Bharat Heavy Electricals Limited
Heavy Plates & Vessels Plant
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INVITATION TO TENDER

Ref: OPS/OS/WS/2016-17/26/039 **Date: 07.10.2016**

Sub: 3D modeling of ONGC-Hazira Fired Heater Package (S.O. No. 7791) in PDS version 08.00.00.10

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

SL. NO.	NAME OF THE WORK	ESTIMATE VALUE ₹	EMD ₹	WORK COMPLETION PERIOD	LAST DATE FOR RECEIPT OF TENDER
01	3D modeling of ONGC-Hazira Fired Heater Package (S.O. No. 7791) in PDS version 08.00.00.10	8.00 Lakhs	16,000/-	Progressively **6 Weeks**	21.10.2016 up to 14.00 Hrs.

1. ELIGIBILITY CRITERIA

I) Average annual turnover of the contractor during the last 3 years ending 31st March 2016 should be at least 30% of the estimated value. (i.e. ₹ 2.40 Lakhs) In case annual turnover for FY 2015-16 is not finalized or ITR is not submitted by the contractor, Average annual turnover during the last 3 years ending 31st March 2015 shall be considered.

Tenderer should enclose PAN, Service Tax New registration no., Turnover last 3 years certified by auditor, Income tax returns for last three years (FY 2012-13, 2013-14 & 2014-15/2015-16) and Profit & Loss account and Balance Sheet certified by the Auditor for the last 3 years.

II) The Bidder should have experience of completing similar works during last 7 years ending 30th Sept'2016 as given below:

(a) Three similar completed works costing not less than the amount equal to 40% of the estimated value (i.e. ₹ 3.20 Lakhs each)

OR

(b) Two similar completed works costing not less than the amount equal to 50% of the estimated value (i.e. ₹ 4.00 Lakhs each)

OR

(c) One similar completed work costing not less than the amount equal to 80% of the estimated value (i.e. ₹ 6.40 Lakhs)

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

Note: Similar work means 3D Modeling in PDS version 08.00.00.10

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

IV) Latest solvency certificate (within One year) from the Banker shall be produced.

2. SCOPE OF THE WORK OF CONTRACTOR:

The detailed scope of work is given in annexure- I.

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3. SCOPE OF THE WORK OF BHEL:

a) Free issue of drawings.
b) Free issue of EIL Standards / specifications
Note: out of given documents whichever is the stringent may be followed.

4. LOCATION OF WORK:

The subject job is to be carried out at contractor works.

5. EARNEST MONEY DEPOSIT (EMD):

I. The tender shall submit EMD for ₹ 16,000/- (Rupees Sixteen Thousand) 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 BHEL, Visakhapatnam along with offer

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.
successful bidder.

Note: Micro & Small Enterprises (MSEs) are eligible for exemption of Tender cost & EMD as per clause no. 16 annexure – II.

6. WORK COMPLETION PERIOD:

Work shall be completed progressively as detailed below:

a) 3 weeks for completion of 60% model from the date of order / issue of drawings.
b) 6 weeks for completion of project from the date of order / issue of drawings.

7. LIQUIDATED DAMAGES:

In the event of any delay in completion of work or part thereof as per the contractual completion period due to the reasons attributable to contractor, BHEL - HPVP shall have the right to impose Liquidated Damage at the rate of 2% of the contract value for every complete week of delay or part thereof subject to a maximum of 10% of the contract value.

8. INSPECTION:

Inspection shall be carried out by BHEL, Visakhapatnam / EIL / Customer

9. SECURITY DEPOSIT:

Security Deposit shall be collected from the successful tenderer as per clause 12 of annexure - II

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10. 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.

11. PAYMENT TERMS:

Payment terms shall be as per clause 13 of annexure - II

12. 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 inclusive of all applicable taxes & duties as applicable as on date of tender submission except service tax. However, Service Tax as applicable shall be reimbursed on submission of proof of payment along with the bill.

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. In case, any new tax is imposed instead of existing tax, difference of the amount shall be reimbursed/ recovered on submission of documentary evidence.

e. 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.

f. The quoted prices shall be fixed & firm without any escalation during the entire period of contract and till completion of the work.

g. Tenderer should quote the amounts in figures & words. It may be noted that corrections, overwriting etc. are not allowed.

h. All rates shall be quoted in the tender format only.

13. REVERSE AUCTION:

"BHEL reserves the right to go for Reverse Auction (RA) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. All bidders to give their acceptance 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.

In case BHEL decides to go for Reverse Auction, only those bidders who have given their acceptance to participate in RA will be allowed to participate in the Reverse Auction. Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit 'online sealed bid' in the Reverse Auction. Non submission of 'online sealed bid' by the bidder will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue."

General terms & conditions governing RA are mentioned in the special conditions at Annexure-VI

14. VALIDITY OF OFFER:

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

15. 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.

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16. GENERAL:

16.1 **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/NSIC/MSME registration certificate, late / delayed bids, incomplete / conditional offers, bids not conforming to the terms & conditions specified in the tender documents are liable for rejection.

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

16.3 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.

16.4 Sr. Manager (Engineering) shall be the Engineer-in-charge for herein after referred to as such in the tender.

16.5 Lowest offer need not be the rate acceptable to BHEL-HPVP. BHEL-HPVP reserves the right for negotiation with the L1 bidders or opt for Reverse Auction as per applicable guidelines.

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

PART - I: TECHNO COMMERCIAL BID

a) Scope of work	: Annexure – I
b) General Terms & Conditions	: Annexure – II
c) Terms & Conditions of Reverse Auction	: Annexure – III
d) Acceptance to the tender terms & conditions	: Annexure – IV
e) Contractor Information	: Annexure – V
f) Check List	: Annexure – VI

PART - II : PRICE BID

g) Price Bid (Schedule of items and Bill of Quantities)	: Annexure – VII

17. TENDER SUBMISSION:

17.1 **The Bid shall be submitted in two parts.**

Part-I : **Techno-Commercial Bid shall be placed in one cover** along with the following documents :

a. All pages of tender document after duly signed & stamped
b. Proof of document for payment of Earnest Money Deposit of ₹ 16,000/-
c. Turnover certificate issued by Auditor for last 3 years
d. Income tax returns for last 3 years, Profit & Loss account statement and Balance Sheet certified by the Practicing Chartered Accountant for the last 3 years
e. Experience Certificates in line with eligibility criteria.
f. Copy of Service Tax Registration Certificate.
g. Copy of PAN.
h. All other applicable documents as detailed in the tender

Part-II: Price Bid in the prescribed format shall be placed in **another separate cover**.

The tender documents including the various supporting documents enclosed by the bidder should be **signed on all pages with seal.**

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Both covers containing Part – I & Part – II bids shall be placed in **another** bigger size envelope duly super scribing the **Tender No. & Subject** on the envelope.

17.2 The tender completed in all respects **shall be dropped** in the **Outsourcing** tender box kept at reception counter, ADM building **latest by 14.00 Hrs. on 21.10.2016**.

Bidder may also send their offers by Post to "Outsourcing Tender Box, Admn. Building, BHEL - HPVP, Visakhapatnam – 530012".

Last date for receipt of tenders is **21.10.2016 up to 14.00 hrs**. BHEL-HPVP is not responsible for any postal or other delays in submission of offers.

Offers received in any other form will not be accepted.

17.3 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.

18. OPENING OF TENDERS:

Techno-commercial Bids will be opened on **21.10.2016 at 14.00 Hrs.** at Customer Cell, Admn. Building, BHEL- HPVP. The bidders may depute their representatives at the time of opening. The price bid of the technically qualified bidders will also be opened in the presence of representatives of the bidders and the date & time of opening of price bids will be intimated later. In case of reverse auction, the date of conducting reverse auction will be intimated in advance at appropriate time.

If bids are not accompanied by requisite EMD/Valid NSIC Certificate/MSME registration certificate along with Part– I (Techno Commercial Bid), then Part-II (Price Bid) will not be considered for opening.

Yours Faithfully,

For BHARAT HEAVY ELECTRICALS LIMITED,

07/10/2016

Sr. Manager (OS)

PART – I

(TECHNO-COMMERCIAL BID)

Annexure – I

Ref: OPS/OS/WS/2016-17/26/039 **Date: 07.10.2016**

SCOPE OF WORK

Sub: 3D modeling of ONGC-Hazira Fired Heater Package (S.O. No. 7791) in PDS version 08.00.00.10

The work shall be shall be carried out as per the following documents:

a. Piping Interface and 3-D Modelling of Atmospheric Column Feed Heater (091-H-901)

b. Guidelines for 3D modelling. (EIL Guide No. 8-76-0022 Rev 2)

c. Piping and Instrumentation Diagram (A694 78 41 91 1131 Rev 00)

d. ATM. COL. FEED HTR. (91-H-901)

SIGNATURE OF TENDERER WITH SEAL

Annexure – II

Ref: OPS/OS/WS/2016-17/26/039 **Date: 07.10.2016**

GENERAL TERMS & CONDITIONS

1. **TIME SCHEDULE:**

   Work mentioned in the contract should be completed in all respects within a period as per tender/work order.

2. **RISK PURCHASE:**

   In case the contractor fails to execute the work within the scheduled time due to any reasons, 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.

3. **Bidders shall confirm their acceptance to all the terms & conditions of the tender enquiry. Any deviations to the tender terms & conditions are not acceptable.**

4. **SUB - LETTING:** Subletting of the assigned work will not be permitted. But in special circumstances, this may be allowed. In such case, the party should obtain the written approval from BHEL before Subletting.

5. **DISPUTE RESOLUTION:**

   (a) Any disputes arising out of this contract shall be referred to a sole Arbitrator to be appointed by the Unit Head of BHEL-HPVP and the sole arbitrator so appointed may be an employee of BHEL-HPVP. The arbitration will be governed by the provisions of The Arbitration and Conciliation Act, 1996. Place of arbitration will be at Visakhapatnam only.

   (b)All cases, suits, petitions, actions, etc. arising out of this contract shall be filed, instituted, tried and auctioned only in the courts, tribunals, forums, etc. situated in Visakhapatnam only and nowhere else.

6. The rates quoted by the contractor should be firm for the contract period. There shall be no revision in contract rates during the contract period.

7. BHEL reserves the right to negotiate for price reduction with L1 party and negotiated price will be considered as contract amount for all practical purposes.

8. BHEL reserves the right to terminate the contract at any stage without assigning any reason.

9. Withdrawal from contract during contract period in BHEL will entitles forfeiture of Security Deposit.

10. The contractor should abide by the company's Security / safety rules and provide such safety requirements as per statutory rules and requirements of the factories act.

11. **Earnest Money Deposit:**

    A. EMD is to be paid by the tenderers for securing fulfillment of any obligations in terms of the NIT.

    B. **Modes of Deposit**: The EMD may be accepted 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 BHEL, Visakhapatnam along with offer.

    C. **Forfeiture of EMD:** 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.

Contd…2

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.

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

E. EMD shall not carry any interest

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

12. **Security deposit**:

A. Security deposit means the security provided by the contractor towards fulfillment 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.
c) Bank Guarantee from Scheduled Banks/ Public Financial Institutions as defined in the companies 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 companies act (FDR should be in the name of the contractor, a/c BHEL.
e) 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)

(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 submitted before start of the work. Balance 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.

E. Security deposit shall be released to the contractor upon fulfillment of contractual obligations as per the terms of the contract.

F. The security deposit shall not carry any interest.

13. **PAYMENT TERMS:**

100% payment will be made after completion of work on pro-rata basis on acceptance and certification of bills by BHEL Engineer. Payment shall be made against certification by Engineer – in- charge.

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Ref: OPS/OS/WS/2016-17/26/039 **Date: 07.10.2016**

GENERAL TERMS & CONDITIONS

Along with the bill contractors has to furnish copy of the following documents for further processing of bill.

a) Original Invoice in duplicate
b) Work completion certificate issued by Engineer-in-charge
c) Service Tax challan along with a certificate from the service provider stating that the service tax collected from BHEL has been remitted to the Govt. of India in time.
d) RTGS form

Note: If the contractor not registered under the service tax, then a declaration shall be submitted along with offer that they are within the threshold hold limit.

In respect of submission of Final bill, "**NO claim certificate**" on a Non judicial stamp paper worth of ₹100/- may be submitted by the vendor/contractor.

All payment shall be made to the contractor, shall be through NEFT (National Electronic Fund Transfer) / RTGS (Real Time Gross Settlement) within reasonable time, say a one month (or as mutually agreed), after receipt of the bill along with user agencies acknowledgement.

14. **Service Tax:**

Where ever service tax is liable to be paid by contractor, the contractor shall register himself under the service tax rules and copy of Certificate of Registration shall be furnished along with the offer.

After registration, the payment of service Tax shall be effected by the Contractor to the Central Government monthly / quarterly based on the invoices raised before the due date of payment. The Service Tax Return also shall be submitted to the Governmnent before the due date.

The invoice/bill in original duly signed by the Contractor claiming the payment for Service Tax shall clearly indicate the following.

a) Continuous serial no. & date of the bill.
b) Cost of the service.
c) Separately showing the service Tax amount calculated at the applicable rate.
d) Separately showing the Cess on Service Tax amount.
e) PAN based Service Tax Registration No.

The Service Tax claimed in the bill will be paid to the Contractor based on the submission of proof of payment of service tax to the central Government along with the bill.

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)

15. **Income Tax :**

Income Tax shall be deducted at the applicable rate in respect of the service Contract including supply of labour for any work as follows:

Xerox copy of PAN card shall be submitted to Account Dept. along with Original for verification.

TDS certificate will be issued to vendors for each quarter ending as on 30th June, 30th Sept, 31st Dec and 31st Mar during the following quarter.

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Ref: OPS/OS/WS/2016-17/26/039 **Date: 07.10.2016**

GENERAL TERMS & CONDITIONS

16. **Liquidated Damages:**

In the event of any delay in completion of work or part thereof as per the contractual completion period due to the reasons attributable to contractor, BHEL - HPVP shall have the right to impose Liquidated Damage at the rate of 2% of the contract value for every complete week of delay or part thereof subject to a maximum of 10% of the contract value.

