Subcontracting Department of CPC (Central Procurement Cell) - PSHQ of BHEL unless specified otherwise in TCC.

1.13 VALIDITY OF OFFER

The rates in the Tender shall be kept open for acceptance for a minimum period of **SIX MONTHS** from latest due date of offer submission (including extension, if any). In case BHEL (Bharat Heavy Electricals Ltd) calls for negotiations, such negotiations shall not amount to cancellation or withdrawal of the original offer which shall be binding on the tenderers.

1.14 EXECUTION OF CONTRACT AGREEMENT

The successful tenderer's responsibility under this contract commences from the date of issue of the Letter of Award by Bharat Heavy Electricals Limited.

The successful tenderer shall be required to execute an agreement in the prescribed form, with BHEL, within a reasonable time after the acceptance of the Letter of Award, and in any case before releasing the first running bill. The contract agreement shall be signed by a person duly authorized/empowered by the tenderer. The expenses for preparation of agreement document shall be borne by BHEL.

1.15 REJECTION OF TENDER AND OTHER CONDITIONS

1.15.1 The acceptance of tender will rest with BHEL which does not bind itself to accept the lowest tender nor any tender and reserves to itself full rights for the following without assigning any reasons whatsoever: -

a) To reject any or all of the tenders.

b) To split up the work amongst two or more tenderers as per NIT.

c) To award the work in part if specified in NIT.

d) In case of either of the contingencies stated in (b) and (c) above, the time for completion as stipulated in the tender shall be applicable.

1.15.2 Conditional tenders, unsolicited tenders, tenders which are incomplete or not in the form specified or defective or have been materially altered or not in accordance with the tender conditions, specifications etc. are liable to be rejected.

1.15.3 Tenders are liable to be rejected in case of unsatisfactory performance of the tenderer with BHEL or tenderer under suspension (debarred) by any unit / region / division of BHEL or tenderers who do not comply with the latest guidelines of Ministry/Commissions of Govt of India. BHEL reserves the right to not consider a bidder for further processing of tender in case it is observed that they are overloaded and may not be in a position to execute this job as per

the required schedule in line with clause no. 9.0 of the 'NIT'. The decision of BHEL will be final in this regard.

1.15.4 If a tenderer who is a proprietor expires after the submission of his tender or after the acceptance of his tender, BHEL may at their discretion, cancel such tender. If a partner of a firm expires after the submission of tender or after the acceptance of the tender, BHEL may then cancel such tender at their discretion, unless the firm retains its character. In case BHEL resolves to cancel the tender under this clause, BHEL will issue a notice in tis regard containing reasons as to the cancellation of tender. The contractor shall be required to furnish his response to such notice within a period of 14 days from the date of receipt of such notice through any means (BHEL reserves the right to decrease the period up to 05 days). BHEL after due consideration of the representation made by contractor shall communicate its final decision within a reasonable period.

In case contractor fails to submit any response to the notice issued by BHEL within the period stipulated in the notice, BHEL at its discretion may proceed to cancel the contract.

Contractor shall not be eligible for any compensation whatsoever for the cancellation of contract under this clause

1.15.5 BHEL will not be bound by any Power of Attorney granted by changes in the composition of the firm made subsequent to the execution of the contract. BHEL may, however, recognize such power of Attorney and changes after obtaining proper legal advice, the cost of which will be chargeable to the contractor concerned.

1.15.6 If the tenderer deliberately gives wrong information in his tender, BHEL reserves the right to reject such tender at any stage or to cancel the contract if awarded and forfeit the Earnest Money/Security Deposit/any other money due.

1.15.7 Canvassing in any form in connection with the tenders submitted by the Tenderer shall make his offer liable to rejection.

1.15.8 In case the Proprietor, Partner or Director of the Company/Firm submitting the Tender, has any relative or relation employed in BHEL, the authority inviting the Tender shall be informed of the fact as per specified format, along with the Offer.

1.16 INTIMATION OF CHANGE OF NAME/ RECONSTRUCTION OF THE ORGANIZATION:

In the event of the organization (Proprietorship/Partnership/Company) undergoing any change of name or reconstitution, prior intimation of the same shall be given to BHEL. Upon such changes coming into effect, the same is to be intimated to BHEL immediately with supporting documents as applicable.

CHAPTER-2

2.1 **DEFINITION:**

The following terms shall have the meaning hereby assigned to them except where the context otherwise requires.

i) BHEL shall mean Bharat Heavy Electricals Limited, a company registered under Indian Companies Act 1956, having its Registered Office at BHEL HOUSE, SIRI FORT, NEW DELHI – 110 049, and its office at HPVP, Visakhapatnam-530012 (inviting tenders) or its Authorized Officers.

ii) "**EXECUTIVE DIRECTOR**" or "**GENERAL MANAGER** (In- charge)" or "**GENERAL MANAGER**" shall mean the Officer in Administrative charge of the respective UNIT/Power Sector Region.

iii)"**COMPETENT AUTHORITY**" shall mean BHEL Officers who are empowered to act on behalf of BHEL

iv) "**ENGINEER**" or "**ENGINEER IN CHARGE**" shall mean an Officer of BHEL as may be duly appointed and authorized by BHEL to act as "Engineer" on his behalf for the purpose of the Contract, to perform the duty set forth in this General Conditions of Contract and other Contract documents. The term also includes **'CONSTRUCTION MANAGER'** or '**SITE IN CHARGE'** as well as Officers at Site or at the Headquarters of the respective Power Sector Regions. For the purpose of joint measurement, verification, certification and/ or approval of the work and/ or documents under the contract the word "Engineer" or "Engineer In charge" shall be deemed to include the Engineers of the Customer and/ or his Consultant also.

v) "**SITE**" shall mean the places or place at which the plants/ equipment are to be erected and services are to be performed as per the specification of this Tender.

vi) "**CLIENT OF BHEL**" or "**CUSTOMER**" shall mean the project authorities with whom BHEL has entered into a contract for supply of equipment or provision of services.

vii) "**CONTRACTOR**" shall mean the successful Bidder/Tenderer who is awarded the Contract and shall include the Contractor's successors, heirs, executors, administrators and permitted assigns.

viii) "**CONTRACT**" or "**CONTRACT DOCUMENT**" shall mean and includes the Agreement or Work Order, the accepted appendices of Rates, Schedules, Quantities if any, Offer submitted by contractor including acceptance to General Conditions of Contract, Special.

Conditions of Contract, Instructions to the Tenderers, Drawings, Technical Specifications, the Special Specifications if any, the Tender documents, subsequent amendments /corrigendum to Tender mutually agreed upon and the Letter of Intent/ Award/ Acceptance issued by BHEL. Any conditions or terms stipulated by the contractor in the tender documents or subsequent letters shall not form part of the contract unless, specifically accepted in writing by BHEL in the Letter of Intent/Award and incorporated in the agreement or amendment thereof.

ix) "**GENERAL CONDITIONS OF CONTRACT**" shall mean the '**Instructions to Tenderers'** and '**General Conditions of Contract**' pertaining to the work for which above tenders have been called for.

x) "**TENDER SPECIFICATION**" or "**TENDER**" or "**TENDER DOCUMENTS**" shall mean General Conditions, Common Conditions, Special Conditions, Price Bid, Rate Schedule, Technical Specifications, Appendices, Annexures, Corrigendum, Amendments, Forms, Procedures, Site information etc. and drawings/documents pertaining to the work for which the tenderers are required to submit their offers. Individual specification number will be assigned to each Tender Specification.

xi) "**LETTER OF INTENT/ AWARD**" shall mean the intimation by a Letter/Fax/email to the tenderer that the tender has been accepted in accordance with provisions contained in the letter. The responsibility of the contractor commences from the date of issue of this letter and all terms and conditions of the contract are applicable from this date.

xii) "**COMPLETION TIME**" shall mean the period by 'date/month' specified in the 'Letter of Intent/Award' or date mutually agreed upon for handing over of the intended scope of work, the erected

equipment/plant which are found acceptable by the Engineer, being of required standard and conforming to the specifications of the Contract.

xiii) "**PLANT**" shall mean and connote the entire assembly of the plant and equipment covered by the contract.

xiv) "**EQUIPMENT**" shall mean equipment, machineries, materials, structural, electricals and other components of the plant covered by the contract.

xv) "**TESTS**" shall mean and include such test or tests to be carried out on the part of the contractor as are prescribed in the contract or considered necessary by BHEL in order to ascertain the quality, workmanship, performance and efficiency of the contractor or part thereof.

xvi) "**APPROVED**", "**DIRECTED**" or "**INSTRUCTED**" shall mean approved, directed or instructed by BHEL.

xvii) "**WORK or CONTRACT WORK**" shall mean and include supply of all categories of labour, specified consumables, tools and tackles and Plants required for complete and satisfactory site transportation, handling, stacking, storing, erecting, testing and commissioning of the equipment to the entire satisfaction of BHEL.

xviii) "**SINGULAR AND PLURALS ETC**" words carrying singular number shall also include plural and vice versa, where the context so requires. Words imparting the masculine Gender shall be taken to include the feminine Gender and words imparting persons shall include any Company or Associations or Body of Individuals, whether incorporated or not.

xix) "**HEADING"** – The heading in these General Conditions are solely for the purpose of facilitating reference and shall not be deemed to be part thereof or be taken as instructions thereof or of the contract.

xx) "**MONTH**" shall mean calendar month unless otherwise specified in the Tender.

xxi) '**Day**' or '**Days**' unless herein otherwise expressly defined shall mean calendar day or days of twenty-four (24) hours each. A Week shall mean continuous period of seven (7) days.

xxii) "**COMMISSIONING**" shall mean the synchronization testing and achieving functional operation of the Equipment with associated system after all initial adjustments, trials, cleaning, re-assembly required at site if any, have been completed and Equipment with associated system is ready for taking into service.

xxiii) "**WRITING**" shall include any manuscript type written or hand written or printed statement or electronically transmitted messages, under the signature or seal or transmittal of BHEL.

xxiv) "**TEMPORARY WORK**" shall mean all temporary works for every kind required in or for the execution, completion, maintenance of the work.

xxv) '**CONTRACT PRICE**' or '**CONTRACT VALUE**' shall mean the sum mentioned in the LOI/ LOA/ Contract Agreement subject to such additions thereto or deductions there from as may be made under provisions hereinafter contained.

xxvi) '**EXECUTED CONTRACT VALUE'** shall mean actual value of works executed by the contractor and certified by BHEL. This value shall not include PVC, ORC, Extra Works and Taxes.

xxvii) "**COMMENCEMENT DATE**" or "**START DATE**" shall mean the commencement/start of work at Site as per terms defined in the Tender.

xxviii) "**SHORT CLOSING**" or "**FORE CLOSING**" of Contract shall mean the premature closing of Contract, for reasons not attributable to the contractor and mutually agreed between BHEL and the contractor.

xxix) "**TERMINATION**" of Contract shall mean the pre-mature closing of contract due to reasons as mentioned in the contract.

xxx) "**DE MOBILIZATION**" shall mean the temporary winding up of Site establishment by Contractor leading to suspension of works temporarily for reasons not attributable to the contractor.

xxxi) "**RE MOBILIZATION**" shall mean the resumption of work with all resources required for the work after demobilization.

xxxii) "**OVERRUN CHARGES (ORC)**" shall mean and include all the costs incurred by the Contractor during the extended period of the contract, including but not limited to any cost arising out of idle labour, administrative cost, T & P and machinery.

2.2 LAW GOVERNING THE CONTRACT AND COURT JURISDICTION

The contract shall be governed by the Laws of India. Subject to clause 2.21.1.1 of this contract, the Civil Court having original Civil Jurisdiction at .....(e.g. **Delhi for PSNR/ Kolkata for PSER/ Nagpur for PSWR/ Chennai for PSSR**, shall alone have exclusive jurisdiction in regard to all matters in respect of the Contract.

2.3 ISSUE OF NOTICE

2.3.1 Service of notice to the Contractor

Any notice to be given to the Contractor under the terms of the contract shall be served by sending the same by **Email/ Registered Post/Speed Post to or leaving the same at** the Contractor's last known address of the principal place of business (or in the event of the contractor being a company, to or at its Registered Office). In case of change of address, the notice shall be served at changed address as notified in writing by the Contractor to BHEL. Such dispatch or display ~~posting or leaving~~ of the notice as the case may be shall be deemed to be good service of such notice and the time mentioned to the condition for doing any act after notice shall be reckoned from the date so mentioned in such notice.

2.3.2 Service of notice to ~~on~~ BHEL

Any notice to be given to BHEL In-charge of the Region under the terms of the Contract shall be served by sending the same by Registered/AD or Speed post to BHEL address or changed address as notified in writing by BHEL to the Contractor.

2.4 USE OF LAND

No land belonging to BHEL or their Customer under temporary possession of BHEL shall be occupied by the contractor without written permission of BHEL.

2.5 COMMENCEMENT OF WORK

2.5.1 The contractor shall commence the work as per the time indicated in the Letter of Intent/Award from BHEL and shall proceed with the same with due expedition without delay.

2.5.2 If the contractor fails to start the work within stipulated time as per LOI/ LOA or as intimated by BHEL, then BHEL at its sole discretion shall have the right to cancel the contract. The Earnest Money and/or Security Deposit furnished by the contractor to under this tender will stand forfeited without any further reference to him and without prejudice to BHEL's other rights and remedies under this contract and the applicable laws in this regard.

2.5.3 All the work shall be carried out under the direction and to the satisfaction of BHEL.

2.6 MEASUREMENT OF WORK AND MODE OF PAYMENT:

2.6.1 All payments due to the contractors shall be made by e mode only, unless otherwise found operationally difficult for reasons to be recorded in writing and approved by contract executing department.

2.6.2 For progress running bill payments: - The Contractor shall present detailed measurement sheets in triplicate, duly indicating all relevant details based on technical documents and connected drawings for work done during the month/period under various categories in line with terms of payment as per contract. The basis of arriving at the quantities, weights shall be relevant documents and drawings released by BHEL. These measurement sheets shall be prepared jointly with BHEL Engineers and signed by both the parties.

2.6.3 These measurement sheets will be checked by BHEL Engineer and quantities and percentage eligible for payment under various groups shall be decided by BHEL Engineer. The abstract of

quantities and percentage so arrived at based on the terms of payment shall be entered in Measurement Book and signed by both the parties.

2.6.4 Based on the above quantities, contractor shall prepare the bills, along with statutory documents, in prescribed format and work out the financial value. These will be entered in Measurement Book and signed by both the parties. Payment shall be made by BHEL after effecting the recoveries due from the contractor.

2.6.5 All recoveries due from the contractor for the month/period shall be effected in full from the corresponding running bills unless specific approval from the competent authorities is obtained to the contrary.

2.6.6 Measurement shall be restricted to that portion of work for which it is required to ascertain the financial liability of BHEL under this contract.

2.6.7 The measurement shall be taken jointly by persons authorized on the part of BHEL and by the Contractor.

2.6.8 The Contractor shall bear the expenditure involved if any, in making the measurements and testing of materials to be used/ used in the work. The contractor shall, without extra charges, provide all the assistance with appliances and other things necessary for measurement.

2.6.9 If at any time due to any reason whatsoever, it becomes necessary to re-measure the work done in full or in part, the expenses towards such re measurements shall be borne by the contractor unless such re measurements are warranted solely for reasons not attributable to contractor.

2.6.10 Passing of bills covered by such measurements does not amount to acceptance of the completion of the work measured. Any left out work has to be completed, if pointed out at a later date by BHEL.

Final measurement bill shall be prepared in the final bill format prescribed for the purpose based on the certificate issued by BHEL Engineer that entire works as stipulated in tender specification has been completed in all respects to the entire satisfaction of BHEL. The Contractor shall submit the final bill in line with WAM 7 format as per tender documents with an additional recording of the dispute, if any and shall sign with the following declaration:

I/ We hereby certify that I/We have performed the work as per the terms and conditions of Contract Agreement/Work Order No……..dated……for which payment is claimed as above and that I/We have no further claim under this agreement/work order except for the following (nature of claim with details & amount claimed, if any. NIL may be mentioned if there are no further claims). –*

a)…….

b)……

c) ……..

It is agreed that the authorized signatory of Contractor shall necessarily record his claims/ dispute in Form WAM 7 only and any claim(s)/ dispute in any other form/ letter shall not be taken cognizance of by BHEL and admissible before any forum. BHEL shall make the payment of undisputed amount within the stipulated time without any unreasonable delay.

All the tools and tackles loaned to him should be returned in satisfactory condition to BHEL. The abstract of final quantities and financial values shall also be entered in the Measurement Books and signed by both parties to the contract. The Final Bill shall be prepared and paid within a reasonable time after completion of work.

2.7 RIGHTS OF BHEL

BHEL reserves the following rights in respect of this contract during the original contract period or its extensions if any, as per the provisions of the contract, without entitling the contractor for any compensation.

2.7.1 To withdraw any portion of work and/or to restrict/alter quantum of work as indicated in the contract during the progress of work and get it done through other agencies to fulfil BHEL's commitment to its customer or the date of completion is advance due to other emergent reasons/ BHEL's obligation to its customer.

Where the contractor fails to deploy adequate manpower to meet the contractual target, BHEL reserves the right to deploy manpower to meet such shortfall, through any other agency for expediting activities in the interest of the project. Supplied manpower shall be put on job by the contractor. Fulfilling of all obligations towards payments and other statutory compliances related to such manpower shall be the contractor's responsibility. In case of contractor's failure to fulfil his obligations in respect of such manpower, BHEL shall be entitled to take action as provided herein.

2.7.2 BREACH OF CONTRACT, REMEDIES AND TERMINATION:

2.7.2.1 The following shall amount to breach of contract:

I. Non-supply of material/ non-completion of work by the Supplier/Vendor within scheduled delivery/ completion period as per contract or as extended from time to time.

II. The Supplier/Vendor fails to perform as per the activity schedule and there are sufficient reasons even before expiry of the delivery/ completion period to justify that supplies shall be inordinately delayed beyond contractual delivery/ completion period.

III. The Supplier/Vendor delivers equipment/ material not of the contracted quality.

IV. The Supplier/Vendor fails to replace the defective equipment/ material/ component as per guarantee clause.

V. Withdrawal from or abandonment of the work by the Supplier/Vendor before completion as per contract.

VI. Assignment, transfer, subletting of Contract by the Supplier/Vendor without BHEL's written permission resulting in termination of Contract or part thereof by BHEL.

VII. Non-compliance to any contractual condition or any other default attributable to Supplier/Vendor.

VIII. Any other reason(s) attributable to Vendor towards failure of performance of contract. In case of breach of contract, BHEL shall have the right to terminate the Purchase Order/ Contract either in whole or in part thereof without any compensation to the Supplier/Vendor.

Any of the declarations furnished by the contractor at the time of bidding and/ or entering into the contract for supply are found untruthful and such declarations were of a nature that could have resulted in non-award of contract to the contractor or could expose BHEL and/ or Owner to adverse consequences, financial or otherwise.

IX. Supplier/Vendor is convicted of any offence involving corrupt business practices, antinational activities or any such offence that compromises the business ethics of BHEL, in violation of the Integrity Pact entered into with BHEL has the potential to harm the overall business of BHEL/ Owner.

Note-Once BHEL considers that a breach of contract has occurred on the part of Supplier/Vendor, BHEL shall notify the Supplier/Vendor by way of notice in this regard. Contractor shall be given an opportunity to rectify the reasons causing the breach of contract within a period of 14 days.

In case the contractor fails to remedy the breach, as mentioned in the notice, to the satisfaction of BHEL, BHEL shall have the right to take recourse to any of the remedial actions available to it under the relevant provisions of contract.

LD against delay in executed work in case of Termination of Contract:

LD against delay in executed work shall be calculated in line with LD clause no. 2.7.9 of GCC, for the delay attributable to contractor. For limiting the maximum value of LD, contract value shall be taken as Executed Value of work till termination of contract.

Method for calculation of "LD against delay in executed work in case of termination of contract" is given below.

i) Let the time period from scheduled date of start of work till termination of contract excluding the period of Hold (if any) not attributable to contractor = T1

ii) Let the value of executed work till the time of termination of contract= X

iii) Let the Total Executable Value of work for which inputs/fronts were made available to contractor and were planned for execution till termination of contract = Y

iv) Delay in executed work attributable to contractor i.e. T2=[1-(X/Y)] x T1

v) LD shall be calculated in line with LD clause (clause 2.7.9) of the Contract for the delay attributable to contractor taking "X" as Contract Value and "T2" as period of delay attributable to contractor.

2.7.2.2 REMEDIES IN CASE OF BREACH OF CONTRACT.

i) Wherein the period as stipulated in the notice issued under clause 14.1 has expired and Contractor has failed to remedy the breach, BHEL will have the right to terminate the contract on the ground of "Breach of Contract" without any further notice to contractor.

ii) Upon termination of contract, BHEL shall be entitled to recover an amount equivalent to 10% of the Contract Value for the damages on account of breach of contract committed by the Contractor. This amount shall be recovered by way of encashing the security instruments like performance bank guarantee etc available with BHEL against the said contract. In case the value of the security instruments available is less than 10% of the contract value, the balance amount shall be recovered from other financial remedies (i.e. available bills of the contractor, retention amount, from the money due to the Contractor etc. with BHEL) or the other legal remedies shall be pursued.

iii) wherever the value of security instruments like performance bank guarantee available with BHEL against the said contract is 10% of the contract value or more, such security instruments to the extent of 10% contract value will be encashed. In case no security instruments are available or the value of the security instruments available is less than 10% of the contract value, the 10% of the contract value or the balance amount, as the case may be, will be recovered in all or any of the following manners:

iv) In case the amount recovered under sub clause (a) above is not sufficient to fulfil the amount recoverable then; a demand notice to deposit the balance amount within 30 days shall be issued to Contractor.

v) If Contractor fails to deposit the balance amount within the period as prescribed in demand notice, following action shall be taken for recovery of the balance amount:

a from dues available in the form of Bills payable to defaulted Contractor against the same contract.

b If it is not possible to recover the dues available from the same contract or dues are insufficient to meet the recoverable amount, balance amount shall be recovered from any money(s) payable to Contractor under any contract with other Units of BHEL including recovery from security deposits or any other deposit available in the form of security instruments of any kind against Security deposit or EMD.

c In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against defaulted Contractor.

vi) It is an agreed term of contract that this amount shall be a genuine pre-estimate of damages that BHEL would incur in completion of balance contractual obligation of the contract through any other agency and BHEL will not be required to furnish any other evidence to the Contractor for the purpose of estimation of damages.

vii) In addition to the above, imposition of liquidated damages, debarment, termination, descoping, short-closure, etc., shall be applied as per provisions of the contract.

Note: The defaulting contractor shall not be eligible for participation in any of the future enquiries floated by BHEL to complete the balance work. The defaulting contractor shall mean and include:

(a) In case defaulted contractor is the Sole Proprietorship Firm, any Sole Proprietorship Firm owned by same Sole Proprietor.

(b) In case defaulted contractor is The Partnership Firm, any firm comprising of same partners/ some of the same partners (but not including any new partner); or sole proprietorship firm owned by any partner(s) as a sole proprietor.

In case Contractor fails to deploy the resources as per requirement informed by BHEL in writing to expedite the work, BHEL can deploy own/hired/otherwise arranged resources and recover the expenses incurred from the dues payable to contractor. Recoveries shall be actual expenses incurred plus 5% overheads or as defined in TCC.

2.7.4 To terminate the contract or to restrict the quantum of work and pay for the portion of work executed in case BHEL's contract with their customer are terminated for any reason, whatsoever.

2.7.5 Whenever any Claim or Claims for payment of any sum of money(s) arises under this or any other contract against the contractor, BHEL shall be entitled to withhold and also have a lien to retain such sum of money(s) in whole or in part from any money(s) payable to contractor and/or security deposits furnished or deducted in cash from the bills of contractor, (if any) under this contract. In the event of the securities or the amounts payable to Contractor, being insufficient to cover BHEL claims, then BHEL shall be entitled to withhold and have a lien to the extent of such claims from any sum or sums found payable or which at any time thereafter may become payable to the contractor under this or any other contract with BHEL.

a) Claim or Claims for payment of any sum of money(s) arising from the Contractor under this or any other contract against the contractor, shall mean, the sum of money(s) actually incurred by BHEL in fulfilling the contractual responsibilities of contractor under the contract, to which he has failed to fulfil plus applicable overheads (@ 5%) along with interest as applicable under the Contract on total amount (i.e. money actually incurred plus overheads)

b) It is an agreed term of the contract that, the sum or sums of money so withheld or retained under the lien by BHEL will be kept withheld or retained as such by BHEL till the claims arising out of this or any other contract are finally adjudicated wither through Arbitration or a Court of competent jurisdiction as the case may be in accordance with the terms of contract. Intimation given by the BHEL Engineer regarding withholding of such money(s) shall be considered as sufficient and relevant date for all purposes. No Interest shall be payable on such sum(s) of money which becomes due or as the case may be adjudged to be due from BHEL to Contractor, whether under contract or otherwise.

c) Where the contractor is a partnership firm, BHEL shall be entitled to withhold and also have a lien to retain towards such claims in whole or in part, from any other money(s) payable to any partner, whether in his individual capacity or otherwise.

d) If any money(s) shall, as a result of any claim or application made under the relevant provisions of any Labour Welfare Act and/ or Rules, including but not limited to Contract Labour Regulation & Abolition Act, Minimum Wages Act, Payment of Gratuity Act, BOCW (RE&CS) Act, Provident Fund Act, Employee State Insurance Act, be directed to be paid by the BHEL, such money shall be deemed to be moneys payable to the BHEL by the Contractor.

e) Where the Contractor fails to repay to BHEL such moneys along with applicable overheads (@ 5%) and interest, as aforesaid within seven days of being demanded, BHEL shall be entitled to recover the same from Contractor's bills/ Security Deposit or any other money(s) payable to Contractor under this Contract or any other Contract with BHEL.

2.7.6 While every endeavour will be made by BHEL to this end, yet BHEL cannot guarantee uninterrupted work due to conditions beyond its control. The Contractor will not be normally entitled for any compensation/extra payment on this account unless otherwise specified elsewhere in the contract.

2.7.7 BHEL may permit or direct contractor to demobilize and remobilize at a future date as intimated by BHEL in case of following situations for reasons other than Force majeure conditions and not attributable to contractor:

i) suspension of work(s) at a Project either by BHEL or Customer,
or

ii) where work comes to a complete halt or reaches a stage wherein worthwhile works cannot be executed and there is no possibility of commencement of work for a period of not less than three months

In such cases, charges towards demobilization and remobilization shall be as decided by BHEL after successful remobilization by contractor at site, and decision of BHEL shall be final and binding on the contractor. After remobilization, all conditions as per contract shall become applicable. In case Contractor does not remobilize with adequate resources or does not start the work within the period as intimated, then BHEL reserves the right to terminate the contract and effect remedies under Clause 2.7.2.2. In case of any conflict, BHEL decision in this regard shall be final and binding on the contractor.

2.7.8 In the unforeseen event of inordinate delay in receipt of materials, drawings, fronts etc. due to which inordinate discontinuity of work is anticipated, BHEL on its own or contractor's request at its discretion may consider to short close the contract in any of the following cases:

a) The balance works (including but not limited to Trial Operation, PG Test etc.) are minor vis a vis the scope of work envisaged as per the contract.

b) There has been no significant work in past 6 months OR no significant work is expected in next 6 months (example in Hydro projects or in projects where work has stopped due to reasons beyond the control of BHEL).

c) The balance works cannot be done within a reasonable period of time as they are dependent on unit shut down or on other facilities of customer or any other such reasons not attributable to the contractor.

At the point of requesting for short closure, contractor shall establish that he has completed all works possible of completion and he is not able to proceed with the balance works due to constraints beyond his control. In such a case, the estimated value of the unexecuted portion of work (or estimated value of services to be provided for carrying out milestone/stage payments like Trial Operation/PG Test etc.) as decided by BHEL, shall however be reduced from the final contract value.

Note: The Contractor shall not be eligible for any compensation on account of Quantity Variation arising out of short-closure of contract as per clause no. 2.7.8 (b) above.

2.7.9 LIQUIDATED DAMAGES

Liquidated Damages, wherever referred under this Tender/Agreement, shall mean and refer to the damages, not in the nature of penalty, which the contractor agrees to pay in the event of delay in delivery of stores, installation, commissioning, breach of contract etc. as the case may be.

Liquidated Damages leviable upon the contractor is a sum which is agreed by the parties as a reasonable and genuine pre-estimate of damages which will be suffered by BHEL on account of delay/breach on the part of the contractor.

Liquidated Damages shall be calculated in the manner stipulated hereinafter:
In case the work is not completed within the stipulated time period, BHEL at its discretion may grant provisional time extension to contractor for the sole purpose of completion of balance works keeping its right reserved under the contract and law.

Grant of any provisional time extension shall by no means be considered as waiver of BHEL rights under the contract or law.
After the completion of work, duly certified by Engineer in charge, a comprehensive delay analysis shall be carried out to ascertain the attribution of delays in the provisional time extensions granted to contractor. The delay analysis shall record:

a) Delays solely attributable to contractor
b) Delays attributable to BHEL
c) Delays on account of Force Majeure (as specified elsewhere in the contract)

The total period under the final time extension shall be equal to the period between the scheduled date of completion and the actual date of completion of contract. LD shall be imposed/ levied for the portion of time
extensions solely attributable to contractor and recoverable from the dues payable to the contractor.
For the periods, wherein the delay as per the comprehensive delay analysis carried out is solely attributable to contractor, BHEL shall have the right to impose Liquidated Damage at the rate of 0.5% of the contract value, per week of delay or part thereof subject to a maximum of 10% of the contract value.
Contract Value for this purpose, shall be the final executed value exclusive of ORC, Extra Works executed on Man-day rate basis, Supplementary/ Additional Items and PVC. Before levying LD, the contractor shall be duly intimated the amount and reasons thereof for imposition of LD.

2.8 RESPONSIBILITIES OF THE CONTRACTOR IN RESPECT OF LOCAL LAWS, EMPLOYMENT OF WORKERS ETC.

The following are the responsibilities of the contractor in respect of observance of local laws, employment of personnel, payment of taxes etc. The subcontractor shall fully indemnify BHEL against any claims of whatsoever nature arising due to the failure of the contractor in discharging any of his responsibilities hereunder:

2.8.1 As far as possible, Unskilled Workers shall be engaged from the local areas in which the work is being executed.

2.8.2 The contractor at all times during the continuance of this contract shall, in all his dealings with local labour for the time being employed on or in connection with the work, have due regard to all local festivals and religious and other customs.

2.8.3 The contractor shall comply with all applicable State and Central Laws, Statutory Rules, Regulations, Notifications etc. such as Payment of Wages Act, Minimum Wages Act, Workmen Compensation Act, Employer's Liability Act, Industrial Disputes Act, Employers Provident Fund and Miscellaneous Provisions Act, 1952, Employees State Insurance Scheme, Contract Labour (Regulation and Abolition) Act, 1970, Payment of Bonus & Gratuity Act, Building and Other

Construction Workers (Regulation of Employment and Conditions of Service) Act 1996, The Building and Other Construction Workers' Welfare Cess Act 1996 and other Acts, Rules, and Regulations for labour/workers as applicable and as may be enacted by the State Government and Central Govt. during the tenure of the Contract and having force or jurisdiction at Site. The Contractor shall also comply with provisions of and give all such notices to the local Governing Body, Police and other relevant Authorities as may be required by the Law. The Contractor shall without any fail maintain all the registers/records in proper formats as per all the Acts, Rules and Regulations mentioned in this clause 2.8.3.

2.8.4 The Contractor shall obtain independent License under the Contract Labour (Regulations and Abolition) Act, 1970 for engaging contract labour as required from the concerned Authorities based on the certificate (Form- V or as applicable) issued by the Principal Employer/Customer.

2.8.5 The contractor shall pay and bear all taxes, fees, license charges, Cess, duties, deposits, tolls, royalties, commission or other charges which may be leviable on account of his operations in executing the contract.

2.8.6 While BHEL would pay the inspection fees and Registration fees of Boiler/Electrical Inspectorate, all other arrangements for site visits periodically by the Inspectorate to site, Inspection certificate etc. will have to be made by contractor. However, BHEL will not make any payment to the Inspectorate in connection with contractor's Welders/Electricians qualification tests etc.

2.8.7 Contractor shall be responsible for provision of Health and Sanitary arrangements (more particularly described in Contract Labour Regulation & Abolition Act), Safety precautions etc. as may be required for safe and satisfactory execution of contract.

2.8.8 The contractor shall be responsible for proper accommodation including adequate medical facilities for personnel employed by him.

2.8.9 The contractor shall be responsible for the proper behaviour and observance of all regulations by the staff employed by him.

2.8.10 The contractor shall ensure that no damage is caused to any person/property of other parties working at site/company" premises. If any such damage is caused, it is responsibility of the contractor to make good the losses or compensate for the same.

2.8.11 All the properties/equipment/components of BHEL/their Client/Customer loaned with or without deposit to the contractor in connection with the contract shall remain properties of BHEL/their Client/Customer.

2.8.12 The contractor shall use such properties for the purpose of execution of this contract. All such properties/equipment/components shall be deemed to be in good condition when received by the contractor unless he notifies within 48 hours to the contrary. The contractor shall return them in good condition as and when required by BHEL/their Client. In case of non-return, loss, damage, repairs etc. the cost thereof as may be fixed by BHEL Engineer will be recovered from the contractor.

2.8.13 In case the contractor is required to undertake any work outside the scope of this contract, the rates payable shall be those mutually agreed upon if the item rates are not mentioned in existing contract.

2.8.14 Any delay in completion of works/or non-achievement of periodical targets/or non execution of contract due to the reasons attributable to the contractor, the same may have to be compensated by the contractor either by increasing manpower and resources or by working extra hours and/or by working more than one shift. All these are to be carried out by the contractor at no extra cost.

2.8.15 The contractor shall arrange, coordinate his work in such a manner as to cause no hindrance to other agencies working in the same premises.

2.8.16 All safety rules and codes applied by the Customer /BHEL at site shall be observed by the contractor without exception. The contractor shall be responsible for the safety of the

equipment/material and works to be performed by him and shall maintain all light, fencing guards, slings etc. or other protection necessary for the purpose. Contractor shall also take such additional precautions as may be indicated from time to time by the Engineer with a view to prevent pilferage, accidents, fire hazards. Due precautions shall be taken against fire hazards and atmospheric conditions. Suitable number of Clerical staff, watch and ward, store keepers to take care of equipment/materials and construction tools and tackles shall be posted at site by the contractor till the completion of work under this contract.

The contractor shall arrange for such safety devices as are necessary for such type of work and carry out the requisite site tests of handling equipment, lifting tools, tackles etc. as per prescribed standards and practices.

Contractor has to ensure the implementation of Health, Safety and Environment (HSE) requirements as per directions given by BHEL/Customer. The contractor has to assist in HSE audit by BHEL/Customer and submit compliance Report. The contractor has to generate and submit record/reports as per HSE plan/activities as per instruction of BHEL/Customer.

2.8.17 The contractor shall be directly responsible for payment of wages to his workmen/labours before the expiry of seven days from the last day of wage period and to ensure disbursement of wages in the presence of the representative from BHEL A pay roll sheet giving all the payments given to the workers and duly signed by the contractor's representative should be furnished to BHEL site for the purpose of maintaining the records for compliance,

Contractor shall create awareness amongst their workforce by helping & encouraging in opening bank accounts and to encourage them to adopt digital mode of transactions. While releasing wages/ salary to their workers/ supervisors/ staff, Contractor shall comply with the GOI's guidelines for maximizing such transactions through Non-Cash / digital means.

2.8.18 In case of any class of work for which there is no such specification as laid down in the contract, such work shall be carried out in accordance with the instructions and requirements of the Engineer.

2.8.19 Also, no idle charges will be admissible in the event of any stoppage caused in the work resulting in contractor's labour and Tools & Plants being rendered idle due to any reason at any time.

2.8.20 The contractor shall take all reasonable care to protect the materials and work till such time the plant/equipment has been taken over by BHEL or their Customer whichever is earlier.

2.8.21 The contractor shall not stop the work or abandon the site for whatsoever reason of dispute, excepting force majeure conditions. All such problems/disputes shall be separately discussed and settled without affecting the progress of work. Such stoppage or abandonment shall be treated as breach of contract and dealt with accordingly.

2.8.22 The contractor shall keep the area of work clean and shall remove the debris etc. while executing day-to-day work. Upon completion of work, the contractor shall remove from the vicinity of work, all scrap, packing materials, rubbish, unused and other materials and deposit them in places specified by the Engineer. The contractor will also demolish all the hutments, sheds, offices etc. constructed and used by him and shall clean the debris. In the event of his failure to do so, the same will be arranged to be done by the Engineer and the expenses recovered from the contractor.

2.8.23 The contractor shall execute the work in the most substantial and workman like manner in the stipulated time. Accuracy of work and timely execution shall be the essence of this contract. The contractor shall be responsible to ensure that the quality, assembly and workmanship conform to the dimensions and clearance given in the drawings and/ or as per the instructions of the Engineer.

2.8.24 The Contractor to note that some of BHEL's T&Ps/MMDs may not be insured. The Contractor will take necessary precautions and due care to protect the same while in his custody from any damage/ loss till the same is handed over back to BHEL. In case the damage / loss is caused

due to carelessness/ negligence on the part of the contractor, the Contractor is liable to get them repair/ replaced immediately and in case of his failure to do so within a reasonable time, BHEL shall lto recover the loss from the contractor.

2.8.25 For all works having contract value of Rs. 5,00,000/- or above, BHEL shall recover the amount of compensation paid to victim(s) by BHEL towards loss of life/ permanent disability due to an accident which is attributable to the negligence of contractor, agency or firm or any of its employees as detailed below.

a) Victim: Any person who suffers permanent disablement or dies in an accident as defined below.

b) Accident: Any death or permanent disability resulting solely and directly from any unintended and unforeseen injurious occurrence caused during the manufacturing/ operation and works incidental thereto at BHEL factories/ offices and precincts thereof, project execution, erection and commissioning, services, repairs and maintenance, trouble shooting, serving, overhaul, renovation and retrofitting, trial operation, performance guarantee testing undertaken by the company or during any works/ during working at BHEL Units/ Offices/ townships and premises/ Project Sites.

c) Compensation in respect of each of the victims:

i. In the event of death or permanent disability resulting from Loss of both limbs: ₹10,00,000/- (Rupees Ten Lakh).

ii. In the event of other permanent disability: ₹.7,00,000/- (Rupees Seven Lakh)

d) Permanent Disablement: A disablement that is classified as a permanent total disablement under the proviso to section 2 (I) of the Employee's Compensation Act, 1923.

2.8.26 Contractor shall be fully responsible for the safety of their T&Ps and other material mobilized at site. In any case, BHEL shall not be liable for any damage/loss/misuse of any item(s) belong to the contractor.

2.8.27 Contractor will ensure that the work/job is executed through his/her employees on and under no circumstances, the contractor shall subcontract the job without prior written permission from BHEL.

2.8.28 The liability for any compensation on account of injury sustained by an employee of the contractor will be exclusively that of the contractor.

2.9 EXECUTION PLAN, PROGRESS MONITORING, MONTHLY REVIEW AND PERFORMANCE EVALUATION

2.9.1 A tentative plan/ programme for completion of the contractual scope of work as per the time schedule given in the contract shall be made jointly by BHEL and Contractor, before commencement of work. The above programme shall be supported by month wise deployment of resources viz Manpower, T&P, Consumables, etc. Progress will be reviewed periodically (Daily/Weekly/Monthly) vis-à-vis this jointly agreed programme.

Subsequently, every month, quarterly rolling plan will be made by BHEL based on budgeted targets.

Monthly plan in F-14 format shall be drawn from this Quarterly plan. Monthly plan shall necessarily include activities required for achieving targets/ milestones unless inputs/ fronts are not available. While planning and arriving on asking rate all available inputs shall be taken into consideration.

Vendor will be required to execute the monthly plan in that month in addition to make full efforts to minimize the cumulative shortfall attributable to him up to the month.

BHEL may require monthly work plan up to one and half times of average monthly value and demand matching manpower.

Where, Average Monthly Value = Total Contract Value (as per latest revision) / Period of Contract (in months) Provided, this requirement is reflected in the rolling quarterly plan two months in advance.

If the Contractor refuses to sign the F-14 format, those F-14 formats requiring Contractor's signature shall be deemed to have been signed and accepted by the Contractor, if communicated to the Contractor through email or any other mode as stated in clause 2.3.1.

The Contractor shall submit periodical progress reports (Daily/Weekly/Monthly) and other reports/information including manpower, consumables, T&P mobilization etc. as desired by BHEL.

2.9.2 Monthly progress review between BHEL and Contractor shall be based on the agreed programme as above, availability of inputs/fronts etc., and constraints if any, as per prescribed formats (i.e. Form F-14). Manpower, T&P and consumable reports as per prescribed formats shall be submitted by contractor every month. Release of RA Bills shall be contingent upon certification by BHEL Site Engineer of the availability of the above prescribed formats duly filled in and signed.

2.9.3 The burden of proof that the causes leading to any shortfall is not due to any reasons attributable to the contractor is on the contractor himself. The monthly progress review shall record shortfalls attributable to (i) Contractor, (ii) Force Majeure Conditions, and (iii)
BHEL

2.9.4 Performance of the Contractor shall be assessed as per prescribed formats and shall form the basis for 'Assessment of Capacity of Bidder' for Tenders where the Contractor is a bidder. BHEL reserves the right to revise the evaluation formats during the course of execution of the works.

2.10 TIME OF COMPLETION

2.10.1 The time for completion shall be as mentioned n the LOA/Contract. The time for completion shall be reckoned from the date of commencement of work at Site as certified/notified in writing by BHEL Engineers.

2.10.2 Time being the essence of the contract, the entire work shall be completed by the contractor within the time schedule or within such extended periods of time as may be allowed by BHEL under clause 2.11.

2.11 EXTENSION OF TIME FOR COMPLETION

2.11.1 If the completion of work as detailed in the scope of work gets delayed beyond the contract period, the contractor shall request for an extension of the contract and BHEL at its discretion may extend the Contract. If the completion of work gets delayed for reasons not attributable to the contractor, the contract period may be suitably extended at the sole discretion of BHEL.

2.11.2 Based on the F-14 formats, the works balance at the end of original contract period less the backlog attributable to the contractor shall be quantified, and the number of months of 'Time extension' required for completion of the same shall be jointly worked out. Within this period of 'Time extension', the contractor is bound to complete the portion of backlog attributable to the contractor. Any further 'Time extension' or 'Time extensions' at the end of the previous extension shall be worked out similarly.

2.11.3 However, if any 'Time extension' is granted to the contractor to facilitate continuation of work and completion of contract, due to backlog attributable to the contractor alone, then it shall be without prejudice to the rights of BHEL to impose penalty/LD for the delays attributable to the contractor, in addition to any other actions BHEL may wish to take under Clause 2.7.2 of GCC i.e. Breach of Contract, Remedies and Termination.

2.11.4 Planning, progress monitoring, monthly review and performance monitoring shall be carried out as per clause 2.9 of GCC.

2.12 OVERRUN COMPENSATION –

2.12.1 ORC during original contract period: No ORC shall be applicable during the original contract period.

2.12.2 ORC during extended period for the reasons solely attributable to contractor: No ORC shall be applicable during the extended period granted for the reasons solely attributable to contractor and work executed during this period shall be paid as per original contract rates.

2.12.3 ORC during extended period for the reasons not attributable to contractor: ORC shall be payable as per following procedure:

2.12.3.1 For initial period of twelve months of extended period, ORC rate applicable over executed value shall be 5%. For every subsequent period of twelve months, ORC rate shall be further increased by 5% over the previous rate. For example, ORC rates applicable for initial period of 12 months and subsequent period of 12 months are given below.

Sl. No.	Extended Period for the reasons attributable to BHEL	ORC rate applicable over executed value
1	First 12 months	5%
2	13^{th}-24^{th} month and so on	10.25% {[(1.05 x 1.05)-1] x 100}

This process of increasing ORC rate for each subsequent period of 12 months shall continue till applicability of ORC.

2.12.3.2 On completion of original contract period as well as on completion of each subsequent period of twelve months i.e. at the time of change in applicable ORC rate, Delay Analysis shall be carried out and percentage shortfall attributable to both BHEL & Contractor shall be calculated.

2.12.3.3 For the purpose of calculation of ORC, executed value of work in the month shall be divided in Part-1 and Part-2 in proportion of percentage shortfall attributable to BHEL and contractor respectively, based on the last delay analysis as worked out in 2.12.3.2.
ORC shall be payable only on Part-1 and no ORC shall be payable on Part-2.
Value of Part-1 shall be further limited to the value of actual inputs provided by BHEL i.e. "Plan - Shortfall attributable to BHEL" for the month, as per Form-14 for calculation of ORC.

2.12.3.4 Payment of ORC amount shall be further regulated as follows:

(i) 50% of the ORC is allocated for deployment of matching resources (with weightages) agreed as per the joint programme drawn vide 2.11.4. ORC Payment against resources shall be calculated in proportion to percentage of resources actually deployed w.r.t. planned resources, as per Form-14.

(ii) 50% of ORC is allocated for achieving of planned progress agreed as per the joint programme drawn vide 2.11.4. ORC Payment shall be reduced in proportion to percentage shortfall attributable to contractor w.r.t.–"Plan - Shortfall attributable to BHEL" for the month, as per Form-14.

2.12.3.5 The maximum amount of ORC payable for the month shall be limited to Rs. 10,00,000/- (Rupees Ten Lakhs).

2.12.3.6 In case, there is no shortfall attributable to contractor for the month and also contractor has deployed the resources as agreed in Form-14 but ORC amount payable for the month worked out as per procedure mentioned in clause 2.12.3.3, 2.12.3.4 and 2.12.3.5, is less than Rs.1,00,000/-, then ORC amount payable for the month shall be Rs.1,00,000/- otherwise ORC amount payable for the month shall be as per procedure mentioned in Clauses clause 2.12.3.3, 2.12.3.4 and 2.12.3.5.

2.12.3.7 In case execution is on **HOLD** (Other than Force Majeure), ORC shall be payable as per following:

i). Contractor has not been permitted by BHEL to de-mobilize

ORC amount of Rs. 1,00,000/- per month shall be applicable during the period of HOLD

a) provided resources as planned are deployed (not demobilised) during the period of hold.

b) Subsequent to lifting of HOLD, Period of HOLD shall not be excluded in calculation of period for deciding applicable ORC rate as per clause 2.12.3.1. ii). Contractor has been permitted to demobilize and to remobilize after lifting of HOLD

a) No ORC shall be payable to contractor for the period of HOLD.

b) Subsequent to lifting of HOLD, Period of HOLD shall not be excluded in calculation of period for deciding applicable ORC rate as per clause 2.12.3.1.

2.12.3.8 In case **Force Majeure** is invoked:

i). No ORC shall be applicable during the period of Force Majeure.

ii). Subsequent to revocation of Force Majeure, period of Force Majeure shall be excluded in calculation of period for deciding applicable ORC rate as per clause 2.12.3.1.

2.12.4 Applicability of ORC: ORC shall not be applicable for following activities.

i). Area cleaning, removal of temporary structures and return of scrap.

ii). Punch list points / pending points liquidation pending due to reasons attributable to contractor

iii). Submission of "As built Drawing"

iv). Material Reconciliation

v). Completion of Contract Closure formalities like HR Clearance/ No dues from various dept./ Statutory Authorities etc.

2.12.5 Total Over Run Compensation shall be limited to 10% of the cumulatively executed contract value till the month (excluding Taxes and Duties if payable extra). For this purpose, executed contract value excludes PVC, ORC and Extra/Supplementary Works.

2.13 SECURED RECOVERABLE ADVANCES:

2.13.1 **INTEREST FREE MOBILIZATION ADVANCE**: Competent Authority of BHEL may approve proposals for payment of Interest Free Secured Mobilization Advance (limited to a maximum of 5% of the Contract Value) only in Installation Works in Power Plants under exceptional circumstances.

Interest Free Mobilization Advance shall be disbursed in specifically mentioned stages of major resource mobilization in the beginning of the contract, as specified in the TCC, in three or more instalments with the value of any instalment not more than 2.5% of the Contract Value. The next instalment will be due only on completion of the activities linked to the previous instalment.

Each such instalment is to be secured through BG of 100% of the instalment amount. Recovery of Interest Free Secured Advance shall be made @ 10% of Running Bill Amount. As and when the total recovered amount exceeds any of the BG value submitted against the advance, that BG shall be returned. In any case, Interest Free Advance shall be fully recovered by the time the contract reaches 50% of the original contract period either from Running Bills or by the Contractor directly depositing the amount. If the Contractor fails to deposit the total amount by the stipulated date, the recovery shall be made by encashing BGs/ Securities available with BHEL for the balance amount.

2.13.2 **INTEREST BEARING ADVANCE:**

2.13.2.1 INTEREST BEARING MOBILIZATION ADVANCE: Competent authority may also approve need based Interest Bearing Mobilization advance after a certification from the Contractor for having achieved a financial progress of 10% of the original contract price. However, the total

mobilization advance (including Interest Free Mobilization Advance) shall not exceed 10% of the Contract Value. Bank Guarantee towards 'Interest Bearing Recoverable Advance' shall be 110% of the advance so as to enable recovery of not only principle amount but also the interest portion, if so required.

2.13.2.2 INTEREST BEARING SECURED ADDITIONAL INTERIM ADVANCE: In exceptional circumstances, with due justification, Competent Authority of BHEL may approve proposals for payment of additional interim interest-bearing advance against Bank Guarantee, for resource augmentation towards expediting work for project implementation. Contractor shall establish the utilization of advance drawn in the form of Utilization Certificate before the release of next instalment.

Bank Guarantee shall be 110% of the advance so as to enable recovery of not only principle amount but also the interest portion, if so required. Unadjusted amount of advances (including Interest Free Mobilization Advance) paid shall not exceed 10% of the total contract value at any point of time.

NOTES for INTEREST BEARING ADVANCE:

(a) Recovery of Interest Bearing Advances shall be made from the Running Bills progressively. Recovery rate per month for Interest Bearing Advances shall be the sum of:
   i) Not less than 10% of Running Bill amount
   ii) Simple interest up to the date of RA Bill on the outstanding Principle amount/amounts

(b) In any case, Interest Bearing Advance shall be fully recovered by the time the contractor's billing reaches 90% of contract value either from Running Bills or by the Contractor directly depositing the amount. If the Contractor fails to deposit the total amount by the stipulated date, the recovery shall be made by encashing BGs/ Securities available with BHEL for the balance amount along with interest.

(c) Payment and recovery of any of the above advance(s) shall be at the sole discretion of BHEL and shall not be a subject matter of arbitration.

(d) The rate of interest applicable for the above advances shall be the repo rate prevailing on the date of release of advance plus 4%, and such rate will remain fixed till the total advance amount is recovered.

(e) Contractor to submit Bank Guarantee as per prescribed formats for each of the advance and shall be valid for at least one year or the recovery duration whichever is earlier. In case the recovery of dues does not get completed within the aforesaid BG period, the contractor shall renew the BG or submit fresh BG for the outstanding amount, valid for at least one year or the remaining recovery duration whichever is earlier. For each advance, the Contractor will be allowed to submit more than one BG so that the BGs can be returned progressively based on recovered amount. In case, the Contractor prefers to submit single BG against an advance, the amount of BG may be progressively reduced by the amount repaid by the Contractor.(f) BHEL is entitled to make recovery of the entire outstanding amount in case the contractor fails to comply with the BG requirement.

2.13.3 **SECURED ADVANCE AGAINST MATERIAL BROUGHT TO SITE:**

Secured advance on the security of materials (which are not combustible, fragile or perishable in nature) brought to the site but not yet incorporated in the works will be made up to 75% of Invoice value, or the 75% of the corresponding value of the materials determined on the basis of BOQ rates, whichever is less, subject to the condition that their quantities are not excessive and shall be used within a period of 90 days and subject to the stipulations, as mentioned below:

(i) Contractor shall obtain prior permission of Engineer-in-charge before procurement of materials against which advance is being sought. Engineer-in-charge shall ensure formal approval of Construction Manager before communicating the permission to Contractor.

(ii) Secured advance shall not be allowed/ payable for materials procured by Contractor before the date of such permission.

(iii) Secured Advance shall be allowed only once against a single invoice. Multiple Secured Advance against single invoice is not allowed.

(iv) Secured advance against materials shall be paid only against non-perishable items. Engineer-in-charge to ensure that such items are adequately covered under insurance cover (to be taken by the Contractor if not covered under BHEL Insurance Policy).

(v) At any point of time, the unadjusted secured payments against material brought to site shall not be more than 5% of the Contract Value.

(vi) The advance will be repaid from each succeeding Running bill(s) to the extent materials for which advance has been previously paid have been incorporated into the works. In any case, such advance payment shall be fully recovered maximum from 3-4 subsequent RA bills whether the material is consumed in the work or not. In absence of sufficient value of RA bills for making the required recovery, the Contractor shall deposit the balance amount. If the Contractor fails to deposit the total amount by the stipulated date, the recovery shall be made by encashing the Securities available with BHEL for the balance amount.

(vii) Contractor has to give a formal deed of hypothecation, drawn up on non-judicial stamp paper under which the BHEL secures a lien on the materials and is safeguarded against losses, due to the contractor postponing the execution of the work or due to the shortage or misuse of materials and against the expenses incurred on their watch and safe custody.

2.14 QUANTITY VARIATION

2.14.1 Variation in Final Executed Contract Value

The quantities given in the contract are tentative and may change to any extent (both in plus side and minus side). No compensation becomes payable in case the variation of the final executed contract value is within the limits of Minus (-) 15% of awarded contract value. Also, no compensation becomes payable in case the contract gets partially executed/ short closed/ terminated/ work withdrawn under Rights of BHEL mentioned in Clause 2.7 of GCC. In case of work terminated/ short closed under clause 2.7.4 of GCC, compensation may be considered only if BHEL receives compensation from customer.

Compensation due to variation of final executed contract value in excess of the limits defined in clause above, shall be as follows:

i) In the event the finally executed contract value reduces below the lower limit of awarded Contract Value due to quantity variation specified above, the Contractor will be eligible for compensation @ 15% of the difference between the lower limit of the awarded contract value and the actual executed contract value.

ii) In the event the finally executed contract value increases above the awarded Contract Value due to quantity variation, the Contractor is not eligible for any compensation.

2.14.2 Variation in Individual Quantities of BOQ Item(s)

The quantities given in the contract are tentative and may change to any extent (both in plus side and minus side). No compensation becomes payable in case the variation of the quantity of individual BOQ item(s) is within the limits of Plus (+) 100% of the quantity in the original price schedule in this regard.

In case executed quantity for a particular BOQ item(s) exceeds two times the quantity in the original price schedule (100% increase), then the revision in rates for such BOQ item(s) for the quantity in excess of two times the quantity in the original price schedule including any subsequent increase in quantity, may be considered based on request from the Contractor, however, BHEL decision in this regard shall be final. Revised rates for subject BOQ item(s) shall

be worked out on the basis of prevailing market rates mutually agreed between BHEL and Contractor. PVC/ ORC will not be applicable for these revised rates.

BHEL, however, retains the right to arrange the excess quantity through any other source for expediting activities in the interest of the Project.

Note:

(a) Revision in rates under clause 2.14.2 will remain admissible in those cases also, where, the Contractor is eligible for compensation under clause 2.14.1 i).

(b) The value of work executed at revised rates due to variation in Individual Quantities of BOQ Item(s) shall be included while calculating the finally executed contract value in clause no. 2.14.1 above.

2.15 EXTRA WORKS

2.15.1 All rectifications/modifications, revamping and reworks required for any reasons not due to the fault of the contractor, or needed due to any change in deviation from drawings and design of equipment, operation/maintenance requirements, mismatching or due to damages in transit, storage and erection/commissioning and other allied works which are not very specifically indicated in the drawings, but are found essential for satisfactory completion of the work, will be considered as extra works.

2.15.2 Extra works arising on account of the contractor's fault, irrespective of time consumed in rectification of the damage/loss, will have to be carried out by the contractor free of cost. Under such circumstances, any material and consumable required for this purpose will also have to be arranged by the contractor at his cost.

2.15.3 All the extra work should be carried out by a separately identifiable gang, without affecting routine activities. Daily log sheets in the pro-forma prescribed by BHEL should be maintained and shall be signed by the contractor's representative and BHEL engineer. No claim for extra work will be considered/entertained in the absence of the said supporting documents i.e. daily log sheets. Signing of log sheets by BHEL engineer does not necessarily mean the acceptance of such works as extra works.

2.15.4 BHEL retains the right to award or not to award any of the major repair/ rework/ modification/ rectification / fabrication works to the contractor, at their discretion without assigning any reason for the same.

2.15.5 After eligibility of extra works is established and finally accepted by BHEL engineer/designer, payment will be released on competent authority's approval at the following rate.

MAN-HOUR RATE FOR ELIGIBLE EXTRA WORKS: Single composite average labour man-hour rate, including overtime if any, supervision, use of tools and tackles and other site expenses and incidentals, consumables for carrying out any major rework/repairs/ rectification/ modification/ fabrication as certified by site as may arise during the course of erection, testing, commissioning or extra works arising out of transit ,storage and erection damages, payment, if found due will be at Rs139/- per man hour.

2.15.6 The above composite labour man hour rate towards extra works shall remain firm and not subject to any variation during execution of the work. PVC will not be applicable for extra works. Rate revision, Over Run Charges/compensation etc. will not be applicable on extra works.

2.15.7 Extra Works for Civil Packages shall be regulated as follows –

i) Rates for Extra Works arising due to (1) non availability of BOQ (Rate Schedule), OR (2) change in Specifications of materials/works (3) rectification/modification/dismantling & re-erecting etc. due to no fault of Contractor, shall be in the order of the following:

a) Item rates are to be derived from similar nature of items in the BOQ (Rate Schedule) with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities.

b) As per latest edition of CPWD-DSR with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities OR Notification issued by the office of CPWD for 'Cost Index' in that Region where the project is being executed with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities, whichever is less.

c) Item rates are to be worked out on the basis of market rates prevailing on the date of execution mutually agreed between BHEL and Contractor.

ii) PVC and ORC will not be applicable for (i) above.

2.16 SUPPLEMENTARY ITEMS

2.16.1 For NON-Civil Works

Supplementary items are items/works required for completion of entire work but not specified in the scope of work. Subject to certification of such items/works as supplementary items by BHEL Engineer, rates shall be derived on the basis of any one of the following on mutual agreement:

i) Based on percentage breakup/rates indicated for similar/nearby items.

ii) In case (i) above does not exist, then BHEL/site may derive the percentage breakup/rates to suit the type of work.

2.16.2 For Civil Works

i) Rates for Supplementary Works/Additional Works arising out due to additions/alterations in the original scope of works as per contract subject to certification of BHEL Engineer shall be worked out as under:

a) Item rates which are available in existing BOQ (Rate Schedule) shall be operated with applicable escalation derived from All India Consumer Price Index for Whole Sale Commodities

Items of works which are not available in existing BOQ shall be operated as an 'Extra Works' and rate shall be derived as per clause no 2.15.7

ii) Execution of Supplementary Works/Additional Works through the Contractor shall be at the sole discretion of BHEL, and shall be considered as part of executed contract value for the purpose of Quantity Variation as per clause 2.14

iii) BHEL Engineer's decision regarding fixing the rate as above is final and binding on the contractor.

iv) PVC and ORC will not be applicable for (i) above.

2.17 PRICE VARIATION COMPENSATION –

2.17.1 In order to take care of variation in cost of execution of work on either side, due to variation in the index of LABOUR, HIGH SPEED DIESEL OIL, WELDING ROD, CEMENT, STEEL, MATERIALS, Price Variation Formula as described herein shall be applicable.

2.17.2 85% component of Contract Value shall be considered for PVC calculations and remaining 15% shall be treated as fixed component. The basis for calculation of price variation in each category, their component, Base Index, shall be as under:

SL NO.	CATEGORY	INDEX/ AVERAGE MINIMUM WAGE	PERCENTAGE COMPONENT ('K')				
			CIVIL PACKAGES (See Note A/B/C)			MECHANICAL PACKAGES	Electrical , C&I Material Management/ Handling and other labour oriented Packages
			A	**B**	**C**		
i)	LABOUR (ALL CATEGORIES)	(a) 'MONTHLY ALL-INDIA AVERAGE CONSUMER PRICE INDEX NUMBERS FOR INDUSTRIAL WORKERS' published by Labour Bureau, Ministry of Labour and Employment, Government of India. (50% weightage out of component 'K') (Website: labourbureau.nic.in)	**40**	**25**	**30**	**65**	**80**
		(b) Arithmetical average of minimum wages of Unskilled, Semi-skilled, Skilled and Highly skilled workers as applicable at project site location (50% weightage out of component 'K')					
ii)	HIGH SPEED DIESEL OIL	Name of Commodity: HSD Commodity Code: 1202000005 (**See Note E**)	**5**	**3**	**5**	**5**	**5**
iii)	WELDING ROD	Name of Commodity: MANUFACTURE OF BASIC METALS Commodity Code: 1314000000 (**See Note E**)				**15**	
iv)	CEMENT	Name of Commodity: ORDINARY PORTLAND CEMENT Commodity Code: 1313050003 (**See Note E**)		**20**	**30**		

v)	STEEL (Structural and Reinforcement Steel)	Name of Commodity: MILD STEEL: LONG PRODUCTS Commodity Code: 1314040000 (**See Note E**)		**25**			
vi)	All OTHER MATERIALS (Other than Cement & Steel)	Name of Commodity: ALL COMMODITIES Commodity Code:1000000000 (**See Note E**)	**40**	**12**	**20**		

Note:

A) Cement & Steel: Free Issue (BHEL Scope)

B) Cement & Steel: In Contractor Scope

C) Cement in Contractor Scope, and Steel is Free Issue (BHEL Scope)

D) For Composite packages (i.e. Civil + Mechanical + Electrical and/or C&I or Civil + Mechanical or Mechanical + Electrical and/or C&I), the COMPONENT ('K') for various categories shall be as per respective packages as above.

E) As per the 'MONTHLY WHOLE SALE PRICE INDEX' for the respective Commodity and Type, published by Office of Economic Adviser, Ministry of Commerce and Industry, Government of India. (Website: eaindustry.nic.in). Revisions in the index or commodity will be re-adjusted accordingly.