17. **Termination of contract:**

If the company finds that the contractor is not showing adequate progress of work as per schedules given to him or if the company is not satisfied with the quality of work being done or incase of insolvency etc., the company reserves the right to terminate the contract without assigning any reason whatsoever and the decision of the company shall be final. In addition, to the above the company is entitled to claim damage in respect of any loss consequent to the termination of the contract.

18. MSE suppliers can avail the intended benefits only if they submit along with the offer, attested copies of either EM II certificate having deemed validity (five years from the date of issue of acknowledgement in EM II) **or** valid NSIC certificate **or** EM II certificate along with attested copy of a CA certificate (Format enclosed at **annexure-A** where deemed validity of EM II certificate of five years has expired) applicable for the relevant financial year (latest audited). Date to be reckoned for determining the deemed validity will be the date of bid opening (Part 1 in case of two part bid). Non submission of such documents will lead to consideration of their bid at par with other bidders. No benefits shall be applicable for this enquiry if any deficiency in the above required documents are not submitted before price bid opening. Documents should be notarized or attested by a Gazetted officer".

19. **Fraud Prevention Policy :**

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

20. The contract can be terminated with **One month notice** in writing on either side without assigning any reason whatsoever.

21. 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.

In case, any new tax is imposed instead of existing tax, difference of the amount shall be reimbursed/ recovered on submission of documentary evidence.

22. All corrigenda, addenda, amendments, time extensions, clarifications etc. to the tender will be hosted on our our websites http://www.bhelviz.co.in & http://www.bhel.com only. Bidders should regularly visit website to keep themselves updated

23. **ARBITRATION:**

Notwithstanding anything contained in any document whatsoever, all questions, matters, disputes and claims relating to and arising out of this contract, shall be referred to sole arbitrator, who shall be appointed by the Head of the Unit, BHEL- HPVP, Visakhapatnam at his sole discretion. Such appointment of arbitrator shall not take place unless and until a written request for appointment of arbitrator from any of the contract has been received by the ED as aforesaid. It is a term of this contract that no person other than a person appointed by such Executive Director as aforesaid should act as arbitrator at all. The venue of arbitration shall be such place as may be decided by the ED, BHEL-HPVP, Visakhapatnam.

SIGNATURE OF TENDERER WITH SEAL

ANNEXURE- III

Ref: OPS/OS/WS/2016-17/26/039 **Date: 07.10.2016**

GENERAL TERMS AND CONDITIONS OF RA (REVERSE AUCTION)

BHEL reserves the right to go for Reverse Auction (RA) instead of opening the sealed envelope price bid, submitted by the bidder. This will be decided after techno-commercial evaluation. All bidders to give their acceptance 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.

In case BHEL decides to go for Reverse Auction, only those bidders who have given their acceptance to participate in RA will be allowed to participate in the Reverse Auction. Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit „online sealed bid" in the Reverse Auction. Non-submission of „online sealed bid " by the bidder will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue."

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

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.

2. Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit „online sealed bid" in the Reverse Auction. Non-submission of „online sealed bid" by the bidder for any of the eligible items for which techno-commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.

3. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.

4. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.

5. Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.

6. Bidders have to fax the Compliance form (annexure IV) before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.

7. In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at "Total Cost to BHEL" like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, Service Tax for Services and loading factors (for non-compliance to BHEL standard Commercial terms & conditions) for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.

8. Reverse auction will be conducted on scheduled date & time.

9. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.

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ANNEXURE- III

Ref: OPS/OS/WS/2016-17/26/039 **Date: 07.10.2016**

GENERAL TERMS AND CONDITIONS OF RA (REVERSE AUCTION)

10. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, (Annexure VII) as provided on case-to-case basis to Service provider within two working days of Auction without fail.

11. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL‟s standard practice.

12. Bidders shall be required to read the “Terms and Conditions” section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the „Business Rules of Reverse Auction‟, which will be communicated before the Reverse Auction.

13. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action *as per extant BHEL guidelines*, shall be initiated by BHEL and the results of the RA scrapped/ aborted.

14. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.

15. In case BHEL decides to go for reverse auction, the H1 bidder(s) (whose quote is highest in online sealed bid) may not be allowed to participate in further RA process.

16. All payments will be released through RTGS/NEFT only. (Refer Annexure-B)

SIGNATURE OF THE BIDDER WITH STAMP

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ANNEXURE – IV

Ref: OPS/OS/WS/2016-17/26/039 **Date: 07.10.2016**

Sub: 3D modeling of ONGC-Hazira Fired Heater Package (S.O. No. 7791) in PDS version 08.00.00.10

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 to all the Terms and Conditions of the Tender Enquiry and the prices quoted are in accordance with the same.

I / We accept to offer valid 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 BIDDER WITH STAMP

Annexure- V

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	
09.	Organizational structure with name and designation	

Annexure- VI

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.	Service Tax Registration Certificate		
05.	PAN Number		
06.	Income Tax Returns for last 3 years		
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.	MSE Registration Documents, if applicable EM II certificate having deemed validity (5 years from date of issue of acknowledgement in EM II) **or** valid NSIC certificate **or** EM II certificate along with attested copy of a CA certificate (Format enclosed at **annexure-A** where deemed validity of EM II certificate of five years has expired)		

Annexure- A

Certificate by Chartered Accountant on letter head

This is to certify that M/S ……. (hereinafter referred to as 'company') having its registered office at …… …….. is registered under MSMED Act 2006, (Entrepreneur Memorandum No (part-II) ……..……dated ……., Category: ……..… (Micro/small). (Copy enclosed).

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

1. **For Manufacturing Enterprises:** Investment in plant and machinery (i.e. original cost excluding land and building and the items specified by the Ministry of small scale industries vide its notification No.S.O.1722(E) dated October 5, 2006:
   ₹……..Lakhs

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

(Strike off whichever is not applicable)

The above investment of ₹……Lakhs is within permissible limit of ₹…….Lakhs for ……Micro/ Small (strike off which is not applicable) Category under MSMED Act 2006.

Or

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

Date:

(Signature)
Name -
Membership number –
Seal of Charatered Accountant

Annexure - B

ACCEPTANCEFOR 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:
Date:

Bank Manager / Officer
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 – VII

Ref: OPS/OS/WS/2016-17/26/039 **Date: 07.10.2016**

PART – II

(PRICE BID)

Annexure- VII

PRICE BID

Ref: OPS/OS/WS/2016-17/26/039 **Date: 07.10.2016**

Sub: 3D modeling of ONGC-Hazira Fired Heater Package (S.O. No. 7791) in PDS version 08.00.00.10

Tender Enquiry No.: OPS/OS/WS/2016-17/26/039, Dated: 07.10.2016

SCHEDULE OF RATES

SL No	DESCRIPTION OF WORK	Total amount In ₹	Total Amount in words
1	3D modeling of ONGC-Hazira Fired Heater Package (S.O. No. 7791) in PDS version 08.00.00.10 as per the scope of work, terms & conditions of the tender		

Note:

1) **The prices shall remain fixed and firm for an entire period of contract & No additional payment shall be made to contractor over and above the quoted price.**

2) **L1 shall be evaluated based on quoted total amount.** However, BHEL reserves the right to go for Reverse Auction / negotiate with L1 vendor.

3) **The quoted prices shall be inclusive of all applicable taxes & duties as applicable as on date of tender submission except service tax**. However, Service Tax as applicable shall be paid by contractor and same shall be reimbursed on submission of proof of payment.

SIGNATURE OF THE BIDDER WITH STAMP

PIPING INTERFACE AND 3-D MODELING

OF

ATMOSPHERIC COLUMN FEED HEATER (091-H-901)

UNIT : KRU (091)

PROJECT : MODIFICATION OF HAZIRA PLANT UNDER DDP

CLIENT : ONGC

JOB NO. : A694

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
A	13.08.2015	ISSUED FOR BIDS	AVA	SKG	UC

1.0 SCOPE

The bidder's scope of work shall include 3D modeling complete in all respects, of all items as per the scope of tender.

2.0 3D MODEL GUIDELINES FOR HEATER PACKAGE:

a) All items included in Heater Vendor's Scope as per MR/PR are in bidder's scope of modeling.

b) Vendor shall ensure that required operation & maintenance access are provided and also ensure that there is no interference with Purchaser's piping and pipe supports.

c) 3D model for complete heater package (including all components included in heater vendor scope) shall be prepared using PDS 08.00.00.10 version as per Guidelines for 3D Modeling (8-76-0022 Rev 2)

d) Complete internal Piping incl. all pipe supports along with concrete pedestals to be modeled in complete details and all spring hangers, roller supports, Rotational stops, Anchors ,Structural steel members used for the pipe supports to be modeled in complete details.

e) All Equipments and Packaged units/modular units to be modeled with exact geometry including but not limited to: manholes with davits, pipe davits on top platforms, nozzles, stiffener rings, bellows, break flanges, platforms, ladders, handrails, lifting lugs etc., for all the equipments in the package with details of instruments, blowers, motors and fans, duct, stack, etc. Equipments supports: skirts, support legs/lugs, saddles to be modeled along with the equipments with near exact geometry.

f) Maintenance areas around equipments, davit swing areas, swing elbows sweep areas, bundle removal areas, drop out areas to be modeled as soft envelopes and should be used for clash detections.

g) Bidder shall submit 3-D model within 1 month of award of contract, and shall send revised model with updation as per commented drawings minimum once in a month. If purchaser has major comments on vendor drawings then it has to be incorporated in the model and updated model has to be sent within 15 days from receipt of comments. All GAD & Elevations should be extracted from PDS model.

h) Model review shall be conducted at 30%, 60% and 90% progress stage for purchaser's review. Complete 3D model along with PDS Design database shall be delivered at each model review stage (minimum 15 days prior to model review date) and also final as built shall be submitted at the completion of the job.

i) Bidder shall submit model in CD for purchase's review. Subsequently model review with bidder shall be conducted prior to client review for each stage at EIL-HO. Bidder shall submit PDS data well in advance so that bidders model can be integrated, reviewed, commented and the comments be incorporated prior to model review by client for main model. Bidder shall be liable to incorporate client comments at all stages and deliver compliance report prior to next stage. Bidder shall be responsible for seamless integration of their model with main model.

j) Before the 90% model review, isometrics of process lines and utility lines shall be provided to vendor by EIL to ensure that there is no fouling with structure member and there is proper access to nozzle/instruments etc.

k) Exact shape and geometries shall be modeled.

l) All piping & instrumentation connection inside the heater package shall be modeled as per applicable piping class/PMS (wherever applicable).

m) Instrumentation & Electrical cable trays shall be modeled.

n) All burners along with the sight doors/peep doors etc. shall be modeled.

o) Soot blowers (if applicable) shall be modeled as per the equipment supplier drawings.

p) Entire APH elements including structure/ducting shall be modeled by heater package vendor.

q) During model review or otherwise any observation/requirements specified by purchaser/client have to be incorporated.

3.0 SPECIFICATIONS / STANDARDS/ ENCLOSURES:

Sl. No.	Description	Doc. No.	Rev. No.	No. of sheets
1	Guidelines for 3D Modeling	8-76-0022	2	28

Note-1: Piping material specification and Valve material specifications, if applicable, shall be given to the successful bidder.

4.0 INSTRUCTION TO BIDDERS:

Piping external to heater package has been excluded from the heater contractor scope. Therefore all terminal points (coordinates, sizes etc.) should be finalized to enable downstream engineering by owner.

a) APH System:

Location of all terminal nozzles for piping of the APH system shall be finalized by the heater vendor before 30% model review.

b) Burner piping:

The location and orientation of the burner nozzle and the drawings of the burner should be finalized before 30% model review.

c) Terminal flanges and loadings (Process & Steam connections):

i) Process and steam terminal nozzles should be finalized before 30% model review

.

ii) Ratings of terminal flanges for all process piping and steam piping shall be 600# rating to take care of the loading/ flange leakage.

iii) All terminal flanges shall be securely anchored near the terminal location. Loadings on the flanges/ terminal anchor location shall be minimum 7 times of API 560 loadings. For heater process outlet terminal loadings, the loadings will be mutually agreed after stress analysis since the loadings may be required more than 7 times API 560 allowable, therefore anchors have to be suitably designed.

3डी मॉडलिंग के लिये दिशा निर्देश

GUIDELINES FOR 3D MODELING

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
2	12.07.2012	REVISED AND REISSEUD AS GUIDE	RN	SC	VK	DM
1	02.02.2009	REVISED AND REISSUED AS GUIDE	DM	AK	AA	VC
0	04.06.2001	ISSUED AS GUIDE	RP	VPS	MR	MI

Abbreviations:

3D	-	Three Dimensional
AFC	-	Approved for Construction
DCN	-	Design Change Note
GAD	-	General Arrangement Drawing
RED	-	Rotating Equipment Department
SED	-	Static Equipment Department
PED	-	Package Equipment Department
HMTD	-	Heat & Mass Transfer Department
POSD	-	Plant Operation and Saftey Department
PDMS	-	Plant Design Management System
PDS	-	Plant Design System
P&ID	-	Piping & Instrumentation Diagram
MTO	-	Material Take Off
ISO	-	Isometric
ITS	-	Information Technology Services
IBR	-	Indian Boiler Regulations
LSTK	-	Lump Sum Turn Key
PEM	-	Project Engineering Manager
PM	-	Project Manager
RCM	-	Resident Construction Manager
SGL	-	Senior Group Leader

General Engineering Standards Committee

Convenor : Mr. Vinay Kumar

Members : Mr. S. Chanda
Mr. J.M. Singh
Ms. N.P. Guha
Mr. M.P. Jain
Mr. D. Khare
Mr. Rakesh Nanda
Ms.Vartika Shukla

CONTENTS

1.0 INTRODUCTION

These guidelines are developed to frame and implement the requirements of 3D modeling of a plant on PDS / PDMS systems. Primary objective of these guidelines are

- To define the scope of various departments participating in the 3D model design.
- To establish a procedure of developing the model.
- To standardise on working philosophy for using these packages.
- Define backup storage and retrieval methodology.

This guide will help in achieving uniformity for various projects and reduce problems during interdepartmental coordination. The projects can be easily monitored, structured files can be transferred to site and deciphering of the names will be easier. This will also help in developing an archival system for all future reference of the electronic files generated during a project execution.

2.0 REFERENCE DOCUMENTS

8-76-0033 - Guidelines for Review of 3D Model

8-76-0032 - Guidelines for Preparation of As-Built Documents

3.0 SCOPE AND EXTENT OF MODELING

All plant engineering activities beginning from Plot Plan development to generation of as-built drawings shall be done using 3D modeling applications. All plant items listed below shall be modeled for completeness of 3D model and for extraction of deliverables from model.

Discipline wise scope of modeling is as under:

A. Piping

a) Overall system co-ordination.
b) All equipments to be modeled with exact geometry including but not limited to : manholes with davits, pipe davits on top platforms, nozzles, stiffener rings, bellows, break flanges, lifting lugs, piping clips etc., for all the equipments in the plant like, vessels, columns, reactor, receivers, pumps with motors, air coolers with motors and fans, filters, blow down drums, heat exchangers etc.
c) Maintenance areas around equipments, davit swing areas, swing elbows, sweep areas bundle removal areas, drop out areas to be modeled as soft envelopes and should be used for clash detections.
d) Equipments supports: skirts, support legs/lugs, saddles etc.
e) Above ground (AG) piping, big bore and small bore, shall be modeled. This shall include all pipes, valves, flanges, fittings, reducers, spectacle blinds, drains, temperature/pressure connections, sample points, drip legs, jacketed pipes etc.
f) All in-line instruments like control valves, safety valves, rota-meters, orifice plate, flow meter etc.
g) All piping special items like expansion bellows, slide valves, special valves with purge/bleed points, Steam traps, strainers etc.
h) Complete vessel trims with level gauges, level switches, level transmitters, equipment/instrument vents/drains, utility connections, temperature / pressure gauges etc.
i) Insulation type like IH, IT, IJ, IC etc., Insulation thickness operating/design

pressure/temperature etc.

j) Manhole vent piping to atmosphere etc.
k) Steam supply and condensate recovery stations up to the first valves in tracer lines.
l) All pipe supports with complete details.
m) Integration of packages like Compressor, Blower, Heater, Refrigeration etc.. If package modeling is not done by Vendor, the same shall also be undertaken as per clause G.
n) Tagging of all Line nos., Instruments nos., special items, Equipment nos. shall be as marked in the P&IDs.
o) All Equipments, special Piping items, inline instrument items, trims etc. shall be modeled with exact geometry, to the extent possible.
p) Preliminary modeling of Hot Air duct, Cold air duct, ID/FD Fan, Suction Stack and APH of Heater to be modeled by Piping, However, same shall be replaced by actual Model received from the Heater vendor.

B. General Civil

a) Complete underground facilities including but not limited to Underground (UG) Piping, Equipment break flanges, funnels, manholes, catch pits, etc. to be modeled by General Civil(As per scope defined in the Scope matrix, Annexure-I).
b) Complete Fire water network (UG Piping in unit area & Offsite)
c) Envelopes to be modeled on top of manholes and catch pits and shall be used for interference detection.
d) Overall Plot plan, unit approaches from main roads, main roads outside the units, paving, Site grading, Earth Dyke, Earth Pond, reservoirs Boundary wall, gates, fencing shall be modeled. Hard stands, fabrication space for tall columns, crane access, Pipe sleepers (up to 500mm Height from FGL), Instrument Road Crossing, Electrical Road crossing (IRC/ERC) and Box culvert shall also be modeled.
e) Indicative modeling of Tankages (including dyke) /Spheres/Bullets/Flare shall be modeled by General civil for Plot Plan extraction purpose.

C. Structural

The scope of modeling for structural shall include but not limited to the following:

a) Main steel/secondary steel equipment support beams, bracing, columns , stiffener plates, platforms, platform openings, ladders, pipe racks, stair cases, walkways , wind shield supports, claddings, supporting structure for air coolers with operating platforms and staircase, monorails, EOT support , entire technological structure, compressor sheds etc. shall be modeled in exact geometry.
b) Handrails, gratings to be modeled in approximate geometry.
c) Skid supports, platforms, ladders & Equipment supports inside skids are to be modeled in exact geometry. No welds to be modeled.
d) Equipment and structure foundations, Technological Buildings, Equipment supporting structure, flue gas stack and any other concrete structure to be modeled in exact geometry with exact locations of all insert plates.
e) Foundation and structure for platforms, gratings, hand rails etc. for packaged item and skid mounted items are also included.
f) Structural modeling of Hot Air duct, Cold air duct, ID/FD Fan, Suction Stack and APH of Heater, Compressors foundation with details, blowers, HRSG units and Flue Gas units (FGD/FGC) shall be modeled as per project guidelines/requirements.
g) Structural steel members used for the pipe supports to be modeled in complete details based on Structural input furnished by Piping on Model.
h) For applicable Buildings, Control Rooms, Doors, Ceiling and Floors, compressor house asbestos sheeting etc.
i) Modeling of buildings shall include all doors, windows, trenches, walls, openings in

walls etc., all approach roads around units.

j) Prelim modeling of Hot Air duct, Cold air duct, ID/FD Fan, Suction Stack and APH of Heater to be modeled by Piping, However, same shall be replaced by actual Model received from the Heater vendor.

D. Instrumentation

a) Instrument cable Duct (Instrument ducts are of minimum 400mm width).
b) Following instrument entities shall be modeled:
   - Analyser Shelter / House, Analyser Racks/ Cabinets located in the field to be modeled near exact geometry
   - Control Room with piping & cable entry points
   - Local Control Panels

   Inside details of control Room/ Shelter/ Racks/Cabinets/ Local Control Room are excluded from the scope of modeling.
c) Prefabricated Assemblies (Hook-ups)
d) Gas detectors
e) Closed Circuit Television (CCTV)
f) Instrument Stanchions
g) Instrument Air lines from the Air Header to the consumer
h) Instrument Junction Boxes
i) Input to General Civil / Structures for Instrument Cable Trench (Concrete/Buried), Sleeves and Culvert.

E. Electrical

The modeling for electrical facilities shall include the following:

a) Electrical Cable Trays of size 100mm & above.
b) Local Control Stations in the field for motor/other equipments.
c) Lighting & power panels.
d) Light fixtures, plugs, sockets, welding receptacle, lighting masts, lighting poles in the field.
e) Earth strips, earth electrodes and earth plates in the field.
f) Plant communication system equipment including field call stations, paging loudspeakers and telephones in the field.
g) FA system equipment including break glass units in the field.
h) Sleeves for cables in the field.

F. Others / Miscellaneous Models

- Packaged units /modular units are to be treated like the main units and all the requirements of modeling shall be followed for such units by the vendor.
- Skid mounted Equipments to be modeled with exact geometry.
- Skid to be tagged as main equipment.
- All sub-equipments of all skids to have skid tag as a prefix.
- All sub-equipments to be modeled with exact geometry.
- Extent of internal Piping of the skid with all inline and online instruments to be modeled.

G. For Discipline wise modeling responsibilities refer "SCOPE MATRIX FOR 3D MODELLING" (Annexure –I)

4.0 PROJECT SETUP & DATA MANAGEMENT

A. Software Selection

Piping department shall be the overall coordinator for the 3D systems. 3D modeling software to be used should be decided at the beginning of the project based on client specific / contract requirements, reference project data and availability of system resources. Piping HOD will decide about the use of PDS or PDMS system for a project and communicate to participating departments.

B. Project Database Setup

Piping department shall carry out the project creation activity. Major steps involved are:

- Creating directory structure in the server.
- Creation of Project databases for all disciplines.
- Copying of reference database / files / catalogues etc. from master, reference project.
- If the project consists of multiple units then one project master to be maintained for all the specs & catalogs for ease of maintenance & uniformity. All the units shall refer to this one project master.
- Any new catalog requirement is to be created in the project master.
- Once the project is complete, the project specific catalogs have to be reviewed by the respective department and added in the master project catalog.
- Creating user log in's for all disciplines.
- Setting up of Project back-up systems.
- Configuration of database files in case 3D modeling is being carried out at multiple locations.
- Other misc. activities required for project creation.
- Completed project databases and Master catalog shall be maintained at one location (central repository)

Piping administrator will create the project database and inform respective disciplines administrators. Administrators of respective disciplines shall be responsible for creation / updation and maintenance of specifications and catalogues used for their part of work.

C. Creation Of Areas / Model Files And Design Databases

This activity shall be carried out by piping on finalisation of the equipment layout and area division drawings. It involves creation of areas / model files / databases for piping, equipment, structure disciplines. The advantages of creating several areas / models are to break-up a big plant into smaller parts and facilitate simultaneous working of several persons of a discipline. Area division shall conform generally to piping area division. However, multiple areas can be clubbed together for modeling ease and shall be termed as modeling zones. Organisation of areas shall generally be uniform for all disciplines and any variation shall be in consultation with piping and well documented. Maintaining uniformity in areas for various departments shall help in organising data properly and facilitate generation of deliverables, reports and interference management.

D. Project Database & Naming Convention

Standard project naming convention for 3D Modeling shall be followed as under:

a) **PDS**

Separate models to be generated for each discipline

	Discipline		Model Identifier
-	Piping above ground	-	PI
-	Piping under ground	-	UG
-	Equipment	-	EQ
-	HVAC	-	HV
-	Structural	-	ST
-	Architectural	-	AR
-	Electrical	-	EL
-	Instrumentation	-	IN

Within each discipline models to be generated based on the zone division developed by piping. The naming conventions for model in the PDS, Database in PDS shall be as follows:

X	X	_	XX
Model Identifier as given in 1.5.1	Levels (given below)	Under Score	Area number from Key Plan

A - Grade
B - First Level above Grade
C - Second Level above Grade
X - All Levels in one model
U - Under ground

- Above ground and underground piping shall always be in different models.

Database Hierarchy

PIPING

a)PIPE NAME:
INSPECTION ISO ID
P&ID(NPD)+FLUID CODE +UNIT NUMBER+LINE SEQUENCE NUMBER+SPECIN(P&ID)+INSULATION GIVEN BELOW

b)LINE ID:
FLUID CODE + UNIT NUMBER +LINE SEQUENCE NUMBER

c)TAG NOS. For all Inline Instruments, Special items as component Name in PDS, Same tag numbering philosophy to be followed in PDS.

XXX	-	XXX	XXXX	- X
UNIT No.	DASH	INST. TYPE i.e. PSV, FV, PV	INST. NO./ SPECIAL ITEM NO.	A,B,C.. Only if same no. is getting repeated

EQUIPMENT NAME

a) EQUIPMENTNAME = UNIT NUMBER + EQUIPMENT NAME(A,B,C,ONLY IF THE N0.IS GETTING REPEATED.)

b) Description= Drawing number + revision number given in datasheet.

Line information required in PDS model:

The following attributes must be keyed in while modeling:

- Line operating/design, temperature/pressure in deg.C and Kg/cm2g respectively.
- Insulation type i.e. IH/IC/IJ/IC etc
- Contractor Code;

INSPECTION ISO ID= Line number label should be as per the P&ID with the following attributes:

Line size + unit no. + line sequence no.+ sub-line no. + Piping material specification + Insulation Type .Pre-requisite attributes viz., PMS, Insulation and Model Zone (for hierarchy) to be ensured before creating Pipe as per Line List and Zone-Division.

b) **PDMS**

Separate models to be generated for each discipline

Discipline		Model Identifier
- Piping above ground	-	PI
- Piping under-ground	-	PI
- Equipment	-	EQ
- HVAC	-	HV
- Structural	-	ST
- Architectural	-	AR
- Electrical	-	EL
- Instrumentation	-	IN

Within each discipline, models to be generated based on the Zone Division developed by piping. The Naming conventions for model Database in PDMS shall be as follows:

XX	ZONE	XX
Model Identifier as given above	Levels	Zone Number

- Above ground and underground piping shall always be in different models.

Database Hierarchy in PDMS

Piping

a) PIPE NAME:

Line No. Label Specified in 1.4.1.13)	- Under Score	XX Zone/Area No

b) Branch Name:
PIPE NAME/B1,B2

c) TAG NOS:
For all Inline Instruments, Special items as component Name in PDS, Same tag numbering philosophy to be followed in PDMS.

XXX	-	XXX	XXXX	- X
UNIT No.	DASH	INST. TYPE i.e. PSV, FV, PV	INST. NO./ SPECIAL ITEM NO.	1,2,3.. Only if same no. is getting repeated

d) Structure:
All Structures shall be individually modeled in Zones, including all associated with Electrical / Instrumentation Supports, Saddle Supports, Pipe Supports etc.

Naming	
/XXX/TSXX	Tech Structure
/XXX/MPRXX	Container for Main Pipe Rack
/XX-CC-XXX/STR	Container for Structural Foundation and Platforms
/XX-CC-XXX/FDN	Foundation for the Equipment
/XX-VV-XXX/STR	Container for Saddle Support for Vessel, all Associated Platforms etc.

Line information required in PDMS model:

The following attributes must be keyed in while modeling:

- Line operating/design, temperature/pressure in deg.C and Kg/cm2g respectively.
- Insulation type i.e. IH/IC/IJ/IC etc
- Contractor Code;

Line number label should be as per the P&ID with the following attributes:

- Line size + unit no. + line sequence no.+ sub-line no. + Piping material specification + Insulation Type + Model Zone number.
- Pre-requisite attributes viz., PMS, Insulation and Model Zone (for hierarchy) to be ensured before creating Pipe as per Line List and Zone-Division.

5.0 WORKING METHODOLOGY

Detailed workflow of 3D model is indicated in the Annexure-III, However, discipline-wise 3D modeling methodology shall be as follows:

5.1 Working Methodology of Piping Department

Piping department shall be responsible for overall coordination, Project creation, piping specifications & catalogues, equipment modeling, piping modeling, interference management and extraction of piping deliverables eg. GAD's, Isometrics, System Isometrics and MTO.

5.1.1 Piping Specifications & Catalogues

Piping specifications and catalogues shall preferably be created after first issue of PMS. Piping specifications shall be imported from IPMCS using utilities developed for PDS & PDMS. During the course of the project these specifications and catalogues shall be updated based upon specific project requirements and new catalogs may be required.

Job specific new catalogs shall be created following EIL's naming convention. At the end of the project all newly created catalogs & specs shall be sent back to piping administrator at EIL HO for incorporation in master library.