2.17.3 # Not Applicable

2.17.4 Payment/recovery due to variation in index shall be determined on the basis of the following notional formula in respect of the identified COMPONENT ('K') viz LABOUR, HIGH SPEED DIESEL OIL, WELDING ROD, CEMENT, STEEL, MATERIALS.

$$P = K \times R \times \frac{(X_N - Xo)}{Xo}$$

Where,

P = Amount to be paid/recovered due to variation in the Index for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials

K = Percentage COMPONENT ('K') applicable for Labour, High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials

R = Value of work done for the billing month (Excluding Taxes and Duties if payable extra)

X_N = Revised Index for Labour, Revised Average Minimum Wages for Labour, Revised Index for High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials for the billing month under consideration

Xo = Index for Labour, Average Minimum Wages for Labour, Index for High Speed Diesel Oil, Welding Rod, Cement, Steel and Materials as on the Base date

2.17.5 PVC shall not be payable for the ORC amount, Supplementary/Additional Items, Extra works. However, PVC will be payable for items executed under quantity variation of BOQ items under originally awarded contract.

2.17.6 Base date shall be calendar month of the 'last date of submission of Tender'.

2.17.7 The contractor shall furnish necessary monthly bulletins in support of the requisite indices from the relevant websites along with his Bills.

2.17.8 The contractor will be required to raise the bills for price variation payments on a monthly basis along with the running bills irrespective of the fact whether any increase/decrease in the index for relevant categories has taken place or not. In case there is delay in publication of bulletins (final figure), the provisional values as published can be considered for payments and arrears shall be paid/recovered on getting the final values.

2.17.9 PVC shall be applicable for the entire original contract period plus the extended period, i.e. for the complete execution period, as follows:

For PVC computation of the n^{th} month:

Let the cumulative delay attributable to the Contractor is D_n in the n^{th} month as per Form-14.

Considering R_n as the billing value for the n^{th} month, PVC for the n^{th} month shall be calculated as follows:

a) PVC for the portion of R_n for an amount of $D_{(n-1)}$ shall be payable as per indices for the $(n-1)^{th}$ month.

b) PVC for the balance portion of R_n shall be payable as per indices for the n^{th} month

In case $D_{(n-1)}$ is greater than R_n, then entire R_n shall be payable as per indices for the $(n1)^{th}$ month and the balance portion of $D_{(n-1)}$ shall be adjusted from $R_{(n+1)}$ of the $(n+1)^{th}$ month and will be payable as per indices for the $(n-1)^{th}$ month. The above process shall be continued for subsequent month(s) also till full $D_{(n-1)}$ is consumed.

i) For milestones mentioned in the contract, PVC shall be applicable as per average of the indices from the month of base date till the month of execution of milestone. ii) PVC shall not be applicable for time extension provided for the delays solely attributable to the contractor. No PVC is payable during the period of Provisional Time Extension till grant of final time extension. Applicability of PVC will be decided at the time of grant of final time extension.

ii) The total amount of PVC shall not exceed 15% of the cumulatively executed contract value. Executed contract value for this purpose is exclusive of PVC, ORC, Supplementary/Additional Items and Extra works except items due to quantity variation.

Note: Work Planning in F-14 format to be meticulously done as per Clause 2.9 of this GCC.

2.18 INSURANCE

2.18.1 BHEL/their customer shall arrange for insuring the materials/properties of BHEL/customer covering the risks during transit, storage, erection and commissioning.

2.18.2 It is the sole responsibility of the contractor to insure his materials, equipment, workmen etc. against accidents and injury while at work and to pay compensation, if any, to workmen as per Workmen's compensation Act. The work will be carried out in a protected area and all the rules and regulations of the client /BHEL in the area of project which are in force from time to time will have to be followed by the contractor.

2.18.3 If due to negligence and or non-observation of safety and other precautions by the contractors, any accident/injury occurs to the property / manpower belong to third party, the contractor shall have to pay necessary compensation and other expense, if so decided by the appropriate authorities.

2.18.4 The contractor will take necessary precautions and due care to protect the material, while in his custody from any damage/ loss due to theft or otherwise till the same is taken over by BHEL or customer. For lodging / processing of insurance claim, the contractor will submit necessary documents. BHEL will recover the loss including the deductible franchise from the contractor, in case the damage / loss is due to carelessness / negligence on the part of the contractor. In case of any theft of material under contractor's custody, matter shall be reported to Police by the

contractor immediately and copy of FIR and subsequently police investigation report shall be submitted to BHEL for taking up with insurance. However, this will not relieve the contractor of his contractual obligation for the material in his custody.

2.19 STRIKES & LOCKOUT

2.19.1 The contractor will be fully responsible for all disputes and other issues connected with his labour. In the event of the contractor's labour resorting to strike or the Contractor resorting to lockout and if the strike or lockout declared is not settled within a period of one month, it may be considered as 'Breach of Contract' under Clause 2.7 and the remedies under Clause 2.7.2.2 may be executed, at the discretion of BHEL.

2.19.2 For all purposes whatsoever, the employees of the contractor shall not be deemed to be in the employment of BHEL.

2.20 FORCE MAJEURE

2.20.1 "Force Majeure" shall mean circumstance which is:

a) beyond control of either of the parties to contract,

b) either of the parties could not reasonably have provided against the event before entering into the contract,

c) having arisen, either of the parties could not reasonably have avoided or overcome, and

d) is not substantially attributable to either of the parties And Prevents the performance of the contract,

Such circumstances include but shall not be limited to:

i) War, hostilities , invasion, act of foreign enemies.

ii) Rebellion, terrorism, revolution, insurrection, military or usurped power, or civil war.

iii) Riot, commotion or disorder by persons other than the contractor's personnel and other employees of the contractor and sub-contractors.

iv) Strike or lockout not solely involving the contractor's personnel and other employees of the contractor and sub-contractors.

v) Encountering munitions of war, explosive materials, ionizing radiation or contamination by radio-activity, except as may be attributable to the contractor's use of such munitions, explosives, radiation or radio- activity.

vi) Natural catastrophes such as earthquake, tsunami, volcanic activity, hurricane or typhoon, flood, fire, cyclones etc.

vii) Epidemic, pandemic etc.

2.20.2 The following events are explicitly excluded from Force Majeure and are solely the responsibilities of the non-performing party: a) any strike, work-to-rule action, go-slow or similar labour difficulty (b) late delivery of equipment or material (unless caused by Force Majeure event) and (c) economic hardship.

2.20.3 If either party is prevented, hindered or delayed from or in performing any of its obligations under the Contract by an event of Force Majeure, then it shall notify the other in writing of the occurrence of such event and the circumstances thereof within 15 (fifteen) days after the occurrence of such event.

2.20.4 The party who has given such notice shall be excused from the performance or punctual performance of its obligations under the Contract for so long as the relevant event of Force Majeure continues and to the extent that such party's performance is prevented, hindered or delayed. The Time for Completion shall be extended by a period of time equal to period of delay caused due to such Force Majeure event.

2.20.5 Delay or non-performance by either party hereto caused by the occurrence of any event of Force Majeure shall not

a) Constitute a default or breach of the Contract.
b) Give rise to any claim for damages or additional cost expense occasioned thereby, if and to the extent that such delay or non-performance is caused by the occurrence of an event of Force Majeure.

2.20.6 BHEL at its discretion may consider short closure of contract after 1 year of imposition of Force Majeure in line with extant guidelines. In any case, Supplier/Vendor cannot consider deemed short-closure after 1 year of imposition of Force Majeure.

2.21 SETTLEMENT OF DISPUTE:

If any dispute or difference of any kind whatsoever shall arise between BHEL and the Supplier/Vendor, arising out of the contract for the performance of the work whether during the progress of contract termination, abandonment or breach of the contract, it shall in the first place referred to Designated Engineer for amicable resolution by the parties. Designated Engineer (to be nominated by BHEL for settlement of disputes arising out of the contract) who within 60 days after being requested shall give written notice of his decision to the contractor. Save as hereinafter provided, such decision in respect of every matter so referred shall forthwith be given effect to by the Supplier/Vendor who shall proceed with the work with all due diligence, whether he or BHEL desires to resolve the dispute as hereinafter provided or not.

If after the Designated Engineer has given written notice of this decision to the party and no intention to pursue the dispute has been communicated to him by the affected party within 30 days from the receipt of such notice, the said decision shall become final and binding on the parties. In the event the Supplier/Vendor being dissatisfied with any such decision or if amicable settlement cannot be reached then all such disputed issues shall be resolved through conciliation in terms of the BHEL Conciliation Scheme 2018 as per Clause 2.21.1.

2.21.1 **Conciliation:**

Any dispute, difference or controversy of whatever nature howsoever arising under or out of or in relation to this Agreement (including its interpretation) between the Parties, and so notified in writing by either Party to the other Party (the “Dispute”) shall, in the first instance, be attempted to be resolved amicably in accordance with the conciliation procedure as per BHEL Conciliation Scheme 2018. The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and as provided in - “Procedure for conduct of conciliation proceedings” (as available in www.bhel.com)).

Note: Ministry of Finance has issued OM reference No. 1/2/24 dated 03.06.2024 regarding “Guidelines for Arbitration and Mediation in Contracts of Domestic Public Procurement. In the said OM it has been recommended that Government departments/

Entities/agencies are to encourage mediation under the Mediation Act. 2023 . The said Act has not yet been notified by the Government. Therefore, the clause “Settlement of Disputes” shall be modified accordingly as and when the Mediation Act 2023 gets notified.

2.21.2 ARBITRATION:

2.21.2.1 Except as provided elsewhere in this Contract, in case Parties are unable to reach amicable settlement (whether by Conciliation to be conducted as provided in Clause 21.1 herein above or otherwise) in respect of any dispute or difference; arising out of the formation, breach, termination, validity or execution of the Contract; or, the respective rights and liabilities of the Parties; or, in relation to interpretation of any provision of the Contract; or. in any manner touching upon the Contract (hereinafter referred to as the ‘Dispute’), then, either Party may, refer the disputes to Arbitral Institution (to be identified by the contract issuing agency (eg. “IIAC” (India International Arbitration Centre) for Delhi/NCR offices) and such dispute to be

adjudicated by Sole Arbitrator appointed in accordance with the Rules of said Arbitral Institution.

2.21.2.2 A party willing to commence arbitration proceeding shall invoke Arbitration Clause by giving notice to the other party in terms of section 21 of the Arbitration & Conciliation Act, 1996 (hereinafter referred to as the 'Notice') before referring the matter to arbitral institution. The Notice shall be addressed to the Head of the Region, Power Sector/ Unit,
BHEL, executing the Contract and shall contain the particulars of all claims to be referred to arbitration with sufficient detail and shall also indicate the monetary amount of such claim including interest, if any.

2.21.2.3 After expiry of 30 days from the date of receipt of aforesaid notice, the party invoking the Arbitration shall submit that dispute to the Arbitral Institutions..... (to be identified by the contract issuing agency) and that dispute shall be adjudicated in accordance with their respective Arbitration Rules. The matter shall be adjudicated by a Sole Arbitrator who shall necessarily be a Retd Judge having considerable experience in commercial matters to be appointed/nominated by the respective institution. The cost/expenses pertaining to the said Arbitration shall also be governed in accordance with the Rules of the respective Arbitral Institution. The decision of the party invoking the Arbitration for reference of dispute to a specific Arbitral institution for adjudication of that dispute shall be final and binding on both the parties and shall not be subject to any change thereafter. The institution once selected at the time of invocation of dispute shall remain unchanged.

2.21.2.4 The fee and expenses shall be borne by the parties as per the Arbitral Institutional rules.

2.21.2.5 The Arbitration proceedings shall be in English language and the seat and venue of Arbitration shall be (to be identified by the contract issuing agency) .....(i. e. New Delhi for Delhi/NCR based Units).

2.21.2.6 Subject to the above, the provisions of Arbitration & Conciliation Act 1996 and any amendment thereof shall be applicable. All matters relating to this Contract and arising out of invocation of Arbitration clause are subject to the exclusive jurisdiction of the Court(s) situated at..... (i.e. New Delhi for Delhi/NCR based Units).

2.21.2.7 Notwithstanding any reference to the Designated Engineer or Conciliation or Arbitration herein,
a. the parties shall continue to perform their respective obligations under the Contract unless they otherwise agree. Settlement of Dispute clause cannot be invoked by the Contractor, if the Contract has been mutually closed or 'No Demand Certificate' has been furnished by the Contractor or any Settlement Agreement has been signed between the Employer and the Contractor.

2.21.2.8 It is agreed that Mechanism of resolution of disputes through arbitration shall be available only in the cases where the value of the dispute is less than Rs. 10 Crores.

2.21.2.9 In case the disputed amount (Claim, Counter claim including interest is Rs. 10 crores and above, the parties shall be within their rights to take recourse to remedies other than Arbitration, as may be available to them under the applicable laws after prior intimation to the other party. Subject to the aforesaid conditions, provisions of the Arbitration and Conciliation Act, 1996 and any statutory modifications or re-enactment thereof as amended from time to time, shall apply to the arbitration proceedings under this clause.

2.21.2.10 In case, multiple arbitrations are invoked (whether sub-judice or arbitral award passed) by any party to under this contract, then the cumulative value of claims (including interest claimed or awarded) in all such arbitrations shall be taken in account while arriving at the total claim in dispute for the subject contract for the purpose of clause 21.2.9. Disputes having cumulative value of less than 10 crores shall be resolved through arbitration and any additional dispute shall be adjudicated by the court of competent jurisdiction.

2.21.3 In case of Contract with Public Sector Enterprise (PSE) or a Government Department, the following shall be applicable:

In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs)/ Port Trusts inter se and also between CPSEs and Government Departments/Organizations (excluding disputes concerning Railways, Income Tax, Customs & Excise Departments), such dispute or difference shall be taken up by either party for resolution through AMRCD (Administrative Mechanism for Resolution of CPSEs Disputes) as mentioned in DPE OM No. 05/0003/2019-FTS10937 dated 14-12-2022 as amended from time to time.

2.21.4 NO INTEREST PAYABLE TO CONTRACTOR

Notwithstanding anything to the contrary contained in any other document comprising in the Contract, no interest shall be payable by BHEL to Contractor on any moneys or balances including but not limited to the Security Deposit, EMD, Retention Money, RA Bills or the Final Bill, or any amount withheld and/or appropriated by BHEL. etc., which becomes or as the case may be, is adjudged to be due from BHEL to Contractor whether under the Contract or otherwise.

2.22 RETENTION AMOUNT

2.22.1 Retention Amount shall be 5% of contract value and shall be furnished before the first RA Bill becomes due for payment. In case of increase in contract value, additional 5% of differential amount shall be submitted by Contractor before payment of next RA Bill due.

The Retention amount of 5% of the contract value may be accepted in the following forms: -

i. Cash (as permissible under the extant Income Tax Act).
ii. Local cheques of Scheduled Banks (subject to realization)/ Pay Order/ Demand Draft/ Electronic Fund Transfer in favour of BHEL.
iii. Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (held in the name of Contractor furnishing the security and duly endorsed/ hypothecated / pledged, as applicable, in favour of BHEL).
iv. Bank Guarantee from Scheduled Banks/ Public Financial Institutions as defined in the Companies Act and in line with clause 1.12 of GCC. The Bank Guarantee format for Retention Amount shall be in the prescribed formats. The validity of BG shall be initially for the contract period & shall be extended up to acceptance of final bill if the final bill is not settled during the contract period.
v. Fixed Deposit Receipt issued by Scheduled Banks/ Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL).
vi. Insurance Surety Bonds.

Alternatively, on successful bidder's request, the Retention Amount can also be recovered at the rate of 10% of the gross amount, progressively, from each of the running bills of the contractor till the total amount of the required retention amount is collected.

In case, contractor opts cash deduction from RA bills in the beginning & subsequently submit 5% of the Contract Value as Retention amount in any form as mentioned above, then refund of deducted retention amount may be permitted to contractor.

Note:

BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith.

2.22.2 **Refund of Retention Amount shall be as follows:**

100% of Retention Amount/ BG shall be released along with Final Bill after deduction all expenses/ other amounts due to BHEL under the contract/ other contracts entered into with them (contractor) by BHEL provided that.

2.22.3 **In case of short closure of contract**

a) due to the premature termination of BHEL contract with customer for any reason whatsoever;

b) upon the request of contractor for any reason, prior to completion and acceptance of Trial Run by the end customer

The retention money equivalent to the 5% of contract value executed by the contractor shall not be refundable and the contractor shall be discharged of his liabilities as provided in the clause 2.22.1

2.23 PAYMENTS

Payments to Contractors are made in any one of the following forms: -

2.23.1 Running Account Bills (RA Bills)

i) These are for interim payments when the contracts are in progress. The bills for such interim payments are to be prepared by Contractor in prescribed formats (RA Bill forms).

ii) Payments shall be made according to the extent of work done as per measurements taken up to the end of the calendar month and in line with the terms of payments described in the Tender documents.

iii) Recoveries on account of electricity, water, statutory deductions etc. are made as per terms of contract.

iv) Full rates for the work done shall be allowed only if the quantum of work has been done as per the specifications stipulated in the contract. If the work is not executed as per the stipulated specifications, BHEL may ask the contractor to redo the work according to the required specifications, without any extra cost. However, where this is not considered necessary 'OR' where the part work is done due to factors like non-availability of material to be supplied by BHEL 'OR' non availability of fronts 'OR' non availability of drawings, fraction payment against full rate, as is considered reasonable, may be allowed with due regard for the work remaining to be done. BHEL decision in this regard will be final and binding on the contractor.

v) In order to facilitate part payment, BHEL at its discretion may further split the contracted rates/percentages to suit site conditions, cash flow requirements according to the progress of work, subject to following:

a) Provided no 'part' payment is recommended till 25% of work in the item rate is executed.

b) Payment of item rate to be made in not more than three instalments, last stage payment to be not lower than 20% of the item rate.

2.23.2 Final Bill

Final Bill' is used for final payment on closing of Running Account for works or for single payment after completion of works. 'Final Bill' shall be submitted as per prescribed format after completion of works as per scope and upon material reconciliation, along with the following:

i) 'No Claim Certificate' by Contractor as per Clause 2.6.11 of the GCC.

ii) Clearance certificates where ever applicable viz. Clearance Certificates from Customer, various Statutory Authorities like Labour department, PF Authorities, Commercial Tax Department etc.

iii) Indemnity Bond as per prescribed format.

BHEL shall settle the final bills after deducting all liabilities of Contractor to BHEL.

2.24 PERFORMANCE GUARANTEE FOR WORKMANSHIP:

2.24.1 Even though the work will be carried out under the supervision of BHEL Engineers the Contractor will be responsible for the quality of the workmanship and shall guarantee the work done for a period of Twelve months from the date of commencement of guarantee period as defined in Technical Conditions of Contract, for good workmanship and shall rectify free of cost all defects

due to faulty erection detected during the guarantee period. In the event of the Contractor failing to repair the defective works within the time specified by the Engineer, BHEL may proceed to undertake the repairs of such defective works by itself, without prejudice to any other rights and recover the cost incurred for the same along with 5% overheads from the Security Deposit.

2.24.2 BHEL shall release the Security Deposit subject to the following

i) Contractor has submitted 'Final Bill'
ii) Guarantee period as per contract has expired
iii) Contractor has furnished 'No Claim Certificate' as per clause 2.6.11 of GCC
iv) BHEL Site Engineer/Construction Manager has furnished the 'No Demand Certificate' in specified format
v) Contractor has carried out the works required to be carried out by him during the period of Guarantee and all expenses incurred by BHEL on carrying out such works is included for adjustment from the Security Deposit refundable.

2.25 CLOSING OF CONTRACTS

The Contract shall be considered completed and closed upon completion of contractual obligations and settlement of Final Bill or completion of Guarantee period whichever is later. Upon closing of Contract, BHEL shall issue a performance/ experience certificate as per standard format, based on specific request of Contractor as per extant BHEL guidelines through the online portal available at https://siddhi.bhel.in only.

2.26 SUSPENSION OF BUSINESS DEALINGS

BHEL reserves the right to take action against Contractors who either fail to perform or Tenderers/Contractor who indulge in malpractices, by suspending business dealings with them in line with BHEL guidelines issued from time to time.

The offers of the bidders who are under suspension as also the offers of the bidders, who engage the services of the banned firms / principal / agents, shall be rejected. The list of banned firms is available on BHEL web site www.bhel.com.

If any bidder / supplier / contractor during pre-tendering / tendering / post tendering / award / execution / post-execution stage indulges in any act, including but not limited to, mal-practices, cheating, bribery, fraud or and other misconduct or formation of cartel so as to influence the bidding process or influence the price or tampers the tendering process or acts or omits in any manner which tantamount to an offence punishable under any provision of the Indian Penal Code, 1860 or any other law in force in India, or does anything which is actionable under the Guidelines for Suspension of Business dealings, action may be taken against such bidder / supplier / contractor as per extant guidelines of the company available on www.bhel.com and / or under applicable legal provisions.

Guidelines for suspension of business dealings is available in the webpage:

http://www.bhel.com/vender_registration/vender.php

2.27 LIMITATION ON LIABILITY:

Notwithstanding anything to the contrary in this Contract or LOA or Work Order or any other mutually agreed document between the parties, the maximum liability, for damages, of the contractor, its servants or agents, shall under no circumstances exceed an amount equal to the Price of the Contract or the Work Order. The Contractor shall not in any case be liable for loss of profit or special, punitive, exemplary, indirect or consequential losses whatsoever. This shall not be applicable on the recoveries made by Customer from BHEL on account of Contractor, any other type of recoveries for workmanship, material, T&P etc. due from the contractor.

2.28 NON-DISCLOSURE AGREEMENT (NDA):

The bidders shall enter into the Non-disclosure agreement totally voluntarily, with full knowledge of its meaning and without duress. (Format attached).

2.29 CARTEL FORMATION

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

2.30 FRAUD PREVENTION POLICY

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

2.31 ORDER OF PRECEDENCE:

In the event of any ambiguity or conflict between the contract Documents, the order of precedence shall be in the order below:

a. Contract agreement with its Amendments/
b. Clarifications/Corrigenda/Errata etc. issued in respect of the tender documents by BHEL
c. Notice Inviting Tender (NIT)
d. Price Bid
e. Technical Conditions of Contract (TCC)—Volume-1A
f. Special Conditions of Contract (SCC) —Volume-1B
g. General Conditions of Contract (GCC) —Volume-1C
h. Forms and Procedures —Volume-1D

2.32 OTHER ISSUES

2.32.1 Value of Non judicial Stamp Paper for Bank Guarantees and for Contract Agreement shall be not less than Rs 100/- unless otherwise required under relevant statutes.

2.32.2 In case of any conflict between the General Conditions of Contract and Special Conditions of Contract, provisions contained in the Special Conditions of Contract shall prevail.

2.32.3 Unless otherwise specified in NIT, offers from consortium/ JVs shall not be considered.

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SPECIAL CONDITIONS OF CONTRACT (SCC)

CONTENTS

SPECIAL CONDITIONS OF CONTRACT (SCC)
Chapter - I: General Intent of Specifications

1.0	INTENT OF THE SPECIFICATION
1.1	The intent of this erection specification is to provide services for execution of the project according to most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for the proper and efficient services towards installation of the plant shall not relieve the contractor of the responsibility of providing such services / facilities to complete the work or portion of work awarded to him. The quoted / accepted rates / price shall deem to be inclusive of all such contingencies.
1.2	The work shall conform to dimensions and tolerances given in various drawings and documents that will be provided during erection. If any portion of works is found to be defective in workmanship and not conforming to drawings / documents or other stipulations, the contractor shall dismantle and re-do the work duly replacing the defective materials at their own cost, failing which recoveries, as determined by BHEL, shall be effected from contractor's bills.
1.3	It is not the intent of this specification to specify herein all the details of erection and commissioning. However, the system shall conform in all respects to high standards of quality and workmanship for performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgments is not in full accordance herewith.
1.4	The omission of specific reference to any fabrication / erection or other method, equipment or material necessary for proper and efficient working of the plant shall not relieve the tenderer of the responsibility of providing such facilities to complete the work at quoted rates. Any mismatch/ defect found due to mistake in fabrication / erection shall have to be rectified by the vendor free of cost. Inspection by BHEL/Customer does not relieve vendor of his responsibility of executing quality erection.
1.5	The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, supervision, engineering and construction management. The contractor should ensure proper planning and successful and timely completion of the work to meet the overall project schedule. The contractor must deploy adequate quantity of tools & plants, modern / latest construction aids etc. He must also deploy adequate trained, qualified and experienced supervisory staff and skilled personnel.
1.6	Contractor shall erect and commission all the equipments and auxiliaries as per the sequence & methodology prescribed by BHEL depending upon the technical requirements. Availability of materials and fronts will decide this. BHEL Engineer's decision regarding correctness of the work and method of working shall be final and binding on the contractor. No claims for extra payment from the contractor will be entertained on the ground of deviation from the methods / sequence adopted in erection of similar sets elsewhere.
1.7	Following shall be the minimum responsibility of contractor and have to be provided within finally accepted rates / prices:
1.7.1	Provision as required of all types of labour, supervisors, engineers, watch and ward, tools & tackles, calibrated MMEs (Monitoring and Measuring Equipment) as specified and otherwise required for the work, consumables for erection, testing and commissioning including material handling.
1.7.2	Achieving Proper out-turns / Turn-over as per BHEL plan and commitment.
1.7.3	Completion of work as per BHEL Schedule.
1.7.4	Good quality and accurate workmanship for proper performance of the equipment
1.7.5	Repair and rectification
1.7.6	Preservation / Re-conservation of all components during storage / erection / commissioning till handing over.

SPECIAL CONDITIONS OF CONTRACT (SCC)
Chapter - II: General Services to be rendered by the Bidder

2.0	**GENERAL SERVICES TO BE RENDERED BY THE BIDDER**
2.1	Services for construction, fabrication, equipment erection, testing as well as trial run & commissioning of various equipment and accessories under the contract shall include but not be limited to the following:
2.2	Issuing materials from store/open yard from time to time for erection as per the construction programme. The Contractor shall be the custodian of all the materials issued till the plant/equipment is officially taken over by the owner / BHEL after complete erection and successful trial run & commissioning.
2.3	Transport of material to their respective places of erection and erection of the complete plant & equipment as supplied under this specification.
2.4	Trial run and commissioning of individual equipment / sub-systems to the satisfaction of Owner/BHEL.
2.5	Deployment of all skilled and unskilled manpower required for erection, supervision of erection, watch & ward, commissioning and other services to the rendered under this specification.
2.6	Deployment of all erection tools & tackle, construction machinery, transportation vehicles and all other implements in adequate number and size, appropriate for the erection work to be handled under scope of this specification except otherwise specified.
2.7	Supply of all consumables, e.g. welding electrodes, gases, grinding/cutting wheels, cleaning agents, diesel oil, lubricant etc. as well as materials required for temporary supports, scaffolding etc. as necessary for such erection work, unless specified otherwise.
2.8	Providing support services for the contractor's erection staff e.g. construction of site offices, temporary stores, residential accommodation and transport to work site for erection personnel, watch and ward for security and safety of the materials under the Contractor's custody etc. as required.
2.9	Maintaining proper documentation of all the site activities undertaken by the Contractor as per the proforma mutually agreed with BHEL, Submission of monthly progress reports and any such document as and when desired by BHEL/owner, taking approval of all statutory authorities i.e. Boiler Inspector, Factory Inspector, Inspector of Explosives etc., as applicable for respective portions of work fall under the jurisdiction of such statutes of laws.
2.10	Any other service, although not specifically called for but required for a contract of the size and nature indicated in the specification.

SPECIAL CONDITIONS OF CONTRACT (SCC)
Chapter - III: General Technical Requirements (Codes and Standards)

3.0	**GENERAL TECHNICAL REQUIREMENTS (CODES AND STANDARDS)**
3.1	Except where otherwise specified, the plant/equipment shall comply with the appropriate Indian Standard or an agreed internationally accepted Standard Specification as mentioned elsewhere in contract specifications, each incorporating the latest revisions at the time of tendering. Where no internationally accepted standard is applicable, the Bidder shall give all particulars and details as necessary; to enable BHEL to identify all of the plant/equipment in the same detail as would be possible had there been a Standard Specification.
3.2	Where the Bidder proposes alternative codes or standards he shall include in his tender one copy (in English) of each Standard Specification to which materials offered shall comply. In such case, the adopted alternative standard shall be equivalent or superior to the standards mentioned in the specification.
3.3	In the event of any conflict between the codes and standards referred above, and the requirements of this specification, the requirements which are more stringent shall govern.
3.4	Tools used during erection and commissioning shall not be accepted except with the specific approval of the Engineer.

SPECIAL CONDITIONS OF CONTRACT (SCC)
Chapter - IV: Obligations of Contractor

4.0	**OBLIGATIONS OF CONTRACTOR**
4.1	**CONSUMABLES & OTHER ITEMS**
4.1.1	The contractor shall provide within finally accepted price / rates, all consumables (except those indicated in BHEL scope) like welding electrodes (including alloy steel and stainless steel), filler wires, TIG filler wires, gases (inert, welding, cutting), soldering material, dye penetrants, radiography films, etc. Other erection consumables such as tapes, jointing compound, grease, mobile oil, M-seal, Araldite, petrol, CTC / other cleaning agents, grinding and cutting wheels are to be provided by the contractor. Steel, packers, shims, wooden planks, scaffolding materials hardware items etc. required for temporary works such as supports, scaffoldings are to be arranged by the contractor. Sealing compounds, gaskets, gland packing, wooden/concrete sleepers, for temporary work, required for completion of work except those which are specifically supplied by manufacturing unit are also to be arranged by the contractor.
4.1.2	All the shims, gaskets and packing, which are required for erection and alignment of equipments, shall be supplied by contractor free of cost.
4.1.3	It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of consumables. Non-availability of any consumable materials or equivalent suggested by BHEL cannot be considered as reason for not attaining the required progress or for additional claim.
4.1.4	**Void.**
4.1.5	It shall be the responsibility of the contractor to obtain prior approval of BHEL, regarding suppliers, type of electrodes etc. before procurement of welding electrodes. On receipt of electrodes at site these shall be subjected to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes, batch number, date of expiry etc. and produce test certificate for each lot / batch with correlation of batch / lot number with respective test certificate. No electrode without a valid test certificate will be used.
4.1.6	BHEL reserves the right to reject the use of any consumable including electrodes, gases, lubricants / special consumables if it is not found to be of the required standard / make / purity or when shelf life has expired. Contractor shall ensure display of shelf life on consumable wherever required and records maintained.
4.1.7	Storage of all consumables including welding electrodes shall be done as per requirement / instruction of the Engineer by the contractor at his cost.
4.1.8	In case of improper arrangement for procurement of any consumable, BHEL reserves the right to procure the same from any source and recover the cost from the Contractor's first subsequent bill at market value plus the departmental charges of BHEL from time to time. Postponement of such recovery is normally not permitted. The decision of Engineer in this regard shall be final and binding on the Contractor.
4.1.9	All lubricants and chemicals required for pre-commissioning, commissioning, testing, preservation and lubricants for trial runs of the equipment shall be supplied by BHEL / BHEL's client. All services including labour and T&P will be provided by the contractor for handling, filling, emptying, refilling etc. The consumption of lubricants / chemicals shall be properly accounted for. Surplus material if any shall be properly stacked/ tagged and returned to BHEL/ CUSTOMER stores at no extra cost to BHEL. BHEL reserves the right to recover costs for wastage by the contractor.
4.1.10	Transportation of oil drums from stores, filling of oil for flushing, first filling, subsequent changeover if any; topping/making up till the unit is fully commissioned and handed over to customer is included in scope of this contract. The contractor shall have to return all the empty drums to BHEL / BHEL's client store at no extra cost. Any loss / damage to above drums shall be to contractor's account.
4.1.11	All charges on account of Octroi, terminal or sales tax and other duties on materials obtained from any source for carrying out the works in the scope of the contractor shall be borne by the contractor.
4.2	**TOOLS AND PLANTS / MONITORING AND MEASURING EQUIPMENT (MMEs)**
4.2.1	**T&Ps and MMEs to be provided by Contractor**

SPECIAL CONDITIONS OF CONTRACT (SCC)
Chapter - IV: Obligations of Contractor

4.2.1.1	All T&Ps and MMEs excepting those specifically indicated in BHEL scope are to be provided by the Contractor. Contractor has to make his own arrangement at his cost for completing the formalities (including arrangement of Road permits, if any) if required with Sales Tax/VAT authorities, for bringing their materials, plants and equipments at site for the execution of work under this contract.
4.2.1.2	All suitable cranes for erection of equipments, pipe lines, structural, unloading & loading and material handling, lifting and transport equipments for material handling at stores/yard/siding of BHEL/Customer are included in contractor's scope. BHEL's cranes will not be available for this purpose unless otherwise specifically permitted as per contract conditions
4.2.1.3	All T&Ps to be deployed by the contractor shall have the approval of BHEL Engineer with regard to brand, quality and specification.
4.2.1.4	Indicative list of Major T&Ps in the scope of Contractor are given in the Technical Conditions of Contract. Bidders to note that these are only indicative and as such all other T&P necessary for timely and satisfactory completion of work in scope shall be mobilized by Contractor
4.2.1.5	Timely deployment of adequate T&Ps is the responsibility of the contractor. The contractor shall be prepared to augment the T&P at short notice to match the planned programme and to achieve the milestones.
4.2.1.6	Contractor shall maintain and operate his tools and plants in such a way that major breakdowns are avoided. In the event of major breakdown, contractor shall make alternative arrangements expeditiously so that the progress of work is not hampered.
4.2.1.7	In the event of contractor failing to arrange the required tools, plants, machinery, equipment, material or non-availability of the same owing to breakdown, BHEL will make alternative arrangement at the risk and cost of the contractor. Decision of BHEL shall be final and binding on the contractor
4.2.1.8	The T&P to be arranged by the contractor shall be in proper working condition and their operation shall not lead to unsafe condition. The movements of cranes and other equipment should be such that no damage / breakage occur to foundations, other equipments, material, property and men. All arrangements for the movement of the T&P etc. shall be the contractor's responsibility.
4.2.1.9	Use of welding generators / rectifiers only shall be permitted for welding. Use of welding transformers will be subject to specific approval of BHEL engineer.
4.2.1.10	The contractor at his cost shall carry out periodical testing of his construction equipments. Test certificates shall be furnished to BHEL.
4.2.1.11	Contractor shall ensure deployment of serviced and healthy T&Ps including cranes, lifting tackles, wire ropes, manila ropes, winches and slings etc. History card and maintenance records for major T&Ps will be maintained by the contractor and will be made available to BHEL Engineer for inspection as and when required. Fitness certificate / Test Certificates of T&P shall have to be submitted before it is put in use. Identification for such T&Ps will be done as per BHEL Engineer's advice. BHEL reserves the right to permit only new slings up to 20 mm and lifting tackles up to 3 MT capacities.
4.2.1.12	Contractor shall ensure deployment of reliable and calibrated MMEs (Inspection measuring and Monitoring equipment). The MMEs shall have test / calibration certificates from authorized / Government approved / accredited agencies traceable to National / International standards. Each MME shall have a label indicating calibration status i.e. date of calibration, calibration agency and due date for calibration. A list of such instruments deployed by contractor at site with its calibration status is to be submitted to BHEL Engineer for control.
4.2.1.13	Re-testing / re-calibration shall also be arranged at regular intervals during the period of use as advised by BHEL Engineer within the contract price. The contractor will also have alternate arrangements for such MME so that work does not suffer when the particular instrument is sent for calibration. If any MMEs not found fit for use, BHEL shall have the right to stop the use of such item. It will be necessary for the contractor to deploy proper item. Any readings taken by the defective instrument will be recalled and repeat the readings taken by that instrument with a proper one. In case he fails to do so, BHEL may deploy MMEs and retake the readings at contractor's cost.

SPECIAL CONDITIONS OF CONTRACT (SCC)

Chapter - IV: Obligations of Contractor

4.2.1.14	BHEL shall have lien on all T&P, MMEs and other equipment of the contractor brought to the site for the purpose of erection, testing and commissioning. BHEL shall continue to hold the lien on all such items throughout the period of contract / extended period. The contractor and / or his sub-contractors, without the prior written approval of the Engineer, shall remove no material brought to the site.
4.2.1.15	The month wise T&P deployment plan to execute the work is to be submitted as per relevant format as per the instruction of BHEL. It shall be the contractor's responsibility to deploy the required T&P, for timely and successful completion of the job, to any extent.
4.2.2	**Obligations in respect of T&Ps and MMEs if provided by BHEL**
4.2.2.1	T&P **/** MMEs being provided by BHEL to sub- contractor free of hire charges shall be shared by other subcontractors working for BHEL at site and the allotment done by BHEL Engineer shall be final and binding.
4.2.2.2	BHEL T&P will be issued in basic assembled condition. Additional loose components / sub-assemblies / attachments as and when necessary, will be issued by BHEL. Assembly of such additional loose components/sub-assemblies/ attachments is in contractor's scope.
4.2.2.3	In case of non-availability of the T&Ps to be provided by BHEL due to breakdown, major overhauls, distribution pattern or any other reason, the contractor shall plan / amend / alter his activities to meet erection / commissioning targets in consultation with BHEL.
4.2.2.4	**void**
4.2.2.5	The contractor shall engage trained and experienced operators for the operation of BHEL's T&Ps. Their skill / performance will be checked by BHEL Engineer before they are allowed to operate the same. However checking of skills by BHEL does not absolve the contractor of his responsibilities for proper and safe handling of equipment, consistent good performance of operators and regular performance evaluation of operators.
4.2.2.6	void
4.2.2.7	Void
4.2.2.8	Increasing / shortening of the crane boom to suit work requirements shall have to be arranged by the indenting contractor at his cost including restoration to a state as directed by BHEL. All necessary manpower tools, support, consumables, illumination etc. will have to be arranged by contractor at his cost. If required,
4.2.2.9	The area and infrastructure development of the area to be carried out by the customer. However, in construction projects of this magnitude it is possible that all the areas / approaches may not be ready. In such cases backfilling of approaches where ever necessary, consolidation of ground and arrangement of sleepers / sand bag filling etc., for safe operation / movement of equipment including cranes / trailers etc., shall be the responsibility of the contractor at his cost. No compensation on this account shall be payable.
4.2.2.10	Void
4.2.2.11	Void
4.2.2.12	Void
4.2.2.13	Void
4.2.2.14	Void
4.2.2.15	Void
4.2.2.17	Void.

SPECIAL CONDITIONS OF CONTRACT (SCC)

Chapter – V: Responsibilities of Contractor in respect of Labour, Supervisory Staff, etc.

5.0	**RESPONSIBILITIES OF CONTRACTOR IN RESPECT OF LABOUR, SUPERVISORY STAFF, ETC.**
5.1	Refer relevant clauses of General Conditions of Contract (GCC) also in this regard
5.2	The contractor shall deploy all the necessary skilled, semiskilled, unskilled labour including highly skilled workmen etc. These workmen should have previous experience on similar job. They shall hold valid certificates wherever necessary. BHEL reserves the right to insist on removal of any employee of the contractor at any time if he is found to be unsuitable and the contractor shall forthwith remove him.
5.3	Contractor shall also comply with the requirements of local authorities/ project authorities calling for police verification of antecedents of the workmen, staff etc.
5.4	It is the responsibility of the contractor to engage his workmen in shifts and or on overtime basis for achieving the targets set by BHEL. This target may be set to suit BHEL's commitments to its customer or to advance date of completion of events or due to other reasons. The decision of BHEL in regard to setting the erection and commissioning targets will be final and binding on the contractor.
5.5	Contractor shall provide at different elevation suitable arrangement for urinal and drinking water facility with necessary plumbing & disposal arrangement including construction of septic tank. These installations shall be maintained in hygienic condition at all times.
5.6	The Contractor in the event of engaging 20 or more workmen, shall obtain Independent license under the Contract labour (Regulation and Abolition) Act 1970 from the concerned authorities based on Form-V issued by the Principal Employer/Customer. In order to issue Form-V by Customer, Contractor shall fulfill all Statutory requirements like Insurance Policy, PF Code/PF Account number etc. as per the requirement of BHEL/Customer.
5.7	Contractor shall deduct the necessary amount towards Provident Fund and contribute equal amount as per Government of India laws. This amount will be deposited regularly to the provident Fund Commissioner. BHEL/Customer may insist for submission of the account code duly certified by PF Commissioner.
5.8	Contractor may also be required to comply with provisions of ESI Act in vogue if applicable and submit evidence to BHEL.
5.9	BHEL / customer may insist for witnessing the regular payment to the labour. They may also like to verify the relevant records for compliance with statutory requirements. Contractor shall enable such facilities to BHEL / Customer.
5.10	Contractor shall deploy only qualified and experienced engineers/ supervisors. They shall have professional approach in executing the work.
5.11	The contractor's supervisory staff shall execute the work in the most professional manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. They shall be responsible to ensure that the assembly and workmanship conform to dimensions and tolerances given in the drawings / instructions given by BHEL engineer from time to time.
5.12	The supervisory staff employed by the contractor shall ensure proper outturn of work and discipline on the part of the labour put on the job by the contractor. Also in general they should see that the works are carried out in a safe and proper manner and in coordination with other labour and staff employed directly by BHEL or other contractors of BHEL or BHEL's client.
5.13	It is the responsibility of the contractor to arrange gate pass for all his employees, T&P etc for entering the project premises. Necessary coordination with customer officials is the responsibility of the contractor. Contractor to follow all the procedures laid down by the customer for making gate passes. Where permitted, by customer / BHEL, to work beyond normal working hours, the contractor shall arrange necessary work permits for working beyond normal working hours.
5.14	The actual deployment of Labour and Engineer/supervision staff shall be so as to satisfy the erection and commissioning targets set by BHEL. If at any time, it is found that the contractor is not in a position to deploy the required engineers/supervisors/workmen due to any reason, BHEL shall have the option to make alternate arrangements at the contractor's risk and cost. The expenditure incurred along with BHEL overheads thereon shall be recovered from the contractor
5.15	Contractor shall not deploy women labour at night.

SPECIAL CONDITIONS OF CONTRACT (SCC)

Chapter – VI: Material Handling, Storage & preservation

6.0	**MATERIAL HANDLING, STORAGE AND PRESERVATION ETC**
6.1	**MATERIAL HANDLING AND STORAGE**
6.1.1	All the equipments/materials furnished under this contract shall be received from the project stores, sheds / storage yards and transported to pre assembly area / erection site and stored in the storage spaces in a manner so that they are easily retrievable till the contractor erects them. **While drawing/lifting material from BHEL / customer stores, the contractor shall ensure that the balance / other materials are stacked back immediately. No claim is admissible on this account**
6.1.2	While BHEL will endeavor to store / stack / identify materials properly in their open / close / semi closed / tarpaulins covered storage yard / shed, it shall be contractor's responsibility to assist BHEL in identifying materials well in time for erection. They should take the delivery of the same, following the procedure indicated by BHEL, and transport the material safely to pre-assembly yard / erection site in time, according to program.
6.1.3	The contractor shall take delivery of components, equipment / consumables from storage area after getting the approval of BHEL Engineer on standard indent forms.
6.1.4	The contractor shall identify and deploy necessary Engineers / supervisors / workmen for the above work in sufficient number as may be needed by BHEL, for areas covering their scope.
6.1.5	All the equipment shall be handled very carefully to prevent any damage or loss. No untested wire ropes / slings etc. shall be used for unloading / handling. The equipment shall be properly protected to prevent damage either to the equipment or to the floor where they are stored. The equipment from the stores shall be moved to the actual location at the appropriate time so as to avoid damage of such equipment at site.
6.1.6	Contractor shall ensure that while lifting slings shall be put over the points indicated on the equipment or as indicated in the manufacturer's drawings. Slings / shackles of proper size shall be used for all lifting and rigging purposes. All care shall be taken to safe guard the equipment against any damage. Dragging of piping / valves should be avoided. In case of any damage the cost shall be covered from the contractor.
6.1.7	Approach road conditions from the stores / yards to the erection site may not be equipped and ideal for smooth transportation of the equipment. Contractor may have to be adequately prepared to transport the materials under the above circumstances without any extra cost. . The contractor may familiar himself with soil conditions at site.
6.1.8	Contractor shall be responsible for examining all the plant and materials issued to him and notify the Engineer immediately of any damage, shortage, discrepancy etc., before they are moved out of the stores / storage area. The contractor shall be solely responsible for any shortages or damages in transit, handling, storage and erection of the equipment once received by him. As the erection work will be spread in different areas / locations of the project, contractor has to arrange sufficient number of watch / ward personal to avoid any pilferage of material.
6.1.9	The contractor shall maintain an accurate and exhaustive record-detailing out the list of all equipment received by him for the purpose of erection and keep such record open for the inspection of the engineer at any time.
6.1.10	All the material in the custody of contractor and stored in the open or dusty locations must be covered with suitable weather proof / fire retardant covering material wherever applicable and shall be blocked up on raised level above ground. All covering materials including blocks and sleeper shall be arranged by the contractor at his cost.
6.1.11	If the material belonging to the contractor are stored in area other than those earmarked for his operation the engineer will have the right to get it moved to the area earmarked for the contractor at the contractors risk and cost.
6.1.12	The contractor shall be responsible for making suitable indoor storage facilities to store all equipment (drawn by the contractor from BHEL / customer stores), which require indoor storage till the time of their installation. The Engineer will direct the contractor in this regard, which item in his opinion will require indoor storage, and the contractor shall comply with Engineer's decision.

SPECIAL CONDITIONS OF CONTRACT (SCC)

Chapter – VI: Material Handling, Storage & preservation

6.1.13	The contractor shall ensure that all surplus / damaged / scrap / unused material, packing wood / containers/ special transporting frames etc. are returned to BHEL at a place in project area identified by the Engineer. The contractor will maintain an account for all items received and returned to BHEL. Any shortage in returning such items shall be chargeable to the contractor except allowable wastage for packing wood only.
6.1.14	The contractor shall hand over all parts / materials remaining extra over the normal requirement with proper identification tags to the stores as directed by the concerned BHEL engineer.
6.1.15	The contractor shall ensure that all the packing materials and protective devices installed on equipment during transit and storage are removed before installation.
6.1.16	It shall be the responsibility of the contractor to keep the work / storage areas in neat, tidy and working conditions. All surplus/unusable packing and other materials shall be removed and deposited at location(s) specified by BHEL within the project premises. If required weighing of the same within the project premises will have to be carried out.
6.2	**PRESERVATION OF COMPONENTS**
6.2.1	After taking delivery from BHEL / customer's stores, plant materials storage shall be subjected to the following protection besides other provisions indicated in these specifications elsewhere.
6.2.1.1	Items stored outdoors shall be stacked up at least six inches (6") off the ground. Items should not be stored in a low lying area where water logging is a possibility. Contractor should have sufficient numbers of wooden / concrete / steel sleepers for the job.
6.2.1.2	Motors, valves, electrical equipment, control equipment and instruments, and special or precision items requiring special care, etc. shall be stored indoors. Motor windings shall be kept dry by use of external heat or space heaters.
6.2.1.3	Bearings and other wearing surfaces of plant materials shall be protected against corrosion and kept clean and should be regularly monitored.
6.2.1.4	Insulation materials shall be stored indoors or otherwise protected against getting wet/ damaged, using suitable measures and should be protected from direct rain.
6.2	**PRESERVATION OF COMPONENTS**
6.2.1	After taking delivery from BHEL / customer's stores, plant materials storage shall be subjected to the following protection besides other provisions indicated in these specifications elsewhere.
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6.2.1.3	Bearings and other wearing surfaces of plant materials shall be protected against corrosion and kept clean and should be regularly monitored.
6.2.1.4	Insulation materials shall be stored indoors or otherwise protected against getting wet/ damaged, using suitable measures and should be protected from direct rain.
6.2.2	It shall be the responsibility of the contractor to apply preservatives / touch up paints (primer) on equipment handled and erected by him till such time of final painting. It shall be contractor's responsibility to arrange for required paints (primer), thinners, labour, scaffolding materials, cleaning materials like wire brush, emery sheets, etc., cleaning of surface and provide one coat of preservatives / paints (primer) from time to time as decided by BHEL engineer. The accepted rate shall include this work also. It is to be noted that such painting may have to be done as and when required till such time the final painting is carried out.
6.2.3	The contractor shall effectively protect the finished work from action of weather and from damage or defacement and shall cover the finished parts then and there for their protection.
6.2.4	Any failure on the part of contractor to carry out works according to above clauses will entail BHEL to carry out the job from any other party and recover the cost from contractor.

SPECIAL CONDITIONS OF CONTRACT (SCC)
Chapter – VII: Drawings and documents

7.0	**DRAWINGS AND DOCUMENTS**
7.1	The detailed drawings, specifications available with BHEL engineers will be made available to the contractor during execution of work at site. The contractor will also ensure availability of all drawings / documents at work place.
7.2	Necessary drawings to carry out the erection work will be furnished to the contractor by BHEL on loan, which shall be returned to BHEL Engineer at site after completion of work. Contractor shall ensure safe storage and quick retrieval of these documents.
7.3	The contractor shall maintain a record of all drawings and documents available with him in a register as per format given by BHEL Engineer. Contractor shall ensure use of pertinent drawings / data / documents and removal of obsolete ones from work place and returning to BHEL.
7.4	The data furnished in various annexure enclosed with this tender specification are only approximate and for guidance. However, the change in the design and in the quantity may occur as is usual in any such large scale of work. The contractors quoted rates shall be inclusive of the above factor
7.5	Should any error or ambiguity be discovered in the specification or information the contractor shall forthwith bring the same to the notice of BHEL before commencement of work. BHEL's interpretation in such cases shall be final and binding on the contractor.
7.6	Deviation from design dimensions should not exceed permissible limit. The contractor shall not correct or alter any dimension / details, without specific approval of BHEL.

SPECIAL CONDITIONS OF CONTRACT (SCC)

Chapter – VIII: Inspection and Quality

8.0	**INSPECTION AND QUALITY**
8.1	**Inspection, Quality Assurance, Quality Control**
8.1.1	Preparation of quality assurance log sheets and protocols with customer/ consultants/statutory authority, welding logs, NDE records, testing & calibration records and other quality control and quality assurance documentation as per BHEL engineer's instructions, is within the scope of work/specification. These records shall be submitted to BHEL/customer for approval from time to time.
8.1.2	The protocols between contractor and customer/ BHEL shall be made prior to installation for correctness of foundations, materials, procedures, at each stage of installation, generally as per the requirement of customer/ BHEL. This is necessary to ensure elimination of errors or keeping them within tolerable limits and to avoid accumulation and multiplication of errors.
8.1.3	A daily log book should be maintained by every supervisor/engineer of contractor on the job in duplicate (one for BHEL and one for contractor) for detailing and incorporating alignment/clearance / centering / leveling readings and inspection details of various equipments etc. High pressure welding details like serial number of weld joints, welders name, date of welding, details of repair, heat treatment etc. will be documented in welding log as per BHEL Engineer's instructions. Record of radiography containing details like serial number of weld joints, date of radiography, repairs, if any, re-shots etc. shall also be maintained as per BHEL Engineer's instructions. **Record of heat treatments performed shall be maintained as prescribed by BHEL**
8.1.4	The performance of welders will be reviewed from time to time as per the BHEL standards. Welders' performance record shall be furnished periodically furnished for scrutiny of BHEL's Engineer. Corrective action as informed by BHEL shall be taken in respect of those welders not conforming to these standards. This may include removal/ discontinuance of concerned welder(s). Contractor shall arrange for the alternate welders immediately
8.1.5	All the welders shall carry identity cards as per the proforma prescribed by BHEL/ Customer/Consultant. Only welders duly authorized by BHEL/customer/consultant shall be engaged on the work.
8.1.6	Contractor shall provide all the Measuring Monitoring Equipments (MMEs) required for completion of the work satisfactorily. These MMEs shall be of brand, quality and accuracy specified by BHEL Engineer and should have necessary calibration and other certificates as per the requirement of BHEL Engineer. Decision of BHEL Engineer regarding acceptance or otherwise of the measuring instruments/gauges/tools for the work under this specification, is final and binding on the contractor. BHEL may give an indicative list of MMEs required for this work and to be made available by the contractor. The list will be reviewed by BHEL and the contractor shall meet any augmentation needed wherever required.
8.1.7	It is the responsibility of the contractor to prove the accuracy of the testing/measuring/calibrating equipments brought by him based on the periodicity of calibration as called for in the BHEL's quality assurance standards/BHEL Engineer's instructions.
8.1.8	Any re-laying or re-termination of cables/re-erection of instruments/ recalibration of instruments etc. required due to contractor's mistake or design requirement and found at any stage inspection, shall be carried out by the contractor at no extra cost.
8.1.9	BHEL have already been accredited with ISO 9001 certification and as such this work is subject to various audits to meet ISO 9001 requirements. One particular aspect which needs special mention is about arrangement of calibration of instruments by the contractor. Contractor shall ensure deployment of reliable and calibrated MMEs (Measuring and Monitoring Equipments). The MMEs shall have test / calibration certificates from authorized / Government approved / Accredited agencies traceable to National / International Standards. Re-testing / re- calibration shall also be arranged at regular intervals during the period of use as advised by BHEL Engineer within the contract price. The contractor will also have alternate arrangements for such MMEs so that work does not suffer when the particular equipment / instrument is sent for calibration. Also if any MMEs not found fit for use, BHEL shall have the right to stop the use of such item and instruct the contractor to deploy proper item and recall ie repeat the readings taken by that instrument, failing which BHEL may deploy MME and retake the readings at Contractor's cost.

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8.1.10	Re-work necessitated on account of use of invalid MMEs shall be entirely to the contractor's account. He shall be responsible to take all corrective actions, including resource augmentation if any, as specified by BHEL to make-up for the loss of time.
8.1.11	In the courses of erection, it may become necessary to carry repeated checks of the work with instruments recently calibrated, re-calibrated. BHEL may counter/ finally check the measurements with their own MMEs. Contractor shall render all assistance in conduct of such counter/final measurements.
8.1.12	Total Quality is the watchword of the work and Contractor shall strive to achieve the Quality Standards, procedures laid down by BHEL. He shall follow all the instructions as per BHEL drawings and Quality Standards.
8.2	**Stage Inspection By FES/QA Engineers**
8.2.1	Apart from day-to-day inspection by BHEL Engineers stationed at Site and Customer's Engineers, stage inspection of equipments under erection and commissioning at various stages shall also be conducted by teams of Engineers from Field Engineering Services of BHEL's Manufacturing Units, Quality Assurance teams from Field Quality Assurance, Unit/Factory Quality Assurance and Commissioning Engineers from Technical Services etc. Contractor shall arrange all labour, tools and tackles etc. along with proper access for such stage inspections free of cost.
8.2.2	Any modifications suggested by BHEL FES and QA Engineers' team shall be carried out by contractor.
8.3	**Statutory Inspection of Work**
8.3.1	The work to be executed under these specifications has to be offered for inspection, at appropriate stages of work completion, to various statutory authorities for compliance with applicable regulations. The work related statutory inspections, though not limited to, are as under: **1)** Inspectorate of Steam Boilers and Smoke Nuisance **2)** Electrical Inspector **3)** Factory Inspector, Labour Commissioner, PF Commissioner and other authority connected to this project work The scope includes getting the approvals from the statutory authorities, which includes arranging for inspection visits of statutory authority periodically as per BHEL Engineer's instructions, arranging materials for ground inspection, taking rub outs for the pressure parts to be offered for inspection, submitting co-related inspection reports, documents, radiographs etc. and following up the matter with them. Contractor shall also make all arrangements for offering the Products / Systems for inspection at location, as applicable, to the concerned authority.
8.3.2	Contractor should be qualified to execute pressure parts & piping work coming under the purview of IBR, for which he should register himself with CIB of state concerned. Contractor also should be aware of the latest IBR regulations and Electricity Act, including the amendments thereof.
8.3.3	Contractor shall comply with 'Qualification Tests for welders engaged in welding of Boilers and Steam Pipes under Construction, Erection and Fabrication at Site in India and in repairing Boilers and steam pipes by welding' in line with Chapter XIII of Indian Boiler Regulations-1950, for testing his welders / men / workers, including all associated fees, procedures, required instruments and equipments and their calibration thereof, shall be contractor's responsibility to obtain approval of Statutory Authorities, wherever applicable, for the conducting of any work which comes under the purview of these authorities, at his cost.
8.3.4	The following fees shall be excluded from scope of Contractor: 1. Registration Fee as per Regulation 385 of Chapter IX of Indian Boiler Regulations-1950 2. Fees for inspection of Boiler at the site of Construction as per Regulation 395 A, Sl. No. 4 of Chapter IX of Indian Boiler Regulations-1950 However all other fees like visit fees charged by the Boiler Inspector and other arrangements for his visit or visits till satisfactory completion of work, shall be included in scope of Contractor

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8.4	The Quality Management System of BHEL- HPVP have already been certified and accredited under ISO 9002 standards in this regard. The basic philosophy of the Quality Management System is to define the organizational responsibility, work as per documented procedures, verify the output with respect to acceptance norms, identify the non-conforming product/ procedure and take corrective action for removal of non-conformance specifying the steps for avoiding recurrence of such non-conformities, & maintain the relevant quality records. The non-conformities are to be identified through the conduct of periodical audit of implementation of quality systems at various locations/stages of work. Suppliers/vendors of various products/services contributing in the work are also considered as part of the quality management system. .as such the contractor is expected not only to conform to the quality management system of BHEL but also it is desirable that they themselves are accredited under any quality management system standard.
8.5	**Field Quality Assurance**
8.5.1	Contractor shall carry out all activities conforming to the approved Field Quality Plan (FQP) as revised from time to time. Total quality shall be the watchword of the work and contractor shall strive to achieve the quality standards, procedures laid down by BHEL. He shall follow all the instructions as per BHEL drawings and quality standards. Contractor shall provide the services of quality assurance engineer as per the relevant clauses.

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9.0	**OCCUPATIONAL HEALTH, SAFETY & ENVIRONMENT MANAGEMENT/ QUALITY ASSURANCE PROGRAMME:** BHEL, HPVP is certified for ISO 9001. Quality of work to customer's satisfaction and fulfilment of system requirements are the essence of ISO 9001 certification. BHEL, have HSE certification (ISO 14001 & OHSAS 18001) and therefore Contractor also shall organize/ plan/ perform all their activities to meet with the applicable requirements of these standards.
9.1	**HSE (Health, safety & Environment):** Contractor will comply with HSE (Health, safety & Environment) requirements of BHEL. HSE requirements in brief, are given below :-
9.1.1	Contractor will nominate one of their qualified and experienced employees as Safety Officer, who will be responsible for all HSE related issues of contractor's work area. Safety Officer will have authority to stop any activity, in case he observes that the activity is not being carried out in safe manner. He will conduct surprise inspection as well as periodic inspection/drill (at least once in a month) and submit such reports to BHEL. He will conduct periodic meetings with supervisors of different working groups and explain HSE issues and use of PPEs to them. Reports of such meetings will be submitted to BHEL. Contractor will develop suitable work procedures based upon HSE guidelines and OCPs and implement it. Such work procedures will consist of Area of work, T&P Details, Work Procedure, and PPE requirements etc. Please refer Schedule VIII of BOCW Rules for number of safety officers, qualification, duties etc. Contractor should highlight the requirement of safety to staff and labour through daily tool box meeting before start of the day's job. Contractor to also submit monthly safety reports as per the format/procedure of BHEL.
9.1.2	The contractor shall arrange induction and regular health check of their employees as per schedule VII of BOCW rules by a registered medical practitioner. The contractor shall take special care of the employees affected with occupational diseases under rule 230 and schedule II of BOCW Rules. The employees not meeting the fitness requirement should not be engaged for such job
9.1.3	Following personnel protective equipments (PPEs), in adequate numbers, will be made available at site & their regular use by all concerned will be ensured: - - HELMET - SAFETY GOGGLES & WELDING FACE SHIELDS - SAFETY BELTS AND PROTECTIVE NET FOR WORKING AT HEIGHT - SAFETY SHOES - EAR PLUG - ANY OTHER SAFETY EQUIPMENT REQUIRED FOR SAFE COMPLETION OF THE WORK Contractor to also submit monthly reports on above as per the format/procedure of BHEL/ Consultant / customer.
9.1.4	Providing appropriate First Aid facilities for prompt treatment of injuries and illness at work place. Arranging training to contractor workmen/ employees for giving first aid.
9.1.5	Arranging ambulance in case of any emergency situation.
9.1.6	Identification of nearest hospital and health check-up of workmen/employees
9.1.7	Providing filtered drinking water at work place in cool container.
9.1.8	Providing Canteen, Rest Room, Washing facilities to the contracted employees as per provisions of Contract Labour Regulation Act 1970 (Chapter V).
9.1.9	Providing appropriate firefighting equipment at designated work place and nominate a fire officer/ warden adequately trained for his job.
9.1.10	Identification of nearest fire station and display contact telephone nos./ person's name around work places for cases of emergencies .
9.1.11	Providing adequate no. of 24 V sources and ensure that no hand lamps are operating at voltage level above 24 Volts.
9.1.12	Fulfilling safety requirements at all power tapping points.