5.1.2 Equipment Modeling

Equipment modeling shall commence at the beginning of the project at Equipment Layout finalization stage. The modeling shall be done using reference dimensions / data provided by originating disciplines (RED, PED, SED, HMTD) or from similar reference jobs previously done in the system. Unit wise Equipment modeling shall be done in relevant model files.

Piping shall also model basic requirement like extent of equipment platforms, ladders, Pipe rack , Tech. structure, Compressor sheds as input for Structures and package units locations . These shall be modeled as outlines in a separate model and shall be referred till the structural modeling is complete. Apex review is conducted on equipment layout extracted from the model.

Issued for engineering equipment layout shall carry location of Control Valve assemblies and Utility stations under pipe rack to enable other departments to plan the location of their facilities on pipe rack column faces. The same shall be modeled as blocks in the 3D model. Refer Annexure-II for location priority of various items on pipe rack column faces.

After issue of Equipment Layout, Equipment modeling shall be done zone wise in relevant zone / model files, based on equipment data sheets / mechanical data sheets / setting plans for exchangers and air coolers / vendor drawings / HMTD drawings for heater etc. Columns and vessels shall be modeled based on the SED drawings and data sheets.

Nozzle orientation drawings shall also be extracted from the model.

Fired heaters including air pre heaters, ID & FD fans, stack, duct's etc., shall be modeled based on HMTD drawings / Vendor drawings as applicable.

Package units and skid's where engineering is done by vendors / other agencies shall be modeled as box with piping hookup locations being precisely modeled.

Maintenance / operational and access areas eg. Exchanger bundle pulling, drop out areas for columns and compressor sheds, unit access areas, pump access areas below pipe racks etc. shall be modeled as soft envelops.

For projects where safety and escape routes are required, shall also be modeled as soft envelops.

5.1.3 Piping Modeling

After the finalization of Equipment layout, Piping modeling shall be carried out zone wise in relevant zone / model files. Piping study and conceptualization of pipe routing shall be done directly on the 3D model and shall commence once the equipment data is received.

It shall be ensured that critical lines such as transfer lines, two phase flow lines, overhead vapor lines, air cooler inlet / outlet piping, reboiler outlet etc. which may influence equipment layout and structure requirements shall be stress analysed during the course of piping study in the model.

One master set of zone marked P&ID's and line list shall be maintained with the piping administrator and modelers shall regularly highlight the extent of modeling on these P&ID's in order to identify and monitor the model progress.

Weekly review sessions of the model shall be extracted and made available to Group leader, designers and engineers for checking, clash detection, support planning and support marking. After 30 % model review stage regular review sessions shall also be sent to site for their reference and construction planning.

Zone wise isometrics shall be extracted and sent for checking, stress analysis & supporting.
A master set of zone marked P&ID's shall also be maintained with the Lead designer wherein the extent of checking shall be colour marked by the checker. Line list shall also be marked & updated in order to know the completeness of the lines.

All DCN's received shall also be marked on the Lead designer's P&ID set as well as the modeling administrator's set.

Support modeling shall be carried out after the receipt of support marked isometrics, clashes if any shall be resolved before AFC issue of isometrics.

AFC Isometrics shall be issued zone wise, however for critical lines these shall be issued after the line is completed. ISO index as extracted from the system shall be used.

In order to reach the second MTO milestone it is envisaged that 80% of the model shall be completed. Model completion shall be targeted to coincide with third MTO stage.
Fire water headers in units shall only be modeled. Tap offs' for sprinkler system in mechanical contractor's scope of supply, shall be modeled for indicative MTO purpose.

All small bore utility lines shall be modeled except lines which are required to be field routed eg., Instrument flushing lines, steam tracing non IBR lines etc.

Record for lines which are not being modeled shall be kept in order to account for manual MTO of these lines. However for steam tracing system, steam supply header up to tracing tap-off valve and condensate manifold beyond steam trap and valves shall be modeled.

Jacketed lines shall be modeled only for core piping. Outer piping shall not be modeled and manual MTO for the same shall be taken care of.

GAD extraction shall commence after 60 % model review is completed. Area wise GAD's shall be taken up progressively depending on the completion of areas. GAD's shall have minimum annotation such as grid nos, equipment nos., line nos. instrument tags and salient locating dimensions.

Line nos. and location co-ordinates of all lines shall be at the B/L of the GAD.

5.2 Working Methodology of Structural Department

Structural modeling shall commence with grid modeling at beginning of project. Model coordinators of piping and structures shall interact for finalization of pipe rack & tech structure floor elevation and extent.
Basic framework like width & elevation, floor elevation, platform extent and tentative column sizes for Pipe racks, Tech structures and plant buildings shall be modeled for Apex review of equipment layout by structures.
After the apex review and finalization of equipment layout for engineering, structures shall proceed with design & modeling of structural entities as listed in the scope matrix (Annexure-I).

The following shall be the sequential steps:

- Structural modeling on TEKLA shall be done for all structures (pipe racks, technological structures, T-supports) and shall be transported to 3D modeling system. Input for pipe racks / technological structures etc. shall be taken from equipment layouts. 3D modeling of pipe rack shall precede piping modeling.

- Inputs for equipment locations, elevation and extent of local & vessel mounted platforms,
- T-supports, inter-connecting platforms, shall be taken from the 3D model after confirmation of completeness of input from piping department.

- All equipment mounted platforms shall be modeled on 3D modeling system on completion of design and drafting of these as per structural standard / CADPAL package.

- For Instrument Duct and Electrical Tray supporting structure, Structure shall take input from 3D model. Trenches, Pipe cross-overs and culverts shall be modeled in consultation with General Civil, Electrical & Instrumentation.

- Gratings / Chequered plates including cutouts, Equipment supporting stools, foundation, table top, saddle supports & monorails etc. shall be modeled on 3D model. All handrail and stairs / ladders shall be modeled using customized modules on 3D modeling system.

MTO for steel structures shall be extracted from the model which shall include stairs, handrails, ladders etc. However mto for concrete structures & foundations will not be generated from the model.

5.3 Working Methodology of Electrical Department

3D modeling by electrical shall commence after unit area equipment layout has been issued for engineering, 3D modeling including pipe rack and tray supports have been completed and the area has been cleared by both piping and structural departments after interference check.

Following methodology shall be adopted for modeling major electrical items in unit areas once the process of customization in PDS/PDMS system is completed.

- Overhead cable trays along with cable tray accessories like horizontal/vertical bends, tee, cross, reducer etc. of size equal to or greater than 100 mm as per standard geometry available in respective PDS/PDMS system.
- Local Control Stations for all motors.
- All lighting/power panels, control gearbox, welding receptacles, flood light mast, earth strip, earth electrodes, earth plates etc., shall be modeled along with their dimensions.
- All break glass type manual call points required for fire alarm system.
- All field mounted call stations, paging loudspeakers, telephones, acoustic hood etc. required for plant communication system.

The following advantages can be derived from the above activities.

- Interference of overhead cable trays and other electrical equipments can be avoided from the structural and piping members already modeled in the unit areas.

- MTO can be generated for overhead cable trays and accessories modeled in 3D.

The following layout drawings can be extracted from the system which are presently being made on AutoCAD.

- Cable Tray layout
- Plant communication system layout
- Lighting Layout
- Fire alarm layout
- Earthing Layout

5.4 Working Methodology of Instrumentation Department

3D modeling by instrumentation shall commence after unit area equipment layout has been finalized for engineering by piping and the following activities can carried out:

- Instrument cable ducts along with fittings like elbows, tees, reducers/expanders etc.
  Instrumentation to discuss with piping and ensure that duct layout is based on the number of zones within a unit given by piping.
  Cable trays on Main Pipe Racks (for trays >= 300mm)
  Piping shall provide area grouping drawing (Zone drawing) as soon as they finish clubbing of area.
  Instrumentation to ensure that continuous and intermediate supports for duct with structural department.
- Near exact geometry representation of analyser shelters and local control panels, analyser racks/cabinets located in field.
- Block representation of control room with piping and cable entry points. Inside control room is not to be modeled.
  Local Control Panels (LCP) like Heater LCPs, Damper Control Panel, LCP for FD/ ID Fan, LCP for BMS shall be modeled based on vendor drawings.
- Instrument Junction boxes.
  Allocate space for mounting Instrument Junction Boxes:
  a) On every alternate column - outer face
  b) Inner face of first and then fourth column.
- Prefabricated Hook ups
- Gas Detectors
- Closed Circuit Television
- Instrument stanchions
- Instrument air lines to consumer

For Package units where engineering is done by vendors / other agencies, shall be modeled as box with hookup locations. Inside the box, it is vendor's responsibility to carry out the precise modeling.

In case of EIL as LSTK contractor, If vendor is unable to carry out the modeling, then EIL to take up and complete the activity if agreed as per contract.

5.5 Working Methodology of General Civil Department

General Civil shall commence the modeling of Plot plan after PPRRC approval. Complete Plot Plan shall be modeled indicating the various blocks for offsites, utilities, units, road layout. These blocks shall be replaced by detailed models as the engineering progresses.

General Civil shall model all the Under-ground facilities like, UG piping, storm water drains, cable trenches, pipe way bridges, storm water culverts, electrical & instrumentation road crossings, pipe sleepers, fire water pipes, hydrants, monitors, hose boxes, hose reels

etc. as defined in the scope matrix (Annexure-I) for Unit as well as offsite in close coordination with Piping and Structure departments.

RCC Pavements and Hardstand Area shall be modeled by General Civil based on input given in Equipment Layout by Piping.

For the Apex Review of Equipment Layout for units, general civil shall model pavement, Grading, UG Fire water circuit, main Roads, Approach Roads, and Culverts etc. Basic corridors of UG piping shall be identified on 3D model by Piping department and shall be modeled by General Civil.

After Apex Review, once Piping department identifies the zones & uploads the PMS in the model, General Civil shall model All UG piping for Cooling water/OWS/CRWS/CBD/Caustic/Drinking water etc., electrical / instrumentation cable trenches, catch basins, manholes, clean out pit, valve pit, fire water network in trenches, hydrants, monitors, hose boxes, hose reels, safety shower & eye-wash at pavement level etc

Piping shall model all AG piping terminal points for OWS, CBD, ABD, SS points for pumps, exchangers, compressors, vessels in 3D model. General civil will connect these points with UG piping connections. In case the AG piping terminal point locations are not available due to lack of vendor data (pumps, compressor sheds, packaged units etc.), General Civil shall start modeling after finalization of standard philosophy of routing headers, sub-headers and UG points with Piping. Once the UG points are finalised and modeled, piping shall modify the AG piping to match UG points.

Interference check shall be carried out on regular basis within General Civil scope of model as well as with Structural and Piping entities for assuring clash free model. General Civil shall extract all Project deliverables from the Model only after interference checking.

MTO for underground piping shall be extracted from the Piping module which shall include pipes, valves, fittings, bends etc. However, MTO for concrete structures like manholes, valve pits, Trenches etc. shall be extracted separately from structural module.

5.6 Data Consistency Check

Modelers shall be responsible for performing a data consistency check on each pipe at completion of its respective input and shall correct all errors and or inconsistencies reported. The modelers shall ensure that:

- Adjacent items are connected
- Connection types are compatible
- Bores are consistent
- No gaps exist in the pipe and all branches are within the network
- Components are geometrically aligned
- All branch connections are made and complete
- All vessels connections are made and complete
- Tube lengths are acceptable
- Elbow angles are acceptable

Working of the other Disciplines, Refer 3D modeling workflow chart Annexure –III

6.0 DISCIPLINE INTERFACE

3D Systems shall be customised to extract all reports and deliverables (eg. General arrangement drawings for structures, electrical and instrumentation, piping GAD's, Isometrics, MTO's etc.) directly from the model so that correct and coherent information and data flows across the project. All the inter-discipline inputs shall be furnished in the model and validation of the data shall be through 3D model platform.

Structural department will match the location & elevations of equipment foundations with respect to the modeled equipments and resolve any discrepancy in consultation with piping. Foundation drawings will be sent to piping for information only. Any change in equipment location during detail engineering stage shall be communicated to structural department by piping.

Floor / platform penetrations shall be taken / verified from the completed piping area models and shall be modeled by structures so that these are not reported as clashes during interference checking.. Coordination for any subsequent change shall be done by piping.

Structures while modeling secondary members and bracings shall keep the piping model in view and locate these members so as to clear piping. Resolutions to problems if any, shall be carried out in consultation with piping.

All underground Piping & trenches being modeled shall be checked for interference with structural foundations.

Co-ordination with Electrical, Instrumentation & Piping departments for cable trenches, pipe sleeves and road crossings.

7.0 INTERFERENCE MANAGEMENT

Modeling of all the disciplines shall progress concurrently in order to have effective interference detection. Interference checking is a progressive activity and shall depend on the modeling status of piping, equipment & structures. The following methodology shall be adopted to check interference:

a) All disciplines to ensure clash-free design prior to extraction of deliverables from the model.
b) All lines / areas for which AFC isometrics are being issued shall be checked for interference by piping.
c) All equipments being modeled shall also be checked for interference and also when these are being modified they shall be checked for interference by piping.
d) All structures being modeled by structural department shall also undergo interference checking as and when the structures are completed and also subsequently as and when any structure is modified. This activity shall be performed by structure group.
e) Piping and structures shall coordinate to resolve interference, sitting on the terminals at the earliest as and when interference is detected.
f) At the 100% model completion stage each area shall once again be checked by piping for clash detection.
g) During the modeling activities, it is mandatory that all modelers attach / display the models of all disciplines for that particular zone so as to minimize clashes. Modelers can also use the clash detection facility of the 3D modeling system on regular (preferably weekly basis) for their respective zones.
h) The complete 3D model must be clash checked prior to any model review, internal review as well as review with the client.

i) The modeler is responsible for correcting any clashes that are highlighted by this utility as they occur and resolve them with the model coordinator of respective discipline.

j) In case of clash between two items modeled by different disciplines, then the resolution will be found after mutual discussion between concerned disciplines. e.g. if there is a clash between rack foundation & Electrical UG cable trench it will be discussed & resolved by Civil, Electrical and Piping.

k) Before release of AFC drawings, all entities will be checked for clashing, reports will be Generated and clashes if any will be resolved. Once the AFC drawings are released, the respective models shall be locked by the concerned discipline coordinator, if further modification are required, the models shall be shall unlocked by respective model coordinator after proper intimation to all the disciplines concerned. Proper record of this activity with reasons shall be maintained.