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9.1.13	Red & White caution tape of proper width(1.5 to 2 inch) to be used for cordoning unsafe area such as open trench, excavation area etc.
9.1.14	Providing contractors company logo on cloths /uniform/ proper identity cards with photographs, for correct identification of people working at project site.
9.1.15	High/ Low pressure welders to be identified with separate colour clothings. No welders will be deployed without passing appropriate tests and holding valid welding certificates. Approved welding procedure should be displayed at work place.
9.1.16	Displaying safe handling procedures for all chemicals such as lube oil, acid, alkali, sealing compounds etc , at work place.
9.1.17	All scaffolding/ platforms should be made from materials of appropriate quality/grade so that these are safe for use. It should be certified/declared safe for use by an experienced contractor person, before any scaffolding/platform is used. Please refer IS:3696 part 1&2 and 4014 part 1 & 2
9.1.18	All T&Ps/ MMEs should be of reputed brand/appropriate quality & must have valid test/calibration certificates bearing endorsement from competent authority of BHEL. Contractor to also submit monthly reports of T&Ps deployed and validity test certificates to BHEL safety Officer as per the format/procedure of BHEL.
9.1.19	Ensure that the regulatory requirement of excessive weight limits (to carry/lift/ move weights beyond prescribed limits) for male and female workers are complied with.
9.1.20	Safety slogan, Safety/ Caution boards, wherever required to be displayed in consultation with BHEL.
9.1.21	Take suitable measures for waste management and environment related laws/legislation as a part of normal construction activities. Compliance with the legal requirements on storage/ disposal of paint drums (including the empty ones), Lubricant containers, Chemical Containers, and transportation and storage of hazardous chemicals will be strictly maintained. Ensure proper cleanliness of work place, housekeeping and waste management (including proper waste disposal) on daily basis.
9.1.22	It is imperative on the part of the contractor to join and effectively contribute in joint measures such as tree plantation, environment protection, contributing towards social upliftment, conversion of packing woods to school furniture, keeping good relation with local populace etc.
9.1.23	The contractor shall carry out periodic air and water quality check and illumination level checking in his area of work place and take suitable control measure.
9.1.24	The Contractor is required to provide proper safety net systems (IS-11057) where ever the hazard of fall from height is present as per instruction of BHEL Engineer. The safety nets shall be fire resistant, duly tested and shall be of ISI Mark and the nets shall be located as per site requirements to arrest or to reduce the consequences of a possible fall of persons working at different heights.
9.1.25	Void..
9.2.	**SAFETY AND CLEANLINESS:** The contractor shall take all necessary safety precautions and arrange for appropriate appliances as per discretion of BHEL or its authorised officials (Site Construction Manager) to prevent loss of human lives, injuries, to personnel engaged and damage to property. Before commencing the work, the contractor shall submit a "Safety Plan" to the above authorised BHEL official and obtain approval on the same. The safety plan shall indicate in detail the measures that would be taken by the contractor to ensure safety of men, equipment, materials and environment during execution of the work. This will also include an organization structure, role and responsibilities of the concerned key personnel, the safety practices that will be followed, PPEs deployed, plan for handling critical activities and emergencies.
9.3	If the contractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instructions issued by the authorised BHEL official, BHEL shall have the right to take corrective steps at the risk and cost of the contractor.
9.4	During the course of construction, alternation or repairs, scrap with protruding nail, sharp edge etc. and all other debris shall be kept clean from working areas, passage, ways and stairs in and around site.
9.5	Combustible scrap and debris shall be removed at regular intervals during the course of execution. Safe means shall be provided to facilitate such removal. The combustible scrap should be stored in safe place away from the plant materials to avoid fire accidents. The area shall be chosen in consultation with the Engineer and to be cordoned off.

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9.6	Rigging equipment for materials handling shall be inspected prior to use in each shift and as necessary during its use to ensure that it is safe. Defective rigging equipment will be removed from service.
9.7	Rigging equipment shall not be loaded in excess of its recommended safe working load. Rigging equipment, when not in use, shall be removed from the original work area so as not to present a hazard to employees.
9.8	Contractor shall notify the engineer, of his intention to bring on to site any equipment or any container, with liquid or gaseous fuel or other substance which may create a hazard. The Engineer shall have the right to prescribe the condition under which such equipment or container may be handled and used during the performance of the works and the contractor shall strictly adhere to such instructions. The Engineer shall have the right to inspect any construction tool and to forbid its use, if in his opinion it is unsafe. No claim due to such prohibition will be entertained.
9.9	Where it is necessary to provide and/or store petroleum products or petroleum mixture & explosives, the contractor shall be responsible for carrying out such provision / storage in accordance with the rules & regulations laid down in the relevant petroleum act, explosive act and petroleum and carbide of calcium manual, published by the chief inspector of explosives of India. All such storage shall have prior approval if necessary from the chief inspector of explosives or any other statutory authority. The contractor shall be responsible for obtaining the same.
9.10	Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally dragged, struck or permitted to strike each other violently.
9.11	When cylinders are transported by powered vehicle they shall be secured in a vertical position.
9.12	All workmen of the contractor working on construction area shall wear safety shoes, hand gloves, safety helmets and safety belt as applicable. The contractor shall provide to its workforce and ensure the use of following personnel protective equipment as found necessary and as directed by BHEL.
9.12.1	Safety Helmets conforming to IS-2925 : 1984
9.12.2	Safety Belts conforming to IS-3521:1983
9.12.3	Safety Shoes conforming to IS-1989 : 1978
9.12.4	Eye and face protection devices conforming to IS – 1179:1967, IS 5983:1980, IS 8521 Part 1:1977, IS 8521 Part 2: 1994.
9.12.5	Hand and body protection devices conforming to IS 4770:1991 and IS- 6994: Part 1: 1973, IS – 8619 : 1977
9.12.6	Ear protection IS-9167:1979
9.12.7	Respiratory Protective Devices as per IS-9473:2002, i4746:1999 and 14166:1994
9.13	The contractor shall insure his workmen against all accidents and the policy shall be presented to BHEL Engineer on demand. Otherwise, BHEL will arrange the same and the expenditure towards this will be debited to the contractor. In case of a fatal or disabling injury accident to any person at construction site due to lapses by the contractor, the victim and/or his/her dependents shall be compensated by the contractor as per statutory requirements. However, if considered necessary BHEL shall have the right to impose appropriate financial penalty on contractor and recover the same from payments due to the contractor for suitably compensating the victim and/or his/her dependence before imposing any such penalty. Appropriate enquiry shall be held by BHEL giving opportunity to the contractor for presenting his case. Above safety conditions are not exhaustive but give an idea for the contractor and contractor shall adhere to all safety precaution given by the Engineer at site.
9.14	The contractor shall arrange at his cost adequate lighting facilities e.g. flood lighting, hand lamps, area lighting etc. at various levels for safe and proper working operations during night hours at the work spot as well as at the pre-assembly area.
9.15	The contractor shall be responsible for provision of all the safety notices and safety equipment as enjoined on him by the application of relevant statutory regulation / provisions and/or as called upon by BHEL from time to time. He shall be held responsible for any violation of statutory regulations (local, state or central) and BHEL instruction that may endanger safety of men, equipment and material.
9.16	The contractor shall provide temporary fencing wherever required as a safety measure against accident and damage to properties. Suitable caution notices shall be displayed where access to any part is found to be unsafe and hazardous.
9.17	Contractor shall ensure safety of all the workmen, material and equipment either belonging to him or to others working at site. He shall observe safety rules and codes applied by BHEL without exception.

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9.18	It will be the responsibility of the contractor to ensure safe lifting of the equipment, taking due precaution to avoid any accident and damage to other equipment and personnel. All requisite tests and inspection of handling equipment, tools & tackle shall be periodically done by the contractor by engaging only the COMPETENT PERSONS as per law. Defective equipment or uncertified shall be removed from service. Any equipment shall not be loaded in excess of its recommended safe working load.
9.19	The contractor shall provide necessary first aid facilities as per schedule III. In addition, ambulance facilities, OHC and CMO as per schedule IV, V, X and XI of BOCW Rules as applicable for all his employees, representatives and workmen at site and BHEL shall have no obligation in this regard. The first aid boxes should be placed at various elevations so as to make them available within the reach and at the quickest possible time. The contractor should conduct periodical first –aid classes to keep his supervisor and Engineers properly trained for attending to any emergency.
9.20	Training
9.20.1	The contractor shall arrange induction safety training for all employees before assigning work. In addition, awareness programme, mock drill at regular intervals and daily tool box meetings shall be arranged. Monthly report of the above to be given to BHEL safety Officer as per prescribed BHEL formats.
9.20.2	All the contractor's supervisory personnel and sufficient number of workers shall be trained for fire protection systems. Enough number of such trained personnel must be available during the tenure of contract. Contractor should nominate his supervisor to coordinate and implement the safety measures.
9.21	Contractor shall provide enough fire protecting equipment of the types and numbers at his office, stores, temporary structure in labour colony etc. Such fire protection equipment shall be easy and kept open at all times. The fire extinguishers shall be properly refilled and kept ready which should be certified at periodic intervals. The date of changing should be marked on the Cylinders. All other fire safety measures as laid down in the "codes for fire safety at construction site" issued by safety coordinator of BHEL shall be followed. Non-compliance of the above requirement under fire protection shall in no way relieve the contractor of any of his responsibility and liabilities to fire accident occurring either to his materials or equipment or those of others. Emergency contacts nos must be displayed at prominent locations.
9.22	The contractor shall at his cost, remove from vicinity of work at least once each day all combustible waste, scrap, panting materials, rubbish, unused or other materials and deposit them in places specified by BHEL to keep the work site clear and tidy. Use of undercoated canvas paper, corrugated paper, fabricated carton, plastic or other flammable materials shall be restricted to the minimum and promptly removed.
9.23	The contractor shall not use any hand lamp energized by Electric power with supply voltage of more than 24 volts in confined spaces like inside water boxes, turbine casings, condensers etc.
9.24	All portable electric tools used by the contractor shall have safe plugging system to source of power and be appropriately earthed. Only electricians licensed by appropriate statutory authority shall be employed by the contractor to carry out all types of electrical works. Details of earth resource ad their test dates to be given to BHEL safety officer as per the prescribed formats of BHEL.
9.25	In case of any delay in completion of a job due to mishaps attributable to lapses by the contractor, BHEL shall have the right to recover cost of such delay from the payments due to the contractor, after notifying the contractor suitably.
9.26	Valve protection caps shall be kept in place and secured.
9.27	The contractor shall be responsible for the safe storage and handling of his radio-active sources as per BARC rules and regulations.
9.28	Tarpaulin being inflammable should not be used (instead, only non-infusible covering materials shall be used) as protective cover while preheating, welding, stress relieving etc. at site.

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9.29	If the contractor fails to improve the standards of safety in its operation to the satisfaction of BHEL after being given reasonable opportunity to do so and/or if the contractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instruction regarding safety issued by BHEL, BHEL shall have the right to take corrective steps at the risk and cost of the contractor after giving a notice of not less than 7 days indicating the steps that would be taken by BHEL.
9.30	If the contractor succeeds in carrying out its job in time without any fatal or disabling injury accident and without any damage to property BHEL may, at its sole discretion, favourably consider to reward the contractor suitably for the performance.
9.31	The contractor shall carefully follow the safety requirement of BHEL/ the purchaser with the regard to voltages used in critical areas.
9.32	The contractor shall use only properly insulated and armoured cables which conform to the requirement of Indian Electricity Act and Rules for all wiring, electrical applications at site. BHEL reserves the right to replace any unsafe electrical installations, wiring, cabling etc. at the cost of the contractor. All electrical appliances used in the work shall be in good working condition and shall be properly earthed. No maintenance work shall be carried out on live equipment. The contractor shall maintain adequate number of qualified electricians to maintain his temporary electrical installations. Area wise Electrical safety inspection is to be carried out on monthly basis as per "Electrical Safety Inspection checklist' and the report is to be submitted to BHEL safety officer.
9.33	The contractor shall arrange adequate number of persons specifically for clearing any debris and for housekeeping of the erection area including restacking of components in the erection areas. Housekeeping to be carried out as per BHEL's check list and report is to be submitted to BHEL safety officer.
9.34	In case of any damage to property due to lapses by the contractor, BHEL shall have the right to recover the cost of such damages from the contractor after holding an appropriate enquiry.
9.35	The contractor shall submit report of all accidents, fires and property damage etc. to the Engineer immediately after such occurrence, but in any case not later than 24 hours of the occurrence. Such reports shall be furnished in the manner prescribed by BHEL. In addition, periodic reports on safety shall also be submitted by the contractor to BHEL from time to time as prescribed by the Engineer. Compiled monthly reports of all kinds of accidents, fires and property damage to be submitted to BHEL safety officer as per prescribed formats
9.36	Before commencing the work, the contractor shall appoint / nominate a responsible person to supervise implementation of all safety measures and liaison with his counterpart of BHEL.
9.37	Suitable scaffolds shall be provided for workman for all works that cannot safely be done from the ground, or from solid construction except in the case of short duration of work which can be done safely from ladders. When a ladder is used, it shall be of rigid construction made of steel. The steps shall have a minimum width of 45 cm and a maximum rise of 30 cm. Suitable handholds of good quality wood or steel shall be provided and the ladder shall be given an inclination not steeper than ¼ horizontal and 1 vertical.
9.38	Scaffolding or staging more than 3.6 m above the ground floor, swung or suspended from an overhead support or erected with stationery support shall have a guard rail properly bolted, braced or otherwise secured, at least 90 cm above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from saver, from swaying, from the building or structure.
9.39	Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally and if the height of the platform gangways provided is more than 3.6 m above ground level or floor level, they shall be closely boarded and shall have adequate width which shall not be less than 750 mm and be suitably fenced as described above.
9.40	Every opening in the floor or a building or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 90 cm.

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9.41	Wherever there is open excavation in ground, they shall be fenced off by suitable railing and danger signals installed at night so as to prevent persons slipping into the excavations.
9.42	Safe means of access shall be provided to all working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 m in the length while the width between side rails in rung ladder shall in no case be less than app. 29.2 cm for ladder up to and including 3 m in length. For longer ladders this width shall be increased at least ¼'' for each additional foot of length.
9.43	A sketch of the ladders and scaffolds proposed to be used shall be prepared and approval of the Engineer obtained prior to Construction.
9.44	All personnel of the Contactor working within the plant site shall be provided with safety helmets. All welders shall wear welding goggles while doing welding work and all metal worker shall be provided with safety gloves. Persons employed on metal cutting and grinding shall wear safety glasses.
9.45	Adequate precautions shall be taken to prevent danger for electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public.
9.46	All trenches, four feet or more in depth, shall at all times be supplied with at least one ladder for each 30 m in length or fraction thereof. The ladder shall be extended from bottom of the trench to at least 90 cm above the surface of the ground. Sides of the trenches which are 1.50 m or more in depth shall be stepped back to give suitable slope or securely held by timer bracing, so as to avoid the danger of sides collapsing. The excavated materials shall not be placed within 1.5 m of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done.
9.47.1	The contractor shall take permission of BHEL prior to risky jobs such as working at height, hot work, lifting activities, etc. through permits. No job should be started without permits.
9.47.2	The Contactor shall take all measures at the sites of the work to protect all persons from accidents and shall be bound to bear the expenses of defense of every suit, action or other proceeding at law that may be brought by any persons for injury sustained or death owing to neglect of the above precautions and to pay any such persons such compensation or which may with the consent of the Contractor be paid to compromise any claim by any such person should such claim proceeding be filed against BHEL, the Contractor hereby agrees to indemnify BHEL against the same.
9.48	Before any demolition work is commenced and also during the process of the work the following shall be ensured:
9.48.1	All roads and open areas adjacent to the work site shall either be closed or suitably protected.
9.48.2	No electric cable or apparatus which is liable to be a source of danger nor a cable or an apparatus used by the operator shall remain electrically charged.
9.48.3	All practical steps shall be taken to prevent danger to persons employed from the risks of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render them unsafe.
9.49	All necessary personnel safety equipment as considered adequate by the Engineer should be kept available for the use of the persons employed in the Site and maintained in a condition suitable for immediate use and the Contactor should take adequate steps to ensure proper use of equipment by those concerned.
9.49.1	Workers employed on mixing asphalted materials, cement and lime mortars shall be provided with protective foot wear and protective goggles.
9.49.2	Those engaged in white washing and mixing or stacking of cement bags or any materials which are injurious to the eyes shall be provided with protective goggles.
9.49.3	Those engaged in welding works shall be provided with welder's protective eyesight lids
9.49.4	Stone breakers shall be provided with protective goggles and protective clothing and seated sufficient to safe intervals.

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9.49.5	Where workers are employed in sewers and manholes, which are in use, the Contractor shall ensure that the manhole covers are opened and ventilated at least for an hour before the workers are allowed to get into manhole, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to the public.
9.49.6	The Contractor shall not employ men below the age of 18 years and women on the work of painting with products containing lead in any form. Wherever men above the age of 18 are employed on the work of lead painting, the following precautions should be taken.
9.49.6.1	No paint containing lead or lead products shall be used except in the form of paste or readymade paint.
9.49.6.2	Suitably face masks should be supplied for use by the workers where paints are applied in the form of spray or a surface having lead paint dry rubbed and crapped.
9.49.6.3	Overalls shall be supplied by the Contractor to the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of work.
9.50	When the work is being done near any place where there is risk of drowning all necessary equipment should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision should be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.
9.51	Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safe guards. Hoisting appliance should be provided with such means as will reduce to the minimum the risk of any part of a suspended load becoming accidentally displaced. When workers employed on electrical installations which are already energized, insulting mats, wearing apparel, such as gloves, sleeves and boots as may be necessary should be provided. The worker should not wear any rings, watches and carry keys or other materials which are good conductor of electricity.
9.52	All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near the places of work.
9.53	The contractor shall maintain and ensure necessary safety measures as required for inspection and tests HV test, Pneumatic test, Hydraulic test, Spring test, Bend test etc as applicable, to enable Inspection Agency for performing Inspection. If any test equipment is found not complying with proper safety requirements then the Inspection Agency may withhold inspection, till such time the desired safety requirements are met.
9.54	The Contractor shall notify BHEL of his intention to bring to site any equipment or material which may create hazard. BHEL shall have the right to prescribe the conditions under which such equipment or materials may be handled and the contractor shall adhere to such instructions. BHEL may prohibit the use of any construction machinery, which according to him is unsafe. No claim for compensation due to such prohibition will be entertained by BHEL.
9.55	All safety precautions shall be taken for welding and cutting operations as per IS-818. All safety precautions shall be taken for foundation and other excavation marks as per IS-3764.
9.56	All gas cylinders shall be stored in upright position. Suitable trolley shall be used. There shall be flash-back arrestors conforming to IS-11006 at both cylinder and burner ends. Damaged tube and regulators must be immediately replaced. No of cylinders shall not exceed the specified quantity as per OCP
9.57	These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent, place at work spot. The persons responsible for compliance of the safety code shall be named therein by the Contractor
9.58	To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangement made by the contract shall be open to inspection by the Engineer of the Engineer's Representative.

SPECIAL CONDITIONS OF CONTRACT (SCC)
Chapter-IX: HSE & OHSAS

9.59	Keeping the work area clean/ free from debris, removed scaffoldings, scraps, insulation/sheeting wastage /cut pieces, temporary structures, packing woods etc. will be in the scope of the contractor. Such cleanings have to be done by contractor within quoted rate, on daily basis by an identified group. If such activity is not carried out by contractor / BHEL is not satisfied, then BHEL may get it done by other agency and actual cost along with BHEL overheads will be deducted from contractor's bill. Such decisions of BHEL shall be binding on the contractor.
9.60	Notwithstanding the above clauses there is nothing to exit the Contractor from the operations of any other Act or Rule in force in area of work in this respect. Provided always that all safety measures apart from those specifically provided in this agreement which are brought to the notice of the Contractor from time to time by the Engineer shall be complied by the Contractor. Provided further that all consequences, damages, or losses arising by reason of any safety code shall be met with by the Contractor.

9.61

NON COMPLIANCE: -

NONCONFORMITY OF SAFETY RULES AND SAFETY APPLIANCES WILL BE VIEWED SERIOUSLY AND BHEL HAS RIGHT TO IMPOSE FINES ON THE CONTRACTOR AS UNDER for every instance of violation noticed:

SN	Violation of Safety Norms	Fine (in Rs)
1	Not Wearing Safety Helmet	50/- *
2	Not wearing Safety Belt or not anchoring life line	100/-*
3	Not wearing safety shoe	100/-*
4	Not keeping gas cylinders vertically	100/-
5	Not using flash back arrestors	50/-
6	Not wearing gloves	50/- *
7	Grinding Without Goggles	50/- *
8	Not using 24 V Supply For Internal Work	500/-
9	Electrical Plugs Not used for hand Machine	100/-
10	Not Slinging property	200/-
11	Using Damaged Sling	200/-
12	Lifting Cylinders Without Cage	500/-
13	Not Using Proper Welding Cable With Lot of Joints And Not Insulated Property.	200/-
14	Not Removing Small Scrap From Platforms	200/-
15	Gas Cutting Without Taking Not Using Sheet Below Gas Cutting	200/-
16	Not Maintaining Electric Operated Dangerously	500/-
17	Improper Earthing Of Electrical T&P	500/-
18	No or improper barricading	500/-
19	Activity carried out without Safety work permit (Height work, Lifting activity, Hot work-each person/case)	1000/-
20	Accident Resulting in Partial Loss in Earning Capacity	25,000/- per victim
21	Fatal Accident/Accidents Resulting in total loss in Earning Capacity	1,00,000/per victim #

Legend: -*: per head, **#:** or as deducted by Customer whichever is higher.

Any other non-conformity noticed not listed above will also be fined as deemed fit by BHEL. The decision of BHEL engineer is final on the above. The amount will be deducted from running bills of the contractor. The amount collected above will be utilized for giving award to the employees who could avoid accident by following safety rules. Also the amount will be spent for purchasing the safety appliances and supporting the safety activity at site.

SPECIAL CONDITIONS OF CONTRACT (SCC)

Chapter-IX: HSE & OHSAS

9.61	**CITATION:**-If safety record of the contractor in execution of the awarded job is to the satisfaction of safety department of BHEL, issue of an appropriate certificate to recognize the safety performance of the contractor may be considered by BHEL after completion of the job.
9.62	**MEMORANDUM OF UNDERSTANDING** After Award Of Work, Contractors Are Required To Enter Into A Memorandum Of Understanding As Given Below: **Memorandum of Understanding** • BHEL, HPVP is committed to Health, Safety and Environment Policy (EHS Policy). • M/s _____ do hereby also commit to the same EHS Policy while executing the Contract Number _____ • M/s _____ shall ensure that safe work practices not limited to the above are followed by all construction workers and supervisors. Spirit and content therein shall be reached to all workers and supervisors for compliance. • BHEL will be carrying out EHS audits twice a year and M/s _____ shall ensure to close any non-conformity observed / reported within fifteen days. Signed by authorized representative of M/s ---------- Name Place & Date

7.2 Delay by OWNER in providing Utilities and Feedstock will not be reason for waiver of price adjustment, if concurrently EPC/LSTK CONTRACTOR has delayed the completion of the project.

7.3 If the EPC/LSTK CONTRACTOR is also one of the suppliers of items supplied by Owner in the Contract, the delay on account of supply of such material against the Owner's Purchase order and or Work order will not be a basis for extension of time without imposition of price reduction schedule on account of such delays.

8. SITE CLEANING

8.1 The EPC/LSTK CONTRACTOR shall clean and keep clean the work site from time to time to the satisfaction of the Engineer In-Charge for easy access to work site and to ensure safe passage, movement and working. All dismantled material shall be shifted /removed by EPC/LSTK CONTRACTOR at his own cost to designated place.

8.2 If the work involves dismantling of any existing structure in whole or part, any RCC foundation, paved area care shall be taken to limit the dismantling up to the exact point and/ or lines as directed by the Engineer In-Charge and any damage caused to the existing structure beyond the said line or point shall be repaired and restored to the original condition at the cost and risk of EPC/LSTK CONTRACTOR to the satisfaction of the Engineer-in-Charge, whose decision shall be final and binding upon the EPC/LSTK CONTRACTOR.

8.3 The EPC/LSTK CONTRACTOR shall dispose of the unserviceable materials, debris etc. as directed by Engineer-in-Charge outside the Refinery Complex and into the designated area outside the Municipal Corporation Limits of the City selected by the EPC/LSTK CONTRACTOR in due permission of local administrative authorities for dumping of the debris, waste etc. The quoted Prices shall be inclusive of the above activities also. The EPC/LSTK CONTRACTOR shall sort out, clear and stack the serviceable materials obtained from the dismantling/renewal at places as directed by the Engineer-in-Charge.

8.4 No extra payment shall be paid on this account. The Prices quoted in SOR are deemed to be inclusive of all the costs towards all the above activities as well.

8.5 The EPC/LSTK CONTRACTOR shall be the custodian of the dismantled materials till the Engineer- in- Charge takes charge thereof.

8.6 LAND FOR TEMPORARY FACILITIES

8.6.1 EPC/LSTK CONTRACTOR shall submit the temporary facilities layout for approval of OWNER/EPCM.

8.6.2 EPC/LSTK CONTRACTOR shall design, supply, construct and maintain the temporary facilities such as Site office, fabrication yard, laydown area, warehouse, grit blasting/painting area etc. as described in this Tender Documents.

8.6.3 EPC/LSTK CONTRACTOR shall dismantle the temporary facilities upon completion of their work and as instructed by OWNER without any extra cost to OWNER.

8.6.4 EPC/LSTK CONTRACTOR shall plan the following at his temporary construction facilities as minimum:

- Site office, porta cabins, closed store and open store
- Grit blasting/ painting area
- Hard barricading/Fencing/boundary wall for the temporary facility area
- Facilities for safety training for workmen, supervisors/engineers inside/ outside refinery. EPC/LSTK CONTRACTOR to provide Quarterly refreshing training programs to workmen.
- Welder qualification booths.
- Security, watch & ward, security gates, watch towers etc.
- Utility supply systems viz. Construction power, construction water, drinking water etc. their storage and distribution
- Area lighting for work site area / temporary facility area
- Firefighting equipment
- Drainage
- Sanitation facility for workers and staff
- Field Testing Laboratory
- Communication facilities viz. Telephone, Fax, E-mail, electronic transmission of drawings./ documents, etc.
- Hutments, transport, Pantry and Canteen for staff and workers
- Vehicle parking area including construction equipment
- First aid arrangement/ medical and health care facilities including health card for workmen before issuance of entry gate passes
- DG sets for construction power (if required)
- Construction water, storage & distribution
- One Ambulance to be provided on round clock basis at Site
- Vehicle arrangement for workmen transportation from camp to work site & back provided
- PPEs, uniform and fluorescent jackets for all workmen with clear identity mark on it.
- Gate pass system for workmen/officials as per the owners guidelines.
- Miscellaneous workshops including maintenance area for construction equipment
- Identification of borrow earth area (if required)/excess earth dumping yards.
- Fabrication and testing facilities for site fabricated equipment.
- Intrinsically safe wireless communication for site job coordination by EPC/LSTK CONTRACTOR personnel

17. GENERAL GUIDELINES DURING AND BEFORE ERECTION:

(Wherever Equipment is mentioned, it should be read as Equipment/Skid/Module/Structures)

17.1 The EPC/LSTK CONTRACTOR shall be responsible for organizing the lifting of the equipment in the proper sequence for orderly progress of the work and to ensure that access routes for erecting the other equipment are kept open. EPC/LSTK CONTRACTOR shall submit the equipment erection plan to the Engineer-in-charge considering sequence of erection for approval.

17.2 Orientation of all foundations, elevations, lengths and disposition of anchor bolts and diameter of holes in the supports and saddles shall be checked by the EPC/LSTK CONTRACTOR well in advance of the installation. Rectifications, including chipping of foundations, shall be carried out where necessary in consultation with the Engineer-in-Charge. If a structural member needs to be dismantled to facilitate the equipment erection, this shall be done by the EPC/LSTK CONTRACTOR after ensuring proper stability of the main structure in consultation with the Engineer-in-Charge. All such dismantled members shall be put back in position to the satisfaction of Engineer-in-Charge after the completion of the equipment erection.

17.3 During the performance of the work the EPC/LSTK CONTRACTOR shall at his own cost keep structures, materials and equipment adequately braced by guys, struts or other approved means which shall be supplied and installed by the EPC/LSTK CONTRACTOR as required till the installation work is satisfactorily completed. Such guys, shoring, bracing, strutting, planking supports etc. shall not interfere with the work of other agencies and shall not damage or cause distortion to other works executed by the EPC/LSTK CONTRACTOR or other agencies.

17.4 The EPC/LSTK CONTRACTOR shall duly comply with manufacturer(s) recommendations and detailed specifications for the installation of the various equipment and machines.

17.5 Various tolerances required as marked on the drawings and/or in accordance with the specifications and/or instructions of the Engineer-in-charge shall be maintained. Verticality shall be verified with the Theodolite and shall be maintained.

17.6 Method Statements for Erection of Heavy Equipment

The utmost safety has to be observed during the erection of heavy equipment like columns, reactors etc. For each equipment, a method statement (erection scheme) signed by EPC/LSTK CONTRACTOR's HSE and approved by EPCM/ Owner has to be prepared by the EPC/LSTK CONTRACTOR which shall include the details of the crane, where the crane will be placed, how crane will move/travel with the equipment, how the equipment is held by the crane, boom swing, capacity of the slings etc and prove that the crane is

capable of lifting and placing the equipment on the ready foundation safely. Slings used to hold the equipment shall be tested before use.

17.7 Testing of Safety Equipment's Record of all the safety equipment used at site shall be kept at site office including the test dates, validity of testing and re-testing dates. All the failed equipment shall be segregated and differently colored with paint for easy identification so that those are not used. Record of failed equipment shall be maintained till the closure of the contract. Month wise color coding for easy identification of valid test certificates of the equipment shall be done. Record of the testing of safety equipment shall be reviewed by Consultant / Owner periodically.

17.8 EPC/LSTK CONTRACTOR shall comply to OWNER's work permit and others safety philosophy system like JSA, before any critical and erection activities.

18. MECHANISATION OF CONSTRUCTION ACTIVITIES AND MOBILISATION OF CONSTRUCTION EQUIPMENT

18.1 Mechanization of Construction Activities

18.1.1 The EPC/LSTK CONTRACTOR shall mechanize the construction activities to the maximum extent by deploying all necessary construction equipment/machinery in adequate numbers and capacities.

18.1.2 It shall be the responsibility of the EPC/LSTK CONTRACTOR to carry out leveling / dressing / grading with a proper approach for the movement of equipment and machinery, at his own cost. No extra payment shall be made by the OWNER for leveling / dressing / grading. The EPC/LSTK CONTRACTOR shall acquaint himself with availability of access, facilities such as railway siding, local labour etc. and the EPC/LSTK CONTRACTOR may have to build temporary access roads to aid his work and the quoted and agreed Prices shall be deemed to include the same.

18.1.3 For speedy execution of work, EPC/LSTK CONTRACTOR shall also ensure use of latest computer software for at least the following:

a) Billing

b) Planning & Scheduling

c) Progress Reporting

d) Material Control & Warehousing

e) Safety Records

f) Resource Deployment

g) Communication

18.1.4 EPC/LSTK CONTRACTOR further agrees that Contract price is inclusive of all the associated costs, which he may incur for actual mobilization, demobilization required in respect of use of mechanized construction techniques and that the OWNER/EPCM in this regard shall entertain no claim whatsoever.

18.1.5 Calibration Requirements of Monitoring and Measuring Devices at Construction Site. Refer **Annexure A-XIV** to this SCC.

18.2 Mobilization of Construction Equipment

The EPC/LSTK CONTRACTOR shall without prejudice to his responsibilities to execute and complete the work as per the specifications and Time Schedule, progressively deploy minimum construction equipment, tools and tackles and further augment the same depending on the exigencies of work and as decided by the Engineer-in-Charge so as to suit the construction schedule within scheduled completion date without any additional cost to OWNER. The bidder shall submit a list of construction equipment he proposes to deploy for the subject work along with deployment schedule. No construction equipment shall be supplied by the OWNER, unless specified by Owner specifically in the bidding document.

18.3 Work in Monsoon Season

In addition to the Clause No. 4.2.2.0 of General Conditions of Contract, EPC/LSTK CONTRACTOR shall submit within 15 days of award of work, to the Engineer-in Charge / OWNER, his contingency plan for work during monsoon clearly stating their methodology/ strategy to progress uninterruptedly during monsoon mentioning the deployment of resources viz, numbers, capacity, category of equipment and manpower on a weekly basis for approval. During monsoon and other periods, it shall be the responsibility of the BIDDER to keep the construction work site free from water, at his own cost by deploying suitable dewatering pumps. The EPC/LSTK CONTRACTOR shall adhere to the Special Conditions specified in **Annexure A-III** to this SCC.

19. QUALITY ASSURANCE SYSTEM

19.1 EPC/LSTK CONTRACTOR shall include in his offer the Quality Assurance Program containing the overall quality management and procedures which is required to be adhered to during the execution of Contract. After the award of the Contract, detailed quality assurance program to be for the execution of Contract under various divisions of works will be mutually discussed and agreed to.

The EPC/LSTK CONTRACTOR shall establish, document and maintain an effective quality assurance system as outlined in recognized codes. Specification for Quality

vendors(s), by OWNER/EPCM, shall not entitle the EPC/LSTK CONTRACTOR for any claim for time extension or any cost implication.

33.2.2 Tests after receipt of Cement at Site: Each batch of cement (week wise as mentioned on cement bags) supplied by the EPC/LSTK CONTRACTOR after delivery at site shall be subject to the tests and analysis required by the relevant Indian Standard codes. The EPC/LSTK CONTRACTOR shall carry out and bear the cost of all tests and analysis to ensure quality of cement before using in actual works.

34. CONSTRUCTION

34.1 The EPC/LSTK CONTRACTOR shall within the scope of work observe in addition to specifications, all national and local laws, ordinances, rules and regulation and requirements pertaining to the work.

34.2 Various procedures and methods to be adopted by EPC/LSTK CONTRACTOR during the construction as required in the respective specifications shall be submitted to OWNER/ CONSULTANT in due time and well in advance of the specific work for approval.

34.3 The EPC/LSTK CONTRACTOR shall carry out required supervision as per Quality Assurance Plan and furnish all assistance required by OWNER/ CONSULTANT in carrying out inspection work. OWNER/CONSULTANT will have authorized representatives present who shall have free access to the work at all times. If an OWNER/ CONSULTANT representative notifies the EPC/LSTK CONTRACTOR"S representative of any deficiency in any work or in the supervision thereof, the EPC/LSTK CONTRACTOR shall make every effort to carry out such instructions consistent with best industry practice.

35. ERECTION OF EQUIPMENT / BARRICADING

35.1 All erection shall be carried out by deploying a crane(s) of suitable capacity. Erection by derrick shall not be permissible. The EPC/LSTK CONTRACTOR shall submit erection schemes for erection of critical equipment / skid / Barricading to Engineer-in-Charge for his approval. No equipment/Skid / barricading shall be erected in the absence of an approved erection scheme for such equipment.

35.2 The quoted Prices of the EPC/LSTK CONTRACTOR shall be deemed to include load testing of the crane as required to establish the lifting capacity of the crane.

36. SPECIAL REQUIREMENT FOR ERECTION& BARRICADING WORKS

36.1 ERECTION and Barricading Works shall be carried out as per Drawings and Technical Specifications attached with the Tender Document and as per instructions of EPCM/OWNER.

36.2 Job shall be carried out on round the clock 24 x7 basis with intermittent break as per agreement with EPCM/OWNER.

36.3 EPC/LSTK CONTRACTOR should ensure testing of Construction materials at local approved IOCL authorized approved testing laboratory prior to starting of the job and get approval of CONSULTANT.

36.4 Maintenance personnel with all tools & tackles and spares should be available on round the clock basis for attending the breakdown of equipment, machinery, pump etc. immediately after breakdown.

36.5 EPC/LSTK CONTRACTOR shall use wire rope of reputed make only along with valid Test Certificate to avoid accidents. Spare wire rope shall be kept readily available to avoid downtime.

36.6 Winch & Fly wheel to be provided with Safety Guard without which the rig shall not be allowed to be operated.

36.7 100% PPE to be used by all workmen and personnel engaged for the job, otherwise penalty shall be imposed as per GCC.

36.8 The EPC/LSTK CONTRACTOR shall deploy and ensure availability of qualified supervisor including safety supervisor having full knowledge of jobs and safety on round the clock basis.

36.9 In case of non-availability of water by OWNER, the EPC/LSTK CONTRACTOR shall arrange water without any extra cost to OWNER.

36.10 Dress code: All the EPC/LSTK CONTRACTOR"s workers and officers should use uniform During working hrs. at site and reflecting jackets in night working hours.

36.11 OWNER/ CONSULTANT reserves the right to physically check/verify the Ownership/availability of the equipment at any stage prior to award of work. Bidder shall organize and coordinate the inspection process. OWNER/CONSULTANT’s option shall be final and binding in this regard.

36.12 Bidder to confirm that these equipment’s are available for deployment in this project site and shall be timely mobilized in good working condition to maintain work progress. BIDDER has option to propose equipment’s OWNED or HIRED sources against this category.

36.13 Bidder to deploy well qualified ASNT Level III interpreter and Level II Personnel for scanning and reporting for NDT.

37. LIABILITY OF GOVERNMENT OF INDIA

37.1 It is expressly understood that Govt. of India is not a party to this Contract and has no liability,obligations or rights hereunder. It is expressly understood that OWNER is an independent legal entity with power and authority to enter into the Contract solely on its behalf under the Applicable Laws and general principles of contract law.

37.2 The EPC/LSTK CONTRACTOR expressly agrees and acknowledges and understands that OWNER is not an agent, representative or delegate of Government of India.

38. GENERAL REQUIREMENTS FOR RADIOGRAPHY & OTHER NDT FOR MECHANICAL/ COMPOSITE ITEM RATE CONTRACTS

38.1 EPC/LSTK CONTRACTOR shall appoint radiography/ NDT agency (ies) only after acceptance of such agency(ies) by OWNER/EPCM. However, acceptance of radiography/ NDT agency by OWNER/EPCM shall not absolve the EPC/LSTK CONTRACTOR of his responsibility to execute radiography work as per requirements of the Contract.

38.2 EPC/LSTK CONTRACTOR shall mobilize Radiography/ NDT agency at site along with adequate number of radiography resources/ NDT equipment & appliances, commensurate with the welding activity and quantum of Radiography/ NDT work load to avoid delays in Radiography / NDT and consequent generation of back log. In the event of generation of back log leading to Delay / Holdup of subsequent, activities OWNER/EPCM has right to engage additional agency for carrying out the radiography at the risk and cost of EPC/LSTK CONTRACTOR including 100% overhead charge.

38.3 Date and extent of mobilization of radiography/ NDT agency/resources shall be agreed by the EPC/LSTK CONTRACTOR and the Engineer-in-Charge at the start of work.

Radiography Check Shots

a) To verify that radiographs are being taken on the prescribed / selected welds / spots only, 5% of already radiographed spots shall be selected by the Engineer-in-Charge or his designated person for check shots. The check shots shall be taken up before any further radiography work.

b) The EPC/LSTK CONTRACTOR will be paid for the check shots at the quoted rates if no variation is found. If mismatch / variation is found in any of the check shot as per para 38.3 a), EPC/LSTK CONTRACTOR shall have to take re-radiography of the entire lot represented by check shot (a day production or more as decided by Engineer In-Charge).

ANNEXURE – IV

Ref: OS/WC/2025-26/149/96 **Date: 28.01.2026**

Sub: Contract for Mechanical works of Erection and pre-commissioning / start-up, commissioning assistance and performance guarantee test, closure activities of Fired Heater Packages and interconnection systems, handing over of the Facilities along with Spares for DCU HEATER at IOCL DIGBOI REFINERY and Revamping of existing Ind-Coker Primary Furnace (07-FF-00-001) against S.O 8118– Reg.

ACCEPTANCE TO TENDER TERMS & CONDITIONS

I / We hereby confirm that the Tender documents, all Annexures etc. have been studied in detail and we have fully understood the scope of work.

I / We accept all the **Terms and Conditions** of the Tender Enquiry and the prices quoted are in accordance with the same.

I / We accept to offer validity for a period of **3 months** from the last date for tender submission.

I / We give our acceptance to participate in **Reverse Auction** in case BHEL decides to go for reverse auction for this tender.

Tender documents duly signed on all the pages by the Owner / authorized representative of the bidder are attached herewith.

SIGNATURE OF THE TENDERER WITH SEAL

ANNEXURE- V

Ref: OS/WC/2025-26/149/96 **Date: 28.01.2026**

CONTRACTOR INFORMATION

Sl. No.	Particulars	To be Filled by Bidder
01.	Name of the Contractor	
02.	Nature of Firm / Concern (Proprietor/Partnership/Pvt. Limited/Public Ltd.) Note: In case of partnership concern, please enclose photo copies of the partnership deed	
03.	Full address	
04.	Name of the Proprietor/Partner	
05.	Name of the Person(s) and designation authorized for signing the contract/dealing with BHEL	
06.	Telephone No. of the firm	
07.	Fax No.	
08.	Mobile No.	
09.	E-mail ID	
10.	HSN Code./ SAC Code	
11.	Organizational structure with name and designation	

SIGNATURE OF THE TENDERER WITH SEAL

ANNEXURE- VI

Ref: OS/WC/2025-26/149/96 **Date: 28.01.2026**

CHECK LIST

Sl. No.	Particulars	Document Enclosed (Yes / No)	Document No
01.	Name of the Contractor		
02.	Tender Document Signed & Stamped		
03.	Earnest Money Deposit (EMD)		
04.	GSTIN Registration Certificate		
05.	PAN Number		
06.	Income Tax Returns for last 3 years (AY- 2023-24, 2024-25 & 2025-26/ 2022-23)		
07.	Profit & Loss account and Balance Sheet certified by the Practicing Chartered Accountant for the last 3 years		
08.	Work orders & Job Completion Certificates in similar works as mentioned in eligibility criteria.		
09	Cancelled Cheque / NEFT Form		
10	Copy of Udyam Registration		

SIGNATURE OF THE TENDERER WITH SEAL

ANNEXURE-VII

Ref: OS/WC/2025-26/149/96 **Date: 28.01.2026**

TENTATIVE MANPOWER DEPLOYMENT SCHEDULE AT DIGBOI SITE		
Sl. No	**Description**	**Min. Qty. Required**
1	Site In-charge with Power of Attorney	1 No.
2	Site Engineer (Mechanical)	1 No.
3	Site Supervisors (Mechanical)	2 No.
4	Quality Engineer / Supervisor / RT Films Interpreter	1 No.
5	Qualified Safety Engineer / Supervisor	1 No.
6	Qualified Electrician (Should have License from State Electricity Authorities)	1 No.
7	Structural Welders	6 Nos.
8	Pipe Welder (6G position)	4 Nos.
9	Structure Fabricator / Fitter	2 Nos.
10	Pipe Fabricator / Fitter	1 No.
11	Skilled / Semiskilled / Unskilled manpower	As per site requirement

SIGNATURE OF THE TENDERER WITH SEAL

ANNEXURE-VIII

Ref: OS/WC/2025-26/149/96 **Date: 28.01.2026**

CONSTRUCTION MACHINERY DEPLOYMENT SCHEDULE AT DIGBOI SITE		
Sl. No	**Description**	**Min. Qty. Required**
1	Hydra Crane 14T	1 No.
2	Suitable Higher Capacity Crane	As Required
3	Welding Machines	12 Nos.
4	TIG Welding set	2 Sets
5	Gas Cutting sets	3 Nos.
6	PUG Cutting Machines	2 Nos.
7	Grinding Machines	10 Nos.
8	Drilling Machines including Potable drilling Machine	2 Nos.
9	PMI Equipment	1 No.
10	NDT X-ray source & Camera	1 No.
11	Higher Capacity Slings as per requirement	8 Nos.
12	Higher Capacity D Shackles as per requirement	8 Nos.
13	Electrical distribution panel boards along with accessories	2 Nos.
14	Compressor, 350 CFT	1 No.
15	Hydraulic Test pump	1 No.
16	Electrode Baking Ovens	2 Nos.
17	Electrode Portable Ovens	12 Nos.
18	Trailer	As required
19	Man Lifting crane	1No
20	All other tools and tackles as per requirements	As per site requirement

Note : The list of machineries indicated above are tentative only. In addition to the above, if any other machineries and tools & tackles required for completion of the site works in all respects, then same are to be mobilised by the contractor without any additional cost.

SIGNATURE OF THE TENDERER WITH SEAL

ANNEXURE-IX

Ref: OS/WC/2025-26/149/96 **Date: 28.01.2026**

NO DEVIATION CERTIFICATE

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

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

Dear Sir,

Sub : **No Deviation Certificate**

Ref : 1) NIT/Tender Specification No: ……,

2) All other pertinent issues till date

We hereby confirm that we have not changed / modified / materially altered any of the tender documents as downloaded from the website / issued by BHEL and in case of such observance at any stage, it shall be treated as null & void.

We also hereby confirm that we have neither set any Terms & Conditions and nor have we taken any deviation from the Tender conditions together with other references applicable for the above referred NIT / Tender Specifications.

We further confirm our unqualified acceptance to all Terms & Conditions, unqualified compliance to Tender Conditions, Integrity Pact (if applicable) and acceptance to Reverse Auctioning process.

We confirm to have submitted offer in accordance with tender instructions and as per aforesaid references.

Thanking you,

Yours faithfully,

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

ANNEXURE- X

BHARAT HEAVY ELECTRICALS LIMITED

HEAVY PLATES & VESSELS PLANT

VISAKHAPATNAM – 530 012

PART – II

(PRICE BID)

NAME OF WORK : Contract for Mechanical works of Erection and pre-commissioning / start-up, commissioning assistance and performance guarantee test, closure activities of Fired Heater Packages and interconnection systems, handing over of the Facilities along with Spares for DCU HEATER at IOCL DIGBOI REFINERY and Revamping of existing Ind-Coker Primary Furnace (07-FF-00-001) against S.O 8118– Reg.

Tender Enquiry No : OS/WC/2025-26/149/96 Date : 28.01.2026

SCHEDULE OF QUANTITIES AND RATES (SOQR)

Item No. of SOQR	Description of Work	Quantity (a)	Unit	Formula for arriving Unit Rate in ₹ (b/a)	Percentage allocation against each item with respect to Total Value quoted at Sl.No:III in ₹ (b)
I	**New Ind-Coker secondary Furnace (07-FF-00-002)**				
1	Unloading & Stacking:	600	MT	**(b/a) of Sl.No:1**	2.24% of Total Value Quoted at Sl.No:III
2	Steel Structures:	100	MT	**(b/a) of Sl.No:2**	4.66% of Total Value Quoted at Sl.No:III
3	Hot & Cold Air Ducting and other Ducts without Refractory & Insulation:	25	MT	**(b/a) of Sl.No:3**	1.24% of Total Value Quoted at Sl.No:III
4	Hot & Cold Flue Gas Ducts and other Ducts with Refractory Lining	50	MT	**(b/a) of Sl.No:4**	2.91% of Total Value Quoted at Sl.No:III
5	PLATFORM GRATINGS	25	MT	**(b/a) of Sl.No:5**	1.14% of Total Value Quoted at Sl.No:III
6	RADIANT SECTION: (with related structures)	60	MT	**(b/a) of Sl.No:6**	3.71% of Total Value Quoted at Sl.No:III

7	RADIANT COILS				
7.1	Erection of Radiant Coils (with castings BOC)	25	MT	**(b/a) of Sl.No:7.1**	1.34% of Total Value Quoted at Sl.No:III
7.2	Assembly, Fit Up & Welding of In-Situ joints of Radiant Coils including NDT	55	Inch.Dia	**(b/a) of Sl.No:7.2**	0.16% of Total Value Quoted at Sl.No:III
7.3	Erection of Crossover Coils	0.5	MT	**(b/a) of Sl.No:7.3**	0.03% of Total Value Quoted at Sl.No:III
7.4	Assembly, Fit Up & Welding of In-Situ joints of Crossover coils from Radiant to Convection Sections including NDT	45	Inch.Dia	**(b/a) of Sl.No:7.4**	0.13% of Total Value Quoted at Sl.No:III
8	Erection of Convection Modules (Module I-30 MT, Module II-15 MT)	45	MT	**(b/a) of Sl.No:8**	3.21% of Total Value Quoted at Sl.No:III
8.1	Erection of Process Coils	8	MT	**(b/a) of Sl.No:8.1**	0.43% of Total Value Quoted at Sl.No:III
8.2	Assembly, Fit Up & Welding of In-Situ joints of Process Coils including NDT	30	Inch.Dia	**(b/a) of Sl.No:8.2**	0.09% of Total Value Quoted at Sl.No:III
8.3	Erection of Steam Coils (IBR)	1.2	MT	**(b/a) of Sl.No:8.3**	0.07% of Total Value Quoted at Sl.No:III
8.4	Assembly, Fit Up & Welding of In-Situ joints of Steam Coils (IBR) including NDT	18	Inch.Dia	**(b/a) of Sl.No:8.4**	0.05% of Total Value Quoted at Sl.No:III
9	Stack(Module I-25 MT, Module II-12.5 MT, Module III-12.5 MT)	50	MT	**(b/a) of Sl.No:9**	3.84% of Total Value Quoted at Sl.No:III
10	Decoking drum				
10.1	Erection of Decoking Drum as per hook up including platforms and accessories	7	MT	**(b/a) of Sl.No:10.1**	0.44% of Total Value Quoted at Sl.No:III
11	**Piping**				
11.1	**CS Piping**				
11.1.1	Erection of Piping	3400	Inch metre	**(b/a) of Sl.No:11.1.1**	1.75% of Total Value Quoted at Sl.No:III
11.1.2	Fit-up, assembly, welding and NDT of piping	5072	Inch dia	**(b/a) of Sl.No:11.1.2**	11.32% of Total Value Quoted at Sl.No:III
11.1.3	Installation of Valves	156	Nos	**(b/a) of Sl.No:11.1.3**	0.62% of Total Value Quoted at Sl.No:III

11.2	**AS Piping**				
11.2.1	Erection of Piping	751	Inch metre	**(b/a) of Sl.No:11.2.1**	0.61% of Total Value Quoted at Sl.No:III
11.2.2	Fit-up, assembly, welding and NDT of piping	1071	Inch dia	**(b/a) of Sl.No:11.2.2**	3.42% of Total Value Quoted at Sl.No:III
11.2.3	Installation of Valves	16	Nos	**(b/a) of Sl.No:11.2.3**	0.07% of Total Value Quoted at Sl.No:III
11.3	**SS Piping**				
11.3.1	Erection of Piping	120	Inch metre	**(b/a) of Sl.No:11.3.1**	0.11% of Total Value Quoted at Sl.No:III
11.3.2	Fit-up, assembly, welding and NDT of piping	785	Inch dia	**(b/a) of Sl.No:11.3.2**	2.93% of Total Value Quoted at Sl.No:III
11.3.3	Installation of Valves	94	Nos	**b/a) of Sl.No:11.3.3**	0.43% of Total Value Quoted at Sl.No:III
11.4	**IBR Piping including coordination with IBR authorities**				
11.4.1	Erection of Piping	2259	Inch metre	**(b/a) of Sl.No:11.4.1**	1.50% of Total Value Quoted at Sl.No:III
11.4.2	Fit-up, assembly, welding and NDT of piping	3499	Inch dia	**(b/a) of Sl.No:11.4.2**	9.28% of Total Value Quoted at Sl.No:III
11.4.3	Installation of Valves	47	Nos	**(b/a) of Sl.No:11.4.3**	0.26% of Total Value Quoted at Sl.No:III
11.5	**Pipe & Ducts Supports**				
11.5.1	Laying of RCC foundations including procurement of steel, insert plates, etc. (Complete in all respects)	12	Cu.m	**(b/a) of Sl.No:11.5.1**	0.59% of Total Value Quoted at Sl.No:III
11.5.2	Installation of pipe supports	15	MT	**(b/a) of Sl.No:11.5.2**	2.46% of Total Value Quoted at Sl.No:III
11.6	**Steam Tracing for any type of piping**				
11.6.1	Installation of steam tracing line including welding, complete in all respects	5140	Inch metre	**(b/a) of Sl.No:11.6.1**	5.46% of Total Value Quoted at Sl.No:III
11.6.2	Installation of steam traps, valves, manifolds, etc. including welding	9688	Inch dia	**(b/a) of Sl.No:11.6.2**	18.90% of Total Value Quoted at Sl.No:III

12	**Bought Out Components:**				
12.01	Cast Air Pre-Heater (CAPH)	35	MT	**(b/a) of Sl.No:12.01**	1.97% of Total Value Quoted at Sl.No:III
12.02	Steam Cast Air Pre-Heater (SCAPH)	2	MT	**(b/a) of Sl.No:12.02**	0.10% of Total Value Quoted at Sl.No:III
12.03	Soot Blowers	0	MT	0	0.00
12.04	FD Fans (2 Nos.) & ID Fan (1 No.) with Drives	18	MT	**(b/a) of Sl.No:12.04**	1.01% of Total Value Quoted at Sl.No:III
12.05	Burners - 16 Nos. including Burner Blocks, Ignition Equipment and Control Panels	6.4	MT	**(b/a) of Sl.No:12.05**	0.33% of Total Value Quoted at Sl.No:III
12.06	Fabricated Sight Doors - Nos. approx.	50	Nos	**(b/a) of Sl.No:12.06**	0.93% of Total Value Quoted at Sl.No:III
12.07	Dampers - Nos. including control panel at stack / platform, winch cable arrangement and pneumatic /electrical contacts etc. - 11 nos	8	MT	**(b/a) of Sl.No:12.07**	0.38% of Total Value Quoted at Sl.No:III
12.08	Expansion Joints - Nos. approx.- 26 nos	11	MT	**(b/a) of Sl.No:12.08**	0.52% of Total Value Quoted at Sl.No:III
12.09	Skin Thermocouples on the Tube / Coil Surfaces including Heat treatment	32	Nos	**(b/a) of Sl.No:12.09**	0.19% of Total Value Quoted at Sl.No:III
12.10	Erection of Filter for fuel gas	2	Nos	**(b/a) of Sl.No:12.10**	0.02% of Total Value Quoted at Sl.No:III
12.11	Erection of venturi and its related hook up	4	MT	**(b/a) of Sl.No:12.11**	0.13% of Total Value Quoted at Sl.No:III
13	ASSISTANCE DURING COMMISSIONING: Assistance for final dry out of Heater, Pre- Commissioning, Commissioning by providing Skilled, Unskilled manpower including overtime, Sundays & Holidays along with all required tools & tackles, consumables, etc.	400	Man Days	**(b/a) of Sl.No:13**	1.38% of Total Value Quoted at Sl.No:III
14	Mandays rate for executing additional works	400	Man Days	**(b/a) of Sl.No:14**	1.27% of Total Value Quoted at Sl.No:III

15	Providing Air-conditioned Office Space (Container) partitioned into two sections suitably furnished with 6 Sets of Table & Chairs, 1 cabin with 2 sets of tables with executive chairs and another cabin with common room and 4 sets of office table and chairs. Total 3 sets of Personal Computers along with 1 Printer Cum Scanner Cum Xerox M/c. etc. to be provided at site.	12	Months	**(b/a) of Sl.No:15**	3.44% of Total Value Quoted at Sl.No:III
16	Deploying an office boy exclusively for BHEL office during the entire contract period or till completion of the project whichever is earlier	300	Man Days	**(b/a) of Sl.No:16**	0.73% of Total Value Quoted at Sl.No:III
17	Hydrotest of radiant & convection coils along with necessary pipe fittings	1	LOT	**(b/a) of Sl.No:17**	0.44% of Total Value Quoted at Sl.No:III
II	**Revamping of existing Ind-Coker Primary Furnace (07-FF-00-001)**	-	-		
1	Replacement/ Rectification of Radiant tube supports, Radiant coils, Radiant Shell, platform gratings/ handrails, etc, Ladders and Platforms, Convection header boxes, ducts with refractory, ducts without refractory, any piping with welding, NDT, etc. (If required)	10	MT	**(b/a) of Sl.No:1**	1.05% of Total Value Quoted at Sl.No:III
2	Any other miscellaneous works to be done	200	Man days	**(b/a) of Sl.No:2**	0.71% of Total Value Quoted at Sl.No:III
III	TOTAL VALUE (SL. No: I+II)				
IV	GST_____%				
V	TOTAL VALUE INCLUDING GST				

Notes:

1) **Tenderers are requested to visit the site before submitting their tenders and go through the site conditions, nature and quantum of the job to be done and in general shall themselves obtain all necessary information as to risks, safety precautions, contingencies and other circumstances. A tenderer shall be deemed to have full knowledge of the site, whether he inspects it or not, no claim shall be allowed.**

2) **L1 shall be evaluated on Total Value Quoted at Sl. No: III of above SOQR format. Successful L1 bidder in RA shall submit price confirmation along with price -break up in the above SOQR format.** Lowest offer need not be the rate acceptable to BHEL-HPVP and BHEL-HPVP reserves the right to go for negotiation with the L1 bidder.

3) **Quoted rates shall be exclusive of GST**. However, GST as applicable shall be paid by the contractor and same shall be reimbursed on submission of proof of payment along with the bill as per Annexure - GST.

4) **The quoted prices shall be fixed & firm without any escalation during the entire period of contract and till completion of the work irrespective of the final / actual quantities executed.**

5) Though the following activities specifically not mentioned in SOQR, contractor shall carryout these Jobs in their scope only

   a. Replacement/ Rectification of equipment like APH, Fans, Burners, Dampers, Expansion bellows, soot blowers, etc are also to be carried out as per scope of work in Revamping of existing Ind-Coker Primary Furnace (07-FF-00-001)

   b. Material coding of Mandatory Spares in IOCL portal Handing over of Spares to IOCL: All activities including identifying each spares item then to be marked / painted / tagged / stencilled; creating the material code as per IOCL system; hand over to IOCL at their designated place & get the acknowledgement

   c. The various activities/ items mentioned in the SOQR are not exhaustive. Any other activities which may be required to complete the job in all respects even if not mentioned in SOQR description but mentioned elsewhere in tender enquiry shall be deemed to have been included in the total quoted prices & no extra payment for these items shall be made under any circumstances.

6) Unit rates for various items shall include unloading, assembly, surface preparation, painting including consumables & any wastages etc. as per scope of work.

7) The quantities indicated in SOQR are tentative only and may vary +/- 25%. However, the rates quoted by the contractor shall be firm & fixed & valid till completion of all works covered under this contract. No cost escalation will be paid on any account throughout the contract period for any item. The payment will be made based on the actual quantities executed at site.

8) Suitable cranes along with manpower, consumables, tools & tackles required for Unloading, material handling, shifting, assembly & Erection shall be deployed by the contractor within the quoted rates till completion of the project.

SIGNATURE OF TENDERER WITH SEAL

ANNEXURE - NEFT

ACCEPTANCE FOR ELECTRONIC FUND TRANSFER / RTGS / NEFT TRANSFER

01	NAME & ADDRESS OF THE SUPPLIER / SUBCONTRACTOR	
02	VENDOR CODE ASSIGNED BY BHEL, HPVP LTD	

DETAILS OF BANK ACCOUNT

03	NAME & ADDRESS OF THE BANK	
04	NAME OF THE BRANCH	
05	BRANCH CODE	
06	MICR CODE	
07	ACCOUNT NUMBER	
08	TYPE OF ACCOUNT	
09	BENEFICIARY'S NAME	
10	IFSC CODE OF THE BRANCH	
11	EMAIL ID	
12	TELEPHONE / MOBILE NUMBER	

CERTIFICATE

I / We here by agree to receive the payments due from M/s Bharat Heavy Electricals Ltd., by the National Electronic Fund Transfer / or RTGS Transfer mode by credit to my / our above mentioned Bank account. I / We also agree that payments made to the above mentioned account are a valid discharge of the liability of M/s Bharat Heavy Electricals Ltd. I / We also agree to bear the applicable Bank charges for the above mode of transfer. A copy of the cheque leaf/ cancelled cheque leaf of the above account is sent herewith.

(Authorized Signatories with Name & Seal)

BANKER'S CERTIFICATION

We confirm that we are enabled for receiving RTGS and NEFT credits and we further confirm that the account number of_____ _____ (name of account holder), the signature of authorized signatory and the MICR and IFSC codes of our branch mentioned above are correct.

Place: Bank Manager / Officer
Date: Signature with Bank stamp and Name seal

FORWARDED TO ACCOUNTS DEPARTMENT / CASH SECTION

We confirm the above details are verified with the records available with us

Signature of BHEL Official with name & seal
Operating the contract / Services

ANNEXURE- GST

GST COMPLIANCE FOR INDIGENOUS SUPPLIERS / CONTRACTORS

1. In Response to Tenders for Indigenous supplier will be entertained only if the vendor has a valid GSTIN which should be clearly mentioned in the offer. If any specific exemption is available, a declaration with due supporting documents need to be furnished for considering the offer.
2. Supplier shall mention their GSTIN in all their invoices and invoices shall be in the format as specified/prescribed under GST laws. Invoices shall necessarily contain Invoice number (in case of multiple numbering system is being followed for billing like SAP invoice no, commercial invoice no etc., then the Invoice No which is linked/uploaded in GSTN network shall be clearly indicated), item description as per P0, Quantity, Rate, Value, applicable taxes with nomenclature (like IGST, SGST, CGST & UTGST) separately, HSN/ SAC Code, etc.
3. All invoices shall bear the HSN Code for each item separately (Harmonized System of Nomenclature)/ SAC code (Services Accounting Code).
4. A declaration to the effect that all invoice particulars are/were uploaded in the GSTN network/ portal & all tax liability as per GST rules and regulations have been and will be discharged, shall be mentioned in the invoice. If not mentioned in the invoice, a separate declaration shall be submitted as per the requirement of BHEL.
5. All documents like Test Certificate, LR copy, Guarantee/Warrantee certificate, work completion certificate, any other document mentioned in PO, shall be sent along with the vehicle/consignment where ever applicable. For all consignments received within the calendar month, input credit will be availed within that month in line with monthly returns filing cycle. In case of any discrepancy in the document or non-submission of documents mentioned in the PO, then BHEL will not be able to accept or account the material, in such case availing of tax credit will be deferred to next month or so.
6. 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 suppliers, within the calendar month notified by BHEL.
7. For any such delay in availing of tax credit for reasons attributable to supplier (as mentioned above), interest (calculated @ SBI Base Rate + 6%) along with penalty if any will be deducted for the delayed period i.e. from the month of receipt till the month tax credit is availed, from the running bills.
8. This is to inform that GST portion of invoice, shall be released only upon Vendor declaring such invoice in his GSTR-1 and receipt of goods and Tax invoice by BHEL and Confirmation of payment of GST thereon by vendor on GSTN portal. Alternatively, BG of appropriate value may be obtained from vendor which shall be valid At least one month after the confirmation of date of payment of GST by vendor on GSTN portal and receipt of Tax invoice and receipt of goods, whichever is later. Above is subject to receipt of goods/service and tax invoice thereof along with vendor declaring invoice in his return and paying GST within timeline prescribed for availing ITC by BHEL.
9. That 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 shall be recoverable from vendor/contractor along with interest levied/ leviable on BHEL.

Note: The above will be followed strictly for Processing vendor payments to ensure GST Compliance.