8.0 DESIGN REVIEW

The 3D model is an intelligent to the scale and specification driven electronic replica of the plant to be constructed which is amenable to review in design office. Stage wise reviews shall be carried out with active participation by Piping, Structural, Instrumentation, Electrical, General Civil, Process, POSD, Construction and Client.

Design review for a project shall be carried out in two stages.

- Internal Model Review
- Client Model Review

A. Internal Model Review

3D Model Review shall be conducted internally by individual Departments to check the model for completeness of inputs, hold identification, progress review, identification & resolution of model queries and interface with other departments. Model Coordinator shall arrange for Internal Reviews as directed by the SGL, all Engineers shall be present in the Review. Internal Model Review shall be conducted regularly (preferably on monthly basis).

Regular Inter departmental reviews are crucial to create consensus on the plant layout and avoiding future rework. Internal review of model shall be carried out regularly and at 4 significant progress milestones. The monthly Internal model reviews to coordinate engineering inputs, resolve clashes and improve model interface shall be coordinated by Piping administrator. Model coordinators and Lead engineers of all modeling departments shall be a part of these reviews, other departments can be invited on need basis.

3D model shall be furnished to HO construction for their comments regarding constructability, Heavy equipment movement, crane movement etc. before finalization of equipment layout.

The internal model review with wider participation shall be conducted at following project progress stages:

Equipment Layout	- Apex review of Equipment layout shall be accompanied by 3D model for finalising unit size, construction methodology and erection sequence etc.
Stage I(30%) -	After modeling of major equipments, pipe rack, technological structures, foundations, cable trays and ducts, major lines.
Stage II (60%) -	When approximately 50 to 60% piping modeling is complete.

Stage III(90%) - When 90% piping modeling is complete.

These Internal reviews shall be coordinated by PEM / Project Manager and conducted by piping involving all the modeling participating departments, Process, POSD and Construction.

The review shall be carried out on the system and comments if any shall be jointly finalised so that the respective departments can update the model accordingly. Subsequent to updation of the model, a second review shall be carried out to verify the incorporation of the comments.

B. Client Model Review

Review by Client shall be done after the completion of 30%, 60% and 90% modeling by all participating departments. This activity shall be coordinated by PEM / Project Manager. All the modeling departments as well as process, POSD and Construction (preferably RCM) shall participate in this review.

The Review shall be carried out on the system and all finalised comments originating as a result of this review shall be compiled by PEM / Project Manager and incorporated by respective engineering discipline in the model.

After the incorporation of client comments, a further review will be performed by PEM/PM to check compliance, client participation can be at the discretion of PM.

For LSTK jobs, where EIL is the LSTK contractor, specific Client and PMC requirements shall be taken into account before finalization of the Model Review plan and sequence.

The model shall be reviewed with the client in the presence of the relevant discipline Engineers/Designers, to discuss accessibility, operability, maintainability and constructability aspects.

Model review report will be prepared listing all action points with comments and recommendations. Modifications / changes if suggested by client shall be mutually agreed. The same will be issued as MOM after the review.

Model review comment-Action close out report will be issued once all the actions are taken incorporating model review comments.

The review schedule for 3D Model shall be as follows:

FIRST MODEL REVIEW (30% REVIEW):

The objective of the first model review is to consolidate the Equipment, Piping and platform layouts focusing mainly on the constructability, maintenance and safety (HSE) aspects. Consequently this review includes a safety review, constructability review and Basic Design review.

The model content must consist of the following items:

- All equipment with nozzles.
- Approx. 40% of the piping (Big bore & process critical lines).
- All Buildings (as a block), Shelters (with main frames).
- All package Units (as a block).
- Major maintenance areas (bundle pulling, dropping areas, etc).

- Main Pipe rack and sleepers.
- Electrical Cable Tray/Trenches & Instrumentation items that impact plot plan
- Main platforms, ladders and stairs.
- Roads and plot limits.
- Location of all critical instruments.
- Escape routes.
- Main fires fighting equipments.
- Plant Boundary.
- Main headers of underground piping
- Underground trenches

SECOND MODEL REVIEW (60% REVIEW):

This review is the design review intended to confirm the entire plant layout. The main focus will be on operability, accessibility, process design review and maintenance of the facilities. All action items of 30% model review shall be resolved before 60% model review.
The model content must consist of the following items:

- All large bore piping and associated instruments
- All buildings and shelters with detailing as applicable
- All Equipment with trims such as stand pipes / level gauges/transmitters etc.
- All package units (as a block with limited details if required).
- All structures & supports
- All platforms, ladders, stairs
- All fire fighting systems (including hydrant, monitors)
- All Underground Systems
- Branch cable tray/trench routing & support
- Main earth strips, earth electrodes and earth plates
- Instrumentation duct routings and support
- CCTV, Fire and Gas Detectors, Part of Instrument Junction Boxes.

THIRD & FINAL MODEL REVIEW (90% REVIEW):

The third & final model review is intended to confirm the results of the other outstanding details of the 60% model review. The model must be complete with only minor items under "HOLD".

- All small bore piping and associated instruments
- Offline instruments
- Utility stations
- Instrumentation facilities including local operation panels
- Instrument Duct & Electrical branch cable tray routing & supports
- Instrument Prefabricated Hookups
- All safety systems (eye-washer, safety showers, escape routes).
- Instrument Air line distribution
- Instrument Junction Boxes, Instrument Stanchions
- All Cable Trenches /Trays
- All lighting fixtures, lighting & power panels, junction boxes
- All earth strips, earth electrodes and earth plates
- All fire alarm equipments
- All PA system equipments
- All local control stations for motors

9.0 DELIVERABLES & DRAWING EXTRACTION

All reports and deliverables for various disciplines like Piping, General Civil, Structures, Electrical and Instrumentation shall be extracted from the system so that correct and coherent information and data flows across the project. All deliverables listed below shall be extracted from the model and uploaded in EDMS as per EIL numbering procedure:

Piping

a) Equipment Layout
b) Nozzle Orientation
c) Piping Isometrics for all lines (including small bore)
d) Piping General Arrangement Drawings
e) Support Index for Offsites

Structure

a) Foundation Drawings
b) Pipe rack structure drawings (Plan & Elevation)
c) Equipment Platforms, UG Pits, Tech Structure Drawings
d) Platform on Grade, T-Support Drawings
e) Compressor House Drawings
f) Pile Layout
g) Offsite Structural Facility Drawings

Instrumentation

a) Instrument Duct Layout
b) Gas detector, CCTV Location Drawing

Electrical

a) Electrical Cable Layout
b) Lighting Layout
c) Earthing Layout
d) Plant Communication and Fire Alarm system layout

General Civil

a) Plot Plan
b) Offsite Area Drawings
c) Unit underground piping area drawings
d) Fire Fighting System Drawing
e) Roads, Access-ways, Escape Route Drawings
f) Hard Surface for Crane Movement.
g) Unit RCC Pavement Layout.
h) MTO for underground piping

10.0 SYSTEM BACKUP

System backups shall be taken at two levels.

Level 1-Level 1 backup is a back up which is taken by the ITS group every week .

Level 2- Level 2 back ups are to be taken by individual administrators at their respective locations These backups shall be taken for the entire project and shall be taken on one of the local hard disk of the system. The frequency of such backups shall be decided by each coordinator depending on the criticality of the project. However, at least one backup must be taken every week preferably on Wednesday so that midweek data is available.

Annexure – I

Scope Matrix for 3D Modeling

	Category	Design Item	Modeling Item	SCOPE of MODELING (department)					REMARKS
				PIP	INST.	ELEC.	GEN CIVIL	STR.	
A/G	Piping	A/G Piping Components	All Piping Components (*)	X					(*) Except for steam trace piping, jacketed piping
			Insulation	X					
			Piping Supports	X					
			Piping Specialty	X					
			Piping clips	X					
			Vendor's Piping	X					Wherever applicable
	Equipment	Reactors / Columns/ Vessel Drums	Body	X					including envelops for maintenance , drop out areas etc
			Nozzle	X					
			Skirt	X					
		Horizontal Drums	Body	X					
			Nozzle	X					
		H/Exchangers	Body	X					
			Nozzle	X					
		Air Fin Coolers	Body	X					
			Nozzle	X					
			Support structure					X	
		Tanks	Equipment Body	X					
			Nozzle	X					
		Equipment Platform	Body					X	Initial input by piping in 3D model
			Handrail					X	
			Bracket					X	
		Ladder for Equipment	All					X	
		Stair for Equipment	All					X	Tank top platform & staircase drawing shall not be extracted from model
		Insulation		X					extent & detailing to be debated
	Rotary	Rotating Machinery (Pumps, Blowers, Compressors, Turbines)	Body	X					Simplified Model(Outline Only)
			Nozzle	X					
			Driver	X					Simplified Model(Outline, tie-in nozzle and elect. JB)
			Auxiliary Skid such as Lube oil unit, Dry Gas Seal unit, Water Injection unit and so on	X					Simplified Model(Outline, tie-in points)
	Package	Packaged Equipment	Body	X					Simplified Model(Outline, tie-in points), as per project requirement
			Nozzle	X					

	Category	Design Item	Modeling Item	SCOPE of MODELING (department)					REMARKS
				PIP	INST.	ELEC.	GEN CIVIL	STR.	
	Furnace	Furnace	Body	X					Simplified Model(Outline Only)
			Nozzle	X					
			Platform, Handrail					X	
			Ladder					X	
			Stair					X	
			Duct	X					
	Fire Fighting	Fire Fighting Equipment	Body	X					
		Spray systems, Dry risers, Foam systems, Fire ring main routing, Block valves, Fixed Monitors, Hose boxes, Deluge valve manifolds	Nozzle	X					
		Hydrant / Monitor	ALL	X					
	Civil	Paving	ALL				X		(*) Paving will be modeled as a flat slab at high point level
		Road	ALL				X		
		Site Grading	ALL				X		If required
		Earth Dike & Earth Pond	ALL				X		If required
A/G	Structure	Foundation (Pedestal)	ALL					X	
		Concrete Structure	ALL					X	
		Table Top	ALL					X	
		Pit & Pond	ALL					X	
		Retaining Wall	ALL					X	
		Spill Wall	ALL					X	
		Pipe Sleeper	ALL				X		
		Concrete Dike	ALL					X	
		Steel Pipe rack	ALL					X	
		Steel Structure	ALL					X	
		Shelters	ALL					X	
		Monorail	ALL					X	
		Platform	ALL					X	
		Walkway	ALL					X	
		Ladder	ALL					X	
		Stair	ALL					X	
		Handrail	ALL					X	
		Stanchion	ALL		X				
		T support	ALL					X	
		Cable tray / duct support	ALL					X	
		Fireproof	ALL					X	
A/G	In-Line Instruments	Pressure Instruments	ALL	X					

	Category	Design Item	Modeling Item	SCOPE of MODELING (department)					REMARKS
				PIP	INST.	ELEC.	GEN CIVIL	STR.	
		Flow Instruments	ALL	X					
		Prefabricated Assemblies	ALL		X				
		Temperature Instruments	ALL	X					
		Control Valves (*)	ALL	X					actuator dimensions shall be modleled
		On-Off Valves (*)	ALL	X					
	Ofl-Line Instruments	Main A/G Cable Tray	100 mm and above		X				
		Junction Box	ALL		X				
		Local Panel & Cabinet	ALL		X				
			ALL	X	X(**)				(**) For tanks handled by Inst. section.
		gas detector, cctv	ALL		X				
		Stanchion	ALL		X				
		inst air lines	ALL		X				from headers to consumers
		Analyzer House	Outline		X				
	Electrical	A/G Cable Tray	100 mm and above			X			
		Local Control Station including supports	Outline			X			
		Lighting fixtures, control gear boxes, junction boxes, welding receptacles, flood light mast	ALL			X			
		lighting / power panels	ALL			X			
		earth strips , earth electrodes, earth plates	ALL			X			
		break glass units,	ALL			X			
		Outdoor field call stations , loud speakers, telephones	ALL			X			
A/G	Building	Substation & Power Station	Outline					X	Location of entrance to be identified. Simplified Model(Outline Only)
		Control Building & PIB	Outline					X	
		Laboratory	Outline					X	
		Warehouse & Storage Building	Outline					X	
		Machine & Equip. Building (HVAC DUCT shall be modeled.)	Outline					X	
		Office & Clinic	Outline					X	
		Guard House	Outline					X	

	Category	Design Item	Modeling Item	SCOPE of MODELING (department)					REMARKS
				PIP	INST.	ELEC.	GEN CIVIL	STR.	
		Fire Station	Outline					X	
		All other buildings	Outline					X	
	Others	Lay down Area(*) / Drop Down Area		X					(*)Area Marking only
		Tube Bundle Extraction Space		X					
		Escape Way		X					
U/G	Non-Pressure Piping	Oily Water Sewer/Contaminated Surface Water/ Sanitary Drain (OWS/SWS/SYS)	U/G Piping components				X		
			Catch Basin				X		
			Manhole				X		
			Valve Pit				X		
			Vent Pipe	X			X		Above ground by piping
			Drip Funnel				X		
	Pressure Piping	Closed Drain, Amine Drain etc.	U/G Piping				X		
			Pipe Trench				X		
		Fire Water/Foam line (FW / FF)	U/G Piping				X		
			Valve Pit(*)				X		(*)If any
		Other Pressured Line (CW, DW, etc)	Modeling (U/G Piping)				X		
			Valve Pit(*)				X		(*)If any
	Inst./Elec. Cables	Direct Buried Cable Trench	Outline		X	X	X		intial input by inst. Electrical in 3d model
		Concrete Cable Trench	Outline		X	X	X	X	intial input by inst. Electrical in 3d model
		Telecom Manhole	Outline				X		
		box culvert	Outline		X(*)	X(*)		X	(*) Information only
		Electrical / instrumentation Road crossing					X		intial input by inst. Electrical in 3d model
		Road culvert					X		intial input by inst. Electrical in 3d model
	Concrete	Foundation	All					X	
		Concrete Pit	All					X	
		Open Ditch	All					X	
		Pile	All					X	