(A MAHARATNA COMPANY)

BHARAT HEAVY ELECTRICALS LIMITED

Heavy Plates & Vessels Plant (A Govt. of India Enterprise)

VISAKHAPATNAM - 530 012

MANDATE FORM

OPTION TO RECEIVE E-PAYMENT THROUGH NEFT & RTGS

1. NAME : **BHARAT HEAVY ELECTRICALS LIMITED (HPVP)**
2. ADDRESS : NATHAYYA PALEM, VISAKHAPATNAM, 530012
3. PARTICULARS OF BANK ACCOUNT –
   a. BANK NAME : **STATE BANK OF INDIA**
   b. BRANCH NAME : **BHPV Branch**
   c. BRANCH ADDRESS : **BHPV POST, VISAKHAPATNAM- 530012**
   d. IFSC CODe **: SBIN0001675**
   e. ACCOUNT NO. : **33276118389**
   f. E-MAIL ID FOR RECEIVING SYSTEM GENERATED PAYMENT ADVICE:
   : **vivaan@bhel.in**

I hereby declare that the above account details are of our BHEL- HPVP, Visakhapatnam receipt Bank Account and the particulars furnished above are correct.

For Bharat Heavy Electricals Limited, Visakhapatnam,

Vivan Mohanty
(Authorised Signatory)

BANK CERTIFICATION:

This is to certify that the particulars furnished at point no. 3, above are correct & complete as per our records.

Date:

Bank Manager / Officer
Signature with Bank stamp and Name seal

HACHIT KUMAR
Chief Manager
PF No. 4462939 SS No. AK3189
SBI, BHPV BR. 01675

INTEGRITY PACT (AGREEMENT FORMAT)

INTEGRITY PACT

Between

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

And

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

Preamble

The Principal intends to award, under laid-down organizational procedures, Contract/s for
.....
..... The Principal values full compliance with all relevant laws of the land, rules and regulations, and the principles of economic use of resources, and of fairness and transparency in its relations with its Bidder(s)/ .

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

Section 1- Commitments of the Principal

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

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

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

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

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

Section 2 - Commitments of the Bidder(s):

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

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

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

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

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

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

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

Section 3 - Disqualification from Tender process and exclusion from future Contracts:

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

Section 4 -Compensation for Damages

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

4.2 If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to section 3, the Principal shall be entitled to demand and recover from the Bidder liquidated damages equivalent to 5% of the contract value or the amount equivalent to Security Deposit/Performance Bank Guarantee, whichever is higher, as damages, in addition to and without prejudice to its right to demand and recover compensation for any other loss or damages specified elsewhere in the contract.

Section 5 - Previous Transgression

5.1 The Bidder declares that no previous transgressions occurred in the last 3 (three) years (to be reckoned from date of bid submission) with any other company in any country conforming to the anti-corruption approach in India that could justify his exclusion from the tender process. The date of such transgression, for the purpose of disclosure by the bidders in this regard, would be the date on which cognizance of the said transgression was taken by the competent authority. The transgression(s), for which cognizance was taken even before the said period of three years, but are pending conclusion, shall also be reported by the bidders.

5.2 If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason or action can be taken as per the separate "Guidelines on Suspension of Business dealings with Suppliers/ Contractors", framed by the Principal.

Section 6 -Equal treatment of all Bidders

6.1 The Principal will enter into Integrity Pacts with identical conditions as this Integrity Pact with all Bidders and Contractors.

6.2 In case of a joint venture, all the partners of the joint venture should sign the Integrity Pact. In case of Sub-contracting, the Principal Contractor shall be solely responsible for the adherence to the provisions of IP by the sub-contractor(s)..

6.3 The Principal will disqualify from the tender process all Bidders who do not sign this Integrity Pact or violate its provisions.

Section 7 - Criminal Charges against violating Bidders

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

Section 8 -Independent External Monitor(s)

8.1 The Principal appoints competent and credible panel of Independent External Monitor (s) (IEMs) for this Integrity Pact. The task of the IEMs is to review independently and objectively, whether and to what extent the parties comply with the obligations under this Integrity Pact on receipt of any complaint by them from the bidder(s)..

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

8.3 The IEMs shall be provided access to all documents/ records pertaining to the Contract, for which a complaint or issue is raised before them as and when warranted. However, the documents/records/information having National Security implications and those documents which have been classified as /Top Secret are not to be disclosed.

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

8.5 The role of IEM is advisory and the advice of IEM is non- binding on the Organization. However, as IEMs are invariably persons with rich experience who have retired as senior functionaries of the government, their advice would help in proper implementation of the IP.

8.6 For ensuring the desired transparency and objectivity in dealing with the complaints arising out of the tendering process, the matter should be examined by the full panel of IEMs jointly, who would look into the records, conduct an examination, and submit their joint recommendations to the Management. In case the full panel is not available due to some unavoidable reasons, the available IEM(s) will conduct examination of the complaints. Consent of the IEM(s), who may not be available, shall be taken on record.

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8.7 The IEMs shall examine all the representations/grievances/ complaints received by them from the bidders or their authorized representative related to any discrimination on account of lack of fair play in modes of procurement and bidding systems, tendering method, eligibility conditions, bid evaluation criteria, commercial terms & conditions, choice of technology/ specifications etc.

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

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

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

8.11 After award of work, the IEMs shall look into any issue relating to execution of Contract, if specifically raised before them. As an illustrative example, if a Contractor who has been awarded the Contract, during the execution of Contract, raises issue of delayed payment etc. before the IEMs, the same shall be examined by the panel of IEMs

8.12 However, the IEMs may suggest systemic improvements to the management of the Principal, if considered necessary, to bring about transparency, equity and fairness in the system of procurement.

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

Section 9 - Pact Duration

9.1 This Integrity Pact shall be operative from the date this Integrity Pact is signed by both the parties. Any violation of the same would entail disqualification of the bidders and exclusion from future business dealings..

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

Section 10 - Other Provisions

10.1 This Integrity Pact is subject to Indian Laws and exclusive jurisdiction shall be of the competent Courts as indicated in the Tender or Contract, as the case may be.

10.2 Changes and supplements as well as termination notices need to be made in writing.

10.3 If the Bidder(s)/ Contractor(s) is a partnership or a consortium or a joint venture, this Integrity Pact shall be signed by all partners of the partnership or joint venture or all consortium members..

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

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

10.6 In the event of any dispute between the Principal and Bidder(s)/ Contractor(s) relating to the Contract, in case, both the parties are agreeable, they may try to settle dispute through Mediation before the panel of IEMs in a time bound manner. If required, the Principal may adopt any mediation rules for this purpose. However, not more than five meetings shall be held for a particular dispute resolution. The fees/expenses on dispute resolution shall be equally shared by both the parties. In case, the dispute remains unresolved even after mediation by the panel of IEMs, either party may take further action as per the terms & conditions of the Contract. .

Ramesh

.....	.....
For & On behalf of the Principal (Office Seal)	For & On behalf of the Bidder (Office Seal)
एस.एन.वी.एस.रमेश / S.N.V.S. RAMESH उप महा प्रबन्धक (वाणिज्य, ओ एस & लोजिस्टिक्स) Dy. General Manager (Comml., OS & Logistics) बीएचईएल-एचपीवीपी/BHEL-HPVP विशाखपट्टणम/VISAKHAPATNAM-530 012	
Place----------	Place----------
Date----------	Date----------
Witness:.....	Witness:.....
D.GOWRI SANKAR Sr.Manager (OS) Bharat Heavy Electricals Ltd. HPVP, VSP-530 012	
(Name & Address).....	(Name & Address).....
.....	.....
.....	.....

INDIAN OIL CORPORATION LIMITED. TECHNIP ENERGIES INDIA LIMITED	PROJECT TITLE **DR 1.0 EXPANSION PROJECT** TECHNIP ENERGIES REQUISITION NUMBER **214227C-07-REQ-0110-0001** TECHNIP ENERGIES DOCUMENT NUMBER **MR-00-0110-0001-B1304-0001** EQUIPMENT NUMBER **07-FF-00-002** VENDOR DOCUMENT NUMBER **HPVP-WT-8118-WELDMAP REV.0**
WELDING BOOK, WELDING MAP, WELDING PROCEDURE SPECIFICATION, PROCEDURE QUALIFICATION REPORT	
	CODE STAMP

00	18-11-2025	ISSUE FOR REVIEW	DLKRISHNA	PVD RAMESH	Y P KUMAR
Rev	Date DD-MM-YYYY	**Revision Purpose**	**Written**	**Checked By**	**PM**
DOCUMENT REVISIONS					

Sections changed in last revision are identified by a vertical line in the margin

Weld map for DCU heater (Tag no. 07-FF-00-002)

SL. NO.	PARTS TO BE WELDED	COMPONENT DETAILS *Refer Note-1	Material (P.No.)	WPS NO.	THICKNESS RANGE (mm)	WEDLDING PROCESS	WELDING CONSUMABLE	PWHT	PQR NO.	REMARKS
1	Welding of joints in between pipe to pipe of SA335 Gr. P9 (or) equivalent materials.	*(1), (2), (3)	P5B to P5B	T.5B.5B.20 R01	1.5 –13.10	GTAW	ER80SB8	YES	3027	
2	Welding of joints in between pipe to pipe of SA335 Gr. P9 (or) equivalent materials.	*(1), (2), (3)	P5B to P5B	T.M.5B.5B. 26 R01	1.5 –16.36	GTAW + SMAW	ER80SB8 + E8018B8	YES	2331	
3	Welding of joints in between pipe to pipe of SA335 Gr. P9 (or) equivalent materials.	*(5)	P5B to P5B	M.5B.5B.45 R01	1.5 –10.36	SMAW	E8018B8	YES	2331	
4	Welding of joints between CS materials.	* (6), (7)	P1 to P1	T.M.1.1.50 R03	5 - 200	GTAW + SMAW	ER70S2 + E7018	NO	2871	
5	Welding of joints between CS materials.	*(4), (6)	P1 to P1	M.1.1.88 R03	5 - 200	SMAW	E7018	NO	3632	
6	Welding of joints between CS and SS 310 Materials	*(4)	P1 to P8	M.1.8.36 R00	5 - 40	SMAW	E310	NO	3075	
7	Welding of joints between CS and SS 304/SS 304L Materials	*(4)	P1 to P8	M.1.8.19 R00	1.5 – 20	SMAW	E309L	NO	2305, 3546	

8	Welding of joints between SS 310 Materials	*(4)	P8 to P8	M.8.8.53 R01	1.5 – 16	SMAW	E310	NO	1815	
9	Welding of joints between SS 304/ SS 304L Materials	*(4)	P8 to P8	M.8.8.23 R01	5 – 60	SMAW	E308L	NO	3558	

GENERAL NOTE:

1) DCU heater consisting of Radiant coils (1), Convection coils assembly (2), Crossovers assembly (3), Casing walls and attachments (4) other attachments in Radiant Coils, Convection coils (5) Piping & Fittings (6) and Steam Super Heat coil (7).
2) Tack weld and temporary attachment welding shall be carried out as per applicable WPS and with qualified welders.
3) For repair welds same WPS shall be used as used for fresh welds. After completion of repair weld same NDE shall be carried out to ensure complete defect removal. NDT shall be carried out as per approved QAP and NDE plan.

LIST OF WPS & PQR DOCUMENTS

Sl. NO.	WPS	PQR	Page No.
1	T.5B.5B.20 R01	3027	5-8
2	T.M.5B.5B.26 R01	2331	9-12
3	M.5B.5B.45 R01	2331	13-16
4	T.M.1.1.50 R03	2871	17-20
5	M.1.1.88 R03	3632	21-24
6	M.1.8.36 R00	3075	25-28
7	M.1.8.19 R00	2305, 3546	29-34
8	M.8.8.53 R01	1815	35-38
9	M.8.8.23 R01	3558	39-42p

Form No. 1901/04

BHARAT HEAVY ELECTRICALS LIMITED

HEAVY PLATES & VESSELS PLANT-VISAKHAPATNAM-530012

WELDING TECHNOLOGY

WELDING PROCEDURE SPECIFICATION

Page 1 of 2

WPS No.	: T.5B.5B.20	Date	: 30 / 12 / 2016	Supporting	
Rev No.	: 01	Date	: 01 / 06 / 2023	PQR No.	3027

Welding Process : GTAW Type : Manual (Auto/Semi-Auto/Manual/Machine)

Application : Groove welding of P5B Group 1 Low Alloy steel components with P5B Group 1 Low Alloy steel components & For all Fillet welds of P5B to P5B materials.

JOINTS (QW-402)

Joint Design : Groove as per approved fabrication drawing
Backing (Yes/No) : GTAW : No
Backing Material (Type) : GTAW : Nil
(Metal/Non fusing metal/ Non metallic/Others)
Root spacing : As per approved fabrication drawing

BASE METAL (QW-403)

P. No. : 5B Group No : 1 TO P. No. : 5B Group No : 1
Spec. Type & Grade : N.A.
Chem. Analysis & Mech. Prop : N.A.
Thickness Range (T) Groove : 1.5 to 13.10 Fillet : N.A.
Maximum Pass Thickness ≤13mm (Yes): Yes_____ (No): _____
Others : Nil

FILLER METALS (QW-404)

	GTAW		
AWS No. (Class)	: ER80SB8	Size of filler metal	: Refer Table
Specn. No. (SFA)	: 5.28	Filler Metal Product Form	: Solid (GTAW)
F. No.	: 6	Flux trade name	: N.A.
A. No.	: 5	Electrode-flux (Class)	: N.A.
		Consumable insert	: Without addition
		Filler	: With addition

Deposited weld metal thickness range (t)
Groove : Max. 13.10 mm (Max.2.5 mm/pass)
Fillet : All
Others : None

POSITION (QW-405)

Position(s) of Groove : All
Position(s) of Fillet : All
Weld Progression : Uphill
Others : Nil

PREHEAT (QW-406)

Preheat Temp. (min) : 210 °C
Interpass Temp. (max) : 300 °C
Preheat Maintenance : During welding
Others: : Post heat at 300°C for 30min. and cover the joint with asbestos cloth at any stoppage of welding.

BHEL-HPVP
Visakhapatnam – 12 **WPS No. : T.5B.5B.20** **Page 2 of 2** **Rev. No. : 01**

PWHT (QW-407)

Temp. Range : As per approved PWHT procedure.
Time Range : As per approved PWHT procedure.
Others : Nil

GAS (QW - 408)

	Gases	Mix %	Flow Rt.(lpm)
Shielding	Argon	99.95	8-10
Trailing	None	----	----
Backing	Argon	99.95	6-8

ELECTRICAL CHARACTERISTICS (QW – 409)

Current (AC/DC) : Refer Table
Amps (Range) : Refer Table
Tungsten Electrode type and size : EWTh2 and ϕ2.4mm
Mode of Metal transfer for GMAW : N.A.
Electrode wire feed speed range : N.A.
Pulsing current (GTAW) : None
Heat input (max.) : N.A.
Polarity : Refer Table
Volts : Refer Table

TECHNIQUES (QW-410)

String or Weave Bead : String / Weave.
Oscillation : N.A.
Initial and Interpass Cleaning : Chipping, Wire brushing & Grinding
Method of Back Gouging : N.A.
Orifice or Gas cup size : 10mm (I.D)
Contact tube to work distance : N.A
Multiple or single pass (per side) : Multiple
Multiple or single Electrode : Single
Electrode spacing : N.A
Travel Speed Range : N.A.
Peening : None
Use of thermal processes : None
Others : Nil

Weld Layer(s)	Process	Filler Metal		Current		Volt Range	ROL/ Travel speed Range	Others
		Class	Dia.(mm)	Type	Amps.	V		
Root (L1)	GTAW	ER80SB8	1.6	DCEN	90-100	12-14	70mm minimum per minute	Nil
L2	GTAW	ER80SB8	2.4	DCEN	110-135	14-16	90mm minimum per minute	Nil
Subsequent	GTAW	ER80SB8	2.4	DCEN	110-135	14-16	90mm minimum per minute	Nil

Prepared by:
01/06/23
D Lova Krishna
Dy. Engineer / W.T

Approved by:
P V D Ramesh 1/6/23
P V D Ramesh
Manager / W.T

BHPV QW-483 PROCEDURE QUALIFICATION RECORD (PQR)

PPT NO: 4222 LAB. NO.: P 097A & B/06.04.2K PQR NO.: 3027

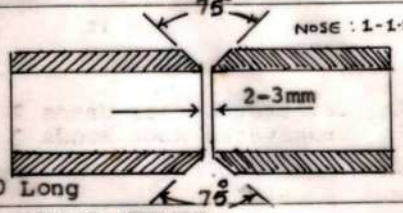
Company Name: M/s. BHARAT HEAVY PLATE AND VESSELS LIMITED, VISAKHAPATNAM 530 012

Procedure Qualification Record No.: 3027 Date: 25.04.2000

Welding Procedure Specification No.: 7213/9T-1 REV A Date: 08.03.2000

Welding Process(es): GTAW Type(s): MANUAL

JOINTS (QW-402): F.P JOINT



Test Plate Size: : OD 141.3 X 6.55 Thick X 150 Long

BASE METALS (QW-403):

Material Spec.: SA 335 to SA 335

Type or Grade: P9 to P9

P.No. 5B Gr.No.: 1 to P.No.: 5B Gr.No. 1

Thickness: 6.55mm to 6.55mm

Outside Dia: 141.3mm to 141.3mm

Other: NONE

FILLER METALS (QW-404):

Weld Metal Analysis A No: 5

Filler Metal Size (mm): 1.6/2.4 Ø

Filler Metal F.No: 6

SFA Specification: 5.9

AWS Classification: ER 505

Other: BRAND NAME: HILCO-SG CrMo 9

POSITION (QW-405):

Position of Groove/Fillet: 1G ROTATED

Weld Progression: Uphill NA

Other: NONE

PREHEAT (QW-406):

Preheat Temp. (Deg. C): 200°

Interpass Temp. (Deg. C): 300°

Other: Post heat at 300C for 30 Minutes and Cover with asbestos at any Interruption in Welding

POSTWELD HEAT TREATMENT (QW-407):

Temperature: 750 ± 10C

Time: (A) 120 Minutes (B) 60 Minutes

Other: (A) All Tests including Hardness (B) Only Hardness

GAS (QW-408):

Type of Gas(es): ARGON

Composition of Gas Mixture: 99.995% Argon

Flow rate: Shielding : 8-10 lpm: Backing : 6-8 : Trailing : NA

Gas Cup Size: 10mm ID

ELECTRICAL CHARACTERISTICS (QW-409)

Current Type: DC Polarity: GTAW : DC EN

Tungsten Electrode Type/Size: EW Th_2/2.4 Ø

TECHNIQUE (QW-410):

String/Weave Bead: String

Pass per side: Multipass

Electrode: Single Oscillation: NA

Process	Dia	Amps	Volts	Travel Speed	Wire Feed	ROL/Time
GTAW	1.6	90-100	12-14	70mm/Minute	-	-
GTAW	2.0	120-130	12-14	80mm/Minute	-	-
GTAW	2.0	120-130	12-14	80mm/Minute	-	-
GTAW	2.0	120-130	12-14	80mm/Minute	-	-

FORMAT NO 1904

TENSILE TESTS (QW-150):

Specimen No.	Width (mm.)	Thickness (mm)	Area Sq. mm.	Ultimate total load (kgs)	Ultimate Unit stress Kgs/Sq.mm	Character of Failure and location
P 097A$_1$	19.8	5.6	110.88	7300	65.84	BOW
P 097A$_2$	20.3	5.4	109.62	7300	66.59	BOW

GUIDED BEND TEST (QW-160): D= 4t Bend Angle: 180°

Type and Figure No.	Result
P 097A Transverse Face bends 2 Nos.	SATISFACTORY
P 097A Transverse Root Bends 2 Nos.	

TOUGHNESS TESTS (QW-170): Specimen Size: NA Test Temp: NA

Specimen No.	Notch location	Notch type	Test Temp.	Impact value	Lateral expn. Mils

HARDNESS:
HB 2.5Ø/187.5 Kgs
P097A P097B
Weld: 202-215-207-219 BHN
HAZ: 215-229 224-237 BHN
PM: 184-187 195-198 BHN

FILLET WELD TEST (QW-180): NA
Macro Results: NA
Result satisfactory: Yes/NO
Penetration into parent metal: Yes/NO

OTHER TESTS:
Type of Test(s): NA

Deposit Analysis: NA

Welder's Name: SRI V. SESHA RAO B. No.: 3304 PPT No.: 4222
Test conducted by M/s. BHPV Ltd. Laboratory Test No.: Dated: 21.04.2000

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code. & EIL STO-6-17-03

Sd/-
Surveyor(s): M/s LRIS Manufacturer: Sanjeeva Rao.
Date : 24.04.2000 Date : 25.04.2000

Form No. 1901/04

BHARAT HEAVY ELECTRICALS LIMITED

HEAVY PLATES & VESSELS PLANT-VISAKHAPATNAM-530012

WELDING TECHNOLOGY

WELDING PROCEDURE SPECIFICATION

Page 1 of 2

WPS No. : T.M.5B.5B.26 Date : 18 / 08 / 2016 Supporting PQR No. 2331
Rev No. : 01 Date : 01 / 06 / 2023

Welding Process : GTAW + SMAW Type : Manual (Auto/Semi-Auto/Manual/Machine)

Application : Groove welding of P5B Group 1 Low Alloy steel components with P5B Group 1 Low Alloy steel components & For all Fillet welds of P5B materials.

JOINTS (QW-402)
Joint Design : Groove as per approved fabrication drawing
Backing (Yes/No) : GTAW : N.A. SMAW : Yes
Backing Material (Type) : GTAW : N.A. SMAW : Weld Metal
(Metal/Non fusing metal/ Non metallic/Others)
Root spacing : As per approved fabrication drawing

BASE METAL (QW-403)
P. No. : 5B Group No : 1 TO P. No. : 5B Group No : 1
Spec. Type & Grade : N.A.
Chem. Analysis & Mech. Prop : N.A.
Thickness Range (T) Groove : 1.5 to 16.36 mm Fillet : All thicknesses.
Maximum Pass Thickness ≤13mm (Yes): Yes (No): _____
Others : Nil

FILLER METALS (QW-404)

	GTAW	SMAW
AWS No. (Class)	ER80SB8	E8018B8
Specn. No. (SFA)	5.28	5.5
F. No.	6	4
A. No.	5	5

Size of filler metal : Refer Table
Filler Metal Product Form : Solid (GTAW)
Flux trade name : N.A.
Electrode-flux (Class) : N.A.
Consumable insert : Without addition
Filler : With addition

Deposited weld metal thickness range (t)

Groove	Max. 6mm (Max.3mm/pass)	Max. 10.36mm (Max.4mm/pass)
Fillet	All	All
Others	None	None

POSITION (QW-405)
Position(s) of Groove : All
Position(s) of Fillet : All
Weld Progression : Uphill
Others : Nil

PREHEAT (QW-406)
Preheat Temp. (min) : 210 °C
Interpass Temp. (max) : 300 °C
Preheat Maintenance : During welding
Others: : Post heat at 300°C for 30min. and cover the joint with asbestos cloth at any stoppage of welding.

BHEL-HPVP
Visakhapatnam – 12 **WPS No. : T.M.5B.5B.26** **Page 2 of 2** **Rev. No. : 01**

PWHT (QW-407)

Temp. Range : As per approved PWHT procedure.
Time Range : As per approved PWHT procedure.
Others : Nil.

GAS (QW - 408)

	Gases	Mix %	Flow Rt.(lpm)
Shielding	Argon	99.995	8-10
Trailing	None	----	----
Backing	Argon	99.995	6-8

ELECTRICAL CHARACTERISTICS (QW – 409)

Current (AC/DC) : Refer Table
Polarity : Refer Table
Amps (Range) : Refer Table
Volts : Refer Table
Tungsten Electrode type and size : EWTh2 and ϕ2.4mm
Mode of Metal transfer for GMAW : N.A.
Electrode wire feed speed range : N.A.
Pulsing current (GTAW) : None
Heat input (max.) : N.A.

TECHNIQUES (QW-410)

String or Weave Bead : String / Weave (Max. 3 times of the core wire diameter of electrode)
Oscillation : N.A.
Initial and Interpass Cleaning : Chipping, Wire brushing & Grinding
Method of Back Gouging : Grinding
Orifice or Gas cup size : 10mm (I.D)
Contact tube to work distance : N.A
Multiple or single pass (per side) : Multiple
Multiple or single Electrode : Single
Electrode spacing : N.A
Travel Speed Range : N.A.
Peening : Not to be done.
Use of thermal processes : N.A.
Others : Nil

Weld Layer(s)	Process	Filler Metal		Current		Volt Range	ROL/ Travel speed Range	Others
		Class	Dia.(mm)	Type	Amps.	V		
Root (L1)	GTAW	ER80SB8	1.6	DCEN	90-110	14-16	90mm minimum per minute	Nil
L2	GTAW	ER80SB8	2.4	DCEN	110-135	14-16	90mm minimum per minute	Nil
L3	SMAW	E8018B8	3.15	DCEP	120-140	24-28	200mm minimum/electrode	Nil
L4	SMAW	E8018B8	4.0	DCEP	160-180	24-28	225mm minimum/electrode	Nil
L5	SMAW	E8018B8	5.0	DCEP	180-220	24-28	250mm minimum/electrode	Nil
Subsequent	SMAW	E8018B8	5.0	DCEP	180-220	24-28	250mm minimum/electrode	Nil

Prepared by:
D Lova Krishna 01/06/23
Dy. Engineer / WT

Approved by:
P V D Ramesh 1/6/23
P V D Ramesh
Manager / WT

BHPV QW-483 PROCEDURE QUALIFICATION RECORD (PQR)

PPT NO: 3347 LAB. NO.: P188/23.09.94 PQR NO.: 2331

Company Name: M/s. BHARAT HEAVY PLATE AND VESSELS LIMITED, VISAKHAPATNAM 530 012

Procedure Qualification Record No.: 2331 Date: 94.10.06

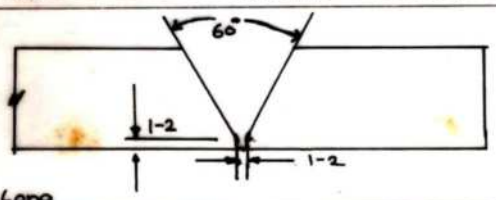
Welding Procedure Specification No.: 7151/ITM REV A Date: 94.03.15

Welding Process(es): GTAW + SMAW Type(s): MANUAL

JOINTS (QW-402): (FP JOINT)

GTAW: 3.0 MM (Root)

SMAW: REST



Test Plate Size: OD 219.1 x 8.18 Tk x 150 Long

BASE METALS (QW-403):			FILLER METALS (QW-404): GTAW	SMAW
Material Spec.:	SA 335	to SA 335	Weld Metal Analysis A No:	5	5
Type or Grade:	Gr P9	to Gr P9	Filler Metal Size (mm):	2.4	3.15 & 4.0
P.No: 5B Gr.No.:	1	to P.No.: 5B Gr.No.: 1	Filler Metal F.No:	6	4
Thickness:	8.18 mm	to 8.18 mm	SFA Specification:	5.9	5.4
Outside Dia:	219.1	to 219.1	AWS Classification:	ER 505	E 505
Other:	NONE		Other:	BRAND:- 1. SUPER ARC 505 2. ESAB KW2	

POSITION (QW-405):		PREHEAT (QW-406):	
Position of Groove/Fillet:	1P C (1G/3G)	Preheat Temp. (Deg. C):	200°c
Weld Progression:	Uphill	Interpass Temp. (Deg. C):	300c
Other:	NONE	Other:	POST HEAT AT 300c FOR 30 MINUTES AND COVER THE JOINT WITH ASBESTOS CLOTH AT ANY STOPPAGE OF WELDING

POSTWELD HEAT TREATMENT (QW-407):		GAS (QW-408);	
Temperature:	740°c	Type of Gas(es):	ARGON
Time:	120 MINUTES	Composition of Gas Mixture:	99.995%
Other:	STRESS RELIEVING	Flow rate: Shielding / Backing / Trailing (lpm):	8-10 / 6-8 / N.A
		Gas Cup Size:	10 mm ID

ELECTRICAL CHARACTERISTICS (QW-409)		TECHNIQUE (QW-410):	
Current Type: DC	Polarity: GTAW: EN (Straight) SMAW: EP (Reverse)	String/Weave Bead:	STRING
Tungsten Electrode Type/Size:	EWTH1/ Ø2.4mm	Pass per side:	MULTIPLE
		Electrode: SINGLE	Oscillation: NA

Process	Dia	Amps	Volts	Travel Speed	Wire Feed	ROL/Time
GTAW	2.4	100-120	14-16	80mm/minute		
SMAW	3.15	100-120	24-26			450 mm/350mm Electrod length
	4.0	130-135	24-26			200mm/350mm ELECTRODE LENGTH

FORMAT NO 1904

TENSILE TESTS (QW-150):

Specimen No.	Width (mm.)	Thickness (mm)	Area Sq. mm.	Ultimate total load (kgs)	Ultimate Unit stress Kgs/Sq.mm	Character of Failure and location
1	20.0	8.0	160.00	9800	61.25%	Bow
2	20.1	7.9	158.79	9550	60.15	Bow

GUIDED BEND TEST (QW-160): D= 4t Bend Angle: 180°

Type and Figure No.	Result
Transverse face bench 2nos Transverse root bench 2nos	Satisfactory

TOUGHNESS TESTS (QW-170): Specimen Size: NA Test Temp:

Specimen No.	Notch location	Notch type	Test Temp.	Impact value	Lateral expn. Mils

HARDNESS:
HB 2.5 Φ / 187.5 Kgs
weld - 198 - 207 BHN
HAZ - 202 - 211 "
PM - 187 - 191 "

FILLET WELD TEST (QW-180):
Macro Results: _____ Result satisfactory: Yes/NO
Penetration into parent metal: Yes/NO

OTHER TESTS:
Type of Test(s): RADIO GRAPHY : ACCEPTABLE

Deposit Analysis: NA

Welder's Name: G. SIVAPRAKASAM & APPARAOSAMY B. No.: 20033 4565 PPT No.: 3343
Test conducted by M/s. BHPV Ltd., Laboratory Test No.: P188/94 Dated: 9.4.94 & 10.9.94

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Surveyor(s): M/S EIL Manufacturer:
Date Date

94/10/17

P. S. S. L. NARAYANA
Engineer (W. T.)

Form No. 1901/04

BHARAT HEAVY ELECTRICALS LIMITED

HEAVY PLATES & VESSELS PLANT-VISAKHAPATNAM-530012

WELDING TECHNOLOGY

WELDING PROCEDURE SPECIFICATION

Page 1 of 2

WPS No.	: M.5B.5B.45	Date	: 18 / 08 / 2016	Supporting	
Rev No.	: 01	Date	: 01 / 06 / 2023	PQR No.	2331

Welding Process : SMAW Type : Manual (Auto/Semi-Auto/Manual/Machine)

Application : Groove welding of P5B Group 1 Low Alloy steel components with P5B Group 1 Low Alloy steel components & For all Fillet welds of P5B materials.

JOINTS (QW-402)

Joint Design : Groove as per approved fabrication drawing

Backing (Yes/No) : GTAW : N.A. SMAW : Yes

Backing Material (Type) : GTAW : N.A. SMAW : Metal

(Metal/Non fusing metal/ Non metallic/Others)

Root spacing : As per approved fabrication drawing

BASE METAL (QW-403)

P. No. : 5B Group No : 1 TO P. No. : 5B Group No : 1

Spec. Type & Grade : N.A.

Chem. Analysis & Mech. Prop : N.A.

Thickness Range (T) Groove : 1.5 to 10.36mm Fillet : All thicknesses.

Maximum Pass Thickness ≤13mm (Yes): Yes_____ (No): _____

Others : Nil

FILLER METALS (QW-404)

		SMAW		
AWS No. (Class)	:	E8018B8	Size of filler metal	: Ref table
Specn. No. (SFA)	:	5.5	Filler Metal Product Form	: N.A.
F. No.	:	4	Flux trade name	: N.A.
A. No.	:	5	Electrode-flux (Class)	: N.A.
			Consumable insert	: N.A.

Deposited weld metal thickness range (t)

Groove : Max.10.36mm (Max.4mm/pass)

Fillet : All

Others : None

POSITION (QW-405)

Position(s) of Groove : All

Position(s) of Fillet : All

Weld Progression : Uphill

Others : Nil

PREHEAT (QW-406)

Preheat Temp. (min) : 210 °C

Interpass Temp. (max) : 300 °C

Postheat Maintenance : During welding

Others: : Post heat at 300°C for 30min. and cover the joint with asbestos cloth at any stoppage of welding.

BHEL-HPVP
Visakhapatnam – 12 **WPS No. : M.5B.5B.45** **Page 2 of 2** **Rev. No. : 01**

PWHT (QW-407)

Temp. Range : As per approved PWHT procedure.
Time Range : As per approved PWHT procedure.
Others : Nil

GAS (QW - 408)

	Gases	Mix %	Flow Rt.(lpm)
Shielding	N.A.	----	----
Trailing	N.A.	----	----
Backing	N.A.	----	----

ELECTRICAL CHARACTERISTICS (QW – 409)

Current (AC/DC) : Refer Table
Polarity : Refer Table
Amps (Range) : Refer Table
Volts : Refer Table
Tungsten Electrode type and size : N.A.
Mode of Metal transfer for GMAW : N.A.
Electrode wire feed speed range : N.A.
Pulsing current (GTAW) : N.A.
Heat input (Max.) : N.A.

TECHNIQUES (QW-410)

String or Weave Bead : String / Weave (Max. 3 times of the core wire diameter of electrode)
Oscillation / Weaving : N.A.
Initial and Interpass Cleaning : Chipping, Wire brushing & Grinding
Method of Back Gouging : Grinding.
Orifice or Gas cup size : N.A
Contact tube to work distance : N.A
Multiple or single pass (per side) : Multiple
Multiple or single Electrode : Single
Electrode spacing : N.A
Travel Speed Range : N.A.
Peening : None
Use of thermal processes : None
Others : Nil

Weld Layer(s)	Process	Filler Metal		Current		Volt Range	ROL/ Travel speed Range	Others
		Class	Dia.(mm)	Type	Amps.	V		
L1	SMAW	E8018B8	3.15	DCEP	120-140	24-28	200mm minimum/electrode	Nil
L2	SMAW	E8018B8	4.0	DCEP	160-180	24-28	225mm minimum/electrode	Nil
Subsequent	SMAW	E8018B8	5.0	DCEP	180-220	24-28	250mm minimum/electrode	Nil

Prepared by:
D Lova Krishna 01/06/23
Dy. Engineer / WT

Approved by:
P V D Ramesh 1/6/23
P V D Ramesh
Manager / WT

BHPV QW-483 PROCEDURE QUALIFICATION RECORD (PQR)

PPT NO: 3347 LAB. NO.: P188/23.09.94 PQR NO.: 2331

Company Name: M/s. BHARAT HEAVY PLATE AND VESSELS LIMITED, VISAKHAPATNAM 530 012

Procedure Qualification Record No.: 2331 Date: 94.10.06

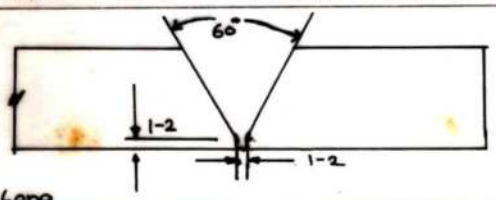
Welding Procedure Specification No.: 7151/ITM REV A Date: 94.03.15

Welding Process(es): GTAW + SMAW Type(s): MANUAL

JOINTS (QW-402): (FP JOINT)

GTAW: 3.0 MM (Root)

SMAW: REST



Test Plate Size: OD 219.1 x 8.18 Tk x 150 Long

BASE METALS (QW-403):		FILLER METALS (QW-404): GTAW	SMAW
Material Spec.:	SA 335 to SA 335	Weld Metal Analysis A No:	5 5
Type or Grade:	Gr P9 to Gr P9	Filler Metal Size (mm):	2.4 3.15 & 4.0
P.No: 5B Gr.No.:	1 to P.No.: 5B Gr.No. 1	Filler Metal F.No:	6 4
Thickness:	8.18 mm to 8.18 mm	SFA Specification:	5.9 5.4
Outside Dia:	219.1 to 219.1	AWS Classification:	ER 505 E 505
Other:	NONE	Other:	1. SUPER ARC 505 BRAND:- 2. ESAB KW2

POSITION (QW-405):		PREHEAT (QW-406):	
Position of Groove/Fillet:	1P C(1G/3G)	Preheat Temp. (Deg. C):	200°c
Weld Progression:	Uphill	Interpass Temp. (Deg. C):	300°c
Other:	NONE	Other:	POST HEAT AT 300°c FOR 30 MINUTES AND COVER THE JOINT WITH ASBESTOS CLOTH AT ANY STOPPAGE OF WELDING

POSTWELD HEAT TREATMENT (QW-407):		GAS (QW-408);	
Temperature:	740°c	Type of Gas(es):	ARGON
Time:	120 MINUTES	Composition of Gas Mixture:	99.995%
Other:	STRESS RELIEVING	Flow rate: Shielding / Backing / Trailing (lpm):	8-10 / 6-8 / N.A
		Gas Cup Size:	10 mm ID

ELECTRICAL CHARACTERISTICS (QW-409)		TECHNIQUE (QW-410):	
Current Type: DC	Polarity: GTAW: EN (Straight) SMAW: EP (Reverse)	String/Weave Bead:	STRING
Tungsten Electrode Type/Size:	EWTh1/ Ø2.4mm	Pass per side:	MULTIPLE
		Electrode: SINGLE	Oscillation: NA

Process	Dia	Amps	Volts	Travel Speed	Wire Feed	ROL/Time
GTAW	2.4	100-120	14-16	80mm/minute		
SMAW	3.15	100-120	24-26			450 mm/350mm Electrod length
	4.0	130-135	24-26			200mm/350mm ELECTRODE LENGTH

FORMAT NO 1904

TENSILE TESTS (QW-150):

Specimen No.	Width (mm.)	Thickness (mm)	Area Sq. mm.	Ultimate total load (kgs)	Ultimate Unit stress Kgs/Sq.mm	Character of Failure and location
1	20.0	8.0	160.00	9800	61.25%	Bow
2	20.1	7.9	158.79	9550	60.15	Bow

GUIDED BEND TEST (QW-160): D= 4t Bend Angle: 180°

Type and Figure No.	Result
Transverse face bench 2nos Transverse root bench 2nos	Satisfactory

TOUGHNESS TESTS (QW-170): Specimen Size: NA Test Temp:

Specimen No.	Notch location	Notch type	Test Temp.	Impact value	Lateral expn. Mils

HARDNESS:
HB 250/187.5 Kgs
weld - 198 - 207 BHN
HAZ - 202 - 211 "
PM - 182 - 191 "

FILLET WELD TEST (QW-180):
Macro Results: Result satisfactory: Yes/NO
Penetration into parent metal: Yes/NO

OTHER TESTS:
Type of Test(s): RADIO GRAPHY : ACCEPTABLE

Deposit Analysis: NA

Welder's Name: G. SIVAPRAKASH & APPARAOSMALO B. No.: 20023 4565 PPT No.: 3343
Test conducted by M/s. BHPV Ltd., Laboratory Test No.: P188/94 Dated: 9.4.94 & 10.9.94

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Surveyor(s): M/S EIL Manufacturer:
Date Date

94/10/94

P. S. S. L. NARAYANA
Engineer (W. T.)

Form No. 1901/04

BHARAT HEAVY ELECTRICALS LIMITED

HEAVY PLATES & VESSELS PLANT-VISAKHAPATNAM-530012

WELDING TECHNOLOGY

WELDING PROCEDURE SPECIFICATION

Page 1 of 2

WPS No.	: T.M.1.1.50	Date	: 23 / 10 / 2020	Supporting	
Rev No.	: 03	Date	: 01 / 06 / 2022	PQR No.	2871

Welding Process : GTAW + SMAW Type : Manual + Manual (Auto/Semi-Auto/Manual/Machine)

Application : Groove welding of P1 Group 1, 2 Carbon steel components with P1 Group 1, 2 Carbon steel components & For all fillet welds of P1 materials (without impact properties)

JOINTS (QW-402)

Joint Design : Groove as per approved fabrication drawing
Backing (Yes/No) : GTAW: N.A. SMAW: Yes
Backing Material (Type) / Retainer (Metal/Non-fusing metal/ Non-metallic/Others) : GTAW: N.A. SMAW: Weld Metal
Root Spacing : As per approved Fabrication drawing

BASE METAL (QW-403)

P. No. : 1 Group No : 1/2 TO P. No. : 1 Group No : 1/2
Spec. Type & Grade : N.A.
Chem. Analysis & Mech. Prop : N.A.
Thickness Range (T) Groove : 5 to 200 mm Fillet : All
Maximum Pass Thickness ≤13mm (Yes): Yes _____ (No): _____
Others : Nil

FILLER METALS (QW-404)

	GTAW	SMAW		
AWS No. (Class)	: ER70S2	: E7018	Size of filler metal	: Refer Table
			Filler Metal Product Form	: Solid (GTAW)
Specn. No. (SFA)	: 5.18	: 5.1	Flux trade name	: N.A.
F. No.	: 6	: 4	Electrode-flux (Class)	: N.A.
A. No.	: 1	: 1	Consumable insert	: Without addition
			Filler	: With addition

Deposited weld metal thickness range (t)

Groove	: Max. 24 mm (Max.3mm/pass)	: Max. 200 mm (Max.4mm/pass)
Fillet	: All	: All
Others	: Nil	

POSITION (QW-405)

Position(s) of Groove : All
Position(s) of Fillet : All
Weld Progression : Uphill & Downhill
Others : Nil

PREHEAT (QW-406)

Preheat Temp. (min) : 38°C for T ≤ 32mm, 95°C for T > 32mm
Interpass Temp. (max) : 150°C
Preheat Maintenance : During welding
Others: : Nil

BHEL-HPVP
Visakhapatnam – 12 **WPS No. : T.M.1.1.50** **Page 2 of 2** **Rev. No. : 03**

PWHT (QW-407)

Temp. Range : None
Time Range : None
Others : Nil

GAS (QW - 408)

	Gases	Mix %	Flow Rt.(lpm)
Shielding	Argon	99.997	8-10
Trailing	None	----	----
Backing	None	----	----

ELECTRICAL CHARACTERISTICS (QW – 409)

Current (AC/DC) : Refer Table
Polarity : Refer Table
Amps (Range) : Refer Table
Volts : Refer Table
Tungsten Electrode type and size : EWTh2 and ϕ2.4mm
Mode of Metal transfer for GMAW : N.A.
Electrode wire feed speed range : N.A.
Pulsing current (GTAW) : None
Heat input (max.) : N.A.

TECHNIQUES (QW-410)

String or Weave Bead : String / Weave (Max. 3 times of the core wire diameter of electrode)
Oscillation : N.A.
Initial and Interpass Cleaning : Chipping, Wire brushing & Grinding
Method of Back Gouging : Grinding (or) Air arc gouging & sound metal weld when required.
Orifice or Gas cup size : 10mm (I.D)
Contact tube to work distance : N.A
Multiple or single pass (per side) : Multiple
Multiple or single Electrode : N.A
Electrode spacing : N.A
Travel Speed Range : N.A.
Peening : Not to be done
Use of thermal processes : N.A
Others : Nil

Weld Layer(s)	Process	Filler Metal		Current		Volt Range	ROL/ Travel speed Range	Others
		Class	Dia.(mm)	Type	Amps.	V		
Root (L1)	GTAW	ER70SA1	2.4	DCEN	110-135	14-16	90mm minimum per minute	Nil
L2	GTAW	ER70SA1	2.4	DCEN	110-135	14-16	90mm minimum per minute	Nil
L3	SMAW	E7018	3.15	DCEP	80-100	24-26	110-115mm minimum / electrode	Nil
L4 & Subsequent	SMAW	E7018	4.0	DCEP	130-140	24-26	200 mm minimum / electrode	Nil

Prepared by:
D Lova Krishna 01/06/22
Dy. Engineer / WT

Approved by:
P V D Ramesh 1/6/22
P V D Ramesh
Manager /WT

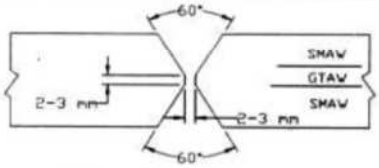
QW-483 PROCEDURE QUALIFICATION RECORD (PQR)

PPT NO.	4031	LAB NO.	P009 / 99	PQR NO.	2871

Organization Name	M/s. BHARAT HEAVY ELECTRICALS LIMITED, HP&VP, VISAKHAPATNAM-530 012		
Procedure Qualification Record No.	2871	Date	09.02.1999
Welding Procedure Specification No.	4420/2TM Rev A	Date	20.11.1998
Welding Process (es)	GTAW + SMAW	Type(s) (Automatic/Manual)	MANUAL + MANUAL

JOINTS (QW-402): B. G. JOINT

2nd Side preparation: Gouging/~~Grinding~~/~~None~~



Test Plate Size: 450 x 150 x 45

Fig. Groove Design of Test Coupon

BASE METALS (QW-403):

Material Spec.	SA516	to	SA516	
Type or Grade	Gr.60	to	Gr.70	
P No. 1 Group.No.1	to	P No. 1	Group. No. 2	
Thickness of test coupon (mm)	45 mm	to	45 mm	
Diameter of test coupon (OD)mm	N.A	to	N.A	
Maximum Pass thickness (t ≤ 13 mm)	< 13mm			

POSITION (QW-405):

Position (s) of Groove/Fillet	3G
Weld Progression (Uphill, Downhill)	UPHILL
Other	NONE

PRE HEAT (QW-406):

Pre heat Temp. (Deg. C)	50
Interpass Temp. (Deg. C)	200
Other	NONE

POSTWELD HEAT TREATMENT (QW-407):

Temperature	NIL
Time	N.A
Other	AS WELDED

ELECTRICAL CHARACTERISTICS (QW-409): GTAW; SMAW

Current Type	DC	Polarity	DCEN; DCEP
Tungsten Electrode Type	EWTh2	Size	2.4Ø
Mode of Metal Transfer for GMAW/FCAW:			N.A
Other	NONE		

FILLER METALS (QW-404):

	GTAW	SMAW
SFA Specification	5.18	5.1
AWS Classification	ER70S2	E7018
Filler Metal F-No.	6	4
Weld Metal Analysis A.No.	1	1
Size of Electrode/Filler Metal	2.4Ø	4.0Ø
Filler Metal Product Form	Solid	N.A
Supplemental Filler Metal	N.A	N.A
Electrode Flux Classification	N.A	Low Hydrogen Potassium, Iron powder
Flux Type	N.A	N.A
Flux Trade Name	N.A	N.A
Weld Metal Thickness (mm)	12	33
Other (Brand):	Hilco SG1A	ANAND THERME

GAS (QW-408): Percent Composition

	Gas(es)	(Mixture)	Flow Rate
Shielding	ARGON	99.95%	8-10 lpm
Trailing	N.A		
Backing	N.A		
Gas cup size	10 mm ID		

TECHNIQUE (QW-410):

String or Weave Bead	STRING		
Multipass or Single Pass (Per Side)			MULTIPLE
Oscillation	N.A	Electrodes	N.A
Closed to Out chamber	N.A		
use of thermal processes			N.A

Process	Diameter, mm	Amps	Volts	Travel Speed, mm/minute	Wire Feed, m/minute	Weld Bead Length/Arc Time/ROL	Heat Input	Other
GTAW	2.4	160	14-16	450mm/ 8Minutes	--	--	--	
SMAW	4	130-140	24-26	--	--	200mm/450mm long Electrode		

FORM NO. 1904/1

PQR No. **2871**

TENSILE TESTS (QW-150) : TRANSVERSE TENSILE TEST

Specimen No.	Width (mm)	Thickness (mm)	Area (Sq.mm)	Ultimate Total load (kgs)	Ultimate Stress (Kgs / Sq. mm)	Character of Failure and location
1	19.50	42.10	820.95	41,500	50.55	B.O.W in P1(1)
2	20.00	42.10	842.00	42,000	49.88	B.O.W in P1(1)

GUIDED BEND TEST (QW-160): GUIDED BEND ROLLER DIA.: **4t** BEND ANGLE: **180°**

Type and Figure No.	Result
Transverse Side bends 4 No's	**Satisfactory**

TOUGHNESS TESTS (QW-170): Specimen Size: **10 X 5 X 55** Test Temp.: **0°C** **HARDNESS:**

Specimen No.	Notch location	Notch type	Toughness Values			≤200 BHN; HB2.5ϕ, 187.5kg load	
			Impact Value (Kg.m) TOP	Impact Value (Kg.m) BOTTOM	Lateral expn. Mills (in.) or mm	Indentation Location	Value
1	WELD	CV	14.8	10.8		WELD	191-198 BHN
2	WELD	CV	16.3	14.2		HAZ P1(1)	177-184 BHN
3	WELD	CV	14.8	12.9		HAZ P1(2)	191-195 BHN
4	HAZ P1 (1)	CV	29.1	22.1		PM P1(1)	143-145 BHN
5	HAZ P1 (1)	CV	28.9	27.2		PM P1(2)	161-164 BHN
6	HAZ P1 (1)	CV	27.7	27.7			
7	HAZ P1 (2)	CV	15.1	16.4			
8	HAZ P1 (2)	CV	17.3	15.7			
9	HAZ P1 (2)	CV	17.8	17.2			

Comments: **N.A**

FILLET WELD TESTS (QW-180) **N.A** Results Satisfactory: Yes / No

Micro Results: **N.A** Penetration into parent metal: Yes / No

OTHER TESTS: N.A

Type of Test (s):	
Deposit Analysis:	
Other:	

Welder's Name: **B ESWARUDU** Badge No. **4596** PPT No. **4031**

Test Conducted by: **M/s BHPV Ltd.** Laboratory Test No.: **P009/99** Dated **04.02.1999**

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code 2019.

The Procedure Qualification Record (PQR) No. **2871** Date: **09.02.1999** is allotted for reference.

P V B Ramesh
5/11/20

Surveyor (s)

Date

Manufacturer

Certification Date

Note: This PQR was carried out in erstwhile M/s. BHPV now known as M/s. BHEL-HPVP. PQR reviewed as per ASME SEC-IX 2019 edition and found meeting the requirements

वेंकट दुर्गा रमेश
P V B DURGA RAMESH
वरिष्ठ प्रबंधक / Deputy Manager
वेल्डिंग प्रौद्योगिकी / Welding Technology
भा.पे.इ.लि.-एच.पी.वी.पी. / BHEL-HPVP
विशाखपट्टणम/Visakhapatnam-530012

Form No. 1901/04

BHARAT HEAVY ELECTRICALS LIMITED

HEAVY PLATES & VESSELS PLANT-VISAKHAPATNAM-530012

WELDING TECHNOLOGY

WELDING PROCEDURE SPECIFICATION

Page 1 of 2

WPS No. : M.1.1.88 Date : 23 / 10 / 2020 Supporting
Rev No. : 03 Date : 30 / 07 / 2021 PQR No. 3632

Welding Process : SMAW Type : Manual
(Auto/Semi-Auto/Manual/Machine)

Application : Groove welding of P1 Group 1 or 2 Carbon steel components with P1 Group 1 or 2 Carbon steel components & For all Fillet welds of P1 materials.

JOINTS (QW-402)

Joint Design : Groove as per approved fabrication drawing
Backing (Yes/No) : No
Backing Material (Type) / Retainer : Nil
(Metal/Non fusing metal/ Non-metallic/Others)
Root Spacing : As per approved fabrication drawing

BASE METAL (QW-403)

P. No. : 1 Group No : 1, 2 TO P. No. : 1 Group No : 1, 2
Spec. Type & Grade : N.A.
Chem. Analysis & Mech. Prop : N.A.
Thickness Range (T) Groove : 5 to 200 mm Fillet : All thicknesses
Maximum Pass Thickness ≤13mm (Yes): Yes (No): _____
Others : Nil

FILLER METALS (QW-404)

	SMAW		
AWS No. (Class)	E7018	Size of filler metal	3.15, 4.0, 5.0mm
Specn. No. (SFA)	5.1	Filler Metal Product Form	N.A.
F. No.	4	Flux trade name	N.A.
A. No.	1	Electrode-flux (Class)	N.A.
		Consumable insert	N.A.

Deposited weld metal thickness range (t)
Groove : Max.200 mm (Max.4mm/pass)
Fillet : All
Others : None

POSITION (QW-405)

Position(s) of Groove : All
Position(s) of Fillet : All
Weld Progression : Uphill & Downhill
Others : Nil

PREHEAT (QW-406)

Preheat Temp. (min) : 38°C for T ≤ 32 mm
95°C for T > 32 mm
Interpass Temp. (max) : 150 °C
Preheat Maintenance : Not required
Others: : Preheat extend to 75mm on either side of weld

BHEL-HPVP
Visakhapatnam – 12 **WPS No. : M.1.1.88** **Page 2 of 2** **Rev. No. : 03**

PWHT (QW-407)

Temp. Range : None
Time Range : None
Others : Nil

GAS (QW - 408)

	Gases	Mix %	Flow Rt.(lpm)
Shielding	N.A.	----	----
Trailing	N.A.	----	----
Backing	N.A.	----	----

ELECTRICAL CHARACTERISTICS (QW – 409)

Current (AC/DC) : Refer Table
Polarity : Refer Table
Amps (Range) : Refer Table
Volts : Refer Table
Tungsten Electrode type and size : N.A.
Mode of Metal transfer for GMAW : N.A.
Electrode wire feed speed range : N.A.
Pulsing current (GTAW) : N.A.
Heat input (Max.) : N.A.

TECHNIQUES (QW-410)

String or Weave Bead : String / Weave (Max. 3 times of the core wire diameter of electrode)
Oscillation : N.A.
Initial and Interpass Cleaning : Chipping, Wire brushing & Grinding
Method of Back Gouging : Grinding (or) Air arc gouging & sound metal weld when required.
Orifice or Gas cup size : N.A
Contact tube to work distance : N.A
Multiple or single pass (per side) : Multiple
Multiple or single Electrode : N.A
Electrode spacing : N.A
Travel Speed Range : N.A.
Peening : Not to be done
Use of thermal processes : N.A
Others : Nil

Weld Layer(s)	Process	Filler Metal		Current		Volt Range	ROL/ Travel speed Range	Others
		Class	Dia.(mm)	Type	Amps.	V		
Root (L1)	SMAW	E7018	3.15	DCEP	90-110	24-26	110-150 mm minimum /electrode	Nil
L2	SMAW	E7018	4.0	DCEP	130-140	24-26	200 mm , minimum / electrode	Nil
L3 & Subsequent	SMAW	E7018	5.0	DCEP	180-220	24-28	250mm minimum/electrode	Nil

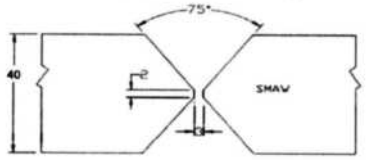
Prepared by:
D Lova Krishna 30/07/24
Dy. Engineer / WT

Approved by:
P V D Ramesh 30/7/24
P V D Ramesh
Dy. Manager / WT

QW-483 PROCEDURE QUALIFICATION RECORD (PQR)

PPT NO. 4886	LAB NO. 54 & 54A / 2020-21	PQR NO. 3632	
Organization Name	M/s. BHARAT HEAVY ELECTRICALS LIMITED, HP&VP, VISAKHAPATNAM-530 012		
Procedure Qualification Record No.	3632	Date	07.12.2020
Welding Procedure Specification No.	M.1.1.01 Rev. 0	Date	07.12.2020
Welding Process (es)	SMAW	Type(s) (Automatic/Manual)	MANUAL

JOINTS (QW-402): B.G. JOINT
2nd Side Preparation B.G. & D.P.



Test Plate Size: L 450 X W 300 X THK 40 mm

Figure: Groove Design of Test Coupon

BASE METALS (QW-403):				FILLER METALS (QW-404):	
Material Spec.	SA 516	to	SA 516	SFA Specification	5.1
Type or Grade	70	to	70	AWS Classification	E7018
P No. 1 Gr No.: 2	to	P No. 1	Gr No.: 2	Filler Metal F-No.	4
Thickness of test coupon	40	to	40	Weld Metal Analysis A.No.	1
Diameter of test coupon	N.A	to	N.A	Size of Electrode/Filler Metal	Ø3.15, Ø4, Ø5
Maximum Pass thickness (t≤13 mm)		2mm		Filler Metal Product Form	N.A
Other				Supplemental Filler Metal	N.A
POSITION (QW-405):				Electrode Flux Classification	Low Hydrogen Potassium, Iron powder
Position (s) of Groove/Fillet	1G			Flux Type	N.A
Weld Progression (Uphill, Downhill)	N.A			Flux Trade Name	N.A
Other	NONE			Weld Metal Thickness, mm	40
PRE HEAT (QW-406):				Other (Brand):	JACKSUN18H (Batch:019 for Ø3.15; 7870 for Ø5); SIVATHERME (Batch:045 for Ø4
Pre heat Temp. (Deg. C)	79				
Interpass Temp. (Deg. C)	150			**GAS (QW-408):** Percent Composition	
Other	NONE				Gas(es) / (Mixture) / Flow Rate
POSTWELD HEAT TREATMENT (QW-407):				Shielding	N.A
Temperature	NIL			Trailing	
Time	NIL			Backing	
Other	As Welded			Gas cup size	

ELECTRICAL CHARACTERISTICS (QW-409):				**TECHNIQUE (QW-410):**	
Current Type	DC	Polarity	DCEP	String or Weave Bead: String for Root pass & Weave for subsequent passes	
Tungsten Electrode	N.A	Size	N.A	Multipass or single pass(per side)	Multipass
Mode of Metal Transfer for GMAW/FCAW:			NA	Oscillation: 2-3 times of electrode dia.	Electrodes: N.A
Other	NONE			Other: Use of thermal processes - N.A	

Process	Dia.	Amps	Volts	Travel Speed, cm/minute	Heat Input, kJ/mm	Weld Bead Length / ROL	Wire Feed, m/minute	Arc Time (seconds)
Root/SMAW	3.15	90 - 95	22 - 27		0.95 to 1.436	100mm to 150mm / 450mm long electrode		70 to 90
Hot & Fill /SMAW	4.0	150 - 155	22 - 27		1.848 to 2.344	100mm to 150 mm / 450mm long electrode		70 to 90
Fill & Cap / SMAW	5.0	220	22 - 27		1.747 to 2.144	200mm to 250mm / 450mm long electrode		90 to 95

Test Plate Welded on 27.08.2020

FORMAT NO. 1904/1

PQR No. **3632**

TENSILE TESTS (QW-150) : TRANSVERSE TENSILE TEST

Specimen No.	Width (mm)	Thickness (mm)	Area (Sq.mm)	Ultimate Total load (N)	Ultimate Stress (N/sq.mm)	Character of Failure and location
54-1	19.3	37.2	717.96	397000	552.96	Ductile & Broken inside weld
54-2	19.6	37.5	735.00	403000	548.30	Ductile & Broken inside weld

GUIDED BEND TEST (QW-160): GUIDED BEND ROLLER DIA.: D = 4t BEND ANGLE: 180°

Type & Figure No.	Result
Side Bend - 4 Nos	No Crack or defect on the Bend portion of the specimen

TOUGHNESS TESTS (QW-170): Specimen Size, mm: 10 x 10 x 55; Test Temp.: 0°C; HARDNESS: (Load: 187.5kg.f)

Specimen No.	Notch location	Notch Type	Toughness Values: Impact Value (Joule)	%Shear	Lateral expn. Mills(in.)or mm	Indentation Location	Value (BHN)
54-1	WELD (top)	V	206.01			PM (1)	174
54-2	WELD (top)	V	281.55			PM (2)	180
54-3	WELD (top)	V	147.15			PM (3)	164
54-4	WELD (bottom)	V	109.87			HAZ (4)	198
54-5	WELD (bottom)	V	115.76			HAZ (5)	195
54-6	WELD (bottom)	V	228.57			HAZ (6)	190
54-7	HAZ (top)	V	284.49			WELD (7)	167
54-8	HAZ (top)	V	251.14			WELD (8)	187
54-9	HAZ (top)	V	284.49			WELD (9)	165
54-10	HAZ (bottom)	V	280.57				
54-11	HAZ (bottom)	V	272.72				
54-12	HAZ (bottom)	V	198.16				
54-13	PM	V	269.78				
54-14	PM	V	264.87				
54-15	PM	V	264.87				

Comments:

FILLET WELD TESTS (QW-180) N.A Results Satisfactory: Yes / No

Macro Results: Penetration into parent metal: Yes / No

OTHER TESTS:

Type of Test (s): N.A

Deposit Analysis:

Other:

Welder's Name: **M UMAPATHI** Staff No. **6268951** PPT No. **4886**

Test Conducted by: **M/s. BHEL - HPVP** Laboratory Test No.: **54 & 54A / 2020-21** Dated: **17.11.2020 & 07.12.2020**

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Boiler and Pressure Vessel Code 2019.

The Procedure Qualification Record (PQR) No. **3632** Date: **07.12.2020** is allotted for reference.

P V D Ramesh
14/12/20

पी. वेंकट दुर्गा रमेश
P. VENKATA DURGA RAMESH
उप प्रबन्धक / Deputy Manager
वेल्डिंग प्रौद्योगिकी / Welding Technology
विशाखपट्टणम/Visakhapatnam-530012

Technical Inspection Services TÜV 279 TÜV India

Surveyor (s): **M/s. TUV-INDIA**
Date **11.12.2020**

Manufacturer
Certification Date: पी वी पी / BHEL-HPVP

Form No. 1901/04

BHARAT HEAVY ELECTRICALS LIMITED

HEAVY PLATES & VESSELS PLANT-VISAKHAPATNAM-530012

WELDING TECHNOLOGY

WELDING PROCEDURE SPECIFICATION

Page 1 of 2

WPS No. : M.1.8.36 Date : 07 / 06 / 2016 Supporting
Rev No. : 00 Date : PQR No. 3075

Welding Process : SMAW Type : Manual
(Auto/Semi-Auto/Manual/Machine)

Application : Groove welding of P1 Group 2 Carbon steel/Eq. components with P8 Group 1 Stainless steel components & For all Fillet welds of P1/Eq. to P8 materials.