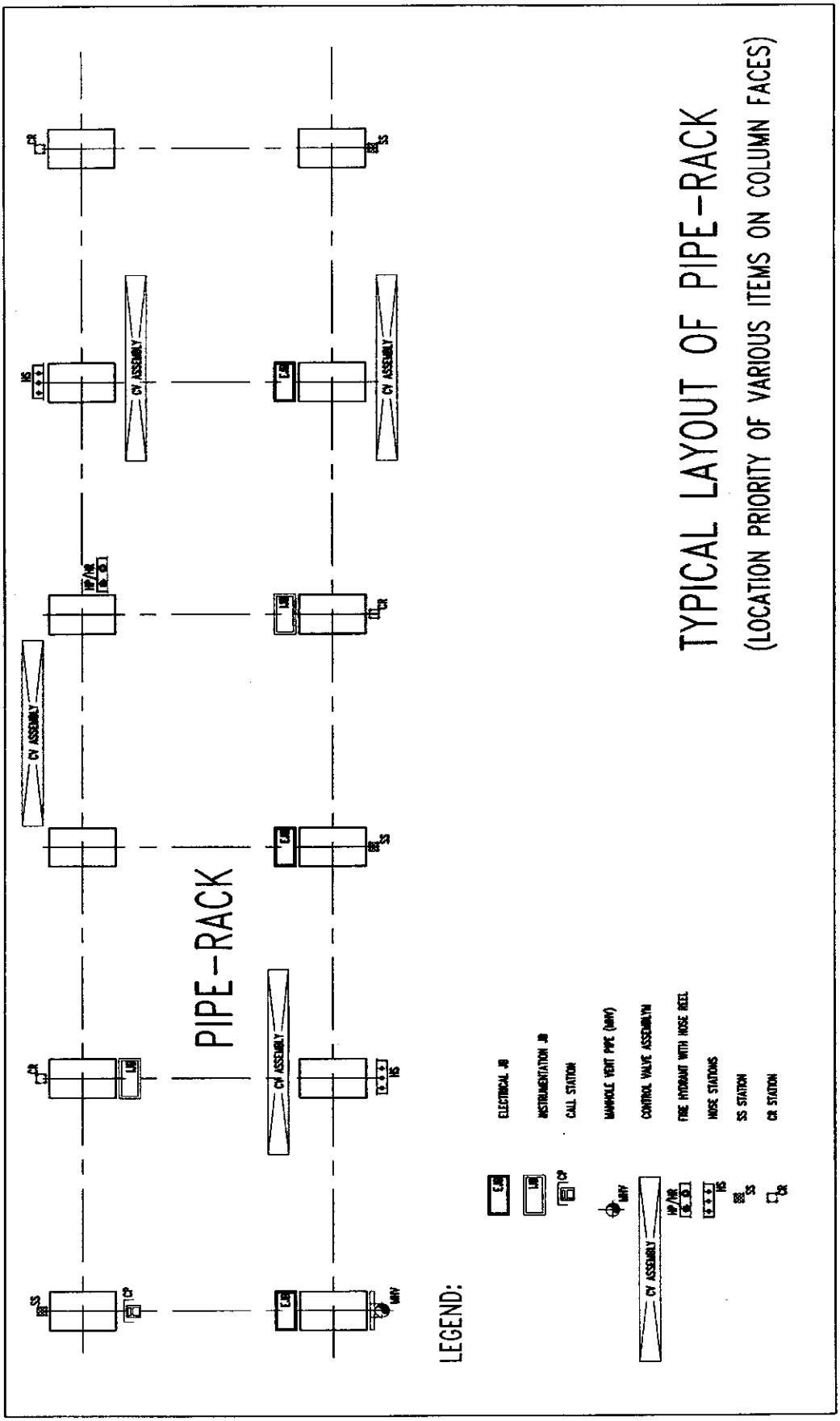
Legend : X Indicates Modeling responsibility

Annexure-II

Location Priority of various items on Pipe rack column faces

Outer face of Pipe rack Column	Manhole vent	Route offset from column centerline
	Steam / condensate station	Every 30 of pipe length
		1 per 3 bays
		Can be run along u-clamp from column face
	Utility hose station	1 per 3 bays
		Can be run along u clamp from column face
	FW hose reel	Occasional as required
	Control Valve Assemblies	Alternate column clearing manhole vents , SS & CR stations
	Stanchion	Wherever space is available
Inner faces	PA system(call station)	Wherever space is available
	Electrical Junction Box (lighting)	Every alternate column
	Instrumentation Junction Box	Every alternate column
	Welding spectacles	Every 50 m
	Control Valve Assemblies	Wherever space is available
Side faces	Bracket	

Refer page 27 of 28 for drawing depicting the above mentioned location priorities.



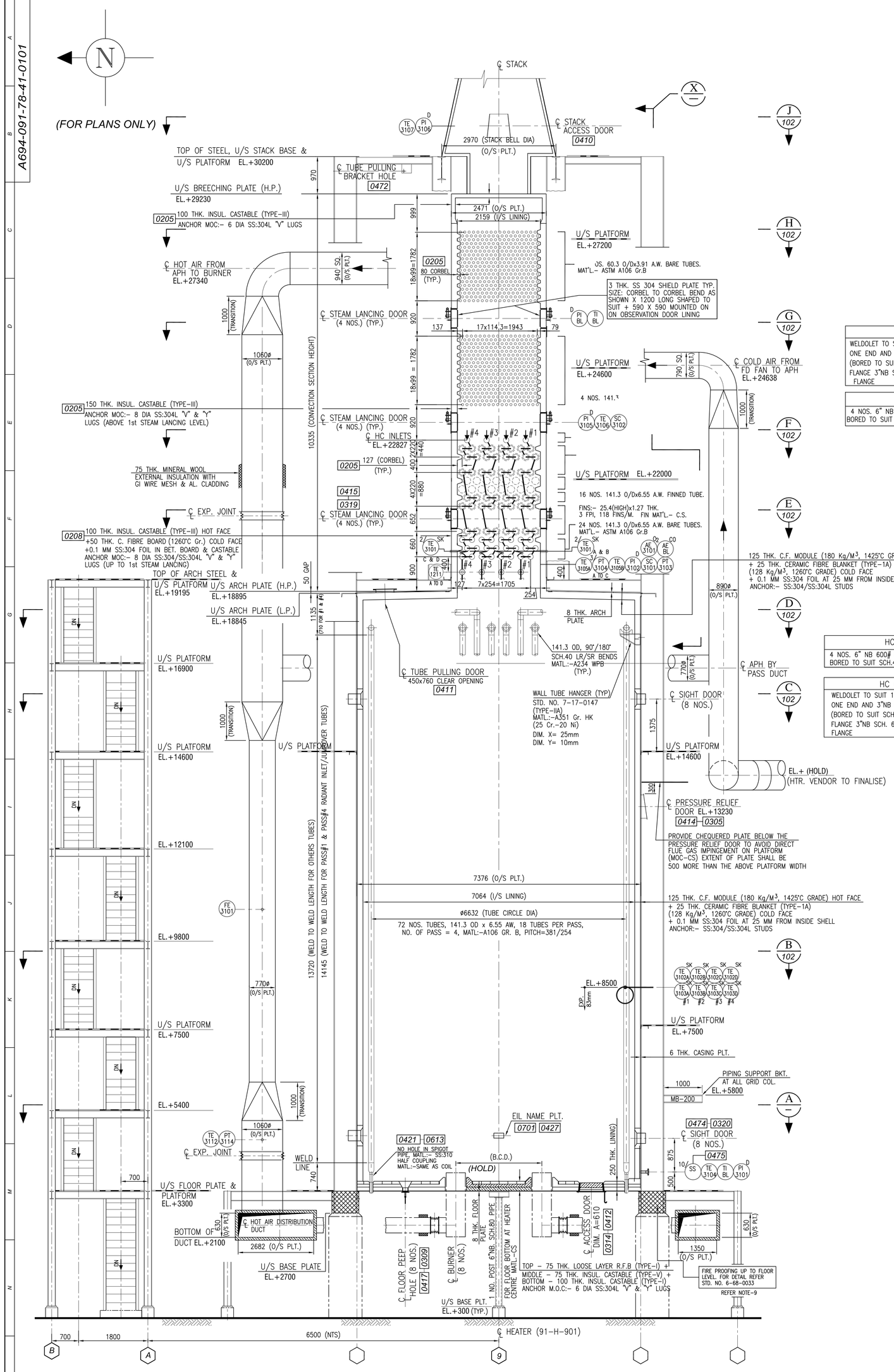
Annexure-III

3D MODELING WORKFLOW

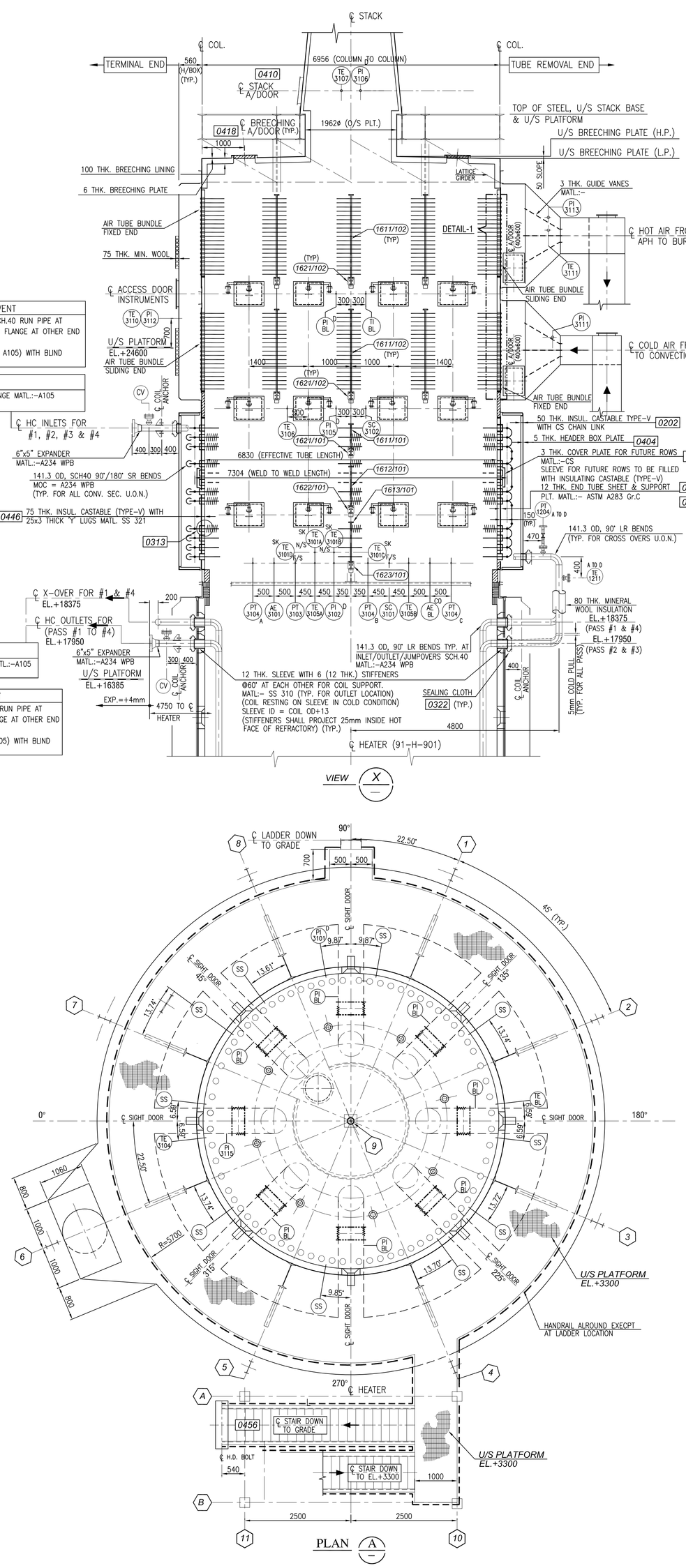
- **PROJECT CREATION**
  - IDENTIFY SYSTEM
  - PIPING ADMIN CREATES PROJECT DATABASES
- **SPECS & CATALOGS**
  - DEPARTMENT ADMINISTRATORS CREATE RESPECTIVE SPECS & CATALOGS
- **PLOT PLAN MODELING**
  - GENERAL CIVIL
    - MODEL ROADS ETC
  - PIPING
    - MODEL UNITS AS BLOCKS
- **EQUIPMENT LAYOUT**
  - PIPING
    - MODEL EQUIPMENTS USING TENTATIVE DATA OR SIMILIAR DATA FROM PREVIOUS JOBS
    - INDICATIVE PIPE RACK, TECH STR, GRIDS
    - EXTRACT 2D LAYOUT FOR COMMENTING AND APEX REVIEW
  - GENERAL CIVIL
    - UG CORRIDOR MODELING UG TRENCHES, ROADS ETC
  - STRUCTURES
    - RACK , TECH STR MODELING BASED ON PIPING INPUT
  - ELECTRICAL
    - ELECTRICAL TRAY LOCATION
  - INSTRUMENTATION
    - INST DUCT LOCATION
    - ANALYSER SHED LOCATION
- **STRUCTURE MODELING**
  - GRID MARKING
  - RACK MODEL
  - MODEL TECH STRUCTURE, AIR COOLER MAIN BEAMS & COLUMNS
- **OFFSITE MODELING**
  - PIPING
    - EQUIPMENT MODEL
      - TANKS
      - PUMP HOUSE
      - FLARE STACK
    - ABOVE GROUND PIPING
      - START AFTER GRID & RACK MODELING
      - ALL ABOVE GROUND PIPING
    - PIPING SUPPORTS TAGS ONLY
      - EXTRACT SUPPORT INDEX FOR OFFSITES
  - STRUCTURES
    - GRID MARKING
    - MODEL RACK, ROAD CROSSING ETC
  - GENERAL CIVIL
    - ROADS
    - ALL OPEN , CLOSED CULVERTS
    - TRENCHES, CATCH BASINS, MANHOLES, UG PITS, FIRE WATER NETWORK MODELING
    - ELECTRICA LINSTRUMENT ROAD CROSSINGS
    - DYKES
    - TRENCEHS
  - ELECTRICAL
    - ALL OFFSITE TRAYS
  - INSTRUMENTATION
    - ALL OFFSITE DUCTS
- **UNIT DETAIL MODLEING**
  - STRUCTURES
    - GRID MARKING
    - RACK MODEL
    - TECH STRUCTURE , AIR COOLER STR. MAIN BEAM & COLUMN MODEL
  - PIPING
    - EQUIPMENT MODEL
      - PDS WITH EQUI DIMENSIONS, NOZZLE SIZES , RATING, NOZZLE PROJECTION
      - PREFFERED NOZZLE ORIENTATIONFOR COLUMNS BY HMTD
      - THERMOWELL NOZZLE ELEVATIONS BY HMTD
      - MANHOLE , BTL ELEVATION & SETTING PLAN BY HMTD
      - FINAL LEVEL SKETCHES
      - TENTATIVE DATA FOR PUMPS & COMPRESSORS BY RED (ORIENTATION, SKID SIZES , LAYOUT, NOZZLE SIZE & RATING)
      - TENTATIVE SIZE OF FILTERS COALESERS PACKAGE ITEM BY PED
      - MODEL EQUIPMENT CLIPS & INSULATION
    - ABOVE GROUND PIPING
      - START AFTER GRID & RACK MODELING
      - BASED ON ZONE MARKED MTO-I PIDS
      - MAJOR ASSMBLIES ON EQUIPMENT LAYOUT
      - MMODEL PIPING OF MAJOR EQUIPMENT LIKE COLUMN, REACTOR , HEATERS PIPING FROM STUDIES
      - PIPING OF VESSELS EXCHANGERS AIRCOOLERS DIRECTLY IN MODEL
    - EXTENT OF VESSEL , TECH STRUCTURE PLATFORMS, EQUIPMENT SUPPORT LOCATION
    - PIPING SUPPORTS IN 3D
      - CLASH REPORTING
      - 2D DRAWING FOR SPECIAL SUPPORTS
      - SUPPORT MTO
  - GENERAL CIVIL
    - UNDER GROUND PIPING MODELING
    - UNDER GROUND EQUIPMENT MODELING
    - TRENCHES, CATCH BASINS, MANHOLES, UG PITS, FIRE WATER NETWORK MODELING
    - EXTRACT DRAWINGS FROM MODEL
  - ELECTRICAL
    - MODEL ALL ELECTRICAL TRAYS
    - UG MOTOR CABLE LAYOUT
    - JUNCTION BOXES , PUSH BUTTONS LOCAL CONTRO LPANELS
    - LIGHT FIXTURES, PCS, PA SYSEMS
    - ELECTRICAL EARTHING PITS & EARTHING STRIPS
    - ELECTRICAL TRAYS FOR ALL SIZES
    - EXTRACT DRAWINGS FROM MODEL
  - INSTRUMENTATION
    - MODEL ALL INSTRUMENT DUCTS
    - MODEL JUNCTION BOXES THROUGH I-ONLINE INTERFACE
    - STANCHIONS
    - BLOCKMODEL OF CONTROL ROOM WITH PIPING & CABLE TRAY ENTRY POINTS
    - MODEL INSTRUMRNT AIR LINES TO CONSUMER
    - CHECK THERMOWELL PROJETION FOR INSULATED LINES
    - EXTRACT DRAWINGS FROM MODEL
- **PIPING STRUCTURTE INTERFACE**
  - PIPING
    - MARK EXTENT OF VESSEL , TECH STRUCUTE PLATFORMS, EQUIPMENT SUPPORT LOCATION, LADDERS STAIRCASE ETC IN MODEL
    - 3D MODEL OF SUPPORTS
  - STRUCTURE
    - PICK PLATFORM, LADDER, STAIRCASE ,EQUIPMENT SUPPORT, PIPING SUPPORT REQUIREMENT FROM PIPING MODEL
    - MODEL SECONDARY BEAMS, EQUIPMENT SUPPORT BEAMS, INSERT PALTES, PIPING SUPPORTING MEMBERS, PLATFORMS ETC
    - EXTRACT ALL DRAWINGS FROM MODEL
  - JOINT REVIEW & COMMENTING BY PIPING & STRUCTURES
    - COMMENTING ON MODEL BY ASSIGNED TEAM BEFORE ISSUING AFC DRAWINGS
- **PIPING GENERAL CIVIL INTERFACE**
  - PIPING
    - TENTATIVE SCHEME FOR PUMP UG CONNECTION BY PIPING & RED
    - COMPRESSOR PACKAGES
      - PLAN SUB HEADERS OUT SIDE THE SHED AREA FOR UG CONNECTION
      - LOCAION OF TIE-IN POINTS ON SUB HEADER BY PIPING & RED
      - CONENCTION BETWEN SKIDS & SUB HEADER TIE-IN POINTS AFTER VENDOR DATA
    - MODEL ALL OWS, CBD ABD POINT FOR PUMPS , COMPRESSORS , EXCHANGERS &VESSELS
    - ABOVE GROUND PIPING FOR MANHOLE VENT
  - GENERAL CIVIL
    - DIRECTLY CONNECT UG PIPING IN MODEL TO POINTS MODELED BY PIPING
    - UG PIPING FOR MANHOLE VENT
    - EXTRACT ALL DRAWINGS FROM MODEL
  - JOINT REVIEW & COMMENTING BY PIPING & GENERAL CIVIL
    - COMMENTING ON MODEL BY ASSIGNED TEAM BEFORE ISSUING AFC DRAWINGS
- **CLASH CHECKING**
- **MTO**
  - ABOVE GROUND PIPING MTO
  - UNDERGROUND PIPING MTO
- **DRAWING EXTRACTION**
  - STRUCTURAL
    - FOUNDATION DRAWINGS
    - PIPE RACK STRUCTURE DRAWINGS (PLAN & ELEVATION)
    - EQUIPMENT PLATFORMS , UG PITS, TECH. STRUCTURE DRAWINGS
    - PLATFORM ON GRADE, T-SUPPORT DRAWINGS
    - COMPRESSOR HOUSE DRAWINGS
    - PILE LAYOUT
    - OFFSITE STRUCTURAL FACILITY DRAWINGS
  - GENERAL CIVIL
    - PLOT PLAN
    - OFFSITE AREA DRAWINGS
    - UNIT U/G PIPING AREA DRAWING
    - FIRE FIGHTING SYSTEM DRAWING
    - ROAD , ACCESSWAY , ESCAPE ROUTE DRAWINGS
    - HARD SURFACE FOR CRANE MOVEMENT
    - UNIT RCC PAVEMENT LAYOUT
  - PIPING
    - EQUIPMENT LAYOUT
    - NOZZLE ORIENTATION
    - ISOMETRICS
    - GADS
    - SPECIAL SUPPORT DRAWINGS
  - ELECTRICAL
    - ELECTRICAL CABLE LAYOUT
    - LIGHTING LAYOUT
    - EARTHING LAYOUT
    - PLANT COMMUNICATION AND FIRE ALARM SYSTEM LAYOUT
  - INSTRUMENTATION
    - INSTRUMENT DUCT LAYOUT
    - GAS DETECTOR , CCTV LOCATION DRAWING
- **MODEL REVIEW**
  - 30%
  - 60%
  - 90%
  - INTERNAL
  - LICENSOR REVIEW
- **MODEL ADMINISTRATION**
  - ZONE WISE TEAMS FOR VARIOUS DISCIPLINES FOR COORDINATION & CONTROL
- **CHANGE MANAGEMENT**
  - LOCK MODES AFTER AFC DRAWING EXTRACTION
  - MODIFICAION AFTER AFC DRAWINGS ONLY AFTER JOINT REVIEEW
- **INTERFACE WITH SITE**
  - 3D MODELS SHALL BE SENT TO SITE AT REGULAR INTERVALS
- **REPORTS**
- **INTERFACE WITH SOFTWARE**
  - IPMCS
  - BOUGHT OUT
  - EDMS
  - I ONLINE
  - TEKLA
- **ARCHIVAL & JOB BACKUP**
- **CUSTOMISATION & PROJECT SPECIFIC REQUIREMENT**

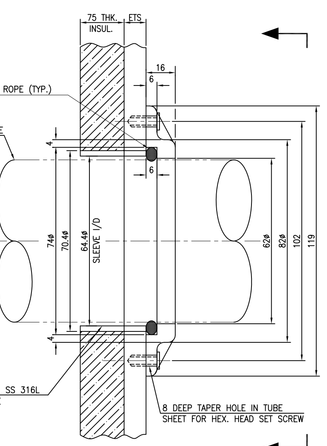
A694-091-78-41-0101

(FOR PLANS ONLY)

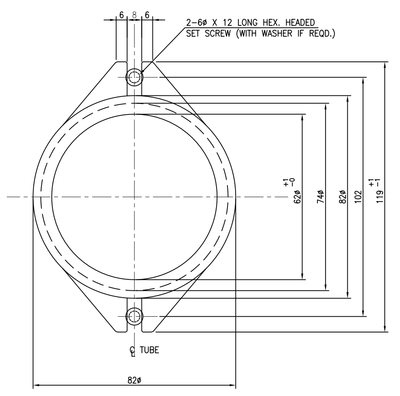


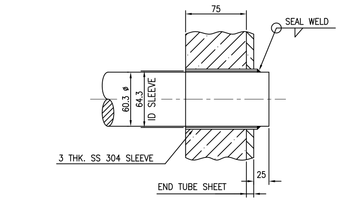
DIAGRAMMATIC ELEVATION OF HEATER (VIEW FROM TERMINAL END)
(FOR TRUE ORIENTATION REFER PLANS)



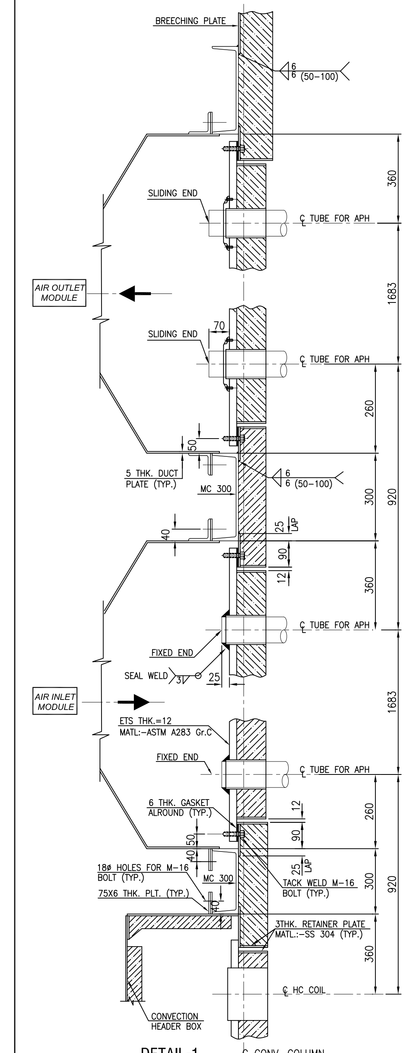


DETAIL OF TUBE SEALING FOR SLIDING END
(OUT SIDE END TUBE SHEET - FOR CONVECTION APH)
(CAST IRON GLAND)





DETAIL FOR FIXED END



DETAIL-1 ℄ CONV. COLUMN

REF. DWG. NO.	REFERENCE DRAWING TITLE
A694-091-78-41-0100	FOUNDATION LOADING PLAN
A694-091-78-41-0102	GENERAL ARRANGEMENT PLANS-I
A694-091-78-41-0104	APH SYSTEM PLAN, ELEVATION AND STACK
A694-091-78-41-1105	INTERMEDIATE TUBE SHEETS
A694-091-78-41-0106	MISCELLANEOUS DUCT SUPPORTING DETAILS
A694-091-78-41-1107	MISCELLANEOUS DETAILS
A694-091-78-41-4108	G.A. NOTES
A694-091-78-41-SP-2005	ANNEXURE TO GA DRG.

NOTES :-

1. TYPICAL NOTATIONS :-
   - A — DENOTES SECTIONS, PLANS OR DETAILS.
   - — CROSS REFERENCE DRAWING NO. IF LEFT BLANK DENOTES DETAILS APPEARS ON THE SAME DRAWING-SHEET.
   - 9 — DENOTES HMTD COLUMN GRID LINE.
   - AE 2001 — DENOTES INSTRUMENT TAG NO.
   - FS — FIXED SUPPORT
   - SS — SLIDING SUPPORT
   - DG — DUCT GUIDE
2. *ALL DIMENSION ARE IN MM UNLESS NOTED OTHERWISE. DO NOT SCALE THE DRAWING ASK IF IN DOUBT.*
3. FOR DETAIL AND DESCRIPTIONS OF REFRACTORY/ INSULATION REFER MISC. DETAIL DRG.
4. FOR INTERNAL PAINTING AND EXTERNAL PAINTING REFER GENERAL NOTES.
5. ALL INSULATION CASTABLE SHALL BE AS PER PMC SPEC. NO. 6-79-0008/0009. CERAMIC FIBRE BLANKET SHALL BE AS PER PMC SPEC NO. 6-79-0005, REFRACTORY FIRE BRICKS SHALL BE AS PER PMC SPEC. NO. 6-79-03.
6. DELETED.
7. REF. RESPECTIVE PIPING MATERIAL SPECIFICATION (PMS) FOR SPECIFICATION OF BOLTS & GASKETS ON PRESSURE PARTS.
8. PACKAGE VENDOR TO NOTE THAT DURING HYDROTEST OF THE RADIANT COILS IT SHALL BE ENSURED THAT THE BLINDING DONE AT INLET/OUTLET TERMINAL END SHALL HAVE A VENTING PROVISION.
9. HEATER CONTRACTOR SHALL ENSURE THAT THERE IS NO FOULING WITH THE ADJACENT DUCTING/STRUCTURE MEMBER WITH FIRE PROOFED COLUMN.
10. SUITABLE LOCAL LADDERS & LOCAL GRATING SHALL BE PROVIDED TO ENSURE APPROACH TO BURNERS/SIGHT DOORS/ACCESS DOORS ON RADIANT BOX.
11. FOR APPLICABLE SPECIFICATION & STANDARD REFER TENDER DOCUMENTS.
12. THE SIZE OF SS CONNECTION AT RADIANT SHALL BE 2"NB.
13. 40 THK. GROUTING OF MIN. BEARING STRENGTH OF 80Kg/cm2 BELOW BASE PLATE SHALL BE DONE BY HEATER CONTYRACTOR.
14. ALL DUCT SLIDING SUPPORTS/RESTING SUPPORTS SHALL BE PROVIDED WITH MIN. 2 NOS BOLTS.
15. FOR OTHER NOTES REFER GENERAL NOTES NO. A694-091-78-41-4108.