JOINTS (QW-402)
Joint Design : Groove as per Production drawing
Backing (Yes/No) : GTAW : No SMAW : Yes
Backing Material (Type) : GTAW : Nil SMAW : Metal
(Metal/Non fusing metal/ Non metallic/Others)

BASE METAL (QW-403)
P. No. : 1 Group No : 2 TO P. No. : 8 Group No : 1
Spec. Type & Grade : N.A.
Chem. Analysis & Mech. Prop : N.A.
Thickness Range (T) Groove : 5 to 40 mm Fillet : All
Maximum Pass Thickness ≤13mm (Yes): Yes (No): _____
Others : Nil

FILLER METALS (QW-404)

	SMAW		
AWS No. (Class)	: E 310	Size of filler metal	: 3.15,4.0 mm
Specn. No. (SFA)	: 5.4	Filler Metal Product Form	: N.A.
F. No.	: 5	Flux trade name	: N.A.
A. No.	: 9	Electrode-flux (Class)	: N.A.
Deposited weld metal thickness range (t)		Consumable insert	: N.A.
Groove	: Max.40 mm (Max.4mm/pass)		
Fillet	: All		
Others	: None		

POSITION (QW-405)
Position(s) of Groove : All
Position(s) of Fillet : All
Weld Progression : Uphill
Others : Nil

PREHEAT (QW-406)
Preheat Temp. (min) : 15°C Upto 25mm
95°C>25mm & Above On P1 side.
Interpass Temp. (max) : 150 °C
Preheat Maintenance : During Welding
Others: : Nil

BHEL-HPVP
Visakhapatnam – 12

WPS No. : M.1.8.36

Page 2 of 2
Rev. No. : 00

PWHT (QW-407)

Temp. Range : NA
Time Range : NA
Others :

GAS (QW - 408)

	Gases	Mix %	Flow Rt.(lpm)
Shielding	N.A.	----	----
Trailing	N.A.	----	----
Backing	N.A.	----	----

ELECTRICAL CHARACTERISTICS (QW – 409)

Current (AC/DC) : Refer Table
Amps (Range) : Refer Table
Tungsten Electrode type and size : N.A.
Mode of Metal transfer for GMAW : N.A.
Electrode wire feed speed range : N.A.
Pulsing current (GTAW) : N.A.
Heat input (Max.) : N.A.

Polarity : Refer Table
Volts : Refer Table

TECHNIQUES (QW-410)

String or Weave Bead : String / Weave (Max. 3 times of the core wire diameter of electrode)
Oscillation / Weaving : N.A.
Initial and Interpass Cleaning : Chipping, Wire brushing & Grinding
Method of Back Gouging : Grinding or Air arc gouging sound metal weld when required.
Orifice or Gas cup size : N.A
Contact tube to work distance : N.A
Multiple or single pass (per side) : Multiple
Multiple or single Electrode : Single
Electrode spacing : N.A
Travel Speed Range : N.A.
Peening : None
Use of thermal processes : None
Others : Nil

Weld Layer(s)	Process	Filler Metal		Current		Volt Range	ROL/ Travel speed Range	Others
		Class	Dia.(mm)	Type	Amps.	V		
Root (L1)	SMAW	E 310	3.15	DCEP	120-140	24-28	200mm minimum/electrode	Nil
L2	SMAW		3.15	DCEP	120-140	24-28	200mm minimum/electrode	Nil
L3	SMAW		4.0	DCEP	160-180	24-28	225mm minimum/electrode	Nil
Subsequent	SMAW		4.0	DCEP	160-180	24-28	225mm minimum/electrode	Nil

Prepared by:
V. Deepak
AE-1 (WT)

Approved by:
G.Sankara Babu
Sr.Manager (WT)

BHPV QW-483 PROCEDURE QUALIFICATION RECORD (PQR)

PPT NO: 4238 LAB. NO.: P 154/06.06.2K PQR NO.: 3075

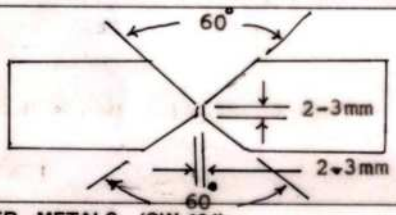
Company Name: M/s. BHARAT HEAVY PLATE AND VESSELS LIMITED, VISAKHAPATNAM 530 012

Procedure Qualification Record No.: 3075 Date: 31.08.2000

Welding Procedure Specification No.: 2128/6M REV. A Date: 10.01.2000

Welding Process(es): SMAW Type(s): MANUAL

JOINTS (QW-402): B.G. JOINT



Test Plate Size: 450 X 150 X 20mm Thick

BASE METALS (QW-403):

Material Spec.: SA 537 to SA 240

Type or Grade: Cl_1 to TP 304L

P.No.: 1 Gr.No.: 2 to P.No.: 8 Gr.No. 1

Thickness: 20.0mm to 20.0mm

Outside Dia: NA to NA

Other: NONE

FILLER METALS (QW-404):

Weld Metal Analysis A No: 9

Filler Metal Size (mm): 3.15/4.0 ø

Filler Metal F.No: 5

SFA Specification: 5.4

AWS Classification: E 310 Mo(Modi)

Other: BRAND: THERMANIT 25/22H

POSITION (QW-405):

Position of Groove/Fillet: 3G

Weld Progression: Uphill Yes

Other: NONE

PREHEAT (QW-406):

Preheat Temp. (Deg. C): 25°

Interpass Temp. (Deg. C): 150°

Other: NONE

POSTWELD HEAT TREATMENT (QW-407):

Temperature: NIL

Time: NA

Other: AS WELDED

GAS (QW-408):

Type of Gas(es): NA

Composition of Gas Mixture: NA

Flow rate: Shielding : Backing : Trailing :
lpm: : NA : NA : NA :

Gas Cup Size: NA

ELECTRICAL CHARACTERISTICS (QW-409)

Current Type: DC Polarity: DC EP

Tungsten Electrode Type/Size: NA

TECHNIQUE (QW-410):

String/Weave Bead: String

Pass per side: Multipass

Electrode: Single Oscillation: NA

Process	Dia	Amps	Volts	Travel Speed	Wire Feed	ROL/Time
SMAW	3.15	60- 70	20-22	-	-	90mm/350mm Electrode
SMAW	4.0	100-110	24-26	-	-	150mm/350mm Electrode
SMAW	4.0	100-110	24-26	-	-	180mm/350mm Electrode

FORMAT NO 1904

TENSILE TESTS (QW-150): & ALL WELD TENSILE:

Specimen No.	Width (mm.)	Thickness (mm)	Area Sq. mm.	Ultimate total load (kgs)	Ultimate Unit stress Kgs/Sq.mm	Character of Failure and location
1.	19.2	24.0	460.80	26200	56.86	BOW IN P1 (2)
2.	18.9	24.2	457.38	26400	57.72	BOW IN P1 (2)

ALL WELD TENSILE : YS = 57.26 Kgs/mm^2
UTS = 69.31 Kgs/mm^2
Elan. 4D = 25
%RA = 59

GUIDED BEND TEST (QW-160): D= 4t Bend Angle: 180°

Type and Figure No. Result

Transverse side bends 4 Nos. = Satisfactory

TOUGHNESS TESTS (QW-170): Specimen Size: 10x10x55 Test Temp: 0°C

Specimen No.	Notch location	Notch type	Test Temp.	Impact value Kgm	Lateral expn. Mils
1.	Weld	CV	0°C	13.2	80
2.	"	"	"	16.8	89
3.	"	"	"	15.0	76
4.	HAZ P1(2)	"	"	19.4	92
5.	"	"	"	21.7	88
6.	"	"	"	20.6	94
7.	HAZ P8(1)	"	"	24.8	83
8.	"	"	"	20.7	75
9.	"	"	"	18.6	73

HARDNESS:
HB 2.5Ø/187.5Kgs
Weld :239-249 BHN
HAZ P1(2) :207-219 BHN
HAZ P8(1) :219-239 BHN
PM P1(2) :161-164 BHN
PM P8(1) :170-177 BHN

FILLET WELD TEST (QW-180):
Macro Results: Satisfactory
Result satisfactory: Yes/NO
Penetration into parent metal: Yes/NO

OTHER TESTS:
Type of Test(s): 1. D.P. Test : Satisfactory
2. RADIOGRAPHY: Accepted
Deposit Analysis: NA
3. UST : Accepted.

Welder's Name: SRI MOHAN SAHU B. No.: 4488 PPT No.: 4238
Test conducted by M/s. BHPV Ltd., Laboratory Test No.: P 154/2K Dated: 24.07.2000

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code. & CR-UR-516 of SNAM Specification

Sd/-
Surveyor(s): M/s PDIL Manufacturer:
Date : 28.08.2000 Date : 31.08.2000

Form No. 1901/04

BHARAT HEAVY ELECTRICALS LIMITED
HEAVY PLATES & VESSELS PLANT-VISAKHAPATNAM-530012
WELDING TECHNOLOGY
WELDING PROCEDURE SPECIFICATION

Page 1 of 2

WPS No. : M.1.8.19 Date : 16 / 09 / 2015 Supporting
Rev No. : 00 Date : PQR No. 2305,3546

Welding Process : SMAW Type : Manual
(Auto/Semi-Auto/Manual/Machine)

Application : Groove welding of P1 Group 1 Carbon steel components with P8 Group 1 Stainless steel components & For all Fillet welds of P1 to P8 materials.

JOINTS (QW-402)
Joint Design : Groove as per Production drawing
Backing (Yes/No) : GTAW : No SMAW : Yes
Backing Material (Type) : GTAW : Nil SMAW : Metal
(Metal/Non fusing metal/ Non metallic/Others)

BASE METAL (QW-403)
P. No. : 1 Group No : 1 TO P. No. : 8 Group No : 1
Spec. Type & Grade : N.A.
Chem. Analysis & Mech. Prop : N.A.
Thickness Range (T) Groove : 1.5 to 20.0mm Fillet : N.A.
Maximum Pass Thickness ≤13mm (Yes): Yes (No): _____
Others : Nil

FILLER METALS (QW-404)

	SMAW		
AWS No. (Class)	E309L	Size of filler metal	3.15,4.0 mm
Specn. No. (SFA)	5.4	Filler Metal Product Form	N.A.
F. No.	5	Flux trade name	N.A.
A. No.	8	Electrode-flux (Class)	N.A.
		Consumable insert	N.A.

Deposited weld metal thickness range (t)
Groove : Max.20.0mm (Max.4mm/pass)
Fillet : All
Others : None

POSITION (QW-405)
Position(s) of Groove : All
Position(s) of Fillet : All
Weld Progression : Uphill
Others : Nil

PREHEAT (QW-406)
Preheat Temp. (min) : 15°C Upto 25mm
95°C≥25mm & Above On P1 side.
Interpass Temp. (max) : 150 °C
Preheat Maintenance : During Welding
Others: : Nil

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Visakhapatnam – 12

WPS No. : M.1.8.19

Page 2 of 2
Rev. No. : 00

PWHT (QW-407)

Temp. Range : NA
Time Range : NA
Others :

GAS (QW - 408)

	Gases	Mix %	Flow Rt.(lpm)
Shielding	N.A.	----	----
Trailing	N.A.	----	----
Backing	N.A.	----	----

ELECTRICAL CHARACTERISTICS (QW – 409)

Current (AC/DC) : Refer Table
Amps (Range) : Refer Table
Tungsten Electrode type and size : N.A.
Mode of Metal transfer for GMAW : N.A.
Electrode wire feed speed range : N.A.
Pulsing current (GTAW) : N.A.
Heat input (Max.) : N.A.
Polarity : Refer Table
Volts : Refer Table

TECHNIQUES (QW-410)

String or Weave Bead : String / Weave (Max. 3 times of the core wire diameter of electrode)
Oscillation / Weaving : N.A.
Initial and Interpass Cleaning : Chipping, Wire brushing & Grinding
Method of Back Gouging : Grinding or Air arc gouging sound metal weld when required.
Orifice or Gas cup size : N.A
Contact tube to work distance : N.A
Multiple or single pass (per side) : Multiple
Multiple or single Electrode : Single
Electrode spacing : N.A
Travel Speed Range : N.A.
Peening : None
Use of thermal processes : None
Others : Nil

Weld Layer(s)	Process	Filler Metal		Current		Volt Range	ROL/ Travel speed Range	Others
		Class	Dia.(mm)	Type	Amps.	V		
ROOT(L1)	SMAW	E309L	3.15	DCEP	120-140	24-28	200mm minimum/electrode	Nil
Subsequent	SMAW	E309L	4.0	DCEP	160-180	24-28	225mm minimum/electrode	Nil

Prepared by:
V. Deepak
AE-1 (WT)

Approved by:
G.Sankara Babu
SR.Manager (WT)

BHPV QW-483 PROCEDURE QUALIFICATION RECORD (PQR)

PPT NO: 3343 LAB. NO.: P133/19-07-94 PQR NO.: 2305

Company Name: M/s. BHARAT HEAVY PLATE AND VESSELS LIMITED, VISAKHAPATNAM 530 012

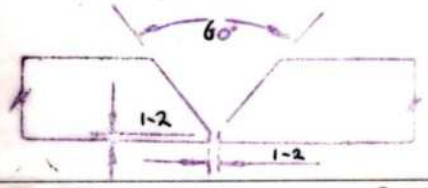
Procedure Qualification Record No.: 2305 Date: 94-08-13

Welding Procedure Specification No.: 401122/GTM Rev A Date: 94-07-08

Welding Process(es): GTAW + SMAW Type(s): MANUAL

JOINTS (QW-402):

BG TO SOUND WELD Metal
GTAW : 3MM
SMAW : 3MM



Test Plate Size: 450 X 150 X 6 MM

BASE METALS (QW-403):		FILLER METALS (QW-404):	SMAW	GTAW
Material Spec.:	SA 516 to SA 240	Weld Metal Analysis A No:	8	8
Type or Grade:	Gr 60 to TP 304	Filler Metal Size (mm):	2.4	4
P.No.: 1 Gr.No.: 1	to P.No.: 8 Gr.No. 1	Filler Metal F.No:	6	5
Thickness:	6MM to 6MM	SFA Specification:	5.9	5.4
Outside Dia:	NA to NA	AWS Classification:	ER 309L	E309Mo
Other:	NONE	Other:	BRAND P26579	ESab 309Mo

POSITION (QW-405):		PREHEAT (QW-406):	
Position of Groove/Fillet:	3G	Preheat Temp. (Deg. C):	25°C
Weld Progression:	Uphill	Interpass Temp. (Deg. C):	150°
Other:	NONE	Other:	NONE

POSTWELD HEAT TREATMENT (QW-407):		GAS (QW-408):			
Temperature:	NIL	Type of Gas(es):	ARGON		
Time:	NA	Composition of Gas Mixture:	99.995%		
Other:	AS WELDED	Flow rate: Shielding	Backing	Trailing	
		lpm:	8-10	NA	NA
		Gas Cup Size:	NONE		

ELECTRICAL CHARACTERISTICS (QW-409)		TECHNIQUE (QW-410):	
Current Type: DC	Polarity: GTAW: EN(STRIGHT) SMAW: EP(REVERSE)	String/Weave Bead:	String
Tungsten Electrode Type/Size:	E3Th2 / 2.4ϕ	Pass per side:	Multipass
		Electrode:	Single
		Oscillation:	NA

Process	Dia	Amps	Volts	Travel Speed	Wire Feed	ROL/Time
GTAW	ϕ2.4	90	14-16	90 mm/ MINUTE		
SMAW	ϕ4	100	24-26	200 MM for 350 mm length of electrode		

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TENSILE TESTS (QW-150): NA

Specimen No.	Width (mm.)	Thickness (mm)	Area Sq. mm.	Ultimate total load (kgs)	Ultimate Unit stress Kgs/Sq.mm	Character of Failure and location

GUIDED BEND TEST (QW-160): D = NA Bend Angle:

Type and Figure No. Result

TOUGHNESS TESTS (QW-170): Specimen Size: 10×4.9×55 Test Temp: −46°C **HARDNESS:** NA

Specimen No.	Notch location	Notch type	Test Temp.	Impact value Kgm	Lateral expn. Mils
1.	weld	CV	−46°C	6.4	73
2.	"	"	"	7.2	79
3.	"	"	"	6.5	65
4.	HAZ P/U	"	"	2.4	-
5.	"	"	"	3.6	-
6.	"	"	"	3.0	-

FILLET WELD TEST (QW-180):

Macro Results: NA Result satisfactory: Yes/NO
Penetration into parent metal: Yes/NO

OTHER TESTS:

Type of Test(s): NA

Deposit Analysis: NA

Welder's Name: B. ESWARUDU B. No.: 4596 PPT No.: 3343
Test conducted by M/s. BHPV Ltd., Laboratory Test No.: P133/94 Dated: 09.08.94

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Sd/-

Surveyor(s): M/s EIL Manufacturer:
Date 11-08-94 Date 94/10/06

P. S. L. NARAYANA
Engineer W.

QW-483 PROCEDURE QUALIFICATION RECORD (PQR)

PPT NO: 4792 LAB NO: P043/B/10 PQR NO : 3546

Company Name: M/s. BHARAT HEAVY PLATE AND VESSELS LIMITED, VISAKHAPATNAM-530 012

Procedure Qualification Record No. 3546 Date: 30.06.10

Welding Procedure Specification No: 7346-17/ 3M REV A Date: 21.06.10

Welding Process (es): SMAW Type(s): MANUAL

JOINTS (QW-402) : B. G. JOINT

2nd side Preparation : ~~Gouging~~ / Grinding / NONE

Back Groove Depth : 2 to 3 MM

Test Plate Size : 450 X 150 X 10 MM

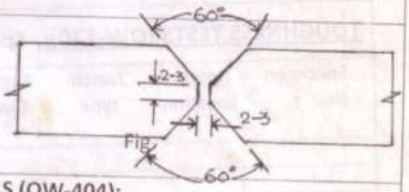


Fig.

BASE METALS (QW-403):

Material Spec: SA 240 to SA 516

Type or Grade: TP 304L to Gr 70

P No: 8 Gr. No: 1 to P. No: 1 Gr. No: 2

Thickness (mm): 10 MM to 10 MM

Outside Dia (mm) NA to NA

Others: NONE

FILLER METALS (QW-404):

Weld Metal Analysis A No: 8

Filler Metal Size (mm): 3.15 ø 4.0 ø

Filler Metal F No: 5

SFA Specification: 5.4

AWS Classification: E 309 L

Alloy Flux / Alloy Elements: NA

Supplements/ Re crushed Slag : NA

Others: BRAND: V J 309 L

POSITION (QW-405):

Position of Groove / Fillet: 1G

Weld Progression: NA

Others: NONE

PRE HEAT (QW-406):

Pre heat Temp. (Deg. C): 25°C

Interpass Temp. (Deg. C): 150°C

Others: NONE

POSTWELD HEAT TREATMENT (QW-407):

Temperature: NIL

Time: NA

Others: AS WELDED

GAS (QW-408):

Type of Gas(es) : NA

Composition : NA

Flow rate: Shielding : Backing : Trailing

LPM : NA : NA : NA

Gas Cup Size: NA

ELECTRICAL CHARACTERISTICS (QW-409):

Current Type: DC Polarity: DCEP

Tungsten Electrode Type/Size: NA

Others: NONE

TECHNIQUE (QW-410):

String/Weave Bead: STRING

Pass per side: MULTIPLE Maximum Pass thickness: 5.0

Electrode: SINGLE Oscillation: NA

Others: NONE

Process	Dia	Amps	Volts	Travel Speed	ROL / Travel Speed
SMAW	3.15ø	80 – 110	24 - 26	---	110mm /350MM LONG ELECTRODE
SMAW	4.0 ø	110 – 120	24 - 26	---	150mm /350MM LONG ELECTRODE.

FORMAT NO 1904/1

Test Plate Welded on: 23.06.2010

INCHARGE(WT) 23/06/10

TENSILE TESTS (QW-150) :

Specimen No.	Width (mm)	Thickness (mm)	Area (Sq. mm)	Ultimate total Load (Kgs)	Ultimate Stress (Kgs / Sq. mm)	Type of Failure and location
1.	19	10	190	11,500	60.53	BIW & DUCTILE
2.	19	10	190	11,000	57.89	BIW & DUCTILE

GUIDED BEND TEST (QW-160) :

GUIDED BEND ROLLER DIA. D = 4t

Bend Angle: 180 º

Type and Figure No. TRANSVERSE SIDE BENDS (QW 462.2) - 4 NOS

Results : SATISFACTORY

TOUGHNESS TESTS (QW-170): Specimen Size: NA Test Temp:

Specimen No.	Notch Location	Notch type	Test Temp.	Impact Value Ft-lb

FILLET WELD TESTS (QW-180)

Macro Results: NA

Results Satisfactory Yes / No

Penetration into parent metal: Yes / No

OTHER TESTS:

Type of Test (s): NA

Deposit Analysis:

NA

Welder's Name: SRI B. APPA RAO B.No. 4565 PPT No. 4792

Test Conducted by: M/s BHPV Ltd. Laboratory Test No. P043/010 Dated: 28.06.10

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

The Procedure Qualification Record (PQR) No. 3546 Date: 30.06.2010 is allotted for reference purpose only.

Surveyor (s) : M/S BHPV

Incharge A.K. SELVARAJ

Certified By:

Date : 30.06.2010

QC-Testing

Form No. 1901/0

BHARAT HEAVY ELECTRICALS LIMITED

HEAVY PLATES & VESSELS PLANT-VISAKHAPATNAM-530012

WELDING TECHNOLOGY

WELDING PROCEDURE SPECIFICATION

Page 1 of 2

WPS No.	: M.8.8.53	Date	: 30 / 12 / 2016	Supporting	
Rev No.	: 01	Date	: 20 / 06 / 2018	PQR No.	1815

Welding Process : SMAW Type : Manual (Auto/Semi-Auto/Manual-Machine)

Application : Groove welding of P8 Group 1 or 2 Stainless steel components with P8 Group 1 or 2 Stainless steel components & For all Fillet welds of P8 materials.

JOINTS (QW-402)

Joint Design : Groove as per Production drawing
Backing (Yes/No) : GTAW : No SMAW : Yes
Backing Material (Type) : GTAW : Nil SMAW : Metal
(Metal/Non fusing metal/ Non metallic/Others)

BASE METAL (QW-403)

P. No. : 8 Group No : 1/2 TO P. No. : 8 Group No : 1/2
Spec. Type & Grade : N.A.
Chem. Analysis & Mech. Prop : N.A.
Thickness Range (T) Groove : 1.5 to 16.0mm Fillet : N.A.
Maximum Pass Thickness ≤13mm (Yes): Yes (No): _____
Others : Nil

FILLER METALS (QW-404)

		SMAW		
AWS No. (Class)	:	E310	Size of filler metal	: 3.15,4 mm
Specn. No. (SFA)	:	5.4	Filler Metal Product Form	: N.A.
F. No.	:	5	Flux trade name	: N.A.
A. No.	:	9	Electrode-flux (Class)	: N.A.
			Consumable insert	: N.A.

Deposited weld metal thickness range (t)
Groove : Max.16.0mm (Max.4mm/pass)
Fillet : All
Others : None

POSITION (QW-405)

Position(s) of Groove : All
Position(s) of Fillet : All
Weld Progression : Uphill
Others : Nil

PREHEAT (QW-406)

Preheat Temp. (min) : 15°C Upto 25mm
95°C≥25mm & Above
Interpass Temp. (max) : 150 °C
Postheat Maintenance : N.A
Others: : Nil

BHEL-HPVP
Visakhapatnam – 12 **WPS No. : M.8.8.53** **Page 2 of 2**
Rev. No. : 01

PWHT (QW-407)

Temp. Range : NA.
Time Range : NA.
Others :

GAS (QW - 408)

	Gases	Mix %	Flow Rt.(lpm)
Shielding	Argon	----	----
Trailing	N.A.	-----	-----
Backing	Argon	-----	-----

ELECTRICAL CHARACTERISTICS (QW – 409)

Current (AC/DC) : Refer Table
Amps (Range) : Refer Table
Tungsten Electrode type and size : N.A.
Mode of Metal transfer for GMAW : N.A.
Electrode wire feed speed range : N.A.
Pulsing current (GTAW) : N.A.
Heat input (Max.) : N.A.
Polarity : Refer Table
Volts : Refer Table

TECHNIQUES (QW-410)

String or Weave Bead : String / Weave (Max. 3 times of the core wire diameter of electrode)
Oscillation / Weaving : N.A.
Initial and Interpass Cleaning : Chipping, Wire brushing & Grinding
Method of Back Gouging : Grinding or Air arc gouging
Orifice or Gas cup size : N.A
Contact tube to work distance : N.A
Multiple or single pass (per side) : Multiple
Multiple or single Electrode : Single
Electrode spacing : N.A
Travel Speed Range : N.A.
Peening : None
Use of thermal processes : None
Others : Nil

Weld Layer(s)	Process	Filler Metal		Current		Volt Range	ROL/ Travel speed Range	Others
		Class	Dia.(mm)	Type	Amps.	V		
Root (L1)	SMAW	E310	3.15	DCEP	120-140	24-28	200mm minimum/electrode	Nil
L2	SMAW	E310	4.0	DCEP	160-180	24-28	225mm minimum/electrode	Nil
Subsequent	SMAW	E310	4.0	DCEP	160-180	24-28	225mm minimum/electrode	Nil

Prepared by:
V. Deepak
AE-1 (WT)

Approved by:
G.Sankara Babu
Sr.Manager (WT)

PPT: 2765
QW-483

PROCEDURE QUALIFICATION RECORD

PQR- 1815

Company Name : M/s· Bharat Heavy Plate and Vessels Limited, Visakhapatnam.

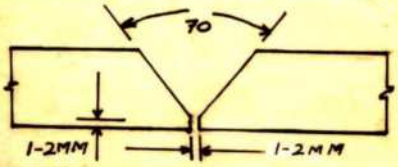
Procedure Qualification Record No : 1815 Date 90-08-27

Welding Procedure Specification No. : IB:88007-3 Date 90-07-16

Welding Process(s) : SMAW/SAW/GTAW/GMAW SMAW

Type(s) : Manual/Automatic/Semi-Automatic MANUAL

JOINTS (QW-402) :



TEST PLATE SIZE: 450x150x8MM Tk

Groove Design used BHPV Standard No. —

BASE METALS (QW-403) :		FILLER METALS (QW-404) :	
Material Spec.	SA 240 to SA 240	Weld Metal Analysis A No.	9
Type or Grade	TP 304L to TP 304L	Size of Electrode/Filler	2.5
P. No.	8 to 8	Filler metal F No.	5
Thickness	8MM to 8MM	SFA Specification	5.4
Diameter	NA to NA	AWS Classification	E 310
other	NONE	Other	D & H 310
POSITION (QW-405) :		PREHEAT (QW-406) :	
Position of Groove	3G	Pre heat Temp.	25°c
Weld Progression	Uphill/~~Downhill~~	Inter-pass Temp.	150°c
Other	NONE	Other	NONE
POSTWELD HEATTREATMENT (QW-407):		GAS (QW-408) :	
Temperature	NA	Type of Gas(es)	NA
Time	NA	Composition of Gas Mixture	NA
Other	NONE	Other	NONE
Electrical Characteristic. (QW-409) :		TECHNIQUE(QW-410) :	
Current	DC	Travel Speed	NA
Polarity	EP	String or Weave Bead	STRING

Process	Dia.	Amps.	Volts	Travel speed	Wire feed	Rol/time
SMAW	2.5ϕ	60-80	24-26	—	—	50-60MM/Electrode

Contd.....2/-

-: 2 :-

Method of BG BY GRINDING. Multipass or single pass (per side) MULTI PASS

single or Multiple Electrode SINGLE

other NONE

Tensile Tests (QW-150) :

Specimen No.	Width mm.	Thickness mm.	Area Sq. mm.	Ultimate total load Kg.	Ultimate Unit stress Kg./Sq.mm.	Character of Failure and location
1.	24.60	6.20	152.520	9,000	59.01	BOW
2.	24.80	6.50	161.20	9,500	58.93	BOW

Guided Bend Tests (QW-160) : D: 4t ANGLE OF BEND: 180°

Type and Figure No	Result	Type and Figure No.	Result
a) TRANSVERSE SIDE BENDS	2 NOS :	SATISFACTORY	
b) TRANSVERSE ROOT BENDS	2 NOS :	SATISFACTORY	

Toughness Tests (QW-170) : NA

Specimen No.	Notch location	Notch-Type	Test Temp.	Impact values	Lateral Expn. %Shear	Lateral Expn. Mils	Drop Weight Break	Drop Weight No break

Fillet weld Tests (QW-180) : NA

Result satisfactory Yes/No Penetration into parent metal Yes/No

Macro Results

other Tests : NA

Type of Test(s)

Deposit Analysis NA

other

Welder's Name B. APPA RAO Badge No. 4565 Stamp No. PPT 2765

Tests conducted by M/S BHPV Ltd Laboratory Test No. P137 Dated 90-08-22

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of section IX of the ASME Code.

Surveyor M/S LRIS

Date 90-08-22

Manufacturer (S.S. PRASAD) J.E.(WT)

Date 90.08.27

Form No. 1901/04

BHARAT HEAVY ELECTRICALS LIMITED

HEAVY PLATES & VESSELS PLANT-VISAKHAPATNAM-530012

WELDING TECHNOLOGY

WELDING PROCEDURE SPECIFICATION

Page 1 of 2

WPS No.	: M.8.8.23	Date	: 06 / 10 / 2015	Supporting	
Rev No.	: 01	Date	: 01 / 10 / 2021	PQR No.	3558

Welding Process : SMAW Type : Manual (Auto/Semi-Auto/Manual/Machine)

Application : Groove welding of P8 Group 1 Stainless steel components with P8 Group 1 Stainless steel components & For all Fillet welds of P8 materials.

JOINTS (QW-402)

Joint Design	: Groove as per approved fabrication drawing	
Backing (Yes/No)	: GTAW: No	SMAW: Yes
Backing Material (Type) (Metal/Non-fusing metal/ Nonmetallic/Others)	: GTAW: Nil	SMAW: Metal
Root spacing	: As per approved fabrication drawing	

BASE METAL (QW-403)

P. No. : 8 Group No : 1 TO P. No. : 8 Group No : 1

Spec. Type & Grade : N.A.

Chem. Analysis & Mech. Prop : N.A.

Thickness Range (T) Groove : 5 to 80mm Fillet : All thicknesses

Maximum Pass Thickness ≤13mm (Yes): Yes (No): _____

Others : Nil

FILLER METALS (QW-404)

		SMAW		
AWS No. (Class)	:	E308L	Size of filler metal	: 3.15, 4.0mm
Specn. No. (SFA)	:	5.4	Filler Metal Product Form	: N.A.
F. No.	:	5	Flux trade name	: N.A.
A. No.	:	8	Electrode-flux (Class)	: N.A.
			Consumable insert	: N.A.

Deposited weld metal thickness range (t)

Groove : Max.60.0mm (Max.4mm/pass)

Fillet : All

Others : None

POSITION (QW-405)

Position(s) of Groove : All

Position(s) of Fillet : All

Weld Progression : Uphill

Others : Nil

PREHEAT (QW-406)

Preheat Temp. (min) : 15°C Upto 25mm
95°C≥25mm & Above

Interpass Temp. (max) : 150 ^{0}C

Postheat Maintenance : N.A

Others: : Nil

BHEL-HPVP
Visakhapatnam – 12 **WPS No. : M.8.8.23** **Page 2 of 2** **Rev. No. : 01**

PWHT (QW-407)

Temp. Range : N.A
Time Range : N.A
Others :

GAS (QW - 408)

	Gases	Mix %	Flow Rt.(lpm)
Shielding	N.A.	----	----
Trailing	N.A.	----	----
Backing	N.A.	----	----

ELECTRICAL CHARACTERISTICS (QW – 409)

Current (AC/DC) : Refer Table
Polarity : Refer Table
Amps (Range) : Refer Table
Volts : Refer Table
Tungsten Electrode type and size : N.A.
Mode of Metal transfer for GMAW : N.A.
Electrode wire feed speed range : N.A.
Pulsing current (GTAW) : N.A.
Heat input (Max.) : N.A.

TECHNIQUES (QW-410)

String or Weave Bead : String / Weave (Max. 3 times of the core wire diameter of electrode)
Oscillation / Weaving : N.A.
Initial and Interpass Cleaning : Chipping, Wire brushing & Grinding
Method of Back Gouging : Grinding
Orifice or Gas cup size : N.A
Contact tube to work distance : N.A
Multiple or single pass (per side) : Multiple
Multiple or single Electrode : Single
Electrode spacing : N.A
Travel Speed Range : N.A.
Peening : Not to be done
Use of thermal processes : None
Others : Nil

Weld Layer(s)	Process	Filler Metal		Current		Volt Range	ROL/ Travel speed Range	Others
		Class	Dia.(mm)	Type	Amps.	V		
L1	SMAW	E308L	3.15	DCEP	90-110	24-26	150mm to 200 mm minimum/electrode	Nil
L2	SMAW	E308L	4.0	DCEP	120-130	24-26	180mm minimum/electrode	Nil

Prepared by:
D Lova Krishna
Dy. Engineer / WT

Approved by:
P V D Ramesh
Manager / WT

QW-483 PROCEDURE QUALIFICATION RECORD (PQR)

100/12

PPT NO.: 4806 LAB. NO.: P-015 PQR NO.: 3558

Company Name : M/s BHARAT HEAVY PLATE AND VESSELS LIMITED, VISAKHAPATNAM 530 012

Procedure Qualification Record No. 3558 Date: 30.11.11

Welding Procedure Specification No.: 5583/6TM Date: 18.11.11

Welding Process(es): SMAW + GTAW Type(s): MANUAL

JOINTS (QW-402) : BG JOINT

2nd Side Preparation ~~Gouging~~ / Grinding ~~None~~

Back Groove Depth 2-3MM
GTAW 10MM
SMAW - REST

Test Plate Size : 450 X 150 X 40

SMAW 2MM
GTAW 2MM
SMAW

Fig.

BASE METALS (QW-403) :

Material Spec.: SA240 to SA240

Type or Grade : TP 304 to TP304

P.No.: 8 Gr.No.: 1 to P.No.: 8 Gr. No.: 1

Thickness (mm): 40 to 40

Outside Dia : (mm) NA to NA

Others : NONE

FILLER METALS (QW-404)

	SMAW	GTAW
Weld Metal Analysis A No.	8	8
Filler Metal Size (mm)	3.15, 4.0	2.4
Filler Metal F.No.	5	6
SFA Specification	5.4	5.9
AWS Classification	E308L	ER308L

Alloy Flux / Alloy Elements : NA / None

Supplements/Supplementing Predor Recrushing Clag : NA/None

Others BRAND: AVESTA. 308L LF, OK 16.10

POSITION (QW-405) :

Position of Groove / ~~Fillet~~ : 3G

Weld Progression : Uphill NA

Others : NA

PREHEAT (QW-406) :

Preheat Temp. (Deg. C) : 25°

Interpass Temp. (Deg. C) : 150°C

Others : NONE

POSTWELD HEAT TREATMENT (QW-407) :

Temperature : AS WELDED

Time : NA

Others : NONE

GAS (QW-408) :

Type of Gas(es) : ARGON

Composition of Gas Mixture : NA

Flow rate :	Shielding	Backing	Trailing
lpm :	8-10	6-8	NA

Gas Cup Size : 10.0 ID

ELECTRICAL CHARACTERISTICS (QW-409)

Current Type : DC Polarity : DCEN

Tungsten Electrode Type/Size : EWTh2 2.4

Others : NONE

TECHNIQUE (QW-410)

String/Weave Bead : STRING

Pass per side : MULTIPLE Pass thickness : 2MM

Electrode : SINGLE Oscillation : NONE

Others : NONE

Process	Dia	Amps	Volts	Travel Speed	Wire Feed	ROL / Time
SMAW	3.15	90 to 100 A	24 to 26V	—	—	150mm/350mm/15 Elec
"	4.0	120 to 130A	24 to 26V	—	—	180mm/350mm/15 Elec
GTAW	2.4	130 to 140A	14 to 16V	450mm/5min	—	—
SMAW	3.15	100 to 110 A	24 to 26V	—	—	200mm/350mm/15 Elec

FORMAT NO 19041

Test Plate Welded on : 17.11.11

Signature (WT) 16.11.11

TENSILE TESTS (QW-150) :

Specimen No.	Width (mm)	Thickness (mm)	Area (Sq.mm)	Ultimate load	Total (kgs)	Ultimate stress (Kgs/Sq.mm)	Character of Failure and location
P-15/①	19.2	39.9	766.08	47,000		61.35	BIW
P-15/②	19.6	39.6	776.16	47,100		60.68	BIW

GUIDED BEND TEST (QW-160) :

GUIDED BEND ROLLER DIA 4t Bend Angle : 180°

Type and Figure No. 4 NOS. Side bends Result Satisfactory

TOUGHNESS TESTS (QW-170) : Specimen Size : Test Temp : -196°C HARDNESS :

Specimen No.	Notch location	Notch type	Test Temp.	Impact value (Kgm)	Lateral expn. Mills
1.	Weld (GTAW)		-196°C	6.3	39
2.	Weld (GTAW)		"	5.7	41
3.	Weld (GTAW)		"	5.0	38
4.	HAZ		-196°C	27.6	84
5.	HAZ		"	21.4	63
6.	HAZ		"	9.9	61
7.	Weld (SMAW)		-196°C	4.6	42
8.	Weld (SMAW)		"	4.9	44
9.	Weld (SMAW)		"	4.1	39

FILLET WELD TESTS (QW-180)

Macro Results : Result satisfacoty : Yes / No

Penatration into parent metal : Yes / No

OTHERS TESTS :

Type of Test(s) : RADIOGRAPHY Acceptable. R-L Sarma 24-11-11

Deposit Analysis :

Welder's Name : M. Sahu, B. Appa Rao, R. Appa Rao B. No. 4485,4565,4631 PPT No. : 4806

Test conducted by M/s. BHPV Ltd. Laboratory Test No : P-05 Dated : 18/11/11

We certify that the statements in this record are correct and that the test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

The Procedure qualification Record (PQR) No. 3558 Dated 30-11-11 is allotted for reference.

Surveyor(s) : M/S BHPV Incharge : 30/11/11 Manufacturer : Sankara Rao

Date : 30.11.11 QC-Testing : Certification Date : 30-11-11

INDIAN OIL CORPORATION LIMITED. TECHNIP ENERGIES INDIA LIMITED	PROJECT TITLE **DR 1.0 EXPANSION PROJECT** TECHNIP ENERGIES REQUISITION NUMBER 214227C-07-REQ-0110-0001 TECHNIP ENERGIES DOCUMENT NUMBER MR-00-0110-0001-A0106-0001 EQUIPMENT NUMBER 07-FF-00-002 VENDOR DOCUMENT NUMBER 4-36-100-U0023

PAINTING SCHEDULE FOR HEATER & APH

Vendor Company logo if any	**CODE STAMP**

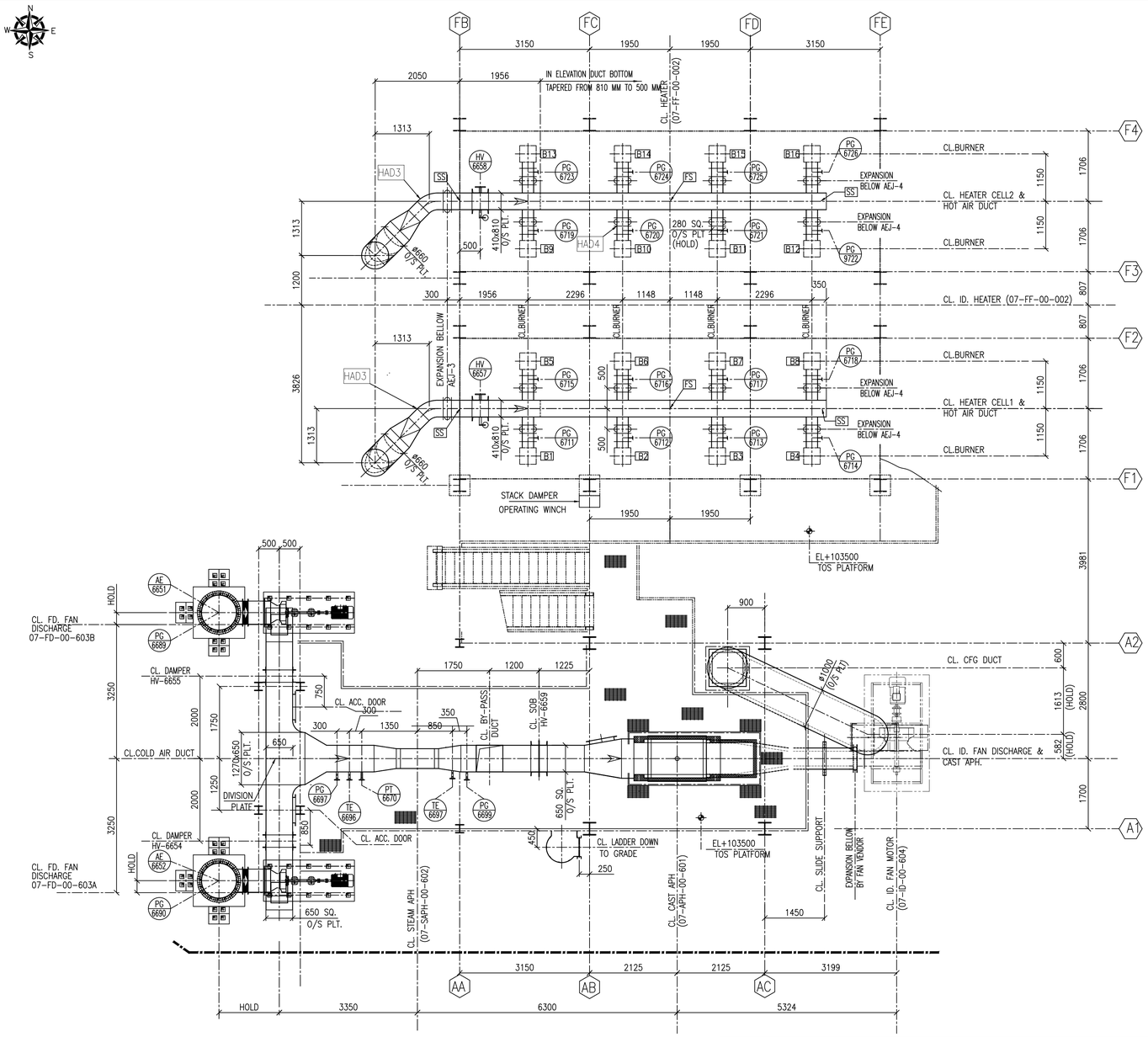
Rev	Date DD-MM-YYYY	Revision Purpose	Written	Checked By	PM
0	18-11-2025	ISSUED FOR REVIEW	AKB	TK	YPK

DOCUMENT REVISIONS

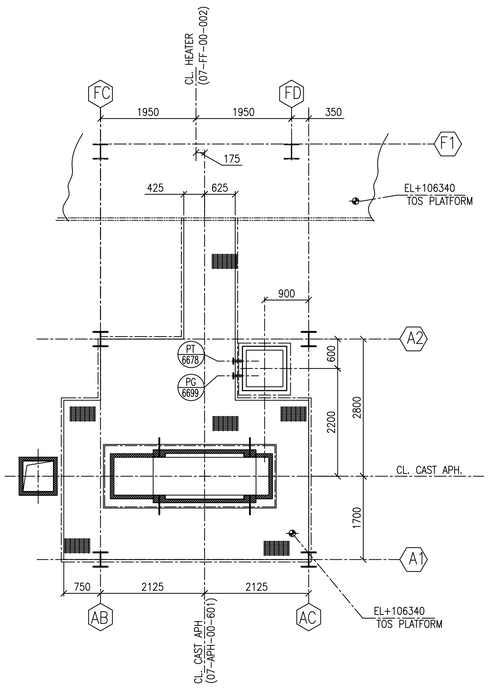
Sections changed in last revision are identified by a vertical line in the margin

Sl. No.	DESCRIPTION	SURFACE PREPARATION & PROFILE	Temp. applicable (°C)	Coating type/ system	PRIMER COAT		INTERMEDIATE Coat		FINISH COAT		TOTAL DFT	Color code
					PAINT	NO OF COATS	PAINT	NO OF COATS	PAINT	NO OF COATS	µm/min	
1	External surfaces of Heater Casing plate, Columns and structural stiffeners in contact with heater casing & Stack shell with stiffeners, Air Duct (Cold, Bypass & Hot), Flue Gas Duct, H/Box plate, Duct stiffeners and supports	Abrasive Blast Clean to Sa 2½	>0 and ≤120		Inorganic zinc silicate @65-75µm	1	High Build Epoxy MIO @100-150µm	1	Two Pack acrylic polyurethane @40-50µm	1	205-275µm	HR Aluminum RAL 9006
2	Stair tower & APH support structure and platform support beams, & misc. structures	SSPC SP10			Inorganic Zinc Silicate @65-75µm	1	Epoxy zinc phosphate primer 40µm	1	2 coat of high build epoxy finish coating 100µm/coat+ 1coat of Acrylic polyurethane finish paint 40µm / coat (2X100+40 =240)	1	345-355µm	STEEL GREY /RAL CODE-7011
3	Hand Rails	SSPC SP10			Hot dip galvanizing	1	Epoxy zinc phosphate primer 40µm	1	2 coat of high build epoxy finish coating 100µm/coat+ 1coat of Acrylic polyurethane finish paint 40µm / coat (2X100+40 =240)	1	345-355µm	YELLOW/RAL CODE-1021
4	Heater inside surface in contact with Ceramic Fiber	Sa 2½			Corrosion resistant epoxy resin	1						
5	Gratings	SSPC SP10			Hot dip galvanizing 120µm							Hot dip galvanizing
6	Staircase stringers, Ladders and Walkways	SSPC SP10			Inorganic Zinc Silicate @65-75µm	1	Epoxy zinc phosphate primer 40µm	1	2 coat of high build epoxy finish coating 100µm/coat+ 1coat of Acrylic polyurethane finish paint 40µm / coat (2X100+40 =240)	1	345-355µm	YELLOW/RAL CODE-1021
7	Hot Flue gas duct	Sa 2½	>0 and ≤120		Inorganic Zinc Silicate 75µ	1	HB Epoxy MIO 150µ	1	Two pack Acrylic Poly-Urethane (PU) 50µ	1	275	HR Aluminium RAL/9006
8	Hot air duct	Sa 2½	>0 and ≤120		Inorganic Zinc Silicate 75µ	1	HB Epoxy MIO 150µ	1	Two pack Acrylic Poly-Urethane (PU) 50µ	1	275	HR Aluminium RAL/9006
9	By pass duct	Sa 2½	>0 and ≤120		Inorganic Zinc Silicate 75µ	1	HB Epoxy MIO 150µ	1	Two pack Acrylic Poly-Urethane (PU) 50µ	1	275	HR Aluminium RAL/9006
10	Cold air duct	Sa 2½	>0 and ≤120		Inorganic Zinc Silicate 75µ	1	HB Epoxy MIO 150µ	1	Two pack Acrylic Poly-Urethane (PU) 50µ	1	275	HR Aluminium RAL/9006
11	Cold flue gas duct	Sa 2½	>0 and ≤120		Two pack epoxy phenolic 150µ	1	-	-	Two pack epoxy phenolic 150µ	1	300	HR Aluminium RAL/9006
12	Radiant Coil	Sa 2½	>200		HR Aluminum Silicone Aluminum 20µ	1	-	-	HR Aluminum Silicone Aluminum 20µ	1	40	
13	Convection Coil	Sa 2½	>200		HR Aluminum Silicone Aluminum 20µ	1	-	-	HR Aluminum Silicone Aluminum 20µ	1	40	
14	Superheater coil	Sa 2½	>200		HR Aluminum Silicone Aluminum 20µ	1	-	-	HR Aluminum Silicone Aluminum 20µ	1	40	
15	MP steam piping IBR, INSULATED	Sa 2½	>200		HR Silicone Aluminum 20µ	1	-	-	HR Silicone Aluminum 20µ	1	40	OFF White/ Aluminum with 1 red strip RAL/9006/3001
16	LP steam piping IBR, INSULATED	Sa 2½	>200		HR Silicone Aluminum 20µ	1	-	-	HR Silicone Aluminum 20µ	1	40	OFF White/ Aluminum with 1 green strip RAL/9006/6021
17	Feed INSULATED	Sa 2½	>200		HR Silicone Aluminum 20µ	1	-	-	HR Silicone Aluminum 20µ	1	40	*Not Found in Tender. Technip to provide details*
18	LP CONDENSATE INSULATED	Sa 2½	>120 and ≤200		Two pack epoxy phenolic 150µ	1	-	-	Two pack epoxy phenolic 150µ	1	300	Sky blue with 3 oxide red strips RAL/5015/3009
19	TURBULIZING WATER INSULATED	Sa 2½	>120 and ≤200		Two pack epoxy phenolic 150µ	1	-	-	Two pack epoxy phenolic 150µ	1	300	*Not Found in Tender. Technip to provide details*
20	Fuel Gas INSULATED	Sa 2½	>0 and ≤120		Two pack epoxy phenolic 150µ	1	-	-	Two pack epoxy phenolic 150µ	1	300	*Not Found in Tender. Technip to provide details*
21	Plant air / Service air UNINSULATED	Sa 2½	>0 and ≤120		Inorganic Zinc Silicate 75µ	1	HB Epoxy MIO 150µ	1	Two pack Acrylic Poly-Urethane (PU) 50µ	1	275	Sea green with 1 signal red strip RAL/6018/3001
22	Instrument air UNINSULATED	Sa 2½	>0 and ≤120		Inorganic Zinc Silicate 75µ	1	HB Epoxy MIO 150µ	1	Two pack Acrylic Poly-Urethane (PU) 50µ	1	275	Sea green with 1 black strip RAL/6018/9005
23	Service water UNINSULATED	Sa 2½	>0 and ≤120		Inorganic Zinc Silicate 75µ	1	HB Epoxy MIO 150µ	1	Two pack Acrylic Poly-Urethane (PU) 50µ	1	275	Sky blue with 1 signal red strip RAL/5015/3001
24	Nitrogen UNINSULATED	Sa 2½	>0 and ≤120		Inorganic Zinc Silicate 75µ	1	HB Epoxy MIO 150µ	1	Two pack Acrylic Poly-Urethane (PU) 50µ	1	275	Milky white RAL/9016
25	Flare lines INSULATED	Sa 2½	>0 and ≤120		Inorganic Zinc Silicate 75µ	1	HB Epoxy MIO 150µ	1	Two pack Acrylic Poly-Urethane (PU) 50µ	1	275	HR Aluminium RAL/9006
26	Flushing Oil UNINSULATED	Sa 2½	>0 and ≤120		Inorganic Zinc Silicate 75µ	1	HB Epoxy MIO 150µ	1	Two pack Acrylic Poly-Urethane (PU) 50µ	1	275	Oxide red with 2 black strips RAL/3009/9005
27	Potable water UNINSULATED	Sa 2½	>0 and ≤120		Inorganic Zinc Silicate 75µ	1	HB Epoxy MIO 150µ	1	Two pack Acrylic Poly-Urethane (PU) 50µ	1	275	Sky blue with 1 Green strip RAL/5015/6010

1. Surface not to be painted in the shop
(a) Surfaces to be embedded in concrete.
(b) Contact surfaces of friction joints.
(c) Surfaces within 50mm of any field weld location.
(d) Closed internal surfaces of members forming perfect airtight spaces.
(e) Parts specified in the drawings to be such.
(f) Welds and adjacent parent metal shall not be painted prior to de-slagging, inspect and approval by the CONTRACTOR'S REPRESENTATIVE.
(g) No painting to be done for surfaces which shall be in direct contact of castable



PLAN BELOW EL+104500



PLAN AT EL+106340

EXPANSION BELLOW DETAILS

S.NO.	TAG NO.	QTY.	LOCATION	SERVICE	REMARKS
1.	AEJ1	1	HAD1	HOT AIR	
2.	AEJ2	1	HAD2		
3.	AEJ2A	1			
4.	AEJ3	2	HAD3		
5.	AEJ4	16	HAD4		
6.	FEJ1	1	HFG1	HOT FLUE GAS	
7.	FEJ2	1			
8.	FEJ3	1	CFG2	COLD FLUE GAS	
9.	FEJ4	1			

NOTES:–

1. ALL DIMENSIONS ARE IN MM U.O.N. DON'T SCALE THE DRAWING, ASK IF IN DOUBT.
2. ELEVATIONS GIVEN IN DRAWING ARE WITH REFERENCE TO GRADE EL.+100000 CORRESPONDS TO FINISHED GRADE LEVEL U.N.O.
3. FOR FURTHER NOTES AND REFERENCE DOCUMENT REFER DRAWING NUMBER BHEL DRAWING NUMBER – 1–00–022–U4090.
4. FOR INSTRUMENT SUMMARY & INSULATION DETAILS REFER BHEL DRAWING NUMBER – 1–00–022–U4099.
5. REFER DRG NO. – 1–00–022–U4089 FOR PLOT PLAN OF HEATER WITH BATTERY LIMIT & COORDINATES.

LEGEND

1	DENOTES COLUMN GRID NO.
TE XXX	DENOTES AUXILIARY CONNECTIONS
	DENOTES GRATING MAIN BAR SPAN
XXXXXXX	ERECTION MARK NUMBER FOR SHOP ASSEMBLY
	DENOTES AIR FLOW DIRECTION
	DENOTES FLUE GAS FLOW DIRECTION
FS	FIXED SUPPORT
SS	SLIDING SUPPORT
GS	GUIDE SUPPORT
1	DENOTES REFRACTORY MARK NUMBER (REFER DRG. NO. – 1–00–022–U4099)
1	DENOTES NOZZLE NUMBER

DUCT DETAILS

DUCT MARK NO.	SERVICE	MINIMUM DUCT AREA (M^2)	DUCT SIZE (O/S PLT.) (MM)	CASING PLATE		INTERNAL REFRACTORY		EXTERNAL INSULATION		REMARKS
				MATERIAL	THICKNESS	TYPE	THICKNESS	TYPE	THICKNESS	
CAD1	COLD AIR DUCT FROM FD FAN DISCH. TO STEAM APH	0.37	650x650	CARBON STEEL	6 MM	NOT APPLICABLE	–	NOT APPLICABLE	–	
CAD2	COLD AIR DUCT FROM STEAM APH TO COMBUSTION APH	0.37	650x650	CARBON STEEL	6 MM	NOT APPLICABLE	–	MINERAL WOOL	50	
BPD1	COLD AIR BY–PASS DUCT	0.28	650x650	CARBON STEEL	6 MM	NOT APPLICABLE	–	MINERAL WOOL	50	
HAD1	HOT AIR DUCT FROM APH COMMON FOR CELL1 & 2	0.62	782x840	CARBON STEEL	6 MM	NOT APPLICABLE	–	MINERAL WOOL	75	
HAD2	HOT AIR DUCT FROM COMMON DUCT TO EACH RADIANT CELL	0.31	580x580 660 ø	CARBON STEEL	6 MM	NOT APPLICABLE	–	MINERAL WOOL	75	
HAD3	BURNER PLENUM	0.31	TAPERED DUCT (SEE DRAWING)	CARBON STEEL	6 MM	NOT APPLICABLE	–	MINERAL WOOL	75	
HAD4	HOT AIR DUCT BRANCH TO BURNER	0.07	HOLD (FOR BURNER INFORMATION)	CARBON STEEL	6 MM	NOT APPLICABLE	–	MINERAL WOOL	75	
HFG1	HOT FLUE GAS DUCT FROM HEATER TO APH	0.77	1100x11100	CARBON STEEL	6 MM	INSULITE 8S OR EQ. (900 KG/M^3)	100	NOT APPLICABLE	–	
CFG1	COLD FLUE GAS DUCT FROM APH TO I/D FAN	0.52	SEE DRAWING	CORTON STEEL	6 MM	ACID RESISTANT REFRACTORY (2200 KG/M^3)	75	MINERAL WOOL	75	
CFG2	COLD FLUE GAS DUCT FROM I/D FAN TO STACK	0.52	910x910 1000 ø	CORTON STEEL	6 MM					

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1	18-09-2025	ISSUED FOR APPROVAL	PKM	AS	MO
0	14-08-2025	ISSUED FOR REVIEW	PKM	AS	MO

DOCUMENT CATEGORY (USE " X " MARK)	DOCUMENT REVIEW STATUS (BY CLIENT)
☒ APPROVAL	
☐ REVIEW	
☐ INFORMATION	

PROJECT : DR 1.0 EXPANSION PROJECT
IOCL DIGBOI REFINERY

OWNER : INDIAN OIL CORPORATION LTD.

EPCM : TECHNIP ENERGIES

EPC CONTRACTOR : BHARAT HEAVY ELECTRICALS LTD., Heavy Plates & Vessels Plant, Visakhapatnam-530012.
361-246/A

ENGINEERING CONSULTANT : UNITBIRWELCO IISP THERMAL EQUIPMENT PVT. LTD.
A-110, 2nd Floor, Sector 136, Noida, Uttar Pradesh - 201304
www.unitbirwelco.com

TITLE : IND-COKER SECONDARY FURNACE (07-FF-00-002)
GENERAL ARRANGEMENT - AIR PREHEAT SYSTEM
PLANS-1

IOCL DOCUMENT NO. : MR-00-0110-0001-A2001-0001M
BHEL DOCUMENT NO. : 1-00-022-U4100
BIRWELCO IISP DOC. NO. : H24065-002-2071-1

SCALE	PROJECT	UNIT	DOC. TYPE	MAT. CODE	SER. NO.	PAGE	REV.
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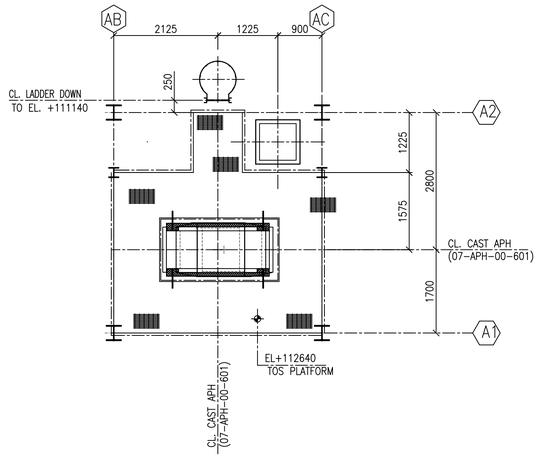
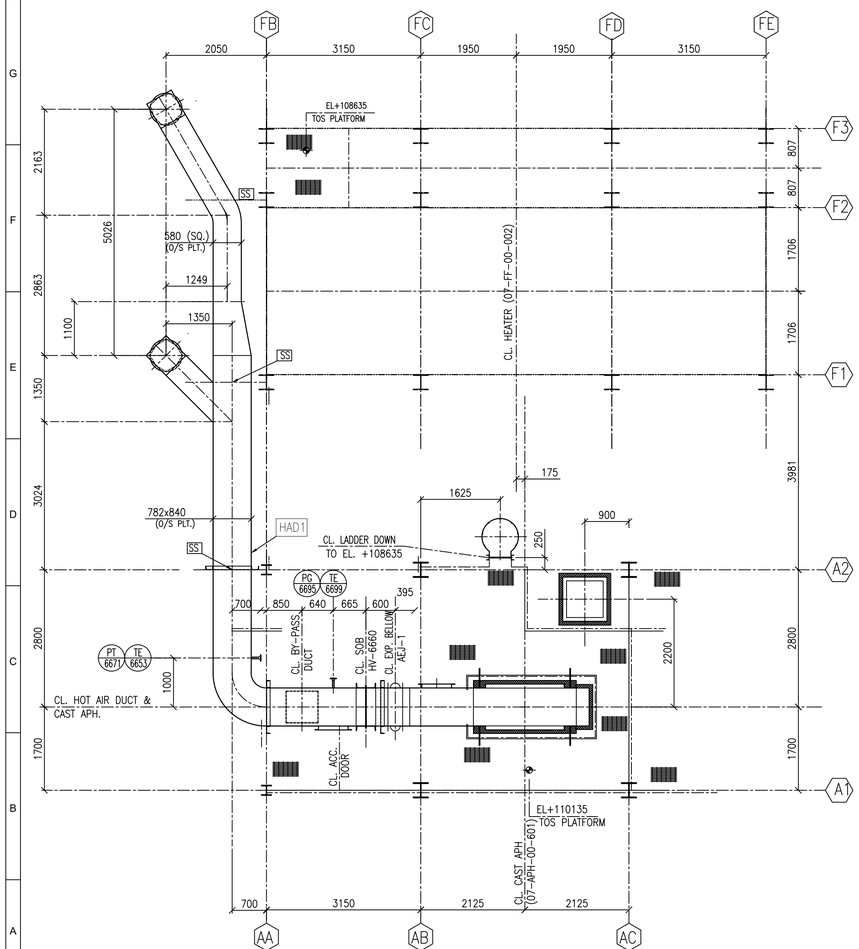


PLAN AT EL+112640



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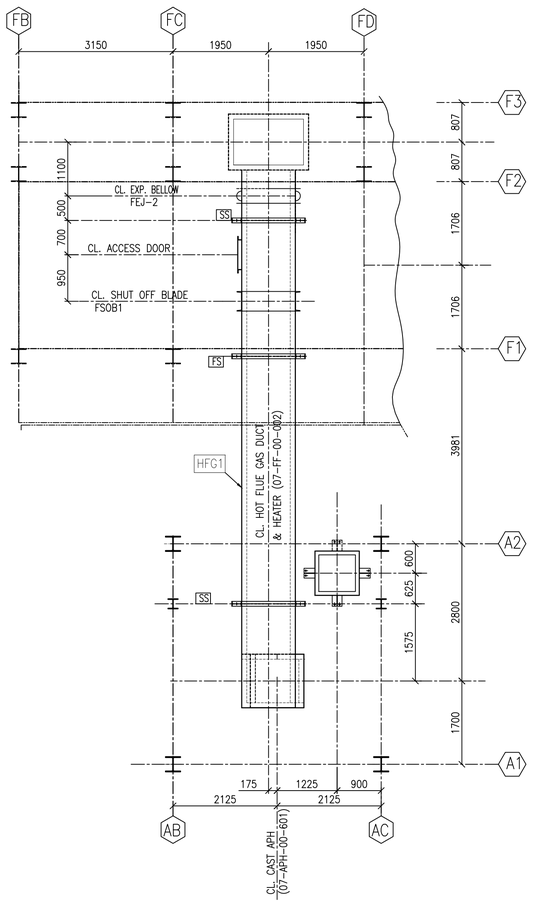
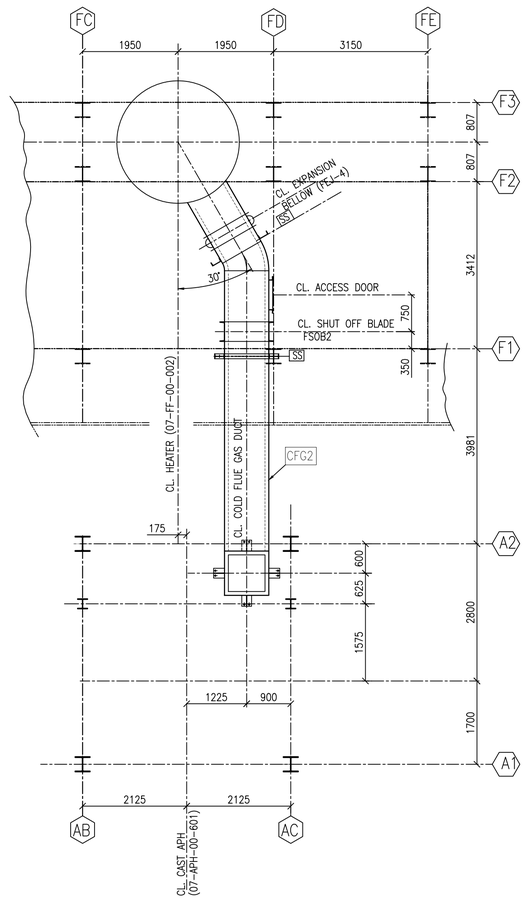


PLAN BELOW EL+119000



PLAN BELOW EL+125000

LIST OF DAMPERS/SHUT-OFF BLADES

S.NO.	TAG NO.	LOCATION	DESCRIPTION	DUCT ORIENTATION	REMARKS
1.	HV-6664	CAD1	DAMPER	HORIZONTAL	SELF CLOSING CHECK DAMPER
2.	HV-6665	CAD1	DAMPER	HORIZONTAL	
3.	HV-6659	CAD1	SHUT-OFF BALDE	HORIZONTAL	MANUALLY OPERATED
4.	HV-6656	BPD1	DAMPER	VERTICAL	PNEUMATIC OPERATED/ MANUALLY OPERATED FROM NEAREST PLATFORM
5.	HV-66659	HAD1	SHUT-OFF BALDE	HORIZONTAL	MANUALLY OPERATED
6.	FV-6657	HAD3	DAMPER	HORIZONTAL	PNEUMATIC OPERATED/ MANUALLY OPERATED FROM NEAREST PLATFORM
7.	FV-6658	HAD3	DAMPER	HORIZONTAL	PNEUMATIC OPERATED/ MANUALLY OPERATED FROM NEAREST PLATFORM
8.	HV-6654	OFF TKE DUCT	DAMPER	VERTICAL	PNEUMATIC OPERATED/ MANUALLY OPERATED FROM GRADE
12.	FSOB1	HFG1	SHUT-OFF BALDE	HORIZONTAL	MANUALLY OPERATED
13.	FSOB2	CFG2	SHUT-OFF BALDE	HORIZONTAL	MANUALLY OPERATED

NOTES:-

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4. FOR INSTRUMENT SUMMARY & INSULATION DETAILS REFER BHEL DRAWING NUMBER – 1-00-022-U4099.
5. REFER DRG NO. – 1-00-022-U4089 FOR PLOT PLAN OF HEATER WITH BATTERY LIMIT & COORDINATES.

LEGEND

1	DENOTES COLUMN GRID NO.
TE XXX	DENOTES AUXILIARY CONNECTIONS
	DENOTES GRATING MAIN BAR SPAN
XXXXXXX	ERECTION MARK NUMBER FOR SHOP ASSEMBLY
	DENOTES AIR FLOW DIRECTION
	DENOTES FLUE GAS FLOW DIRECTION
FS	FIXED SUPPORT
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GS	GUIDE SUPPORT
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1	DENOTES NOZZLE NUMBER

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DOCUMENT CATEGORY (USE " X " MARK)	DOCUMENT REVIEW STATUS (BY CLIENT)
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☐ REVIEW	
☐ INFORMATION	

PROJECT : DR 1.0 EXPANSION PROJECT
IOCL DIGBOI REFINERY

OWNER : INDIAN OIL CORPORATION LTD.

EPCM : TECHNIP ENERGIES

EPC CONTRACTOR : BHARAT HEAVY ELECTRICALS LTD.,
Heavy Plates & Vessels Plant, Visakhapatnam-530012.
361-246/A

ENGINEERING CONSULTANT : UNITBIRWELCO IISP THERMAL EQUIPMENT PVT. LTD.
A-110, 2nd Floor, Sector 136, Noida, Uttar Pradesh - 201304
www.unitbirwelco.com

TITLE : IND-COKER SECONDARY FURNACE (07-FF-00-002)
GENERAL ARRANGEMENT - AIR PREHEAT SYSTEM
PLANS-2

IOCL DOCUMENT NO. : MR-00-0110-0001-A2001-0001N

BHEL DOCUMENT NO. : 1-00-022-U4101

BIRWELCO IISP DOC. NO. : H24065-002-2071-2

SCALE	PROJECT	UNIT	DOC. TYPE	MAT. CODE	SER. NO.	PAGE	REV.
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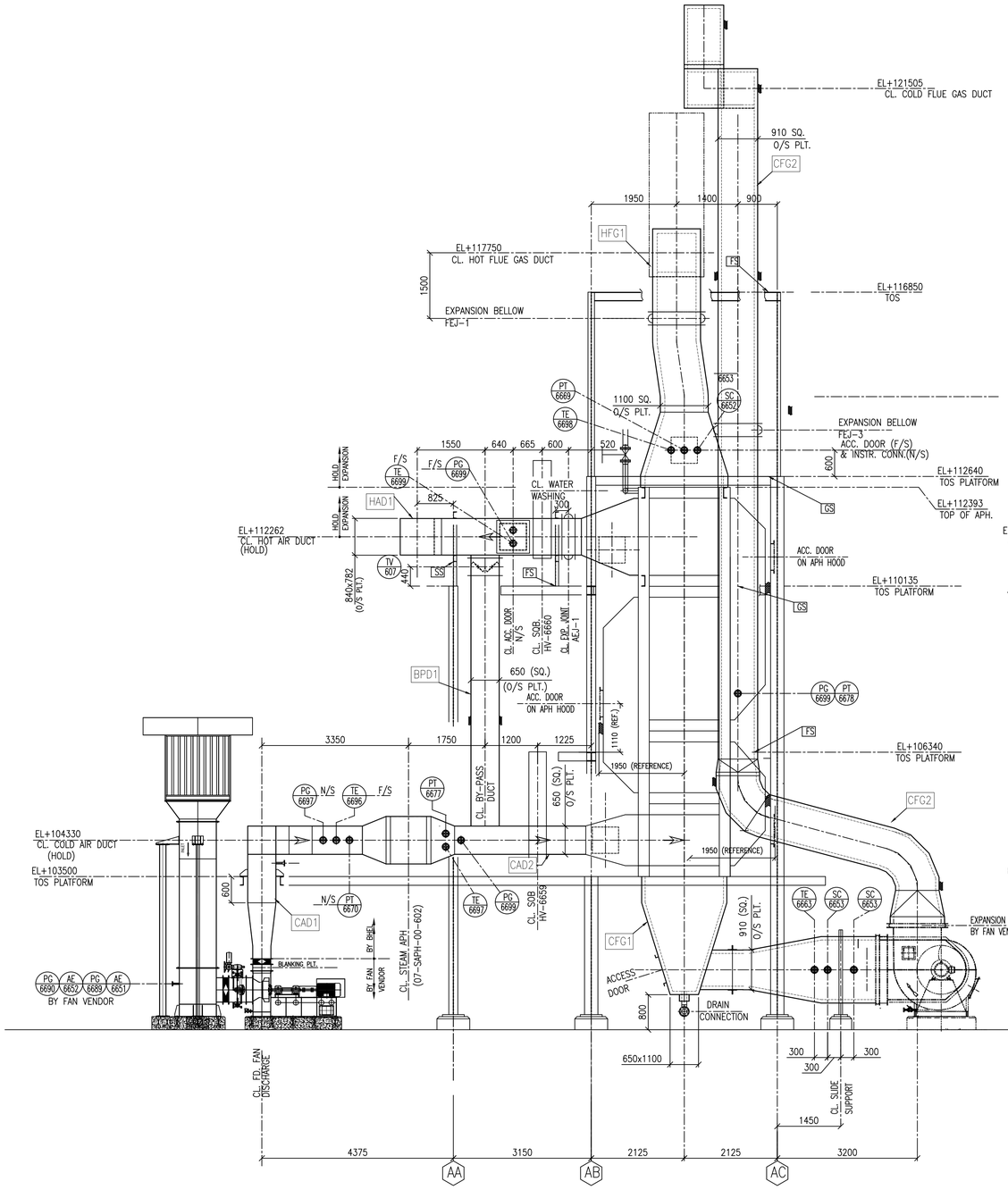
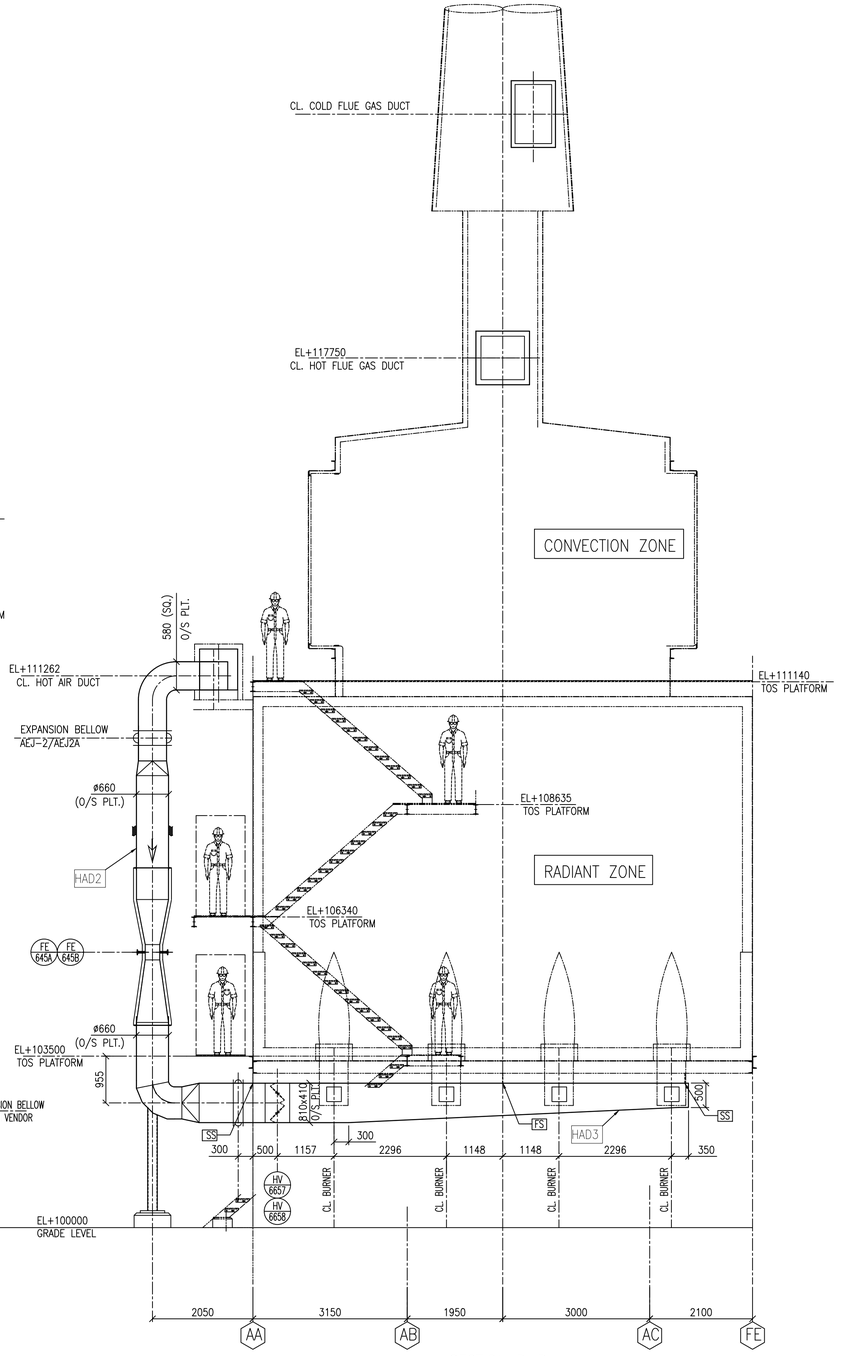


SECTION A–A

(REFER KEY PLAN)



SECTION B–B

(REFER KEY PLAN)

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5. REFER DRG NO. – 1–00–022–U4089 FOR PLOT PLAN OF HEATER WITH BATTERY LIMIT & COORDINATES.

LEGEND

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	DENOTES GRATING MAIN BAR SPAN
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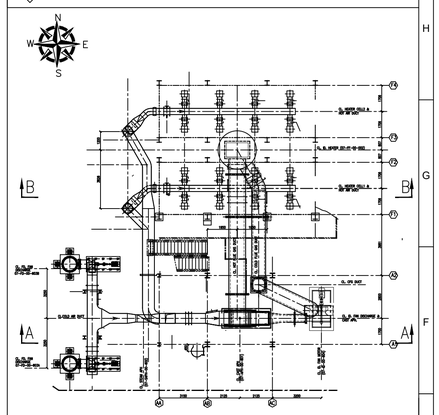
	DENOTES AIR FLOW DIRECTION
	DENOTES FLUE GAS FLOW DIRECTION
FS	FIXED SUPPORT
SS	SLIDING SUPPORT
GS	GUIDE SUPPORT
1	DENOTES REFRACTORY MARK NUMBER (REFER DRG. NO. – 1–00–022–U4099)
1	DENOTES NOZZLE NUMBER



KEY PLAN

Rev	Date DD-MM-YYYY	Status - Description of Issue	Written by	Checked by	Approved by
1	18-09-2025	ISSUED FOR APPROVAL	PKM	AS	MO
0	14-08-2025	ISSUED FOR REVIEW	PKM	AS	MO

DOCUMENT CATEGORY (USE " X " MARK)	DOCUMENT REVIEW STATUS (BY CLIENT)
☒ APPROVAL	
☐ REVIEW	
☐ INFORMATION	

PROJECT : DR 1.0 EXPANSION PROJECT
IOCL DIGBOI REFINERY

OWNER : INDIAN OIL CORPORATION LTD.

EPCM : TECHNIP ENERGIES

EPC CONTRACTOR : BHARAT HEAVY ELECTRICALS LTD.,
Heavy Plates & Vessels Plant, Visakhapatnam-530012.
361-246/A

ENGINEERING CONSULTANT : UNITBIRWELCO IISP
THERMAL EQUIPMENT PVT. LTD.
A-110, 2nd Floor, Sector 136, Noida, Uttar Pradesh - 201304
www.unitbirwelco.com

TITLE : IND-COKER SECONDARY FURNACE (07-FF-00-002)
GENERAL ARRANGEMENT - AIR PREHEAT SYSTEM
ELEVATIONS-1

IOCL DOCUMENT NO. : MR-00-0110-0001-A2001-0001J

BHEL DOCUMENT NO. : 1-00-022-U4102

BIRWELCO IISP DOC. NO. : H24065-002-20772-1

SCALE	PROJECT	UNIT	DOC. TYPE	MAT. CODE	SER. NO.	PAGE	REV.
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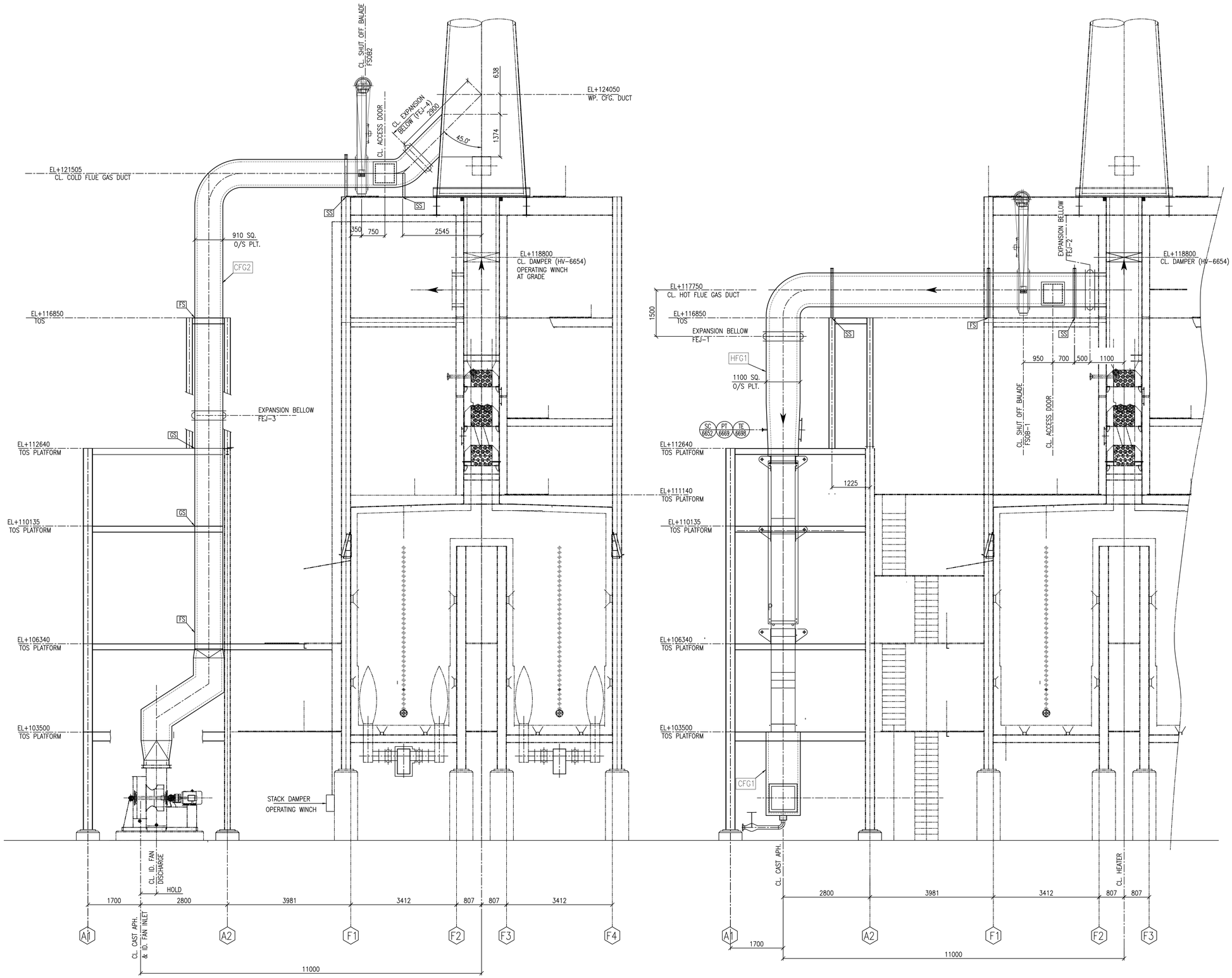
SHEET SIZE : A1



SECTION C–C

(REFER KEY PLAN)
(HOT FLUE GAS DUCT NOT SHOWNN FOR CLARITY)

SECTION D–D

(REFER KEY PLAN)

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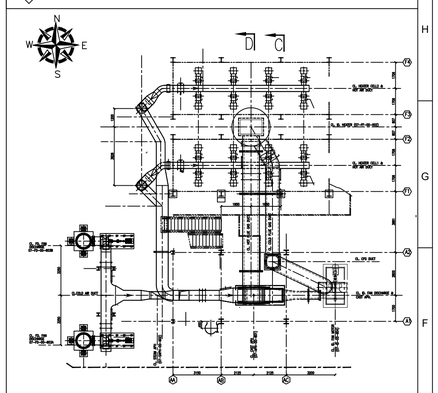

KEY PLAN

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0	14-08-2025	ISSUED FOR REVIEW	PKM	AS	MO

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Heavy Plates & Vessels Plant, Visakhapatnam-530012.
361-246/A

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A-110, 2nd Floor, Sector 136, Noida, Uttar Pradesh - 201304
www.unitbirwelco.com

TITLE : IND-COKER SECONDARY FURNACE (07-FF-00-002)
GENERAL ARRANGEMENT - AIR PREHEAT SYSTEM
ELEVATIONS-2

IOCL DOCUMENT NO. : MR-00-0110-0001-A2001-0001K

BHEL DOCUMENT NO. : 1-00-022-U4103

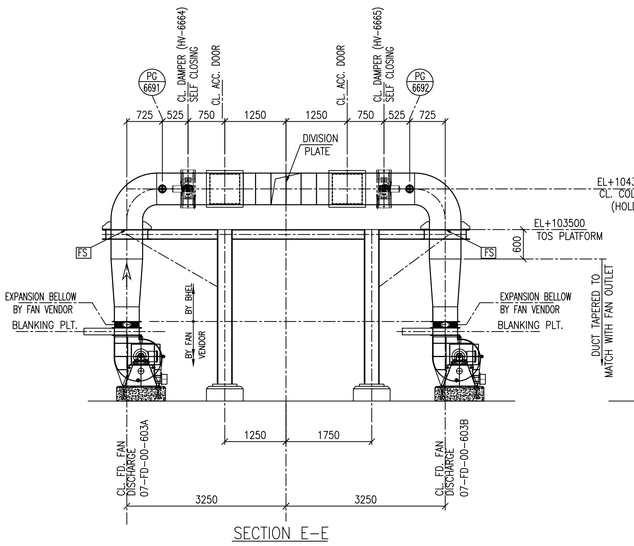
BIRWELCO IISP DOC. NO. : H24065-002-20772-2

SCALE	PROJECT	UNIT	DOC. TYPE	MAT. CODE	SER. NO.	PAGE	REV.
1:60	214227C	07	DW	0110	0001	1 OF 1	01

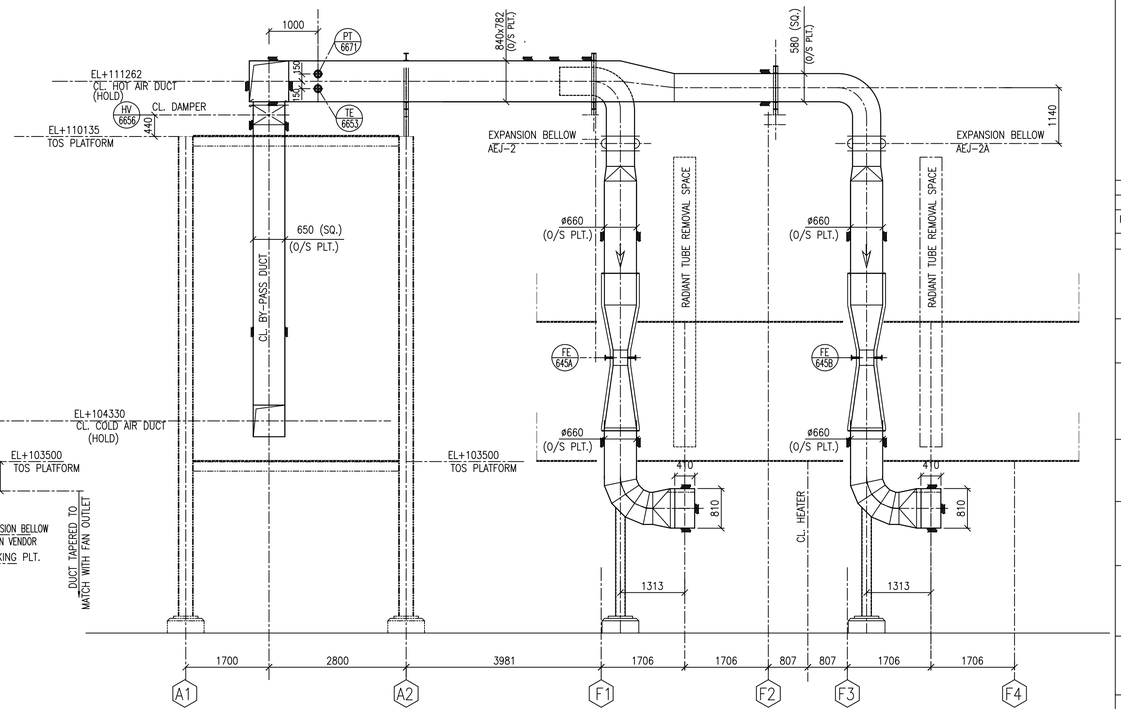
SHEET SIZE : A1

INSTRUMENT CONNECTIONS

INSTRUMENT TAG NUMBER	QUANTITY (NOS)	DESCRIPTION	LOCATION	NOZZLE DETAILS
PG-6711	1	PRESSURE GAUGE	HOT AIR DUCT TO BURNER CELL 1	PIPE-1.5" NB SCH. 80 (MATL. CS) FLANGE- 150# WNRF + BLIND (MATL. A105)
PG-6712	1	PRESSURE GAUGE	HOT AIR DUCT TO BURNER CELL 1	
PG-6713	1	PRESSURE GAUGE	HOT AIR DUCT TO BURNER CELL 1	
PG-6714	1	PRESSURE GAUGE	HOT AIR DUCT TO BURNER CELL 1	
PG-6715	1	PRESSURE GAUGE	HOT AIR DUCT TO BURNER CELL 1	
PG-6716	1	PRESSURE GAUGE	HOT AIR DUCT TO BURNER CELL 1	
PG-6717	1	PRESSURE GAUGE	HOT AIR DUCT TO BURNER CELL 1	
PG-6718	1	PRESSURE GAUGE	HOT AIR DUCT TO BURNER CELL 1	
PG-6719	1	PRESSURE GAUGE	HOT AIR DUCT TO BURNER CELL 2	
PG-6720	1	PRESSURE GAUGE	HOT AIR DUCT TO BURNER CELL 2	
PG-6721	1	PRESSURE GAUGE	HOT AIR DUCT TO BURNER CELL 2	
PG-6722	1	PRESSURE GAUGE	HOT AIR DUCT TO BURNER CELL 2	
PG-6723	1	PRESSURE GAUGE	HOT AIR DUCT TO BURNER CELL 2	
PG-6724	1	PRESSURE GAUGE	HOT AIR DUCT TO BURNER CELL 2	
PG-6725	1	PRESSURE GAUGE	HOT AIR DUCT TO BURNER CELL 2	
PG-6726	1	PRESSURE GAUGE	HOT AIR DUCT TO BURNER CELL 2	
PG-6695	1	PRESSURE GAUGE	HOT AIR DUCT FROM CAPH	
PG-6699	1	PRESSURE GAUGE	SAPH TO CAPH DUCT	
PG-6692	1	PRESSURE GAUGE	FD FAN TO SAPH DUCT	
PG-6692	1	PRESSURE GAUGE	FD FAN 603A TO COMMON DUCT	
PG-6691	1	PRESSURE GAUGE	FD FAN 603B TO COMMON DUCT	
PG-6697	1	PRESSURE GAUGE	SAPH STEAM INLET	
	1			
PG-6696	1	PRESSURE GAUGE	CFG DUCT FROM ID FAN TO STACK	PIPE-1.5" NB SCH. 80 (MATL. SS304) FLANGE- 150# WNRF + BLIND (MATL. A105)
PT-6671	1	PRESSURE TRANSMITTER	HOT AIR DUCT FROM CAPH	PIPE-1.5" NB SCH. 80 (MATL. CS) FLANGE- 150# WNRF + BLIND (MATL. A105)
PT-6677	1	PRESSURE TRANSMITTER	SAPH TO CAPH DUCT	
PT-6670	1	PRESSURE TRANSMITTER	FD FAN TO SAPH DUCT	
PT-6669	1	PRESSURE TRANSMITTER	HFG TO CAPH	PIPE-1.5" NB SCH. 80 (MATL. SS304) FLANGE- 150# WNRF + BLIND (MATL. A105)
PT-6671	1	PRESSURE TRANSMITTER	CFG TO ID FAN	
PT-6678	1	PRESSURE TRANSMITTER	CFG TFROM ID FAN TO STACK	
TE-6654	1	TEMPERATURE TRANSMITTER	HOT AIR DUCT FROM CAPH	PIPE-1.5" NB SCH. 80 (MATL. CS) FLANGE- 300# WNRF + BLIND (MATL. A105)
TE-6653	1	TEMPERATURE TRANSMITTER	HOT AIR DUCT FROM CAPH	
TE-6699	1	TEMPERATURE TRANSMITTER	HOT AIR DUCT FROM CAPH	
TE-6697	1	TEMPERATURE TRANSMITTER	SAPH TO CAPH DUCT	
TE-6696	1	TEMPERATURE TRANSMITTER	FD FAN TO SAPH DUCT	
TE-6698	1	TEMPERATURE TRANSMITTER	HFG TO CAPH	PIPE-1.5" NB SCH. 80 (MATL. SS304) FLANGE- 300# WNRF + BLIND (MATL. A105)
TT-6693	1	TEMPERATURE TRANSMITTER	CFG TO ID FAN	
SC-66652	1	SAMPLE CONNECTION	HFG DUCT	PIPE-4" NB SCH. 40 (MATL. SS304) FLANGE- 150# WNRF + BLIND (MATL. A105)
SC-6653	1	SAMPLE CONNECTION	ID FAN INLET CFG DUCT	



SECTION E-E
(REFER KEY PLAN)



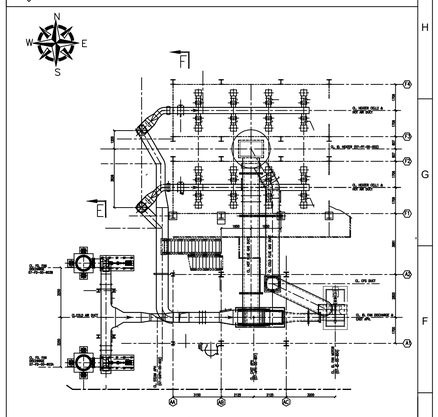
SECTION F-F
(REFER KEY PLAN)

NOTES:-

1. ALL DIMENSIONS ARE IN MM U.O.N. DON'T SCALE THE DRAWING, ASK IF IN DOUBT.
2. ELEVATIONS GIVEN IN DRAWING ARE WITH REFERENCE TO GRADE EL.+100000 CORRESPONDS TO FINISHED GRADE LEVEL U.N.O.
3. FOR FURTHER NOTES AND REFERENCE DOCUMENT REFER DRAWING NUMBER BHEL DRAWING NUMBER – 1-00-022-U4090.
4. FOR INSTRUMENT SUMMARY & INSULATION DETAILS REFER BHEL DRAWING NUMBER – 1-00-022-U4099.
5. REFER DRG NO. – 1-00-022-U4089 FOR PLOT PLAN OF HEATER WITH BATTERY LIMIT & COORDINATES.

LEGEND

1	DENOTES COLUMN GRID NO.
TE XXX	DENOTES AUXILIARY CONNECTIONS
	DENOTES GRATING MAIN BAR SPAN
XXXXXXX	ERECTION MARK NUMBER FOR SHOP ASSEMBLY
	DENOTES AIR FLOW DIRECTION
	DENOTES FLUE GAS FLOW DIRECTION
FS	FIXED SUPPORT
SS	SLIDING SUPPORT
GS	GUIDE SUPPORT
1	DENOTES REFRACTORY MARK NUMBER (REFER DRG. NO. – 1-00-022-U4099)
1	DENOTES NOZZLE NUMBER



E1 F1 KEY PLAN

Rev	Date DD-MM-YYYY	Status - Description of Issue	Written by	Checked by	Approved by
1	18-09-2025	ISSUED FOR APPROVAL	PKM	AS	MO
0	14-08-2025	ISSUED FOR REVIEW	PKM	AS	MO

DOCUMENT CATEGORY (USE " X " MARK)	DOCUMENT REVIEW STATUS (BY CLIENT)
☒ APPROVAL ☐ REVIEW ☐ INFORMATION	

PROJECT : DR 1.0 EXPANSION PROJECT
IOCL DIGBOI REFINERY

OWNER : INDIAN OIL CORPORATION LTD.

EPCM : TECHNIP ENERGIES

EPC CONTRACTOR : BHARAT HEAVY ELECTRICALS LTD.,
Heavy Plates & Vessels Plant, Visakhapatnam-530012.
361-246/A

ENGINEERING CONSULTANT : UNITBIRWELCO IISP
THERMAL EQUIPMENT PVT. LTD.
A-110, 2nd Floor, Sector 136, Noida, Uttar Pradesh - 201304
www.unitbirwelco.com

TITLE : IND-COKER SECONDARY FURNACE (07-FF-00-002)
GENERAL ARRANGEMENT - AIR PREHEAT SYSTEM
ELEVATIONS-3

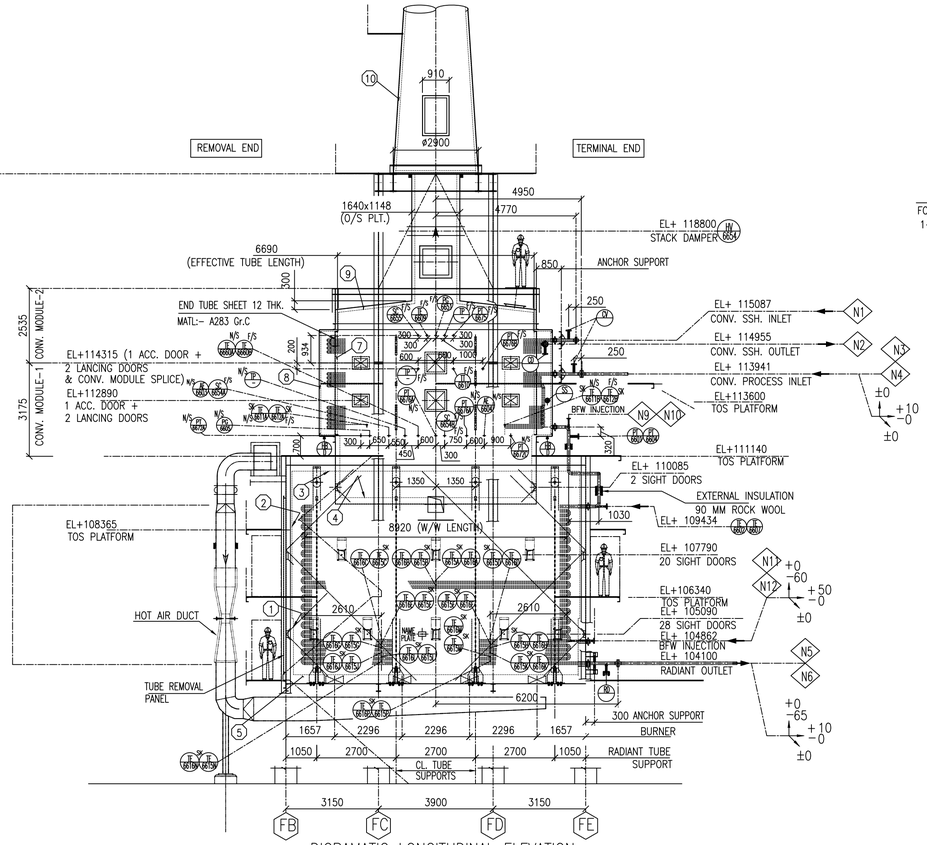
IOCL DOCUMENT NO.	: MR-00-0110-0001-A2001-0001L
BHEL DOCUMENT NO.	: 1-00-022-U4104
BIRWELCO IISP DOC. NO.	: H24065-002-20772-3

SCALE	PROJECT	UNIT	DOC. TYPE	MAT. CODE	SER. NO.	PAGE	REV.
1:60	214227C	07	DW	0110	0001	1 OF 1	01

SHEET SIZE : A1

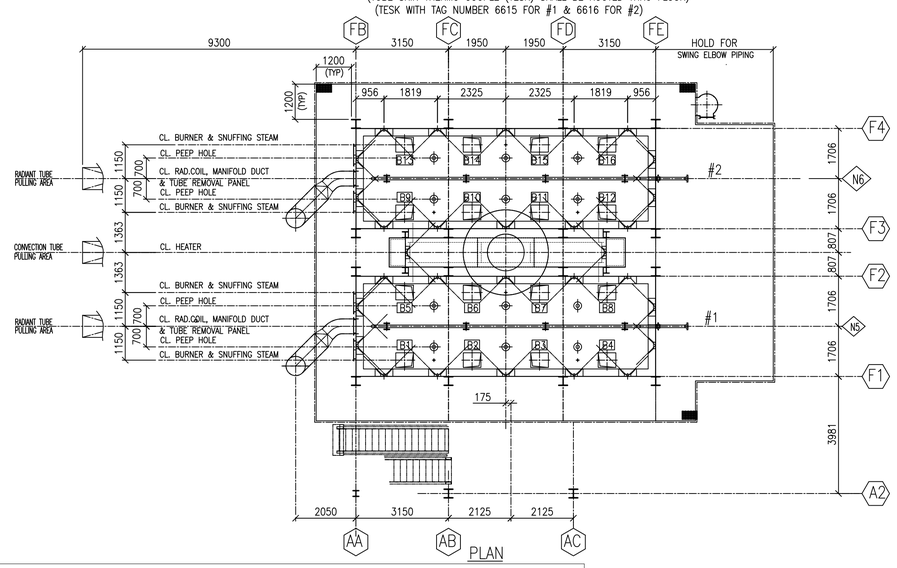
IND. COKER SECONDARY FURNACE (07-FF-00-002) FOR DR 1.0 EXPANSION PROJECT

Document Identification Attributes					
Document Number		**1-00-022-U4100 / U4101 / U4102 / U4103 / U4104**		**Revision Object:**	**1**
Document Title		**GENERAL ARRANGEMENT APH SYSTEM**			
Contractor Name		**BHEL**		**Contractor response date:**	
S. No.	**DRAWING NUMBER**	**Comments from BHEL**	**Status Open / Close**	**Vendor Response**	
1	1-00-022-U4100	Vendor to adhere to the P & ID for the instrument	CLOSED	Instrument tapings updated as per latest P & ID	
2		Refer to the comments in the P& ID aind incoporate in the drawing.	CLOSED	Noted & incorporated	
3		Please ensure the ducting with P & ID	CLOSED	Ensured	
4		Remove holds on fans	OPEN	Holds shall be removed after receiving Final Vendor drawings	
1	1-00-022-U4101	Refer to the comments in the P& ID aind incoporate in the drawing.	CLOSED	Noted & incorporated	
1	1-00-022-U4102	Vendor to adhere to the P & ID for the instrument	CLOSED	Instrument tapings updated as per latest P & ID	
2		Refer to the comments in the P& ID aind incoporate in the drawing.	CLOSED	Noted & incorporated	
3		Access door at bottom of APH not provided	CLOSED	Noted & Provided	
4		Access door shall be provided on either side of SOB	CLOSED	Please note that No SOB in Idfan inlet ducts, Hence No doors required here	
1	1-00-022-U4103	Refer to the comments in the P& ID aind incoporate in the drawing.	CLOSED	Noted & incorporated	
2		FLP of APH Support structure shall be provided	CLOSED	Noted	
1	1-00-022-U4104	Vendor to adhere to the P & ID for the instrument	CLOSED	Instrument tapings updated as per latest P & ID	
2		Refer to the comments in the P& ID aind incoporate in the drawing.	CLOSED	Noted & incorporated	
3		Remove holds on APH outlet	OPEN	Holds shall be removed after receiving Final Vendor drawings	



DIGRAMATIC LONGITUDINAL ELEVATION

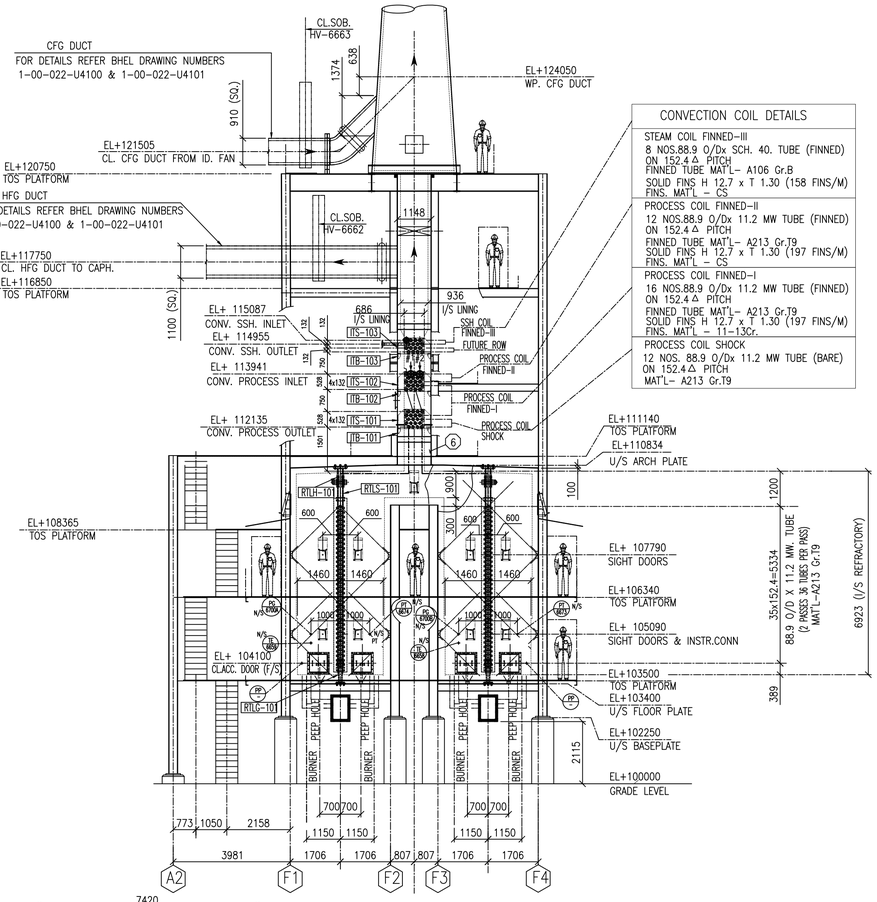
(TUBE SKIN THERMO COUPLE (TESK) SHALL BE ROUTED THRU FLOOR)
(TESK WITH TAG NUMBER 6615 FOR #1 & 6616 FOR #2)



PLAN

CROSS SECTION ELEVATION

(VIEWING FROM TERMINAL END VIEW)



CONVECTION COIL DETAILS

STEAM COIL FINNED-III	8 NOS.88.9 O/Dx SCH. 40. TUBE (FINNED) ON 152.4 Δ PITCH FINNED TUBE MAT'L- A106 Gr.B SOLID FINS H 12.7 x T 1.30 (158 FINS/M) FINS. MAT'L - CS
PROCESS COIL FINNED-II	12 NOS.88.9 O/Dx 11.2 MW TUBE (FINNED) ON 152.4 Δ PITCH FINNED TUBE MAT'L- A213 Gr.T9 SOLID FINS H 12.7 x T 1.30 (197 FINS/M) FINS. MAT'L - CS
PROCESS COIL FINNED-I	16 NOS.88.9 O/Dx 11.2 MW TUBE (FINNED) ON 152.4 Δ PITCH FINNED TUBE MAT'L- A213 Gr.T9 SOLID FINS H 12.7 x T 1.30 (197 FINS/M) FINS. MAT'L - 11-13Cr.
PROCESS COIL SHOCK	12 NOS. 88.9 O/Dx 11.2 MW TUBE (BARE) ON 152.4 Δ PITCH MAT'L- A213 Gr.T9

NOTES:-

1. ALL DIMENSIONS ARE IN MM U.O.N. DON'T SCALE THE DRAWING, ASK IF IN DOUBT.
2. ELEVATIONS GIVEN IN DRAWING ARE WITH REFERENCE TO GRADE EL.+100000 CORRESPONDS TO FINISHED GRADE LEVEL U.N.O.
3. FOR FURTHER NOTES AND REFERENCE DOCUMENT REFER DRAWING NUMBER BHEL DRAWING NUMBER – 1-00-022-U4090.
4. FOR INSTRUMENT SUMMARY & INSULATION DETAILS REFER BHEL DRAWING NUMBER – 1-00-022-U4099.
5. FOR INSTRUMENT & UTILITY CONNECTION LOCATION AND TAG NUMBERS REFER BHEL DRAWING NUMBERS – 1-00-022-U4092,U4093,U4094,U4095,U4096,U4097 & U4098.
6. REFER DRG NO. – 1-00-022-U4089 FOR PLOT PLAN OF HEATER WITH BATTERY LIMIT & COORDINATES.
7. REFER DRG NO. 1-11-001-U8092 FOR RADIANT COIL.
8. REFER DRG NO. 1-11-002-U8093 FOR CONVECTION COIL.

LEGEND

1	DENOTES COLUMN GRID NO.
TE XXX	DENOTES AUXILIARY CONNECTIONS
	DENOTES GRATING MAIN BAR SPAN
XXXXXXX	ERECTION MARK NUMBER FOR SHOP ASSEMBLY
	DENOTES AIR FLOW DIRECTION
	DENOTES FLUE GAS FLOW DIRECTION
FS	FIXED SUPPORT
SS	SLIDING SUPPORT
1	DENOTES REFRACTORY MARK NUMBER (REFER DRG. NO. – 1-00-022-U4099)
1	DENOTES NOZZLE NUMBER

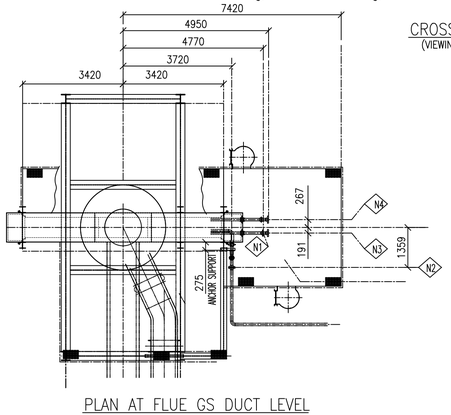
TUBE SUPPORTCASTING DESCRIPTION

(FOR DETAILS REFER DRAWING NUMBER 1-07-430-U8053 & 1-07-430-U8054)

MARK NO	LOCATION	DESCRIPTION	MATERIAL	QUANTITY	REMARKS
RTLS 101	RADIANT	RADINT TUBE LADDER SUPPORT	A351 Gr. HK40	8	
RTSB 101	RADIANT	RADIANT TUBE LADDER SUPPORT HANGER	A351 Gr. HK40	8	
RTSG 101	RADIANT	RADIANT TUBE LADDER SUPPORT GUIDE	A351 Gr. HK40	16	
ITS 101	CONVECTION	INTERMEDIATE TUBE SUPPORT	A351 Gr. HK40	2	
ITS 102	CONVECTION	INTERMEDIATE TUBE SUPPORT	A351 Gr. HK40	2	
ITS 103	CONVECTION	INTERMEDIATE TUBE SUPPORT	A297 Gr. HF	2	
ITB 101	CONVECTION	INTERMEDIATE TUBE SUPPORT BRACKET	A351 Gr. HK40	4	
ITB 102	CONVECTION	INTERMEDIATE TUBE SUPPORT BRACKET	A351 Gr. HK40	4	
ITB 103	CONVECTION	INTERMEDIATE TUBE SUPPORT BRACKET	A297 Gr. HF	4	

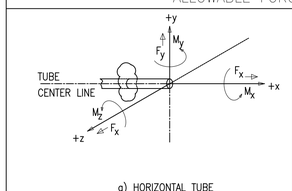
BURNER DATA

NUMBER OF BURNERS	16 (8 NUMBER PER CELL)
NUMBER OF BURNER ROW	2 PER CELL
NUMBER OF BURNER PER ROW	4
BURNER TYPE	FLAT FLAME, LOW NOx, FORCED DRAFT GAS BURNERS
BURNER LOCATION	HEATER FLOOR
BURNER ORIENTATION	UPWORD FIRING
HEAT RELEASE PER BURNER (Gcal/h)	0.528 (DESIGN), 0.459 (NORMAL) & 0.105 (MINIMUM)
PRESSURE DROPS ACROSS BURNER @ DESIGN HEAT RELEASE, mmWC	75
BURNER PILOT TYPE	SELF INSPIRING, CONTINUOUS
BURNER PILOT CAPACITY (Gcal/h)	0.019
BURNER FUEL	FUEL GAS
IGNITION METHOD	MANUAL PORTABLE IGNITOR (ONE ELECTRICAL & ONE BATTERY OPERATED PER CELL)
FLAME DETECTION TYPE	IONISATION ROD (PILOT FLAME) + UV SCANNER (MAIN FLAME)
NUMBER OF FLAME DETECTOR	ONE PER BURNER



PLAN AT FLUE GS DUCT LEVEL

ALLOWABLE FORCES ON TERMINALS



a) HORIZONTAL TUBE

b) VERTICAL TUBE

NOZZLE MARK	SIZE	TYPE	DESCRIPTION	Fx N	Fy N	Fz N	Mx N	My N	Mz N
N1 #1, N2 #2	3" NB	3" 300# WNRF FLG. FACE FINISH 125 AARH BORE TO SUIT 3" TUBE SCH.40 MATL:SA105	CONVECTION STEAM INLET & OUTLET (HORIZONTAL TUBE)	3335	6670	6670	3050	2375	2375
N3 #1, N4 #1	3" NB	3" 1500# WNRF FLG. FACE FINISH 125 AARH BORE TO SUIT 3" TUBE 11.2 MW MATL:A182 F9	CONVECTION PROCESS INLET (HORIZONTAL TUBE)	3335	6670	6670	3050	2375	2375
N5 #1, N6 #2	3" NB	3" 1500# WNRF FLG. FACE FINISH 125 AARH BORE TO SUIT 3" TUBE 11.2 MW MATL:A182 F9	RADIANT PROCESS OUTLET (HORIZONTAL TUBE)	3335	6670	6670	3050	2375	2375
N7 #1, N8 #2		DELETED							
N9 #1, N10 #2	1" NB	1" 1500# WNRF FLG. FACE FINISH 125 AARH BORE TO SUIT 1" TUBE XXS MW MATL:A182 F9	BFW INJECTION NOZZLE AT CROSSOVER						
N11 #1, N12 #2	1" NB	1" 1500# WNRF FLG. FACE FINISH 125 AARH BORE TO SUIT 1" TUBE XXS MW MATL:A182 F9	BFW INJECTION NOZZLE AT RADIANT COIL						

NOTES :-
(a) AW – AVERAGE WALL THICKNESS
(b) MW – MINIMUM WALL THICKNESS
(c) FORCES IN N AND MOMENTS IN N.m
(d) DIR. X,Y,Z : AXES OF NOZZLE
(e) THE ALLOWABLE FORCES (Fx,Fy,Fz) AND MOMENTS (Mx,My,Mz) ARE 5 TIMES API 560 (ISO13705), TABLE– 7 VALUES

Rev	Date DD-MM-YYYY	Status - Description of Issue	Written by	Checked by	Approved by
2	18-09-2025	ISSUED FOR APPROVAL	PKM	AS	MO
1	08-08-2025	REVISED & RE-ISSUED FOR APPROVAL	PKM	AS	MO
0	25-07-2025	ISSUED FOR REVIEW	PKM	AS	MO

DOCUMENT CATEGORY (USE " X " MARK)
☒ APPROVAL
☐ REVIEW
☐ INFORMATION

DOCUMENT REVIEW STATUS (BY CLIENT)

PROJECT : DR 1.0 EXPANSION PROJECT
IOCL DIGBOI REFINERY

OWNER : INDIAN OIL CORPORATION LTD.

EPCM : TECHNIP ENERGIES

EPC CONTRACTOR : BHARAT HEAVY ELECTRICALS LTD., Heavy Plates & Vessels Plant, Visakhapatnam-530012.
361-246/A

ENGINEERING CONSULTANT : UNITBIRWELCO IISP THERMAL EQUIPMENT PVT. LTD.
A-110, 2nd Floor, Sector 136, Noida, Uttar Pradesh - 201304
www.unitbirwelco.com

TITLE : IND-COKER SECONDARY FURNACE (07-FF-00-002)
GENERAL ARRANGEMENT HEATER OVER ALL LAYOUT

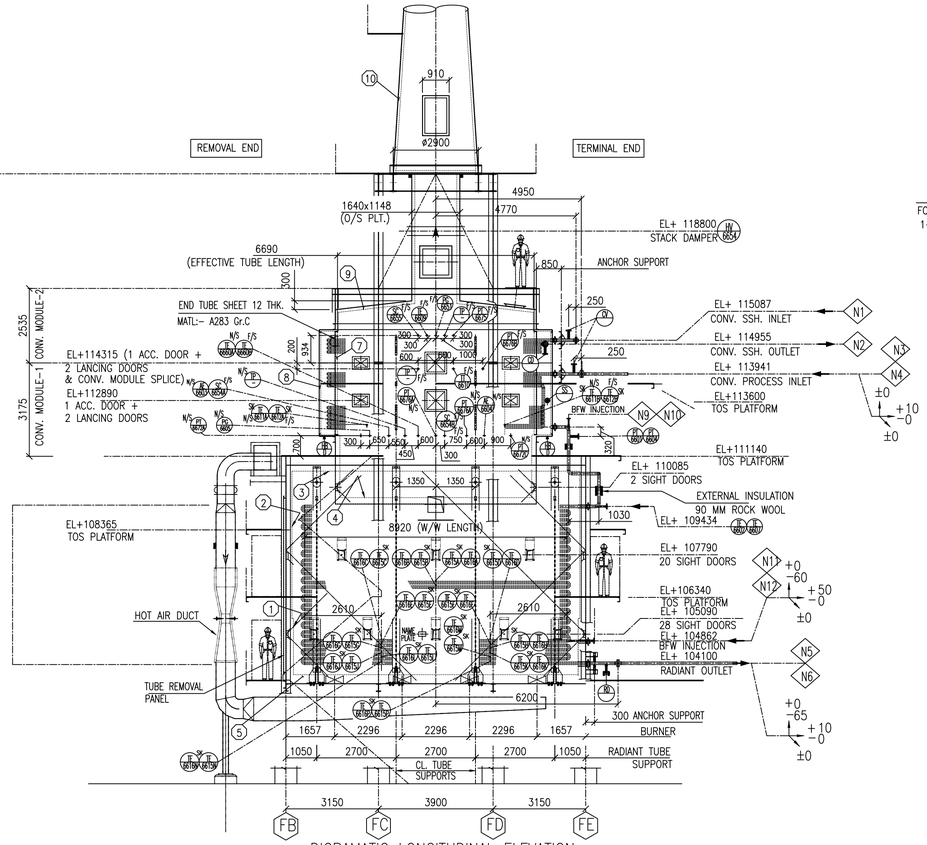
IOCL DOCUMENT NO. : MR-00-0110-0001-A2001-0001
BHEL DOCUMENT NO. : 1-00-022-U4091
BIRWELCO IISP DOC. NO. : H24065-002-2064

SCALE	PROJECT	UNIT	DOC. TYPE	MAT. CODE	SER. NO.	PAGE	REV.
1:100	214227C	07	DW	0110	0001	1 OF 1	02

SHEET SIZE : A1

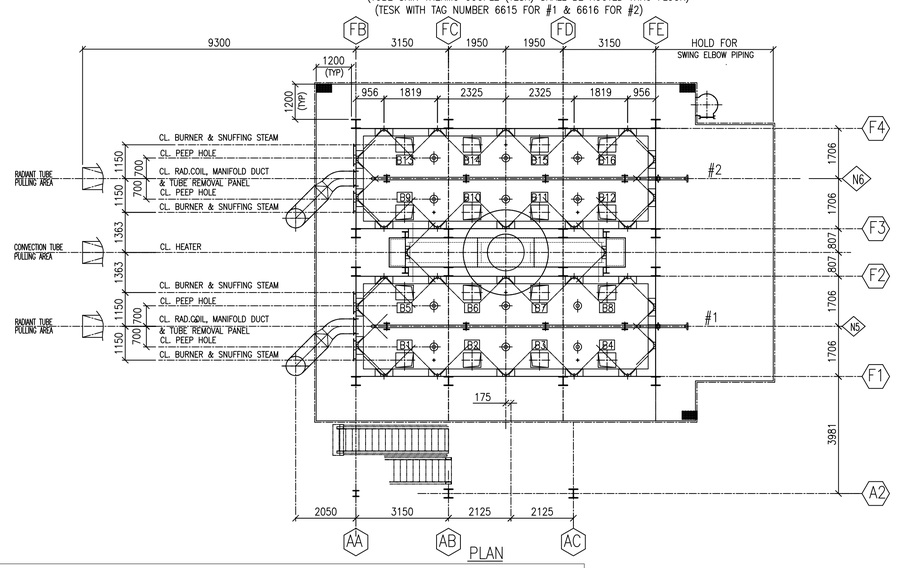
IND. COKER SECONDARY FURNACE (07-FF-00-002) FOR DR 1.0 EXPANSION PROJECT

Document Identification Attributes					
Document Number		**1-00-022-U4091**		**Revision Object:**	**2**
Document Title		**HEATER GENERAL ARRANGEMENT OVERALL LAYOUT**			
Contractor Name		**BHEL**		**Contractor response date:**	
S. No.	**DRAWING NUMBER**	**Comments from PMC**	**Status Open / Close**	**Vendor Response**	
1	1-00-022-U4091	General comments- PLEASE VERIFY AND CHECK ALL THE SPELLING ERRORS.	CLOSED	noted and updated	
2		General comments- MENTION THE PROCESS CONDITIONS IN THE GAD.	CLOSED	For process conditions, refer to the coil drawing	
3		General comments- VENDOR TO HIGHLIGHT THE CHANGES FROM ONE REVISION TO ANOTHER.	CLOSED	Generally revised drawings, hence it is not possible to highlight the revised changes	
4		CONTRACTOR TO MAKE REFRACTORY DRAWING CONSISTENT WITH THE API DATASHEET.	CLOSED	Noted	
5		ADD END TUBE SUPPORT DATA IN THE BELOW TUBE SUPPORT TABLE.	CLOSED	Alfready shown on the drawing Matl: 283 Gr. C	
6		Indicate these values	CLOSED	Will update after stress analysis	
7		Provide Coil design pressures, hydrostatic test pressure, design fluid, CA, tube wall temperatures	CLOSED	Please refer Coil drawings	
8					



DIGRAMATIC LONGITUDINAL ELEVATION

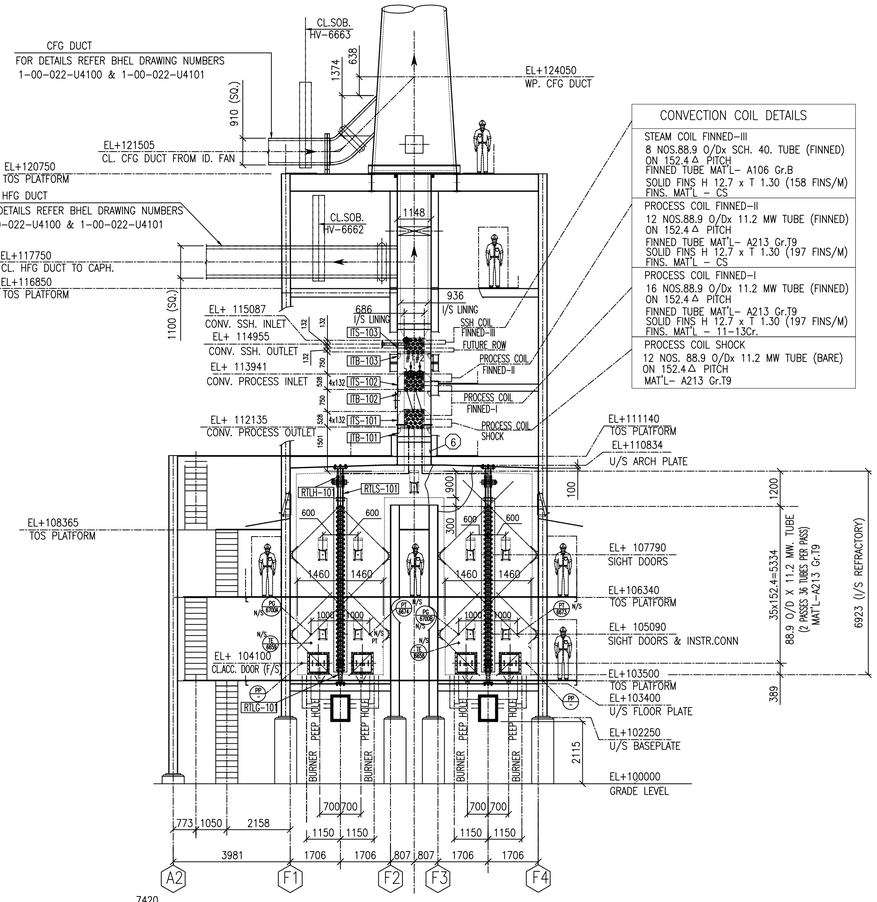
(TUBE SKIN THERMO COUPLE (TESK) SHALL BE ROUTED THRU FLOOR)
(TESK WITH TAG NUMBER 6615 FOR #1 & 6616 FOR #2)



PLAN

CROSS SECTION ELEVATION

(VIEWING FROM TERMINAL END VIEW)



CONVECTION COIL DETAILS

STEAM COIL FINNED-III	8 NOS.88.9 O/Dx SCH. 40. TUBE (FINNED) ON 152.4 Δ PITCH FINNED TUBE MAT'L- A106 Gr.B SOLID FINS H 12.7 x T 1.30 (158 FINS/M) FINS. MAT'L - CS
PROCESS COIL FINNED-II	12 NOS.88.9 O/Dx 11.2 MW TUBE (FINNED) ON 152.4 Δ PITCH FINNED TUBE MAT'L- A213 Gr.T9 SOLID FINS H 12.7 x T 1.30 (197 FINS/M) FINS. MAT'L - CS
PROCESS COIL FINNED-I	16 NOS.88.9 O/Dx 11.2 MW TUBE (FINNED) ON 152.4 Δ PITCH FINNED TUBE MAT'L- A213 Gr.T9 SOLID FINS H 12.7 x T 1.30 (197 FINS/M) FINS. MAT'L - 11-13Cr.
PROCESS COIL SHOCK	12 NOS. 88.9 O/Dx 11.2 MW TUBE (BARE) ON 152.4 Δ PITCH MAT'L- A213 Gr.T9

NOTES:-

1. ALL DIMENSIONS ARE IN MM U.O.N. DON'T SCALE THE DRAWING, ASK IF IN DOUBT.
2. ELEVATIONS GIVEN IN DRAWING ARE WITH REFERENCE TO GRADE EL.+100000 CORRESPONDS TO FINISHED GRADE LEVEL U.N.O.
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6. REFER DRG NO. – 1-00-022-U4089 FOR PLOT PLAN OF HEATER WITH BATTERY LIMIT & COORDINATES.
7. REFER DRG NO. 1-11-001-U8092 FOR RADIANT COIL.
8. REFER DRG NO. 1-11-002-U8093 FOR CONVECTION COIL.