LIST OF HOLDS:-

1. BURNER CUTOUT (TO BE AS PER BURNER DRAWING)
2. LOCATION OF ACCESS DOOR/FLOOR PEEP HOLES.
3. DETAIL OF HOT AIR DISTRIBUTION DUCT (FOR AIR FLOW MODELLING).
4. LOCATION OF VENTURI (TO BE CONFIRMED BU SUPPLIER).

REV.	DATE	REVISIONS	BY	CHKD	APPD	PEMPC
0	07.03.16	ISSUED FOR ENGINEERING	JB	RKM/RH	AP	
B	17.11.15	ISSUED FOR BIDS/COMMENTS	JB	RKM/RH	AP	
A	15.09.15	ISSUED FOR BIDS/COMMENTS	JB	RKM/RH	AP	

इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उद्यम) ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

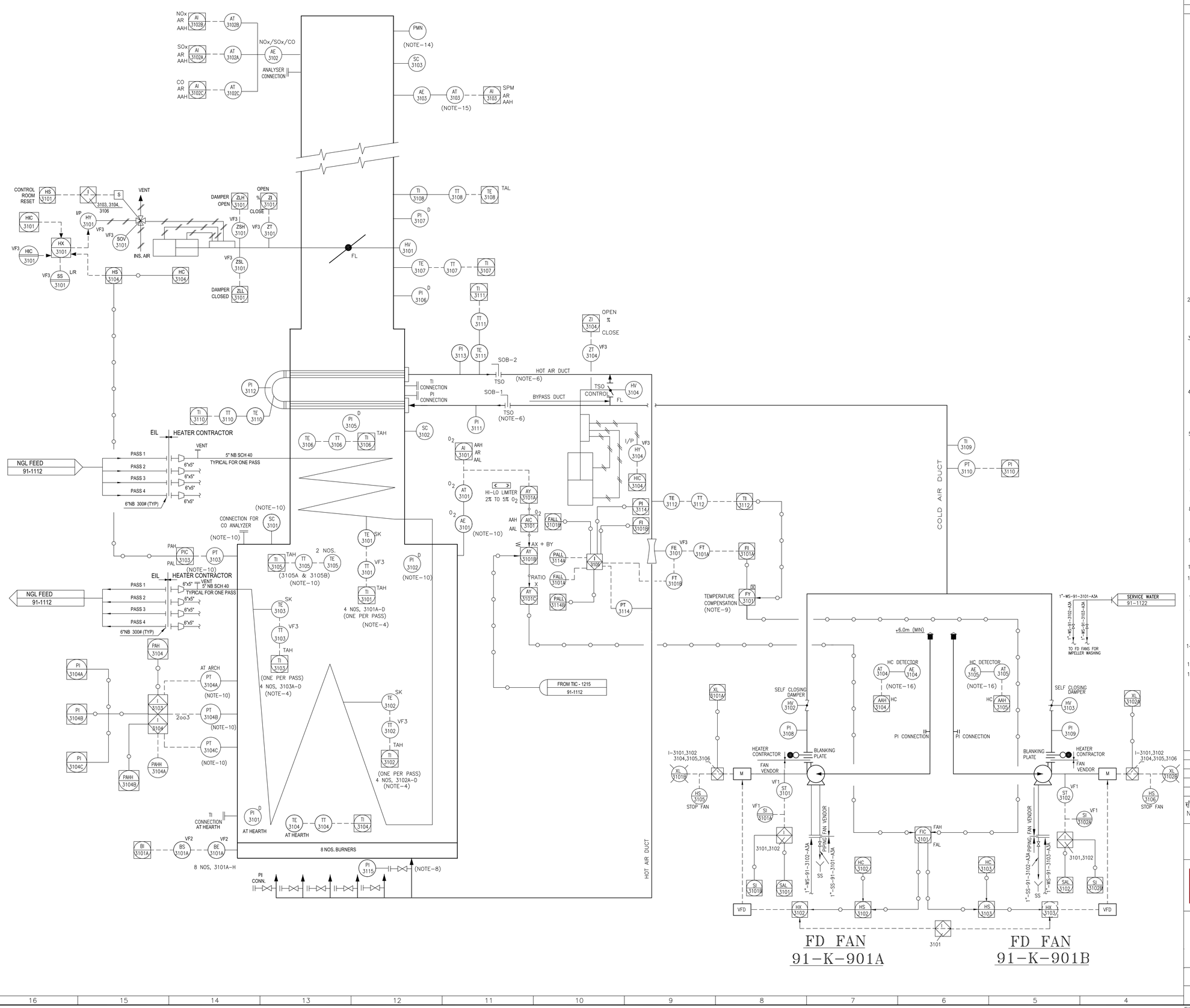
ओएनजीसी — ऑयल एण्ड नेचुरल गैस कारपोरेशन लिमिटेड
OIL & NATURAL GAS CORPORATION LIMITED

हजीरा प्लांट संशोधन अंतर्गत दमन विकास परियोजना	HAZIRA MODIFICATION JOB UNDER DAMAN DEVLOPMENT PROJECT
एटीएम कल फीड हीटर 91-एच-901 सामान्य विन्यास अनुप्रस्थ काट, अनुदैर्ध्य काट एवं तल	ATM. COL. FEED HTR. (91-H-901) GENERAL ARRGT. CROSS SECTION, LONGITUDINAL SECTION, & PLAN

SCALE	JOB NO.	UNIT	DIVN.	DEPT.	DWG. NO.	REV.
1:50/NTS	A 6 9 4	0 9 1	7 8	4 1	0 1 0 1	0

3-1641-0500 REV.2 A0-1189 x 841

ATMOSPHERIC COLUMN FEED HEATER
91-H-901



REFERENCE DRAWING	NO
A694-02-41-91-1112	1- MARKED UP

NOTES:-

1. INTERLOCK LOGIC:

INTERLOCK NO	ACTUATED BY	ACTION UPON
I-3101	91-SAL-3101/3102 OR MOTOR NOT RUNNING (91-XL-3101A/3102A) OF FD FAN	TRIP ONE FAN AND RUN OTHER IN FULL LOAD
I-3102	91-SAL-3101 & 91-SAL-3102 TOGETHER OR 91-XL-3101A & 91-XL-3102A TOGETHER.	CLOSE MAIN FUEL GAS UV-1201 & 1203 OPEN MAIN FUEL GAS BLEED UV-1202 OPEN STACK DAMPER 91-HV-3101 TRIP BOTH FD FANS 91-K-901A & B
I-3103	HIGH ARCH PRESSURE SENSED BY PT-3104A/B/C (2oo3)	OPEN STACK DAMPER 91-HV-3101
I-3104	HIGH HIGH ARCH PRESSURE SENSED BY PT-3104A/B/C (2oo3)	CLOSE MAIN FUEL GAS UV-1201 & 1203 OPEN MAIN FUEL GAS BLEED UV-1202 OPEN STACK DAMPER 91-HV-3101 TRIP BOTH FD FANS 91-K-901A & B
I-3105	LOW LOW COMBUSTION AIR FLOW 91-FALL-3101B COMBINED WITH COMUSTION AIR PRESSURE LOW LOW 91-PALL-3114B	CLOSE MAIN FUEL GAS UV-1201 & 1203 OPEN MAIN FUEL GAS BLEED UV-1202 TRIP BOTH FD FANS 91-K-901A & B
I-3106	MAIN FUEL GAS CUT OFF UV-1201 & 1203 DUE TO ACTUATION OF INTERLOCKS MENTIONED ON P&ID NO. 1112	OPEN STACK DAMPER 91-HV-3101 TRIP BOTH FD FANS 91-K-901A & B

2. EACH INTERLOCK SHALL HAVE INDIVIDUAL BYPASS OPTION WITH LAMP INDICATION AVAILABLE AT MAIN CONTROL PANEL EXCEPT FOR INTERLOCK I-3104. THE BYPASS SWITCH TAG NOS. ARE :- I-3101=HS-3107A, I-3102=HS-3107B, I-3103=HS-3107C & I-3105=HS-3107D. I-3106=HS-3107E.
3. IN THE EVENT OF ACTUATION OF EMERGENCY HEATER SHUT DOWN PUSH BUTTON (SHOWN IN P&ID NO. 1112), MAIN FUEL GAS & PILOT GAS TO THE FURNACE WILL CUT OFF, ALL DRIVES WILL TRIP AND STACK DAMPER WILL OPEN EVEN IF INTERLOCKS ARE IN BY PASS MODE. A LOCAL EMERGENCY PUSH BUTTON HS-1201B (SHOWN IN P&ID NO. 1112) SHALL BE PROVIDED 15 m AWAY FROM FURNACE INSIDE A "BREAK GLASS" ENCLOSURE.
4. TOTAL 12 NOS. (3 NOS. PER PASS) OF SKIN THERMOCOUPLES SHALL BE PROVIDED SKIN THERMOCOUPLE SHALL BE LOCATED AT LAST RADIANT TUBE, 6TH TUBE FROM RADIANT OUTLET AND CONVECTION BOTTOM MOST SHOCK TUBE IN EACH PASS. SKIN THERMOCOUPLES SHALL BE PROVIDED BY THE HEATER CONTRACTOR.
5. CONTROL DAMPERS SHALL HAVE PROVISION FOR DELINKING PNEUMATIC ACTUATOR/POWER CYLINDER. CONTROL DAMPERS SHALL BE PROVIDED WITH WINCH & CABLE ARRANGEMENT OPERABLE FROM GRADE OR NEAREST PLATFORM WITH DAMPER POSITION INDICATOR. (HV-3101 SHALL BE OPERABLE FROM GRADE).
6. SOB'S SHALL BE MANUALLY OPERATED WITH HANDWHEEL/GEARBOX ARRANGEMENT AND SHALL BE PROVIDED WITH EXTERNAL OPEN/CLOSE INDICATION. SOB's SHALL BE PROVIDED IN HORIZONTAL PORTION OF THE DUCT.
7. ALL DRAFT GAUGE ARE GAUGE BOARD MOUNTED. LOCAL DRAFT GUAGES ON HEATER AND FG DUCT SHALL BE VISIBLE WHILE OPERATING THE DAMPER HV-3101 FROM GRADE.
8. PI INSTRUMENT TO BE PROVIDED AT THE BURNER, FARTHEST FROM COMMON AIR ENTRY DUCT IN ALL ROUND HOT AIR DISTRIBUTION DUCT. FOR OTHER BURNERS, SUITABLE PROVISION/ACCESSORIES ARE TO BE PROVIDED FOR MOUNTING PORTABLE PRESSURE INSTRUMENT ON EACH BURNER FINGER DUCT.
9. THE REQUIRED MIN. STRAIGHT LENGTHS ARE PREFERABLY 7D UPSTREAM AND 3D DOWNSTREAM OF FLOW ELEMENT. LENGTH SHALL BE FINALISED AFTER SELECTION OF FLOW ELEMENT. TEMPERATURE COMPENSATION SHALL BE PROVIDED TO OBTAIN MASS FLOW.
10. INSTRUMENTS/CONNECTIONS FOR ARCH LEVEL SHALL BE PLACED BELOW SHOCK ZONE.
11. ALL BENDS IN COMBUSTION AIR DUCTS SHALL BE PROVIDED WITH MINIMUM TWO NOS. OF GUIDE VANES OF CS MATERIAL. CIRCULAR DUCTS ARE PREERED.
12. ALL INSTRUMENT TAG NOS. SHALL BE PREFIXED BY "91".
13. TAG AY-3101B GENERATES SIGNAL (AS PER COIL TIC AND O2) BASED ON INCREASE/DECREASE OF DEMAND. INITIAL SIGNAL RATIO OF 80:20 TO BE CONSIDERED FOR COIL TIC/O2 RESPECTIVELY. THE RATIO 'X' IS INITIALLY SET AT '1' AND MAY BE VARIED BASED ON OPERATION/SITE FEED BACK.
14. FOR POLLUTION MONITORING, 2 NOS. 6"NB SIZE SAMPLING NOZZLE (25MM INSIDE INSULATION) SHALL BE PROVIDED ON STACK.
15. TWO NOZZLES SHALL BE PROVIDED 180 DEGREE APART FOR SPM ANALYSER.
16. HC DETECTORS ARE NOT IN FAN VENDOR'S SCOPE.

NOMENCLATURE:-

VF1: FD FAN VENDOR'S SCOPE.
VF2: BURNER VENDOR'S SCOPE.
VF3: HEATER/DAMPER VENDOR'S SCOPE.
L/R: LOCAL/REMOTE
SS: SELECTOR SWITCH

No.	DATE	REVISIONS	DRN	BY	CHKD	APPD.
0	07.01.15	ISSUED FOR ENGINEERING	MA	AB	RM	NA

इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम) ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

ओएनजीसी ओएनजीसी ऑयल एण्ड नेचुरल गैस कॉरपोरेशन लिमिटेड
OIL AND NATURAL GAS CORPORATION LIMITED
MODIFICATION WORK AT HAZIRA PLANT
UNDER DAMAN DEVELOPMENT PROJECT

पाइपिंग एण्ड इंस्ट्रूमेन्टेशन डायाग्राम
PIPING AND INSTRUMENTATION DIAGRAM
NGL FRACTIONATION UNIT
ATMOSPHERIC COLUMN FEED HEATER

SCALE	JOB NO.	DEPT.	SECTN.	UNIT	DWG. No.	REV.
	A694	78	41	91	1131	0

EIL-0241-502-REV-0-A DISTRIBUTION CODE