LEGEND

1	DENOTES COLUMN GRID NO.
TE XXX	DENOTES AUXILIARY CONNECTIONS
	DENOTES GRATING MAIN BAR SPAN
XXXXXXX	ERECTION MARK NUMBER FOR SHOP ASSEMBLY
	DENOTES AIR FLOW DIRECTION
	DENOTES FLUE GAS FLOW DIRECTION
FS	FIXED SUPPORT
SS	SLIDING SUPPORT
1	DENOTES REFRACTORY MARK NUMBER (REFER DRG. NO. – 1-00-022-U4099)
1	DENOTES NOZZLE NUMBER

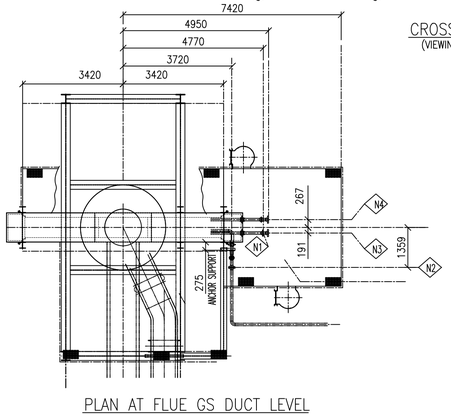
TUBE SUPPORTCASTING DESCRIPTION

(FOR DETAILS REFER DRAWING NUMBER 1-07-430-U8053 & 1-07-430-U8054)

MARK NO	LOCATION	DESCRIPTION	MATERIAL	QUANTITY	REMARKS
RTLS 101	RADIANT	RADINT TUBE LADDER SUPPORT	A351 Gr. HK40	8	
RTSB 101	RADIANT	RADIANT TUBE LADDER SUPPORT HANGER	A351 Gr. HK40	8	
RTSG 101	RADIANT	RADIANT TUBE LADDER SUPPORT GUIDE	A351 Gr. HK40	16	
ITS 101	CONVECTION	INTERMEDIATE TUBE SUPPORT	A351 Gr. HK40	2	
ITS 102	CONVECTION	INTERMEDIATE TUBE SUPPORT	A351 Gr. HK40	2	
ITS 103	CONVECTION	INTERMEDIATE TUBE SUPPORT	A297 Gr. HF	2	
ITB 101	CONVECTION	INTERMEDIATE TUBE SUPPORT BRACKET	A351 Gr. HK40	4	
ITB 102	CONVECTION	INTERMEDIATE TUBE SUPPORT BRACKET	A351 Gr. HK40	4	
ITB 103	CONVECTION	INTERMEDIATE TUBE SUPPORT BRACKET	A297 Gr. HF	4	

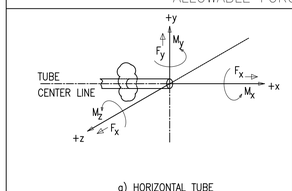
BURNER DATA

NUMBER OF BURNERS	16 (8 NUMBER PER CELL)
NUMBER OF BURNER ROW	2 PER CELL
NUMBER OF BURNER PER ROW	4
BURNER TYPE	FLAT FLAME, LOW NOx, FORCED DRAFT GAS BURNERS
BURNER LOCATION	HEATER FLOOR
BURNER ORIENTATION	UPWORD FIRING
HEAT RELEASE PER BURNER (Gcal/h)	0.528 (DESIGN), 0.459 (NORMAL) & 0.105 (MINIMUM)
PRESSURE DROPS ACROSS BURNER @ DESIGN HEAT RELEASE, mmWC	75
BURNER PILOT TYPE	SELF INSPIRING, CONTINUOUS
BURNER PILOT CAPACITY (Gcal/h)	0.019
BURNER FUEL	FUEL GAS
IGNITION METHOD	MANUAL PORTABLE IGNITOR (ONE ELECTRICAL & ONE BATTERY OPERATED PER CELL)
FLAME DETECTION TYPE	IONISATION ROD (PILOT FLAME) + UV SCANNER (MAIN FLAME)
NUMBER OF FLAME DETECTOR	ONE PER BURNER



PLAN AT FLUE GS DUCT LEVEL

ALLOWABLE FORCES ON TERMINALS



a) HORIZONTAL TUBE

b) VERTICAL TUBE

NOZZLE MARK	SIZE	TYPE	DESCRIPTION	Fx N	Fy N	Fz N	Mx N	My N	Mz N
N1 #1, N2 #2	3" NB	3" 300# WNRF FLG. FACE FINISH 125 AARH BORE TO SUIT 3" TUBE SCH.40 MATL:SA105	CONVECTION STEAM INLET & OUTLET (HORIZONTAL TUBE)	3335	6670	6670	3050	2375	2375
N3 #1, N4 #1	3" NB	3" 1500# WNRF FLG. FACE FINISH 125 AARH BORE TO SUIT 3" TUBE 11.2 MW MATL:A182 F9	CONVECTION PROCESS INLET (HORIZONTAL TUBE)	3335	6670	6670	3050	2375	2375
N5 #1, N6 #2	3" NB	3" 1500# WNRF FLG. FACE FINISH 125 AARH BORE TO SUIT 3" TUBE 11.2 MW MATL:A182 F9	RADIANT PROCESS OUTLET (HORIZONTAL TUBE)	3335	6670	6670	3050	2375	2375
N7 #1, N8 #2		DELETED							
N9 #1, N10 #2	1" NB	1" 1500# WNRF FLG. FACE FINISH 125 AARH BORE TO SUIT 1" TUBE XXS MW MATL:A182 F9	BFW INJECTION NOZZLE AT CROSSOVER						
N11 #1, N12 #2	1" NB	1" 1500# WNRF FLG. FACE FINISH 125 AARH BORE TO SUIT 1" TUBE XXS MW MATL:A182 F9	BFW INJECTION NOZZLE AT RADIANT COIL						

NOTES :-
(a) AW – AVERAGE WALL THICKNESS
(b) MW – MINIMUM WALL THICKNESS
(c) FORCES IN N AND MOMENTS IN N.m
(d) DIR. X,Y,Z : AXES OF NOZZLE
(e) THE ALLOWABLE FORCES (Fx,Fy,Fz) AND MOMENTS (Mx,My,Mz) ARE 5 TIMES API 560 (ISO13705), TABLE– 7 VALUES

Rev	Date DD-MM-YYYY	Status - Description of Issue	Written by	Checked by	Approved by
2	18-09-2025	ISSUED FOR APPROVAL	PKM	AS	MO
1	08-08-2025	REVISED & RE-ISSUED FOR APPROVAL	PKM	AS	MO
0	25-07-2025	ISSUED FOR REVIEW	PKM	AS	MO

DOCUMENT CATEGORY (USE " X " MARK)
☒ APPROVAL
☐ REVIEW
☐ INFORMATION

DOCUMENT REVIEW STATUS (BY CLIENT)

PROJECT : DR 1.0 EXPANSION PROJECT
IOCL DIGBOI REFINERY

OWNER : INDIAN OIL CORPORATION LTD.

EPCM : TECHNIP ENERGIES

EPC CONTRACTOR : BHARAT HEAVY ELECTRICALS LTD., Heavy Plates & Vessels Plant, Visakhapatnam-530012.
361-246/A

ENGINEERING CONSULTANT : UNITBIRWELCO IISP THERMAL EQUIPMENT PVT. LTD.
A-110, 2nd Floor, Sector 136, Noida, Uttar Pradesh - 201304
www.unitbirwelco.com

TITLE : IND-COKER SECONDARY FURNACE (07-FF-00-002)
GENERAL ARRANGEMENT HEATER OVER ALL LAYOUT

IOCL DOCUMENT NO. : MR-00-0110-0001-A2001-0001
BHEL DOCUMENT NO. : 1-00-022-U4091
BIRWELCO IISP DOC. NO. : H24065-002-2064

SCALE	PROJECT	UNIT	DOC. TYPE	MAT. CODE	SER. NO.	PAGE	REV.
1:100	214227C	07	DW	0110	0001	1 OF 1	02

SHEET SIZE : A1

IND. COKER SECONDARY FURNACE (07-FF-00-002) FOR DR 1.0 EXPANSION PROJECT

Document Identification Attributes					
Document Number		**1-00-022-U4091**		**Revision Object:**	**2**
Document Title		**HEATER GENERAL ARRANGEMENT OVERALL LAYOUT**			
Contractor Name		**BHEL**		**Contractor response date:**	
S. No.	**DRAWING NUMBER**	**Comments from PMC**	**Status Open / Close**	**Vendor Response**	
1	1-00-022-U4091	General comments- PLEASE VERIFY AND CHECK ALL THE SPELLING ERRORS.	CLOSED	noted and updated	
2		General comments- MENTION THE PROCESS CONDITIONS IN THE GAD.	CLOSED	For process conditions, refer to the coil drawing	
3		General comments- VENDOR TO HIGHLIGHT THE CHANGES FROM ONE REVISION TO ANOTHER.	CLOSED	Generally revised drawings, hence it is not possible to highlight the revised changes	
4		CONTRACTOR TO MAKE REFRACTORY DRAWING CONSISTENT WITH THE API DATASHEET.	CLOSED	Noted	
5		ADD END TUBE SUPPORT DATA IN THE BELOW TUBE SUPPORT TABLE.	CLOSED	Alfready shown on the drawing Matl: 283 Gr. C	
6		Indicate these values	CLOSED	Will update after stress analysis	
7		Provide Coil design pressures, hydrostatic test pressure, design fluid, CA, tube wall temperatures	CLOSED	Please refer Coil drawings	
8					

PMC/LICENSOR REFERENCE DOCUMENT

PMC (TEN) DOCUMENT NO:	TITLE
214227C-07-MR-0110-0001	MATERIAL REQUISITION
214227C-07-SP-0110-001	API DATA SHEET FOR IND COKER SECONDARY FURNACE 07-FF-00-002
214227C-00-SP-0110-0002	STANDARD SPECIFICATION OF MODULARIZATION OF FIRED HEATERS
214227C-00-SP-0125-0001	STANDARD SPECIFICATION FOR TUBE SUPPORT CASTINGS
214227C-00-SP-0126-0001	STANDARD SPECIFICATION FOR FINNED TUBES
214227C-00-SP-0127-0001	STANDARD SPECIFICATION FOR PIPES, FITTINGS & FORGINGS
214227C-00-SP-0127-0002	STANDARD SPECIFICATION FOR HEATER COIL FABRICATION
214227C-00-SP-0131-0001	STANDARD SPECIFICATION FOR FABRICATION & ERECTION OF FIRED HEATERS & APH SYSTEM
214227C-00-SP-0131-0002	STANDARD SPECIFICATION FOR STEEL WORK OF FIRED HEATERS
214227C-00-SP-0132-0001	STANDARD SPECIFICATION FOR CASTABLE REFRACTORY
214227C-00-SP-0132-0002	STANDARD SPECIFICATION FOR CERAMIC FIBRE PRODUCTS
214227C-00-SP-0132-0003	STANDARD SPECIFICATION FOR REFRACTORY FIRE BRICKS
214227C-00-SP-0132-0004	STANDARD SPECIFICATION FOR MISC. REFRACTORY ITEMS
214227C-00-SP-0132-0005	STANDARD SPECIFICATION FOR WORKMANSHIP OF REFRACTORY LINING
214227C-00-SP-0132-0006	STANDARD SPECIFICATION FOR CASTABLE REFRACTORY APPLICATION
214227C-00-SP-0135-0001	STANDARD SPECIFICATION FOR FABRIC EXPANSION BELLOW
214227C-00-SP-0136-0001	STANDARD SPECIFICATION FOR DAMPERS AND SHUTOFF BLADES
214227C-00-SP-0191-0001	STANDARD SPECIFICATION FOR BURNERS
214227C-00-SP-0195-0001	STANDARD SPECIFICATION FOR AIR PREHEATERS
214227C-00-SP-1040-0001	STANDARD SPECIFICATION FOR FD/ID FANS
214227C-00-STC-1801-0001	SPECIFICATION FOR STRUCTURAL STEEL WORK
214227C-00-STC-1801-0002	SPECIFICATION FOR GROUTING
214227C-00-JSS-1801-0005	SPECIFICATION FOR PAINTING OF STEEL STRUCTURES
214227C-00-JSS-0131-0010	SPECIFICATION FOR GRATING
214227C-00-STC-1790-0001	CONRETE WORKS STANDARD (FOR FIRE PROOFING
214227C-00-STC-1890-0001	STRUCTURAL STEEL WORK STANDARD
214227C-00-DW-1802-0001	GENERAL NOTES STEEL WORK
214227C-00-DW-1802-0001	JOB SPECIFICATION FOR HOT INSULATION OF VESSELS, PIPING & EQUIPMENT

ABBREVIATIONS

APPROX	APPROXIMATE	REQD	REQUIRED
BCD	BOLT (PITCH) CIRCLE DIA	SEC	SECTION
BOS	BOTTOM OF STEEL	STD	STANDARD
BP	BASE PLATE	STIF PL	STIFFENER (RIB) PLATE
BOB	BOTTOM OF BASE PLATE	SYM	SYMMETRICAL
CL	CENTER LINE	SQ	SQUARE
CLR	CLEARENCE	THK	THICKNESS
COL	COLUMN	THRU	THROUGH
CONN	CONNECTION	TOS	TOP OF STEEL
COV PL	COVER PLATE	TOPL	TOP OF PLATE
CTC	CENTER TO CENTER	T WASHER	TAPER WASHER
D	DEPTH	T/W	TIED WITH
DEG	DEGREE	TYP	TYPICAL
DET	DETAIL	U/S	UNDER SIDE
DIA	DIAMETER	VBR	DIAGONAL BRACING IN VERTICAL PLANE
DO	DITTO	W	WIDTH
DN	DOWN	W/O	WITH OUT
DWG	DRAWING	WP	WORKING POINT
EL	ELEVATION (LEVEL)	1	DENOTES COLUMN GRID NO.
EMP PL	EMBEDED PLATE	TE XXX	DENOTES AUXILIARY CONNECTIONS
EXP JT	EXPANSION JOINT		DENOTES GRATING MAIN BAR SPAN
EQ	EQUAL	XXXXXXX	ERECTION MARK NUMBER FOR SHOP ASSEMBLY
EQ P	EQUAL PITCH (SPACING)		DENOTES AIR FLOW DIRECTION
FGL	FINISHED GRADE LEVEL		DENOTES FLUE GAS FLOW DIRECTION
FL	FLOOR	FS	FIXED SUPPORT
FLG	FLANGE	SS	SLIDING SUPPORT
FL PL	FLOOR PLATE	1	DENOTES REFRACTORY MARK NUMBER
F/S	FAR SIDE	1	DENOTES NOZZLE NUMBER
GALV	GALVANIZED		
GRTG	GRATING		
HR	HAND RAILING		
HPP	HIGH POINT OF PAVING		
LD	LADDER		
LG	LENGTH		
MAX	MAXIMUM		
MIN	MINIMUM		
N/S	NEAR SIDE		
OPN	OPENING		
P WASHER	PLAIN WASHER		
QTY	QUANTITY		
R	RADIUS		
REF	REFERENCE		

GENERAL NOTES:-

1. THESE NOTES TO BE READ IN CONJUNCTION WITH STANDARD DRAWING OF GENERAL NOTES FOR STEEL WORKS, DOC. NO. 214227C-00-DW-1802-0001. (PMC DOCUMENT).
2. ELEVATIONS GIVEN IN DRAWING ARE WITH REFERENCE TO GRADE EL.+100000 CORRESPONDS TO FINISHED GRADE LEVEL U.N.O.
3. ALL DIMENSIONS ARE IN MM U.O.N. DON'T SCALE THE DRAWING, ASK IF IN DOUBT.
4. ALL STEEL WORK ELEVATIONS ARE GIVEN TO TOP OF STEEL (T.O.S), PLATFORM ELEVATIONS TO U/S GRATING AND COIL/SLEEVE ELEVATIONS TO CENTERLINE OF TUBE/SLEEVE.
5. ALL GRATINGS SHALL BE (ELECTROFORGED TYPE) PANELS AND HOT DIP GALVANISED. GALVANISING SHALL BE IN ACCORDANCE WITH IS:4759 & TESTED AS PER IS2623 & IS 6745. QUANTITY OF ZINC COATING SHALL BE MINIMUM 900 GRAM/SQ.M. (120 MICRON Min. THICKNESS). ALL GRATING CLAMPS SHALL ALSO BE HOT DIP GALVANISED. GRATING SHALL BE 25 THICK (500 KG/M^2) CAPACITY. (SEE GRATING DETAILS 214227C-00-STC-1890-0001 FOR MORE INFO.
6. GRATING SHALL BE CLAMPED TO SUPPORTING STEEL WORK. EACH GRATING PANNEL SHALL HAVE MINIMUM OF (4) CLAMPS AT A MAXIMUM SPACING OF 850 MM.
7. END OF ANGLE, CHANNEL, BEAM ETC. ARE TO BE NOTCHED TO SUIT THE PROFILE OF CONNECTING MEMBERS FOR WELDED CONSTRUCTION.
8. ALL OVERLAPS ON PLATES TO BE 25 MM UNLESS OTHERWISE NOTED.
9. FOR MATCHING PARTS,BOLT HOLE SHALL BE MATCH MARKED AND HOLES DRILLED.
10. ALL ERECTION BOLTS SHALL BE LEFT IN POSITION.
11. WATER POCKETS ON THE ROOF AND OTHER HORIZONTAL SURFACES TO BE PROVIDED WITH SUFFICIENT DRAIN HOLES IN THE STIFFENERS. DRAIN HOLES IN STRUCTURAL MEMBERS SHALL BE MINIMUM OF 12 MM DIA, U.N.O.
12. ALL FLANGE BOLTS TO STRADDLE VERTICAL AND HORIZONTAL CENTERLINES.
13. ALL FABRICATION SHALL BE OF RIGID CONSTRUCTION AND CARE SHALL BE TAKEN AGAINST WELDING DEFORMATION.
14. INSIDE PLATE DIMENSIONS ARE CRITICAL AND SHALL BE MAINTAINED MORE OR LESS NEAR TO ACTUALLY SPECIFIED ON DRAWINGS.
15. ALL STEEL SURFACES IN CONTACT WITH REFRACTORY SHALL BE MECHANICALLY CLEANED BY WIRE BRUSH OR SAND BLASTING (AS REQD.) TO REMOVE DIRT, DUST ETC. PRIOR TO LINING.
16. ALL CONNECTIONS SHALL BE FULL STRENGTH CONNECTIONS.SHOP CONNECTIONS SHALL BE OF WELDED TYPE AND FIELD CONNECTIONS MAY BE EITHER WELDED OR BOLTED.
17. ALL BEAMS SHALL HAVE END SHEAR CONNECTIONS EQUAL TO CAPACITY TO FULL MEMBER STRENGTH, UNLESS ACTUAL LOADS ARE SHOWN ON THE DRAWING.
18. IN CASE OF BUILT-UP SECTION, EACH INDIVIDUAL COMPONENT SHALL BE SPLICED AT DIFFERENT LOCATION. ALSO SPLICING FOR ADJACENT COLUMNS IN THE SAME STRUCTURE SHALL NOT BE AT SAME ELEVATION BUT STAGGERED BY MINIMUM 1.0-METER EACH OTHER.
19. VERTICAL & HORIZONTAL BRACING
    a. BRACING CONNECTIONS SHALL BE PROVIDED FOR FULL MEMBER STRENGTH OF THE BRACING MEMBERS.WHERE ACTUAL BRACING LOADS ARE GIVEN ON DRAWINGS, THE CONNECTIONS MAY BE DESIGNED ACCORDINGLY.
    b. ALL DIMENSIONS SHALL BE ROUNDED OFF TO THE NEARST MM.
    c. WELDS IN GUSSETS SHALL BE ARRANGED TO ELIMINATE ECCENTRICITY.THE MINIMUM THICKNESS OF GUSSET SHALL BE 8MM.GUSSET PLATES OF DIFFERENT THICKNESS SHALL NOT BE USED IN THE SAME TRUSS OR GIRDER.
    d. CONNECTIONS SHALL BE ARRANGED WITH DUE REGARD TO ECCENTRICITY OF WELDS OR BOLTS.
20. PLATFORMS AND LADDERS
    a. UNLESS SHOWN IN PREFABRICATED SECTIONS ON DRAWINGS,TOP RAIL,MIDDLE BAR AND TOE PLATES SHALL BE SUPPLIED IN RANDOM LENGTH FOR FIELD WELDING TO HANDRAIL POSTS. BENT SECTION AND POSTS SHALL BE SHOP FABRICATED.REMOVABLE SECTIONS OF HANDRAILS SHALL BE FURNISHED WITH POSTS AT EACH END OF THE REMOVABLE SECTIONS FOR BOLTING TO SUPPORTING CLIPS.
    b. TOE PLATES SHALL BE PROVIDED ON WALKWAYS AND PLATFORMS ALONG WITH ALL EDGES PROTECTED BY RAILING,AROUND OPENINGS IN PLATFORMS UNDER EQUIPMENT WHERE NO RAILING IS PROVIDED;UNDER THE BOTTOM TREADS OF ALL STAIRWAYS WHICH RISE FROM LANDINGS; ACROSS LADDER ACCESS OPENINGS AND AROUND ALL OPENINGS WHERE THE NORMAL CLEARANCE BETWEEN THE EDGE OF THE FLOOR PLATE AND THE EQUIPMENT OR PIPING IS 50MM OR MORE.
21. STRUCTURAL SPECIFICATION :
    STRUCTURAL STEEL AND PLATEWORK MATERIAL SPECIFICATION SHALL BE AS FOLLOWS:
    STRUCTURAL SHAPES - IS:2062 E250 GRADE A/BR
    PLATES - IS:2062 Gr.A/B
    PIPES FOR HANDRAILS - IS:1239 CLASS MEDIUM (ERW).
22. BOLTED CONNECTIONS SHALL BE AS FOLLOWS:
    ALL BOLT HOLES SHALL BE DRILLED.
    ALL BOLT HOLES SHALL BE 2 mm LARGER THAN THE BOLT DIAMETER FOR BOLTS UP TO M24. AND 3 mm LARGER THAN THE BOLT DIAMETER OF BOLTS ABOVE M24 FOR STEEL TO STEEL CONNECTION UNLESS NOTED UTHEWISE. SIZE OF OVER SIZE & SLOTTED HOLES SHALL BE AS PER TABLE 19 OF IS:800-2007.
    CONNECTION BOLTS ;-
    ORDINARY BOLTS (GRADE 4.6) SHALL BE OF 16 mm DIAMETER (MAXIMUM).
    FOR SHEAR & MOMENT CONNECTION,S, HIGH STRENGTH BOLTS GRADE 8.8 & 10.9 CONFORMING TO IS:3757 & IS:1367 SHALL BE USED, UNLESS NOTED UTHRWISE.
    HIGH TENSILE BOLT SHALL BE M20 MINIMUM.
    ALL MAIN CONNECTIONS SHALL BE PROVIDED WITH MINIMUM OF 2 NUMBERS M20 BOLTS.
    HIGH STRENGTH NUTS AND WASHER SHALL CONFIRM TO IS:6623 & IS:6649.
    ALL BOLT OF GRADE 10.9 & BOLTS OF SEISMIC RESISTING FRAMES SHALL BE PRETENSIONED AS SPECIFIED IN IS:4000. ALL OTHER BOLTS SHALL BE SNUG TIGHT. STEEL LAYOUT AND SHOP ERECTION DRAWING SHOULD CLEARLY SHOW THE BOLTS WHICH NEED TO BE PRETENSIONED.
    NUTS SHALL BE HEXAGONAL HEADED.
    ALL BOLTS OF GRADE 4.6 & 8.8 WITH CORRESPONDING NUTS AND WASHERS SHALL BE HOT-DIP GALVANIZED IN ACCORDANCE WITH IS:1367 (PART13).
23. ALL AREAS WHICH BECOME IN ACCESSIBLE AFTER ASSEMBLY/ERECTION SHALL BE PROTECTED AGAINST CORROSION PRIOR TO ASSEMBLY.
24. 2% RADIOGRAPHY OF WELD JOINS OF STACK AT "T" JOINTS SHALL BE DONE AS A MINIMUM.

25. ERECTION MARKING SYSTEM:-
    a. ALL STRUCTURAL STEEL AND SUB-ASSEMBLIES SHALL BE CLEARLY IDENTIFIABLE AND SUITABLY MARKED TO PROVIDE AN EASY MEANS OF ERECTION IN THE FIELD.
    b. ALL MARKS SHALL BE PAINTED ON THE STEEL IN A LEGIBLE FASHION WITH LETTERS AND NUMERALS, MINIMUM OF 40 MM HIGH.
    c. ALL BOLTS, WASHERS ETC. SHALL BE SHIPPED IN BAGS OR CRATES AND TAGGED OR CLEARLY MARKED AS TO MOC, SIZE, DIAMETER AND LENGTH.
    d. GALVANIZED MEMBERS (IF REQUIRED) SHALL BE TAGGED WITH A METAL PLATE HAVING RAISED LETTERS SO THAT THE MARK WILL BE VISIBLE AFTER GALVANIZING. THIS METAL PLATE SHALL BE TACK WELDED TO THE NUMBER PRIOR TO GALVANIZING.
    e. NECESSARY PATCH WORKS ON LININGS SHALL BE DONE AFTER REMOVAL OF SPIDER , BEAMS .. ETC.

26. SURFACE PREPARATION AND PAINTING :

    SURFACE PREPARATION AND PAINTING OF PARTS SHALL BE AS PER PMC PAINTING SPECIFICATION 214227C-00-JSS-1801-0005

27. FIRE PROOFING

    MEMBER MARKED WITH SYMBOL ☐ SHALL BE FIRE PROOFED (ONLY ON RADIANT COLUMN LEG BELOW FLOOR PLATE, EXCEPT COLUMN FLANGE IN CONTACT WITH CASING/ FLOOR BEAM). CLIPS TO BE WELDED WITH COLUMNS OR COMPATIBLE PRIMER APPLIED AT SHOP. FIRE PROOFING AT FIELD AS PER SPECIFICATION NUMBER 214227C-00-JSS-1701-0002 AND 214227C-00-STC-1790-0001 (CONRETE WORKS STANDARD).

28. SEAL WELDING REQUIREMENTS :-

    SEAL WELDING, GASKETS AND SEALANTS FOR PLATEWORK BOLTED JOINTS (AT FIELD)
    TO ENSURE ALL CONNECTIONS IN FURNACE WALLS, RADIANT BOXES, CONVECTION SECTIONS, FLUE GAS DUCTING AND STACKS ARE AIR TIGHT;
    FOLLOWING SHALL BE APPLIED FOR FOR FIELD SPLICE JOINTS.

    a) RADIANT FLOOR, WALL AND PANELS - INTERNAL AND EXTERNAL SEAL WELD.
    b) ARCH TO CONVECTION & CONVECTION TO CONVECTION MODULE SPLICE JOINTS - EXTERNAL SEAL WELD + CF BLANKET AT REFRACTORY JOINTS.
    c) DUCTS & STACKS- EXTERNAL SEAL WELD + CF BLANKET AT REFRACTORY JOINTS.
    d) CERAMIC FIBRE LADDER TAPE IS USED FOR; REMOVABLE WALL SECTIONS/ DOORS/ BURNERS/ DAMPERS/ BELLOWS/ VENTURI/ HEADERBOXES/ CONNECTIONS TO FANS.

DRAWING LIST

CLIENT DRAWING NUMBER	BHEL DRAWING NUMBER	Unit Birwelco DRAWING NUMBER	TITLE
MR-00-0110-0001-A0201-0001	1-00-022-U4089	H24065-002-2061	HEATER PLOT PLAN
MR-00-0110-0001-A2001-0001A	1-00-022-U4090	H24065-002-2069	GENERAL NOTES AND ABBREVATIONS
MR-00-0110-0001-A2001-0001	1-00-022-U4091	H24065-002-2064	GENERAL ARRANGEMENT HEATER - OVERALL LAYOUT
MR-00-0110-0001-A2001-0001B	1-00-022-U4092	H24065-002-2062-1	GENERAL ARRANGEMENT HEATER - PLANS-1
MR-00-0110-0001-A2001-0001C	1-00-022-U4093	H24065-002-2062-2	GENERAL ARRANGEMENT HEATER - PLANS-2
MR-00-0110-0001-A2001-0001D	1-00-022-U4094	H24065-002-2063-1	GENERAL ARRANGEMENT HEATER - ELEVATIONS-1
MR-00-0110-0001-A2001-0001E	1-00-022-U4095	H24065-002-2063-2	GENERAL ARRANGEMENT HEATER - ELEVATIONS-2
MR-00-0110-0001-A2001-0001F	1-00-022-U4096	H24065-002-2063-3	GENERAL ARRANGEMENT HEATER - ELEVATIONS-3
MR-00-0110-0001-A2001-0001G	1-00-022-U4097	H24065-002-2063-4	GENERAL ARRANGEMENT HEATER - ELEVATIONS-4
MR-00-0110-0001-A2001-0001H	1-00-022-U4098	H24065-002-2065	GENERAL ARRANGEMENT - STACK
MR-00-0110-0001-A2001-0001I	1-00-022-U4099	H24065-002-2070	GENERAL ARRANGEMENT HEATER - INSTRUMENT & INSULATION SUMMARY
MR-00-0110-0001-A2001-0001M	1-00-022-U4100	H24065-002-2071-1	GENERAL ARRANGEMENT - AIR PREHEAT SYSTEM PLANS-1
MR-00-0110-0001-A2001-0001N	1-00-022-U4101	H24065-002-2071-2	GENERAL ARRANGEMENT - AIR PREHEAT SYSTEM PLANS-2
MR-00-0110-0001-A2001-0001J	1-00-022-U4102	H24065-002-2072-1	GENERAL ARRANGEMENT - AIR PREHEAT SYSTEM ELEVATIONS-1
MR-00-0110-0001-A2001-0001K	1-00-022-U4103	H24065-002-2072-2	GENERAL ARRANGEMENT - AIR PREHEAT SYSTEM ELEVATIONS-2
MR-00-0110-0001-A2001-0001L	1-00-022-U4104	H24065-002-2072-3	GENERAL ARRANGEMENT - AIR PREHEAT SYSTEM ELEVATIONS-3
MR-00-0110-0001-A1109-0001	1-11-001-U8092	H24065-002-2075	RADIANT COIL DETAILS
MR-00-0110-0001-A1109-0002 (SHEET 1)	1-11-002-U8093 (SHEET 1)	H24065-002-2076 (SHEET 1)	CONVECTION PROCESS COIL DETAILS
MR-00-0110-0001-A1109-0002 (SHEET 2)	1-11-002-U8093 (SHEET 2)	H24065-002-2076 (SHEET 2)	COVECTION TO RADIANT CROSS OVER DETAILS
MR-00-0110-0001-A1109-0002 (SHEET 3)	1-11-002-U8093 (SHEET 3)	H24065-002-2076 (SHEET 3)	CONVECTION STEAM COIL DETAILS
MR-00-0110-0001-A1105-0001	1-07-430-U8054	H24065-002-2068	DETAIL OF RADIANT COIL LADDER SUPPORT
MR-00-0110-0001-A1105-0001	1-07-430-U8053	H24065-002-2068	DETAIL OF CONVECTION COIL INTERMEDIATE TUBE SHEETS

Rev	Date DD-MM-YYYY	Status - Description of Issue	Written by	Checked by	Approved by
2	18-09-2025	ISSUED FOR APPROVAL	PKM	AS	MO
1	01-08-2025	REVISED & RE-ISSUED FOR APPROVAL	PKM	AS	MO
0	25-07-2025	ISSUED FOR REVIEW	PKM	AS	MO

DOCUMENT CATEGORY (USE " X " MARK)	DOCUMENT REVIEW STATUS (BY CLIENT)
☒ APPROVAL	
☐ REVIEW	
☐ INFORMATION	

PROJECT : DR 1.0 EXPANSION PROJECT
IOCL DIGBOI REFINERY

OWNER : INDIAN OIL CORPORATION LTD.

EPCM : TECHNIP ENERGIES

EPC CONTRACTOR : BHARAT HEAVY ELECTRICALS LTD.,
Heavy Plates & Vessels Plant, Visakhapatnam-530012.
361-246/A

ENGINEERING CONSULTANT : UNITBIRWELCO IISP
THERMAL EQUIPMENT PVT. LTD.
A-110, 2nd Floor, Sector 136, Noida, Uttar Pradesh - 201304
www.unitbirwelco.com

TITLE : IND-COKER SECONDARY FURNACE (07-FF-00-002)
GENERAL NOTES AND ABBREVATIONS

IOCL DOCUMENT NO. : MR-00-0110-0001-A2001-0001A
BHEL DOCUMENT NO. : 1-00-022-U4090
BIRWELCO IISP DOC. NO. : H24065-002-2069

SCALE	PROJECT	UNIT	DOC. TYPE	MAT. CODE	SER. NO.	PAGE	REV.
1:XX	214227C	07	DW	0110	0001	1 OF 1	02

SHEET SIZE : A1

IND. COKER SECONDARY FURNACE (07-FF-00-002) FOR DR 1.0 EXPANSION PROJECT

Document Identification Attributes					
Document Number		**1-00-022-U4090**		**Revision Object:**	**2**
Document Title		**GENERAL NOTES AND ABBREVATIONS**			
Contractor Name		**BHEL**		**Contractor response date:**	
S. No.	**DRAWING NUMBER**	**Comments from PMC**	**Status Open / Close**	**Vendor Response**	
1	1-00-022-U4090	Drawings and General abbreviations should be in different documents.	CLOSED	This is the general way of preparing drawings. All the Abbreviations and Drawing table in the General notes drawing to cross-check	
2					
3					
4					
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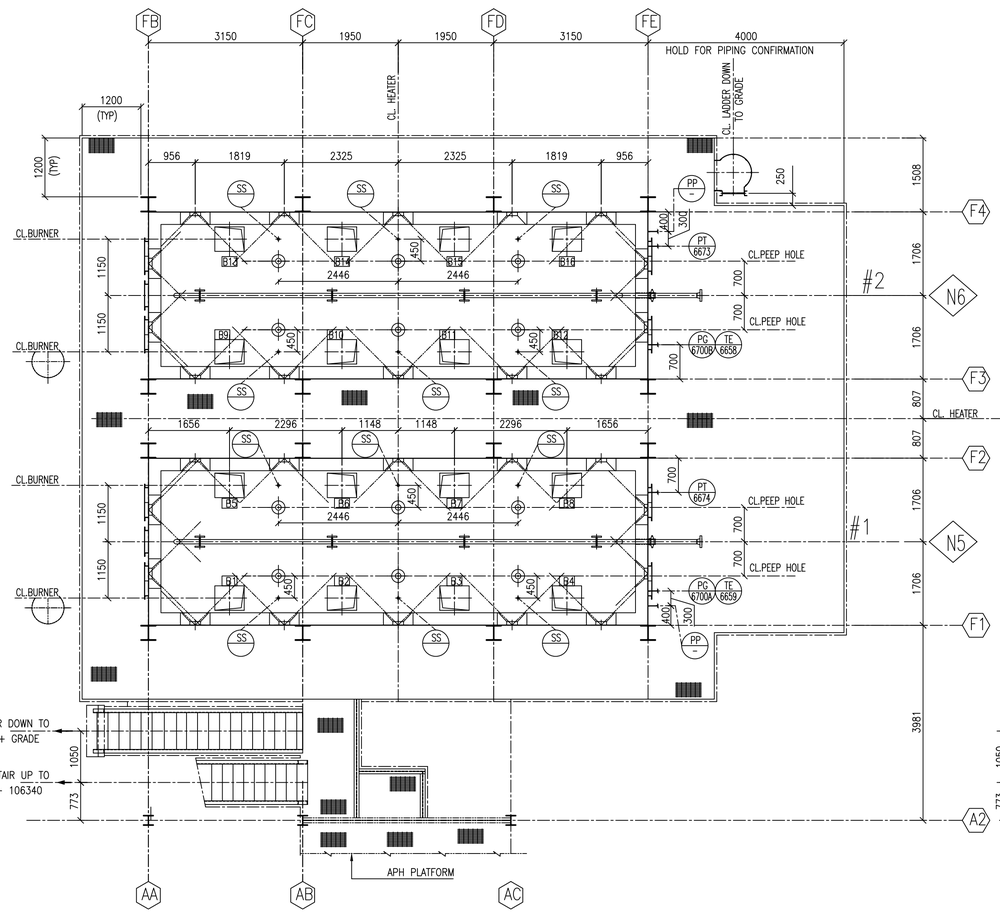
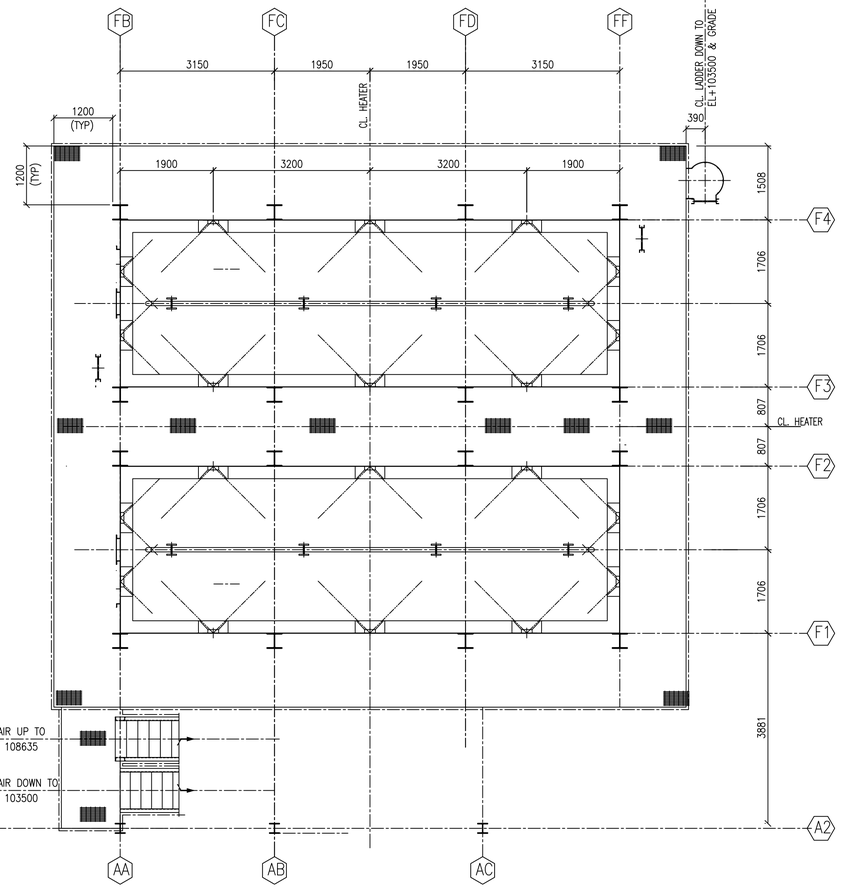


PLAN AT EL+103500 (TOS.)



PLAN AT EL+106340 (TOS.)

NOTES:–

1. ALL DIMENSIONS ARE IN MM U.O.N. DON'T SCALE THE DRAWING, ASK IF IN DOUBT.
2. ELEVATIONS GIVEN IN DRAWING ARE WITH REFERENCE TO GRADE EL.+100000 CORRESPONDS TO FINISHED GRADE LEVEL U.N.O.
3. FOR FURTHER NOTES AND REFERENCE DOCUMENT REFER BHEL DRAWING NUMBER 1-00-022-U4090
4. READ THIS DRAWING IN CONJUNCTION WITH BHEL DRAWING NUMBER 1-00-022-U4091.

LEGEND

1	DENOTES COLUMN GRID NO.
TE XXX	DENOTES AUXILIARY CONNECTIONS
	DENOTES GRATING MAIN BAR SPAN
XXXXXXX	ERECTION MARK NUMBER FOR SHOP ASSEMBLY
	DENOTES AIR FLOW DIRECTION
	DENOTES FLUE GAS FLOW DIRECTION
FS	FIXED SUPPORT
SS	SLIDING SUPPORT
1	DENOTES REFRACTORY MARK NUMBER
1	DENOTES NOZZLE NUMBER

Rev	Date DD-MM-YYYY	Status - Description of Issue	Written by	Checked by	Approved by
1	18-09-2025	ISSUED FOR APPROVAL	PKM	AS	MO
0	25-07-2025	ISSUED FOR REVIEW	PKM	AS	MO

DOCUMENT CATEGORY (USE " X " MARK)	DOCUMENT REVIEW STATUS (BY CLIENT)
☒ APPROVAL	
☐ REVIEW	
☐ INFORMATION	

PROJECT : DR 1.0 EXPANSION PROJECT
IOCL DIGBOI REFINERY

OWNER : INDIAN OIL CORPORATION LTD.

EPCM : TECHNIP ENERGIES

EPC CONTRACTOR : BHARAT HEAVY ELECTRICALS LTD.,
Heavy Plates & Vessels Plant, Visakhapatnam-530012.
361-246/A

ENGINEERING CONSULTANT : UNITBIRWELCO IISP THERMAL EQUIPMENT PVT. LTD.
A-110, 2nd Floor, Sector 136, Noida, Uttar Pradesh - 201304
www.unitbirwelco.com

TITLE : IND-COKER SECONDARY FURNACE (07-FF-00-002)
GENERAL ARRANGEMENT HEATER PLANS-1

IOCL DOCUMENT NO. : MR-00-0110-0001-A2001-0001B

BHEL DOCUMENT NO. : 1-00-022-U4092

BIRWELCO IISP DOC. NO. : H24065-002-2062-1

SCALE	PROJECT	UNIT	DOC. TYPE	MAT. CODE	SER. NO.	PAGE	REV.
1:60	214227C	07	DW	0110	0001	1 OF 1	01

SHEET SIZE : A1

IND. COKER SECONDARY FURNACE (07-FF-00-002) FOR DR 1.0 EXPANSION PROJECT

Document Identification Attributes					
Document Number		**1-00-022-U4092**		**Revision Object:**	**1**
Document Title		**GA PLAN -1**			
Contractor Name		**BHEL**		**Contractor response date:**	
S. No.	**DRAWING NUMBER**	**Comments from PMC**	**Status Open / Close**	**Vendor Response**	
1	1-00-022-U4092	Please ensure all the Instrument and Auxiliary Connections as per the tender	CLOSED	We have updated the instruments in line with the P&ID	
2					
3					
4					
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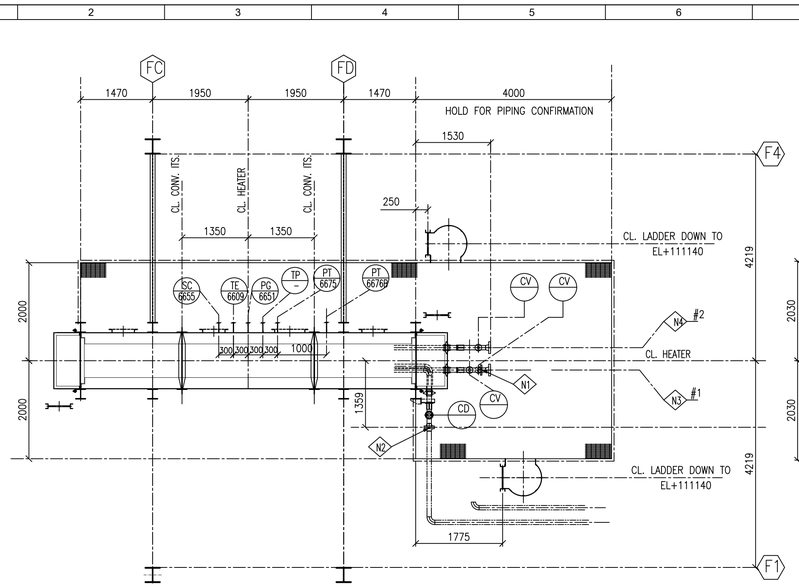
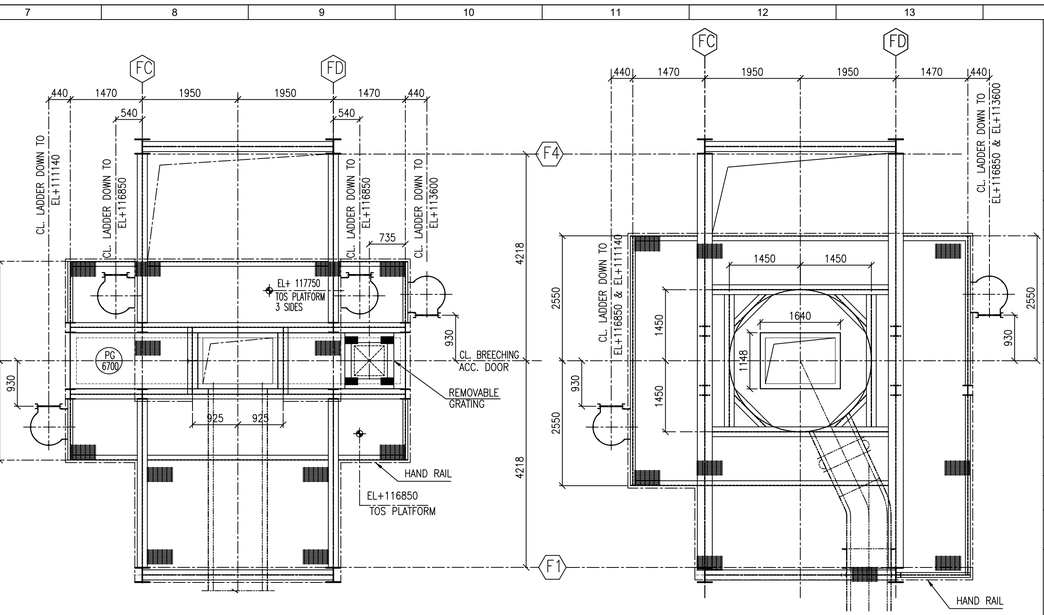
6					
7					
8					

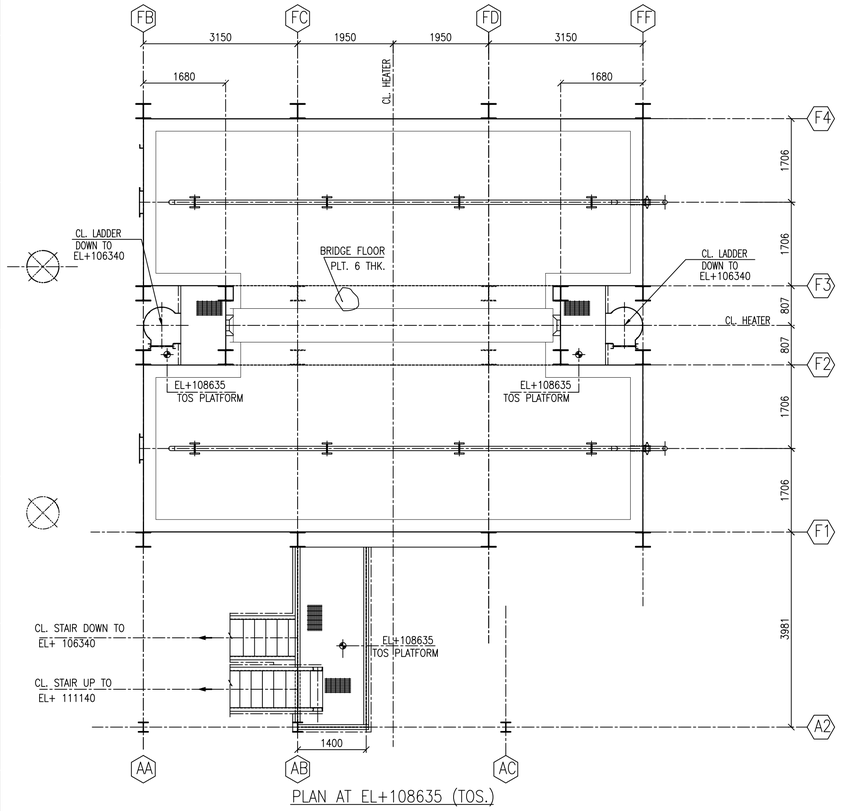


PLAN AT EL+113600 (TOS.)

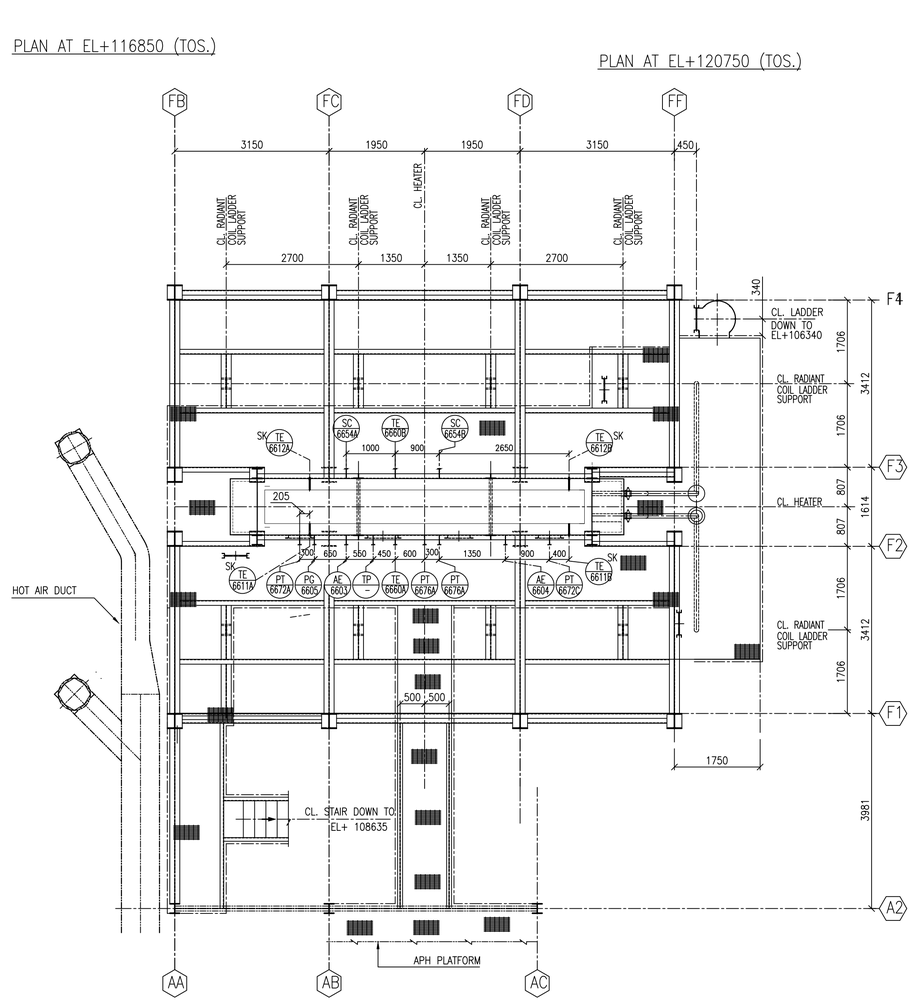


PLAN AT EL+116850 (TOS.)

PLAN AT EL+120750 (TOS.)



PLAN AT EL+108635 (TOS.)



PLAN AT EL+111140 (TOS.)

NOTES:–

1. ALL DIMENSIONS ARE IN MM U.O.N. DON'T SCALE THE DRAWING, ASK IF IN DOUBT.
2. ELEVATIONS GIVEN IN DRAWING ARE WITH REFERENCE TO GRADE EL.+100000 CORRESPONDS TO FINISHED GRADE LEVEL U.N.O.
3. FOR FURTHER NOTES AND REFERENCE DOCUMENT REFER BHEL DRAWING NUMBER 1–00–022–U4090
4. READ THIS DRAWING IN CONJUNCTION WITH BHEL DRAWING NUMBER 1–00–022–U4091.

LEGEND

1	DENOTES COLUMN GRID NO.
TE XXX	DENOTES AUXILIARY CONNECTIONS
	DENOTES GRATING MAIN BAR SPAN
XXXXXXX	ERECTION MARK NUMBER FOR SHOP ASSEMBLY
	DENOTES AIR FLOW DIRECTION
	DENOTES FLUE GAS FLOW DIRECTION
FS	FIXED SUPPORT
SS	SLIDING SUPPORT
1	DENOTES REFRACTORY MARK NUMBER
1	DENOTES NOZZLE NUMBER

Rev	Date DD-MM-YYYY	Status - Description of Issue	Written by	Checked by	Approved by
1	18-09-2025	ISSUED FOR APPROVAL	PKM	AS	MO
0	25-07-2025	ISSUED FOR REVIEW	PKM	AS	MO

DOCUMENT CATEGORY (USE " X " MARK)	DOCUMENT REVIEW STATUS (BY CLIENT)
☒ APPROVAL	
☐ REVIEW	
☐ INFORMATION	

PROJECT : DR 1.0 EXPANSION PROJECT
IOCL DIGBOI REFINERY

OWNER : INDIAN OIL CORPORATION LTD.

EPCM : TECHNIP ENERGIES

EPC CONTRACTOR : BHARAT HEAVY ELECTRICALS LTD.,
Heavy Plates & Vessels Plant, Visakhapatnam-530012.
361-246/A

ENGINEERING CONSULTANT : UNITBIRWELCO IISP THERMAL EQUIPMENT PVT. LTD.
A-110, 2nd Floor, Sector 136, Noida, Uttar Pradesh - 201304
www.unitbirwelco.com

TITLE : IND-COKER SECONDARY FURNACE (07-FF-00-002)
GENERAL ARRANGEMENT HEATER
PLANS-2

IOCL DOCUMENT NO. : MR-00-0110-0001-A2001-0001C

BHEL DOCUMENT NO. : 1-00-022-U4093

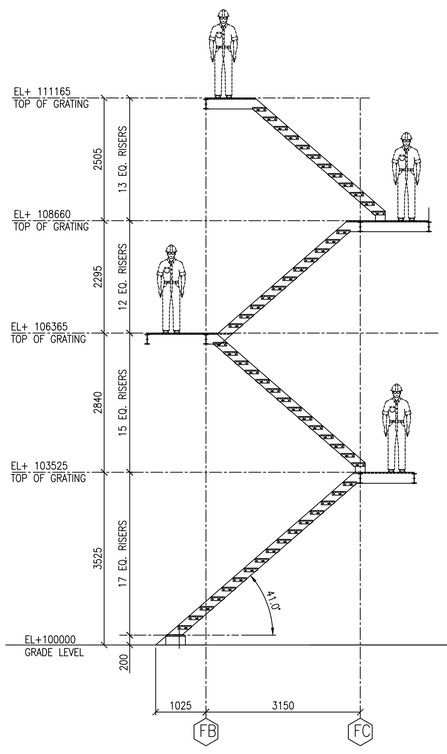
BIRWELCO IISP DOC. NO. : H24065-002-2062-2

SCALE	PROJECT	UNIT	DOC. TYPE	MAT. CODE	SER. NO.	PAGE	REV.
1:60	214227C	07	DW	0110	0001	1 OF1	01

SHEET SIZE : A1

IND. COKER SECONDARY FURNACE (07-FF-00-002) FOR DR 1.0 EXPANSION PROJECT

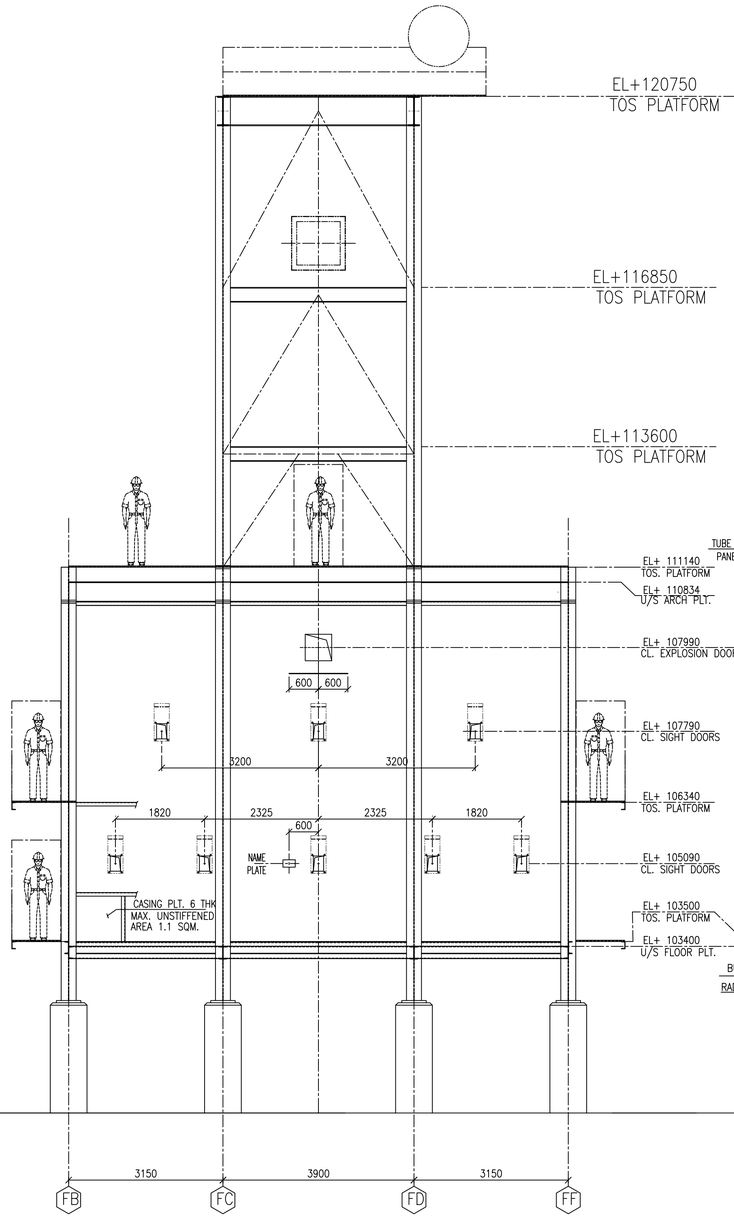
Document Identification Attributes					
Document Number		**1-00-022-U4093**		**Revision Object:**	**1**
Document Title		**GA PLAN -2**			
Contractor Name		**BHEL**		**Contractor response date:**	
S. No.	**DRAWING NUMBER**	**Comments from PMC**	**Status Open / Close**	**Vendor Response**	
1	1-00-022-U4093	Please ensure all the Instrument and Auxiliary Connections as per the tender	CLOSED	We have updated the instruments in line with the P&ID	
2					
3					
4					
5					
6					
7					
8					



ELEVATION ON GRID – A2

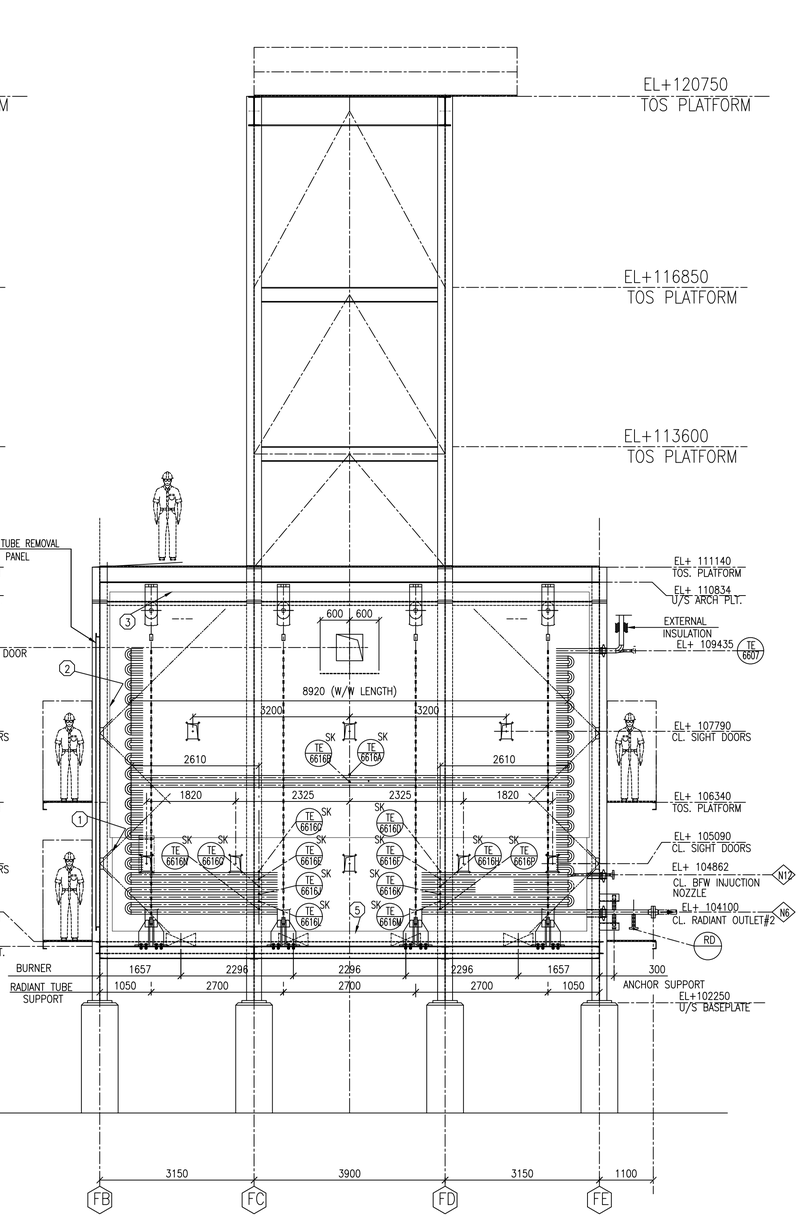
(FOR SHOWING STAIR CASE)

(REFER KEY PLAN)



ELEVATION ON GRID – F1

(REFER KEY PLAN)



SECTION A–A

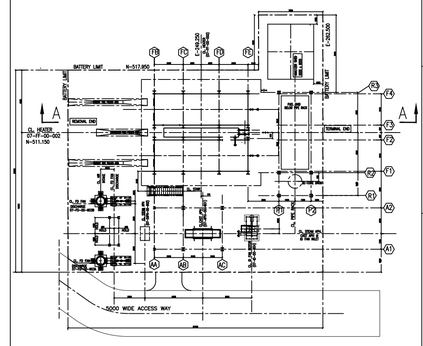
(REFER KEY PLAN)

NOTES:–

1. ALL DIMENSIONS ARE IN MM U.O.N. DON'T SCALE THE DRAWING, ASK IF IN DOUBT.
2. ELEVATIONS GIVEN IN DRAWING ARE WITH REFERENCE TO GRADE EL.+100000 CORRESPONDS TO FINISHED GRADE LEVEL U.N.O.
3. FOR FURTHER NOTES AND REFERENCE DOCUMENT REFER BHEL DRAWING NUMBER 1–00–022–U4090
4. READ THIS DRAWING IN CONJUNCTION WITH BHEL DRAWING NUMBER 1–00–022–U4091.

LEGEND

1	DENOTES COLUMN GRID NO.
TE XXX	DENOTES AUXILIARY CONNECTIONS
	DENOTES GRATING MAIN BAR SPAN
XXXXXXX	ERECTION MARK NUMBER FOR SHOP ASSEMBLY
	DENOTES AIR FLOW DIRECTION
	DENOTES FLUE GAS FLOW DIRECTION
FS	FIXED SUPPORT
SS	SLIDING SUPPORT
1	DENOTES REFRACTORY MARK NUMBER
1	DENOTES NOZZLE NUMBER



KEY PLAN

Rev	Date DD-MM-YYYY	Status - Description of Issue	Written by	Checked by	Approved by
1	18-09-2025	ISSUED FOR APPROVAL	PKM	AS	MO
0	25-07-2025	ISSUED FOR REVIEW	PKM	AS	MO

DOCUMENT CATEGORY (USE " X " MARK)	DOCUMENT REVIEW STATUS (BY CLIENT)
☒ APPROVAL	
☐ REVIEW	
☐ INFORMATION	

PROJECT : DR 1.0 EXPANSION PROJECT
IOCL DIGBOI REFINERY

OWNER : INDIAN OIL CORPORATION LTD.

EPCM : TECHNIP ENERGIES

EPC CONTRACTOR : BHARAT HEAVY ELECTRICALS LTD.,
Heavy Plates & Vessels Plant, Visakhapatnam-530012.
361-246/A

ENGINEERING CONSULTANT : UNITBIRWELCO IISP THERMAL EQUIPMENT PVT. LTD.
A-110, 2nd Floor, Sector 136, Noida, Uttar Pradesh - 201304
www.unitbirwelco.com

TITLE : IND-COKER SECONDARY FURNACE (07-FF-00-002)
GENERAL ARRANGEMENT HEATER
ELEVATIONS - 1

IOCL DOCUMENT NO. : MR-00-0110-0001-A2001-0001D

BHEL DOCUMENT NO. : 1-00-022-U4094

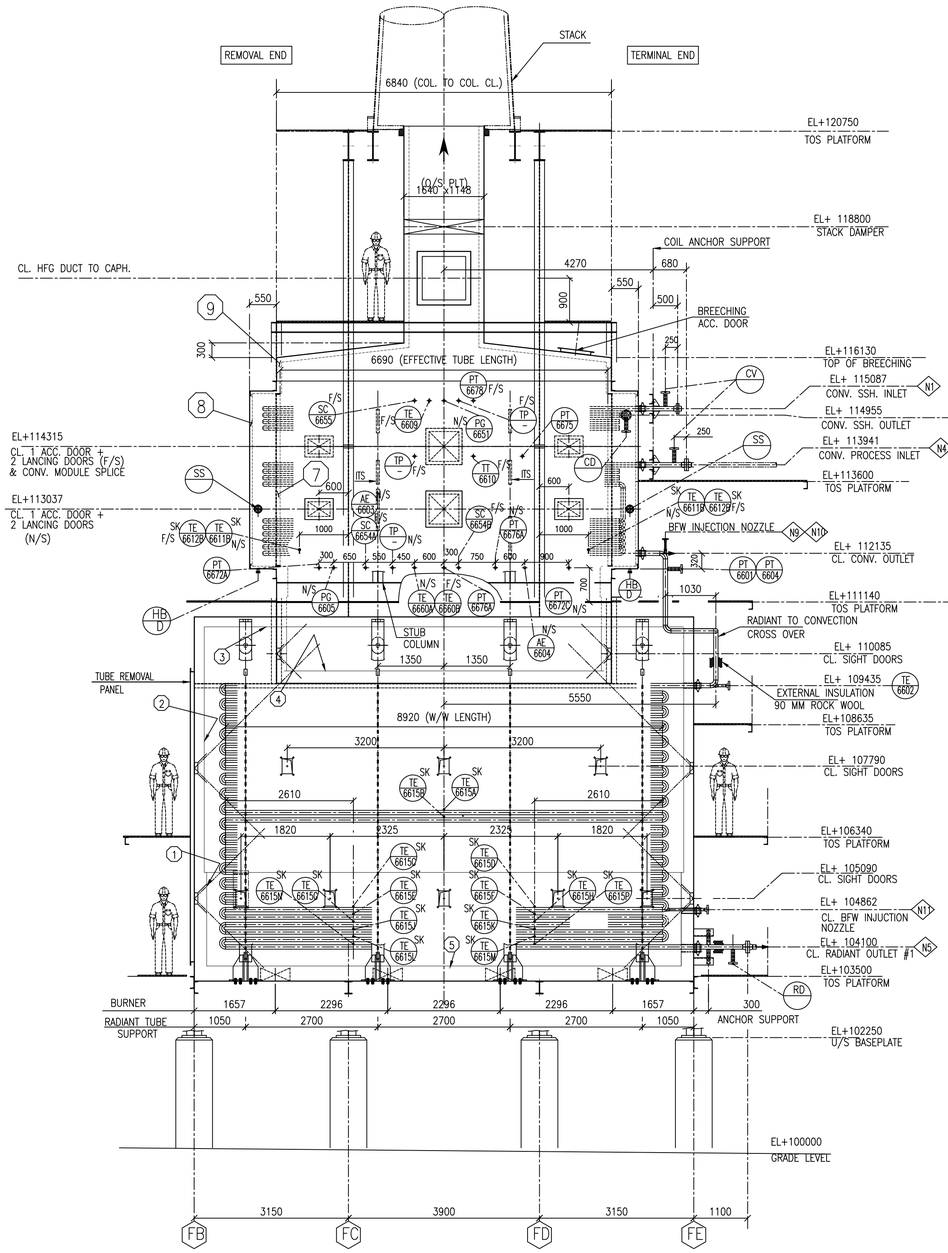
BIRWELCO IISP DOC. NO. : H24065-002-2063-1

SCALE	PROJECT	UNIT	DOC. TYPE	MAT. CODE	SER. NO.	PAGE	REV.
1:60	214227C	07	DW	0110	0001	1 OF 1	01

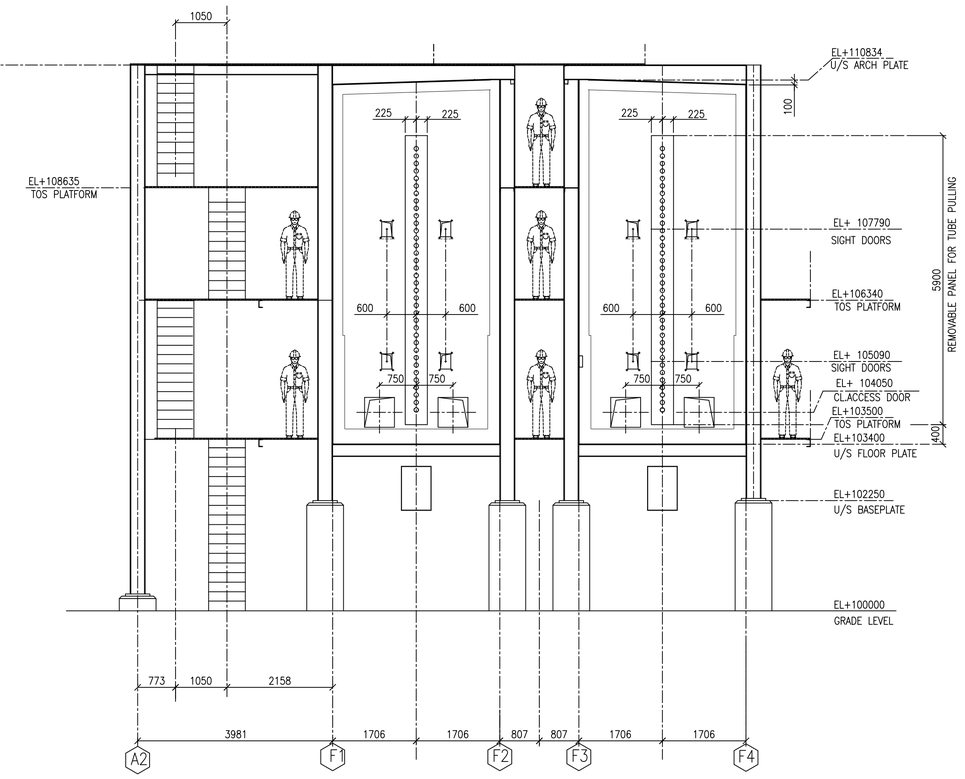
SHEET SIZE : A1

IND. COKER SECONDARY FURNACE (07-FF-00-002) FOR DR 1.0 EXPANSION PROJECT

Document Identification Attributes					
Document Number		**1-00-022-U4094**		**Revision Object:**	**1**
Document Title		**ELEVATION-1**			
Contractor Name		**BHEL**		**Contractor response date:**	
S. No.	**DRAWING NUMBER**	**Comments from PMC**	**Status Open / Close**	**Vendor Response**	
1	1-00-022-U4094	Please ensure all the Instrument and Auxiliary Connections as per the tender	CLOSED	We have updated the instruments in line with the P&ID	
2					
3					
4					
5					
6					
7					
8					



SECTION A-A
(REFER KEY PLAN)



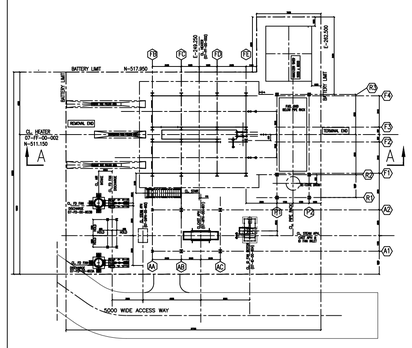
ELEVATION ON GRID -FB
(REFER KEY PLAN)

NOTES:-

1. ALL DIMENSIONS ARE IN MM U.O.N. DON'T SCALE THE DRAWING, ASK IF IN DOUBT.
2. ELEVATIONS GIVEN IN DRAWING ARE WITH REFERENCE TO GRADE EL.+100000 CORRESPONDS TO FINISHED GRADE LEVEL U.N.O.
3. FOR FURTHER NOTES AND REFERENCE DOCUMENT REFER BHEL DRAWING NUMBER 1-00-022-U4090
4. READ THIS DRAWING IN CONJUNCTION WITH BHEL DRAWING NUMBER 1-00-022-U4091.

LEGEND

1	DENOTES COLUMN GRID NO.
TE XXX	DENOTES AUXILIARY CONNECTIONS
	DENOTES GRATING MAIN BAR SPAN
XXXXXXX	ERECTION MARK NUMBER FOR SHOP ASSEMBLY
	DENOTES AIR FLOW DIRECTION
	DENOTES FLUE GAS FLOW DIRECTION
FS	FIXED SUPPORT
SS	SLIDING SUPPORT
1	DENOTES REFRACTORY MARK NUMBER
1	DENOTES NOZZLE NUMBER



KEY PLAN

Rev	Date DD-MM-YYYY	Status - Description of Issue	Written by	Checked by	Approved by
1	18-09-2025	ISSUED FOR APPROVAL	PKM	AS	MO
0	25-07-2025	ISSUED FOR REVIEW	PKM	AS	MO

DOCUMENT CATEGORY (USE " X " MARK)	DOCUMENT REVIEW STATUS (BY CLIENT)
☒ APPROVAL	
☐ REVIEW	
☐ INFORMATION	

PROJECT : DR 1.0 EXPANSION PROJECT
IOCL DIGBOI REFINERY

OWNER : INDIAN OIL CORPORATION LTD.

EPCM : TECHNIP ENERGIES

EPC CONTRACTOR : BHARAT HEAVY ELECTRICALS LTD.,
Heavy Plates & Vessels Plant, Visakhapatnam-530012.
361-246/A

ENGINEERING CONSULTANT : UNITBIRWELCO IISP THERMAL EQUIPMENT PVT. LTD.
A-110, 2nd Floor, Sector 136, Noida, Uttar Pradesh - 201304
www.unitbirwelco.com

TITLE : IND-COKER SECONDARY FURNACE (07-FF-00-002)
GENERAL ARRANGEMENT HEATER
ELEVATIONS - 2

IOCL DOCUMENT NO. : MR-00-0110-0001-A2001-0001E
BHEL DOCUMENT NO. : 1-00-022-U4095
BIRWELCO IISP DOC. NO. : H24065-002-2063-2

SCALE	PROJECT	UNIT	DOC. TYPE	MAT. CODE	SER. NO.	PAGE	REV.
1:60	214227C	07	DW	0110	0001	1 OF 1	01

SHEET SIZE : A1

IND. COKER SECONDARY FURNACE (07-FF-00-002) FOR DR 1.0 EXPANSION PROJECT

Document Identification Attributes					
Document Number		**1-00-022-U4095**		**Revision Object:**	**1**
Document Title		**ELEVATION-2**			
Contractor Name		**BHEL**		**Contractor response date:**	
S. No.	**DRAWING NUMBER**	**Comments from PMC**	**Status Open / Close**	**Vendor Response**	
1	1-00-022-U4095	Please ensure all the Instrument and Auxiliary Connections as per the tender	CLOSED	We have updated the instruments in line with the P&ID	
2		Insulation type and thickness not given	CLOSED	Noted and updated	
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4					
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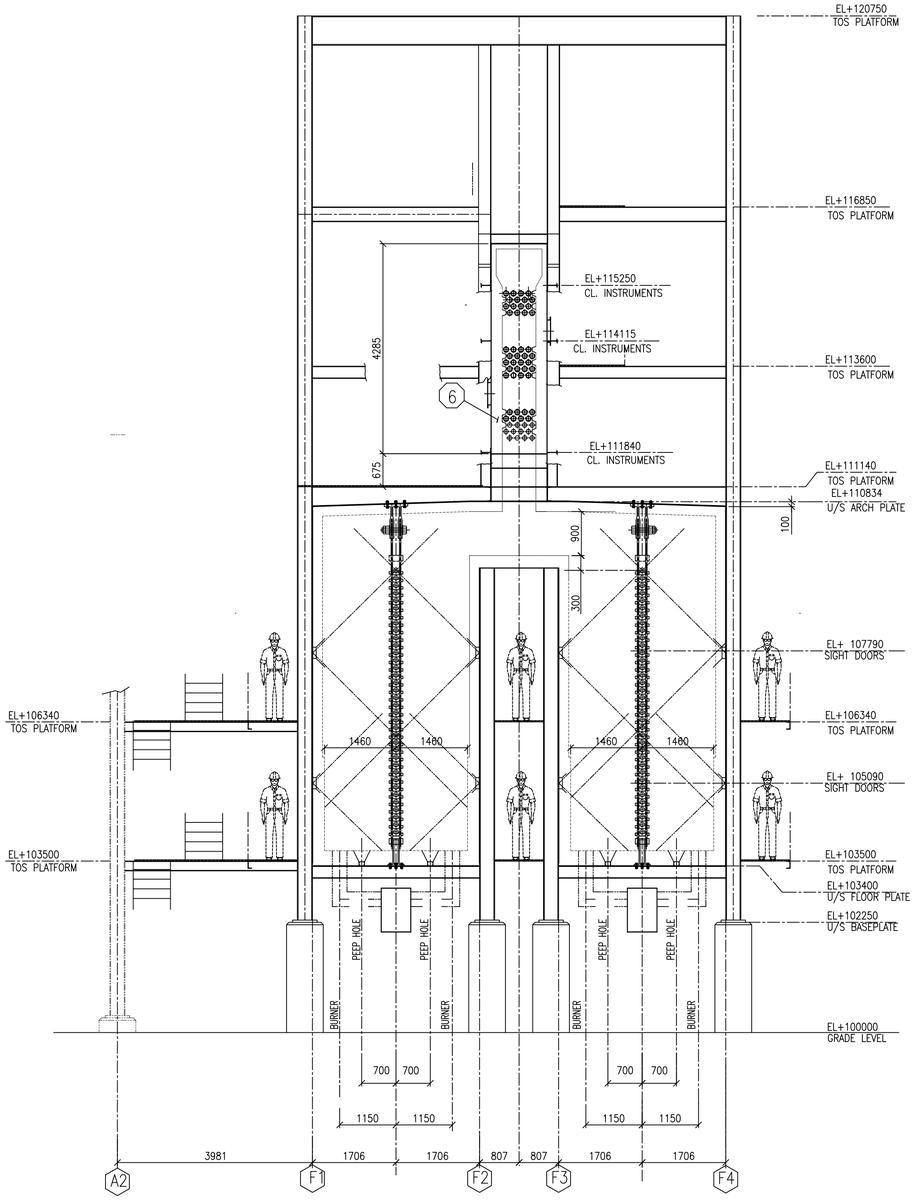
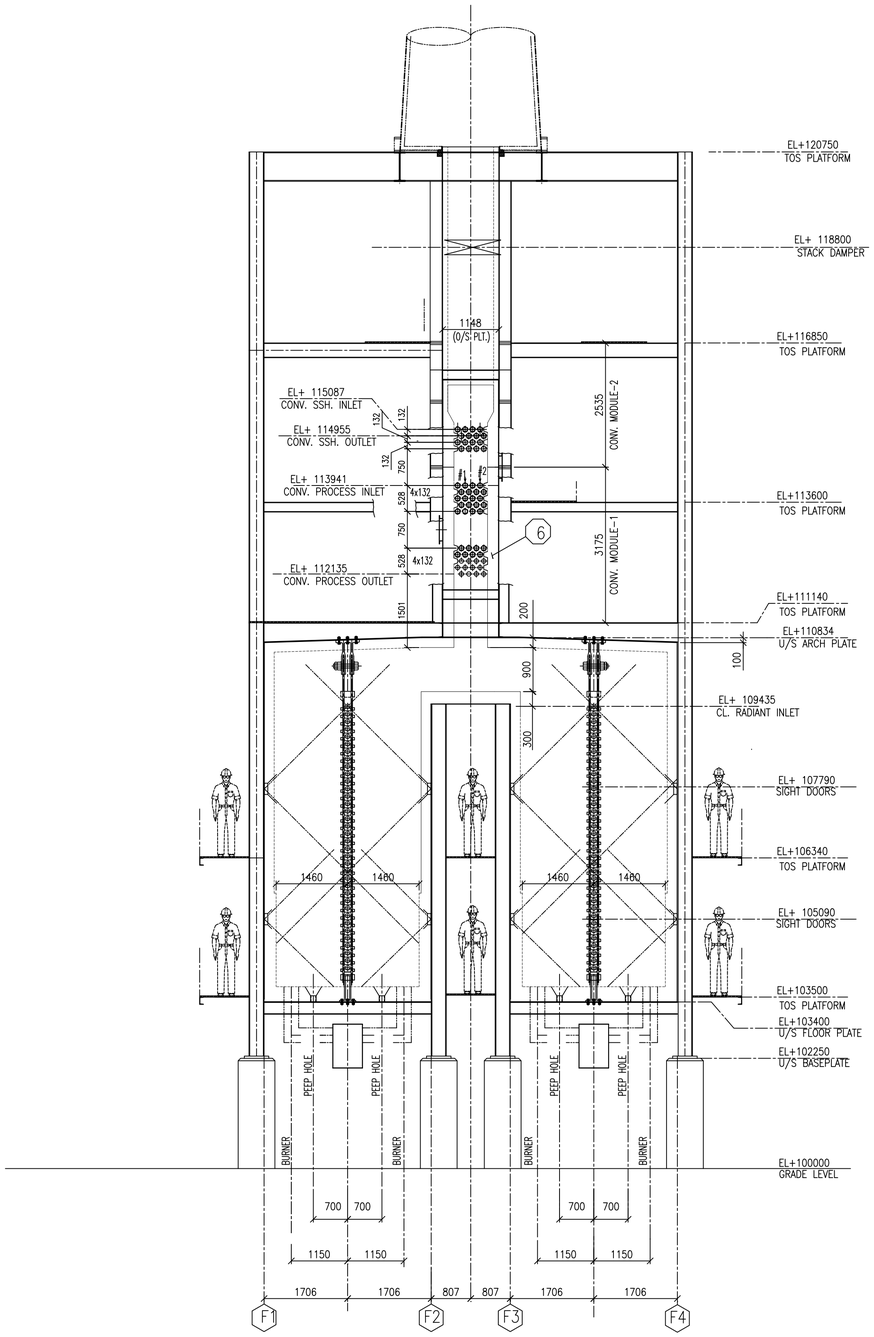
6					
7					
8					



ELEVATION ON GRID –FC
(REFER KEY PLAN)



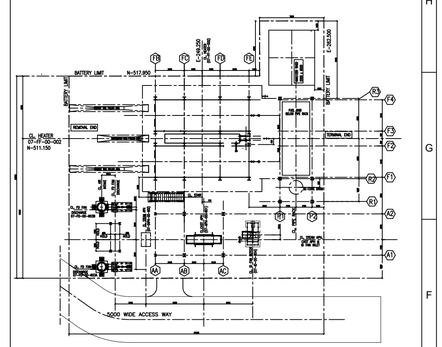
ELEVATION ON GRID –FD
(REFER KEY PLAN)

NOTES:–

1. ALL DIMENSIONS ARE IN MM U.O.N. DON'T SCALE THE DRAWING, ASK IF IN DOUBT.
2. ELEVATIONS GIVEN IN DRAWING ARE WITH REFERENCE TO GRADE EL.+100000 CORRESPONDS TO FINISHED GRADE LEVEL U.N.O.
3. FOR FURTHER NOTES AND REFERENCE DOCUMENT REFER BHEL DRAWING NUMBER 1–00–022–U4090
4. READ THIS DRAWING IN CONJUNCTION WITH BHEL DRAWING NUMBER 1–00–022–U4091.

LEGEND

1	DENOTES COLUMN GRID NO.
TE XXX	DENOTES AUXILIARY CONNECTIONS
	DENOTES GRATING MAIN BAR SPAN
XXXXXXX	ERECTION MARK NUMBER FOR SHOP ASSEMBLY
	DENOTES AIR FLOW DIRECTION
	DENOTES FLUE GAS FLOW DIRECTION
FS	FIXED SUPPORT
SS	SLIDING SUPPORT
1	DENOTES REFRACTORY MARK NUMBER
1	DENOTES NOZZLE NUMBER



KEY PLAN

Rev	Date DD-MM-YYYY	Status - Description of Issue	Written by	Checked by	Approved by
1	18-09-2025	ISSUED FOR APPROVAL	PKM	AS	MO
0	25-07-2025	ISSUED FOR REVIEW	PKM	AS	MO

DOCUMENT CATEGORY (USE " X " MARK)	DOCUMENT REVIEW STATUS (BY CLIENT)
☒ APPROVAL	
☐ REVIEW	
☐ INFORMATION	

PROJECT : DR 1.0 EXPANSION PROJECT
IOCL DIGBOI REFINERY

OWNER : INDIAN OIL CORPORATION LTD.

EPCM : TECHNIP ENERGIES

EPC CONTRACTOR : BHARAT HEAVY ELECTRICALS LTD.,
Heavy Plates & Vessels Plant, Visakhapatnam-530012.
361-246/A

ENGINEERING CONSULTANT : UNITBIRWELCO IISP
THERMAL EQUIPMENT PVT. LTD.
A-110, 2nd Floor, Sector 136, Noida, Uttar Pradesh - 201304
www.unitbirwelco.com

TITLE : IND-COKER SECONDARY FURNACE (07-FF-00-002)
GENERAL ARRANGEMENT HEATER
ELEVATIONS - 3

IOCL DOCUMENT NO.	: MR-00-0110-0001-A2001-0001F
BHEL DOCUMENT NO.	: 1-00-022-U4096
BIRWELCO IISP DOC. NO.	: H24065-002-2063-3

SCALE	PROJECT	UNIT	DOC. TYPE	MAT. CODE	SER. NO.	PAGE	REV.
1:60	214227C	07	DW	0110	0001	1 OF 1	01

SHEET SIZE : A1

IND. COKER SECONDARY FURNACE (07-FF-00-002) FOR DR 1.0 EXPANSION PROJECT

Document Identification Attributes					
Document Number		**1-00-022-U4096**		**Revision Object:**	**1**
Document Title		**ELEVATION-3**			
Contractor Name		**BHEL**		**Contractor response date:**	
S. No.	**DRAWING NUMBER**	**Comments from PMC**	**Status Open / Close**	**Vendor Response**	
1	1-00-022-U4096	Please ensure all the Instrument and Auxiliary Connections as per the tender	CLOSED	We have updated the instruments in line with the P&ID	
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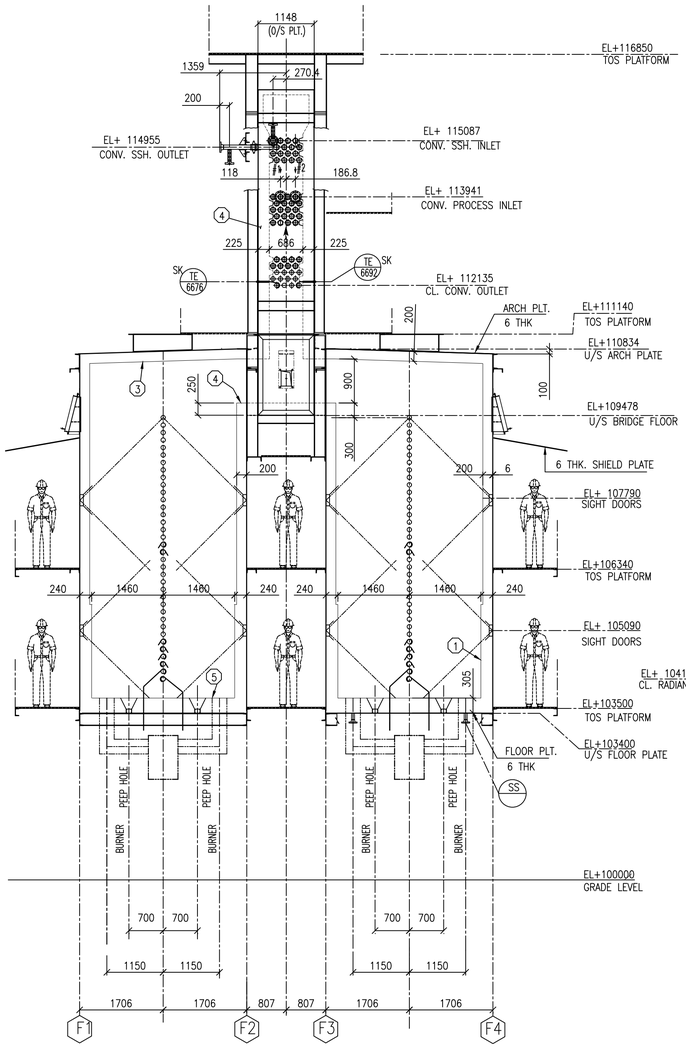
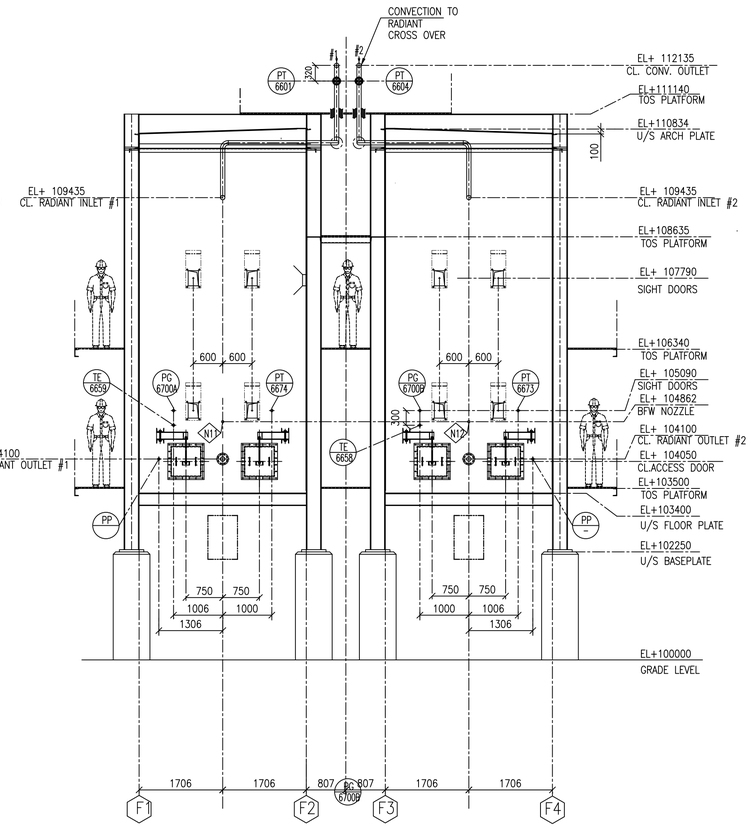
7					
8					



SECTION A–A
(REFER KEY PLAN)



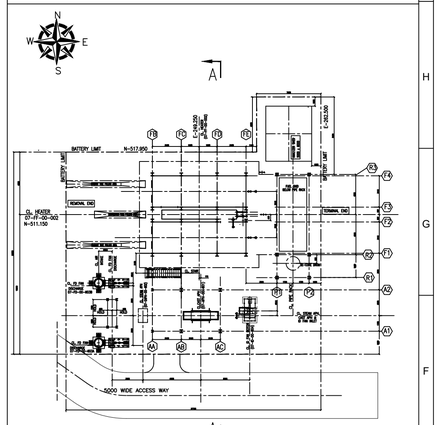
ELEVATION ON GRID –FE
(REFER KEY PLAN)

NOTES:–

1. ALL DIMENSIONS ARE IN MM U.O.N. DON'T SCALE THE DRAWING, ASK IF IN DOUBT.
2. ELEVATIONS GIVEN IN DRAWING ARE WITH REFERENCE TO GRADE EL.+100000 CORRESPONDS TO FINISHED GRADE LEVEL U.N.O.
3. FOR FURTHER NOTES AND REFERENCE DOCUMENT REFER BHEL DRAWING NUMBER 1–00–022–U4090
4. READ THIS DRAWING IN CONJUNCTION WITH BHEL DRAWING NUMBER 1–00–022–U4091.

LEGEND

1	DENOTES COLUMN GRID NO.
TE XXX	DENOTES AUXILIARY CONNECTIONS
	DENOTES GRATING MAIN BAR SPAN
XXXXXXX	ERECTION MARK NUMBER FOR SHOP ASSEMBLY
	DENOTES AIR FLOW DIRECTION
	DENOTES FLUE GAS FLOW DIRECTION
FS	FIXED SUPPORT
SS	SLIDING SUPPORT
1	DENOTES REFRACTORY MARK NUMBER
1	DENOTES NOZZLE NUMBER



KEY PLAN

Rev	Date DD-MM-YYYY	Status - Description of Issue	Written by	Checked by	Approved by
1	18-09-2025	ISSUED FOR APPROVAL	PKM	AS	MO
0	25-07-2025	ISSUED FOR REVIEW	PKM	AS	MO

DOCUMENT CATEGORY (USE " X " MARK)	DOCUMENT REVIEW STATUS (BY CLIENT)
☒ APPROVAL	
☐ REVIEW	
☐ INFORMATION	

PROJECT : DR 1.0 EXPANSION PROJECT
IOCL DIGBOI REFINERY

OWNER : INDIAN OIL CORPORATION LTD.
IndianOil

EPCM : TECHNIP ENERGIES

EPC CONTRACTOR : BHARAT HEAVY ELECTRICALS LTD.,
Heavy Plates & Vessels Plant, Visakhapatnam-530012.
361-246/A

ENGINEERING CONSULTANT : UNITBIRWELCO IISP
THERMAL EQUIPMENT PVT. LTD.
A-110, 2nd Floor, Sector 136, Noida, Uttar Pradesh - 201304
www.unitbirwelco.com

TITLE : IND-COKER SECONDARY FURNACE (07-FF-00-002)
GENERAL ARRANGEMENT HEATER
ELEVATIONS - 4

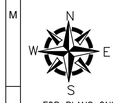
IOCL DOCUMENT NO. : MR-00-0110-0001-A2001-0001G
BHEL DOCUMENT NO. : 1-00-022-U4097
BIRWELCO IISP DOC. NO. : H24065-002-2063-4

SCALE	PROJECT	UNIT	DOC. TYPE	MAT. CODE	SER. NO.	PAGE	REV.
1:60	214227C	07	DW	0110	0001	1 OF 1	01

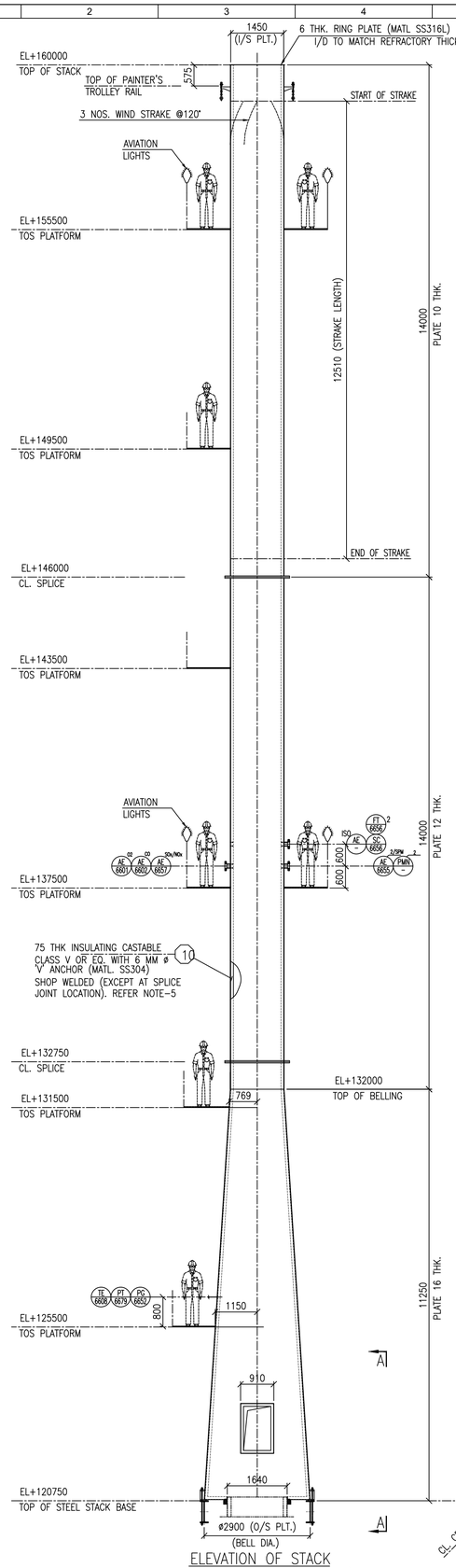
SHEET SIZE : A1

IND. COKER SECONDARY FURNACE (07-FF-00-002) FOR DR 1.0 EXPANSION PROJECT

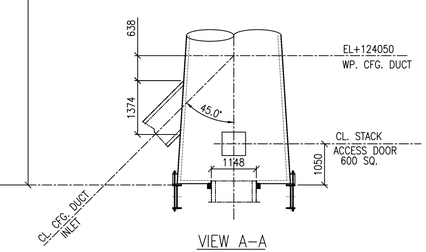
Document Identification Attributes					
Document Number		**1-00-022-U4097**		**Revision Object:**	**1**
Document Title		**ELEVATION-4**			
Contractor Name		**BHEL**		**Contractor response date:**	
S. No.	**DRAWING NUMBER**	**Comments from PMC**	**Status Open / Close**	**Vendor Response**	
1	1-00-022-U4097	Please ensure all the Instrument and Auxiliary Connections as per the tender	CLOSED	We have updated the instruments in line with the P&ID	
2					
3					
4					
5					
6					
7					
8					



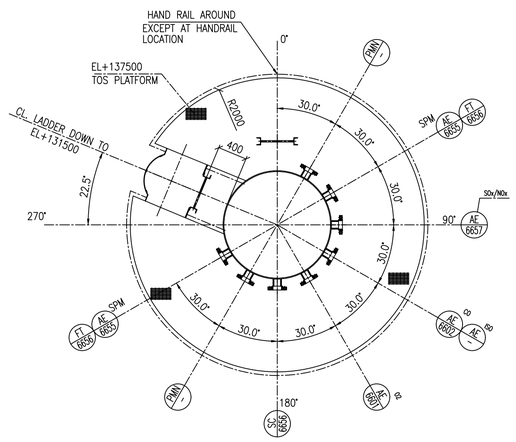
FOR PLANS ONLY



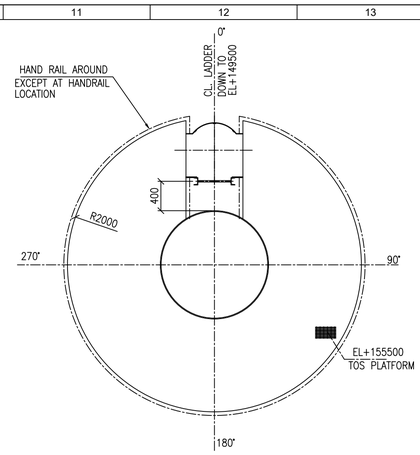
ELEVATION OF STACK
(FOR TRUE ORIENTATION REFER PLANS)



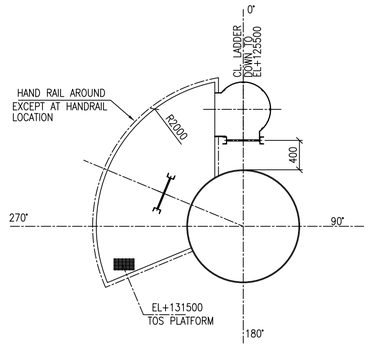
VIEW A-A



PLAN AT EL+137500
(INSTRUMENT & AVIATION PLATFORM)
(SCALE 1:40)



PLAN AT EL+155500
(AVIATION PLATFORM)
(SCALE 1:40)



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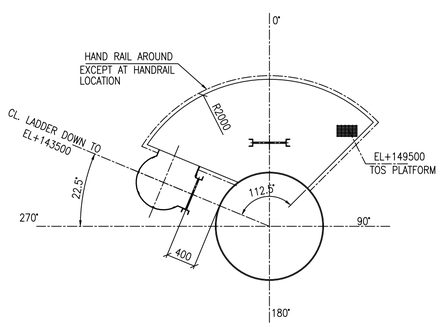
(SCALE 1:40)



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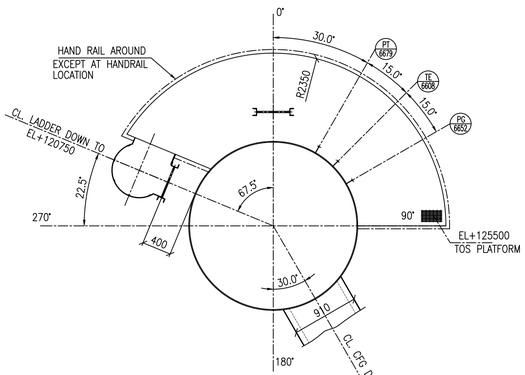
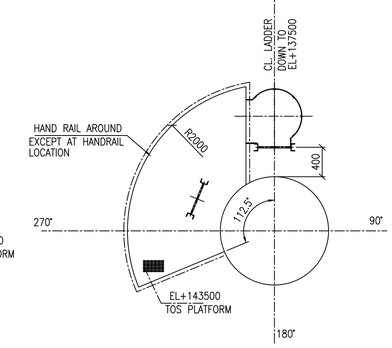
(SCALE 1:40)



PLAN AT EL+125500
(SCALE 1:40)



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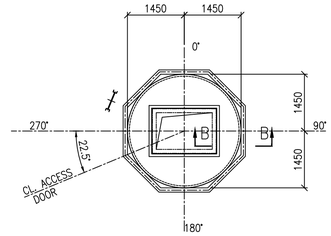
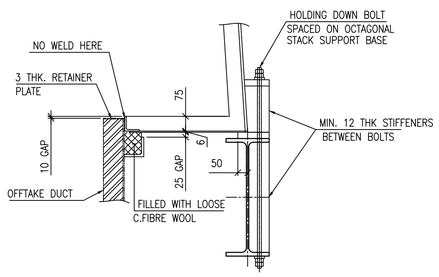
(SCALE 1:40)



PLAN AT EL+120750
(STACK BASE CHAIR DETIL)
(SCALE 1:75)



SECTION B-B
(SCALE 1:15)

NOTES:-

1. ALL DIMENSIONS ARE IN MM U.O.N. DON'T SCALE THE DRAWING, ASK IF IN DOUBT.
2. ELEVATIONS GIVEN IN DRAWING ARE WITH REFERENCE TO GRADE EL.+100000 CORRESPONDS TO FINISHED GRADE LEVEL U.N.O.
3. FOR FURTHER NOTES AND REFERENCE DOCUMENT REFER BHEL DRAWING NUMBER 1-00-022-U4090.
4. READ THIS DRAWING IN CONJUNCTION WITH BHEL DRAWING NUMBER 1-00-022-U4091.
5. ALL STACK SPLICE SHALL BE FULL STRENGTH WELDED FROM INSIDE AFTER ERECTION. AFTER WELDING, INSULATION SHALL BE APPLIED AT SITE.
6. STACK SHALL BE FABRICATED IN CONFIRMITY WITH API560, IS:6533 & RELEVANT SPECIFICATIONS INCLUDED WITH TENDER.

LEGEND

1	DENOTES COLUMN GRID NO.
TE XXX	DENOTES AUXILIARY CONNECTIONS
	DENOTES GRATING MAIN BAR SPAN
XXXXXXX	ERECTION MARK NUMBER FOR SHOP ASSEMBLY
	DENOTES AIR FLOW DIRECTION
	DENOTES FLUE GAS FLOW DIRECTION
FS	FIXED SUPPORT
SS	SLIDING SUPPORT
1	DENOTES REFRACTORY MARK NUMBER
1	DENOTES NOZZLE NUMBER

Rev	Date DD-MM-YYYY	Status - Description of Issue	Written by	Checked by	Approved by
1	18-09-2025	ISSUED FOR APPROVAL	PKM	AS	MO
0	28-07-2025	ISSUED FOR REVIEW	PKM	AS	MO

DOCUMENT CATEGORY (USE " X " MARK)	DOCUMENT REVIEW STATUS (BY CLIENT)
☒ APPROVAL ☐ REVIEW ☐ INFORMATION	

PROJECT : DR 1.0 EXPANSION PROJECT
IOCL DIGBOI REFINERY

OWNER : INDIAN OIL CORPORATION LTD.

EPCM : TECHNIP ENERGIES

EPC CONTRACTOR : BHARAT HEAVY ELECTRICALS LTD.,
Heavy Plates & Vessels Plant, Visakhapatnam-530012.
361-246/A

ENGINEERING CONSULTANT : UNITBIRWELCO IISP
THERMAL EQUIPMENT PVT. LTD.
A-110, 2nd Floor, Sector 136, Noida, Uttar Pradesh - 201304
www.unitbirwelco.com

TITLE : IND-COKER SECONDARY FURNACE (07-FF-00-002)
GENERAL ARRANGEMENT STACK

IOCL DOCUMENT NO. : MR-00-0110-0001-A2001-0001 H
BHEL DOCUMENT NO. : 1-00-022-U4098
BIRWELCO IISP DOC. NO. : H24065-002-2065

SCALE	PROJECT	UNIT	DOC. TYPE	MAT. CODE	SER. NO.	PAGE	REV.
1:75	214227C	07	DW	0110	0001	1 OF 1	01

SHEET SIZE : A1

IND. COKER SECONDARY FURNACE (07-FF-00-002) FOR DR 1.0 EXPANSION PROJECT

Document Identification Attributes					
Document Number		**1-00-022-U4098**		**Revision Object:**	**1**
Document Title		**GA STACK**			
Contractor Name		**BHEL**		**Contractor response date:**	
S. No.	**DRAWING NUMBER**	**Comments from PMC**	**Status Open / Close**	**Vendor Response**	
1	1-00-022-U4098	Please ensure all the Instrument and Auxiliary Connections as per the tender	CLOSED	We have updated the instruments in line with the P&ID	
2					
3					
4					
5					
6					
7					
8					

INTERNAL INSULATION SUMMARY

MARK	TOTAL THICKNESS (MM)	LAYER THICKNESS (MM)	DESCRIPTION		LOCATION	ANCHOR TYPE	ANCHOR MATERIAL	REMARKS
1	250	115	HOT FACE LAYER	HIGH DENSITY FIRE BRICKS (1900 KG/M^3)	RADIANT SECTION EXPOSED VERTICAL LOWER WALL (UP TO 1.8 M FROM FLOOR REFRACTORY)	STUDS+ BRICK HOOK	SS310	INTRNAL COATING ON CASING PLATE REFRACTORY SITE APPLICATION (NOTE-2)
		135	BACKUP LAYER	CERAMIC FIBRE BLANKET (128 KG/M^3) (150 MM COMPRESSED TO 135 MM)				
2	200	175	HOT FACE LAYER	CERAMIC FIBRE BLANKET MODULE (160 KG/M^3, 1425° C)	RADIANT SECTION EXPOSED VERTICAL UPPER WALL (ABOVE TO 1.8 M FROM FLOOR REFRACTORY)	STUDS+ WASHER	SS310	INTRNAL COATING ON CASING PLATE REFRACTORY SITE APPLICATION (NOTE-2)
		25	BACKUP LAYER	CERAMIC FIBRE BLANKET (128 KG/M^3)				
3	200	175	HOT FACE LAYER	CERAMIC FIBRE BLANKET MODULE (160 KG/M^3, 1425° C)	ARCH	STUDS+ WASHER	SS316L	INTRNAL COATING ON CASING PLATE REFRACTORY SITE APPLICATION (NOTE-2)
		25	BACKUP LAYER	CERAMIC FIBRE BLANKET (128 KG/M^3)				
4	250	100	HOT FACE LAYER	INSULITE 8S OR EQ. (900 KG/M^3)	BRIDGE FLOOR	6ø V & Y	SS316L	REFRACTORY SITE APPLICATION
		150	BACKUP LAYER	INSULITE 7 OR EQ. (850 KG/M^3)				
5	305	65	HOT FACE LAYER	HIGH DENSITY FIRE BRICKS (1900 KG/M^3) (LAID LOOSE)	FLOOR	6ø V & Y	SS316L	REFRACTORY SITE APPLICATION
		75	INTERMEDIATE LAYER	INSULITE 8S OR EQ. (900 KG/M^3)				
		165	BACKUP LAYER	INSULITE 7 OR EQ. (850 KG/M^3)				
6	225	150	HOT FACE LAYER	INSULITE 8S OR EQ. (900 KG/M^3)	CONVECTION	6ø V & Y	SS316L	REFRACTORY SHOP APPLICATION
		75	BACKUP LAYER	INSULITE 7 OR EQ. (850 KG/M^3)				
7	75	75	HOT FACE LAYER	INSULITE 8S OR EQ. (900 KG/M^3)	END TUBE SHEET	25 x3 Y	SS321	REFRACTORY SHOP APPLICATION
8	50	50	HOT FACE LAYER	INSULITE 8S OR EQ. (900 KG/M^3)	HEADER BOX	WIRE MESH	CS	REFRACTORY SHOP APPLICATION
9	100	100	HOT FACE LAYER	INSULITE 8S OR EQ. (900 KG/M^3)	BREECHING & OFFTAKE DUCT	6ø V	SS304	REFRACTORY SHOP APPLICATION
10	75	75	HOT FACE LAYER	INSULATING CASTABLE CLASS V OR EQ. (1300 KG/M^3)	STACK	6ø V	SS304	REFRACTORY SHOP APPLICATION
11	100	100	HOT FACE LAYER	INSULITE 8S OR EQ. (900 KG/M^3)	HOT FLUE GAS DUCT	6ø V	SS304	REFRACTORY SHOP APPLICATION
12	75	75	HOT FACE LAYER	ACID RESISTANT REFRACTORY (2200 KG/M^3)	COLD FLUE GAS DUCT	6ø V	SS304	REFRACTORY SHOP APPLICATION 75 MM EXTERNAL INSULATION

EXTERNAL INSULATION SUMMARY

MARK	THICKNESS (MM)	DESCRIPTION	LOCATION	REMARKS
13	50	MINERAL WOOL	STEAM APH & DUCT FROM STEAM APH TO CAST APH	
14	75	MINERAL WOOL	CAST APH, DUCT FROM CAST APH TO VENTURI, VENTURI & BURNER PLENUM	
15	75	MINERAL WOOL	CFG DUCT FROM CAST APH TO ID. FAN & CFG DUCT FROM ID. FAN TO STACK	
16	HOLD	MINERAL WOOL	FD. FAN	ACCOSTIC INSULATION
17	HOLD	MINERAL WOOL	ID. FAN	ACCOSTIC INSULATIOM

INSTRUMENT CONNECTION FOR COIL

POS.	QTY.	DESCRIPTION	LOCATION	COIL DWG. NO.
CV	1	VENT 2" 300#. WNRF FLANGE+BLIND FLANGE. MATL. SA182 F22	1 NUMBER AT CONVECTION SSH COIL INLET	
CD	1	DRAIN 2" 300#. WNRF FLANGE+BLIND FLANGE. MATL. SA182 F22	1 NUMBER AT CONVECTION SSH COIL OUTLET	
CV	2	VENT 2" 1500#. RFRTJ FLANGE+BLIND FLANGE. MATL. A182 F9	2 NUMBERS AT CONVECTION PROCESS INLET	
RD	2	DRAIN 2" 1500#. RFRTJ FLANGE+BLIND FLANGE. MATL. A182 F9	2 NUMBERS AT RADIANT PROCESS OUTLET	
PT	2	1.5" 1500#. RFRTJ FLANGE+BLIND FLANGE. MATL. A182 F9	2 NUMBERS AT RADIANT TO CONVECTION CROSS OVER	
TE	2	1.5" 1500#. RFRTJ FLANGE+BLIND FLANGE. MATL. A182 F9	2 NUMBERS AT RADIANT TO CONVECTION CROSS OVER	

INSTRUMENT CONNECTIONS

INSTRUMENT TAG NUMBER	QUANTITY (NOS)	DESCRIPTION	LOCATION	NOZZLE DETAILS
AT-6601	1	O2 ANALYSER TRANSMITTER	HEATER STACK	PIPE-4" NB SCH. 40 (MATL. SS316L) FLANGE- 150# WNRF + BLIND (MATL. A105)
AT-6657A	1	NOx ANALYSER TRANSMITTER	HEATER STACK	
AT-6657B	1	SOx ANALYSER TRANSMITTER	HEATER STACK	
AT-6602	1	CO ANALYSER TRANSMITTER	HEATER STACK	
AT-6655	1	SPM ANALYSER TRANSMITTER	HEATER STACK	
AT-6603	1	O2 ANALYSER TRANSMITTER	AT ARCH	PIPE-4" NB SCH. 40 (MATL. SS310) FLANGE- 150# WNRF + BLIND (MATL. A105)
AT-6604	1	COMB. ANALYSER TRANSMITTER	AT ARCH	
FT-6656	2	THERMAL MASS FLOW METER	HEATER STACK	HOLD
PG-6652	1	PRESSURE GAUGE	HEATER STACK	PIPE-1.5" NB SCH. 80 (MATL. SS316L) FLANGE- 150# WNRF + BLIND (MATL. A105)
PG-6651	1	PRESSURE GAUGE	HEATER STACK BEFORE STACK DAMPER	
PG-6605	1	PRESSURE GAUGE	AT ARCH	PIPE-1.5" NB SCH. 80 (MATL. SS310) FLANGE- 150# WNRF + BLIND (MATL. A105)
PG-6700A	1	PRESSURE GAUGE	FIREBOX HEARTH	
PG-6700B	1	PRESSURE GAUGE	FIREBOX HEARTH	
PT-6679	1	PRESSURE TRANSMITTER	HEATER STACK	PIPE-1.5" NB SCH. 80 (MATL. SS316L) FLANGE- 150# WNRF + BLIND (MATL. A105)
PT-6675	1	PRESSURE TRANSMITTER	CON. SEC ABOVE OF SSH COILS	
PT-6676A	1	PRESSURE TRANSMITTER	AT ARCH	PIPE-1.5" NB SCH. 80 (MATL. SS310) FLANGE- 150# WNRF + BLIND (MATL. A105)
PT-6676B	1	PRESSURE TRANSMITTER	AT ARCH	
PT-6672A	1	PRESSURE TRANSMITTER	AT ARCH	
PT-6672B	1	PRESSURE TRANSMITTER	AT ARCH	
PT-6672C	1	PRESSURE TRANSMITTER	AT ARCH	
PT-6674	1	PRESSURE TRANSMITTER	FIREBOX HEARTH	
PT-6673	1	PRESSURE TRANSMITTER	FIREBOX HEARTH	
TT-6608	1	TEMPERATURE TRANSMITTER	HEATER STACK	PIPE-1.5" NB SCH. 80 (MATL. SS316L) FLANGE- 300# WNRF + BLIND (MATL. A105)
TT-6609	1	TEMPERATURE TRANSMITTER	CON. SEC ABOVE SSH COILS	
TT-6610	1	TEMPERATURE TRANSMITTER	BETWEEN SSH COIL AND PROCESS COILS	
TT-6660A	1	TEMPERATURE TRANSMITTER	AT ARCH	PIPE-1.5" NB SCH. 80 (MATL. SS310) FLANGE- 300# WNRF + BLIND (MATL. A105)
TT-6660B	1	TEMPERATURE TRANSMITTER	AT ARCH	
TT-6658	1	TEMPERATURE TRANSMITTER	FIREBOX HEARTH	
TT-6659	1	TEMPERATURE TRANSMITTER	FIREBOX HEARTH	
SS	2	SNUFFING STEAM	HEADER BOX	PIPE-2" NB SCH. 80 (MATL. SS316L) FLANGE- 300# WNRF + BLIND (MATL. A105)
SS	12	SNUFFING STEAM	RADIANT FLOOR	PIPE-2" NB SCH. 80 (MATL. SS310) FLANGE- 300# WNRF + BLIND (MATL. A105)
HBD	2	HEADER BOX DRAIN	HEADER BOX	1½" NPT FULL COUPLING WITH FEMALE CAP 3000#. (CS)
TESK-6611A	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 1	PIPE - 1.5" SCH. 80 (MAT. SS310) WITH COUPLING THREADED 1½" NPT, 3000 LB MATL. CS +
TESK-6611B	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 1	
TESK-6612A	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 2	
TESK-6612B	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 2	
TESK-6615A	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 1	
TESK-6615B	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 1	
TESK-6615C	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 1	
TESK-6615D	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 1	
TESK-6615E	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 1	
TESK-6615F	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 1	
TESK-6615G	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 1	
TESK-6615H	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 1	
TESK-6615J	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 1	
TESK-6615K	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 1	
TESK-6615L	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 1	
TESK-6615M	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 1	
TESK-6615N	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 1	
TESK-6615P	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 1	
TESK-6616A	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 2	
TESK-6616B	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 2	
TESK-6616C	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 2	
TESK-6616D	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 2	
TESK-6616E	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 2	
TESK-6616F	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 2	
TESK-6616G	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 2	
TESK-6616H	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 2	
TESK-6616J	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 2	
TESK-6616K	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 2	
TESK-6616L	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 2	
TESK-6616M	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 2	
TESK-6616N	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 2	
TESK-6616P	1	TUBE SKIN THERMOCOUPLE	RADIANT BOX CELL 2	
PMN	2	POLUTION MONITORING NOZZLE	STACK	PIPE - 6" NB SCH. 40 (MATL. SS316L) FLANGE- 150# WNRF + BLIND (MATL. A105) WITH 25 MM INSIDE REFRACTORY LINING
SC-6656	1	SAMPLE CONNECTION	ARCH	PIPE-4" NB SCH. 40 (MATL. SS316L) FLANGE- 150# WNRF + BLIND (MATL. A105)
SC-6654A	1	SAMPLE CONNECTION	ARCH	PIPE-4" NB SCH. 40 (MATL. SS310) FLANGE- 150# WNRF + BLIND (MATL. A105)
SC-6654A	1	SAMPLE CONNECTION	ARCH	
AE ISO	1	ISO KINETIC NOZZLE	STACK	PIPE-4" NB SCH. 40 (MATL. SS316L) FLANGE- 150# WNRF + BLIND (MATL. A105)

FOR INSTRUMENT CONNECTIONS ON APH SYSTEM REFER AIRE PREHEAT SYSTEM GENERAL ARRANGEMENT DRAWING NUMBER 1-00-022-U4100

DOORS AND PORTS DESCRIPTION

QTY	DESCRIPTION	LOCATION	REMARKS
12	FLOOR PEEP HOLE (4 INCH DIA)	RADIANT WALL BOTTOM	
8	ACCESS DOOR (610x610)	RADIANT WALL BOTTOM	
48	SIGHT DOOR (150x200)	RADIANT WALL	
2	SIGHT DOOR (150x200)	RADIANT END WALL (TOP)	
2	EXPLOSION DOOR (310X310)	RADIANT WALL	
3	LANCING DOOR 610x300	CONVECTION WALL	
1	ACCESS DOOR 610x610	CONVECTION WALL	
1	ACCESS DOOR 610x610	BREECHING	
1	ACCESS DOOR (610x610)	STACK	

NOTES:-

1. READ THIS DRAWING IN CONJUNCTION WITH THE FOLLOWING DRAWINGS
   - a. 1-00-022-U4090 GENERAL NOTES AND ABBREVATIONS
   - b. 1-00-022-U4091 GENERAL ARRANGEMENT HEATER - OVERALL LAYOUT
   - c. 1-00-022-U4092 GENERAL ARRANGEMENT HEATER - PLANS-1
   - d. 1-00-022-U4093 GENERAL ARRANGEMENT HEATER - PLANS-2
   - e. 1-00-022-U4094 GENERAL ARRANGEMENT HEATER - ELEVATIONS-1
   - f. 1-00-022-U4095 GENERAL ARRANGEMENT HEATER - ELEVATIONS-2
   - g. 1-00-022-U4096 GENERAL ARRANGEMENT HEATER - ELEVATIONS-3
   - h. 1-00-022-U4097 GENERAL ARRANGEMENT HEATER - ELEVATIONS-4
   - i. 1-00-022-U4098 GENERAL ARRANGEMENT - STACK
2. INTERNAL COATING OF 3 MM WET THICKNESS OF HIGH TEMPERATURE MASTIC 500 (OR EQUAL) PROTECTIVE COATING SUITABLE FOR 260°C SHALL BE PROVIDED WHERE CF BLANKET IS IN CONTACT WITH THE CASING.

LEGEND

- (1) DENOTES COLUMN GRID NO.
- (TE XXX) DENOTES AUXILIARY CONNECTIONS
- DENOTES GRATING MAIN BAR SPAN
- XXXXXXX ERECTION MARK NUMBER FOR SHOP ASSEMBLY
- DENOTES AIR FLOW DIRECTION
- DENOTES FLUE GAS FLOW DIRECTION
- FS FIXED SUPPORT
- SS SLIDING SUPPORT
- (1) DENOTES REFRACTORY MARK NUMBER
- <1> DENOTES NOZZLE NUMBER

Rev	Date DD-MM-YYYY	Status - Description of Issue	Written by	Checked by	Approved by
1	18-09-2025	ISSUED FOR APPROVAL	PKM	AS	MO
0	28-07-2025	ISSUED FOR REVIEW	PKM	AS	MO

DOCUMENT CATEGORY (USE " X " MARK)
- [X] APPROVAL
- [ ] REVIEW
- [ ] INFORMATION

DOCUMENT REVIEW STATUS (BY CLIENT)

PROJECT : DR 1.0 EXPANSION PROJECT
IOCL DIGBOI REFINERY

OWNER : INDIAN OIL CORPORATION LTD.

EPCM : TECHNIP ENERGIES

EPC CONTRACTOR : BHARAT HEAVY ELECTRICALS LTD., Heavy Plates & Vessels Plant, Visakhapatnam-530012.
361-246/A

ENGINEERING CONSULTANT : UNITBIRWELCO IISP THERMAL EQUIPMENT PVT. LTD.
A-110, 2nd Floor, Sector 136, Noida, Uttar Pradesh - 201304
www.unitbirwelco.com

TITLE : IND-COKER SECONDARY FURNACE (07-FF-00-002)
INSTRUMENT AND INSULATION SUMMARY

IOCL DOCUMENT NO. : MR-00-0110-0001-A2001-0001 I

BHEL DOCUMENT NO. : 1-00-022-U4099

BIRWELCO IISP DOC. NO. : H24065-002-2070

SCALE	PROJECT	UNIT	DOC. TYPE	MAT. CODE	SER. NO.	PAGE	REV.
1:1	214227C	07	DW	0110	0001	1 OF 1	01

SHEET SIZE : A1

IND. COKER SECONDARY FURNACE (07-FF-00-002) FOR DR 1.0 EXPANSION PROJECT

Document Identification Attributes					
Document Number		**1-00-022-U4099**		**Revision Object:**	**1**
Document Title		**GENERAL ARRANGEMENT HEATER - INSTRUMENT & INSULATION SUMMARY**			
Contractor Name		**BHEL**		**Contractor response date:**	
S. No.	**DRAWING NUMBER**	**Comments from PMC**	**Status Open / Close**	**Vendor Response**	
1	1-00-022-U4099	Refer Comments on Refractory section of API datasheet and update here as applicable.	CLOSED	We have updated refractory in line with the revised API data sheet	
2		Instrument connections shall be as per Doc No. RHQ-EC-IN-0007, Vendor to update document accordingly	CLOSED	We have update all the instrument connections as per P&ID	
3		Process connections for analyzers shall be as per Doc No. RHQ-EC-IN-0007 & Analyzers vendor recommendation. Vendor to check & update document accordingly.	CLOSED	We have update all the instrument connections as per P&ID	
4		HOLDs to be finalyzed and Instrument count to be consistent with PID and API datasheet.	CLOSED	HOLD removed	
5		Not matching with API datasheet	CLOSED	Data sheet will be uodated	
6					
7					
8					