BHARAT HEAVY ELECTRICALS LIMITED
HPEP, RAMACHANDRAPURAM, HYDERABAD-32
(T & C ENGINEERING Department)
TELEPHONE NO. 040-23185261 & 040-23184325

TENDER NOTICE

Name of the Department : T & C ENGINEERING
TENDER NOTICE REF NO.: HY/TCENGG/ PIPING/3D-OFFLOAD/NIT/2022-23/001, Date: 01-08-2022

Bharat Heavy Electricals Limited, a Government of India Public Sector undertaking having its Registered Office at Siri Fort, New Delhi. BHEL Ramachandrapuram, one of its manufacturing Units, invites sealed tenders in two-part bid from eligible Contractor, who fulfil qualification criteria as stipulated in NIT, for the work, **"Piping 3D modelling (using Smart 3D version 2019) offloading for Numaligarh Refinery Limited (4 Projects)".**

1. Sealed quotations in single cover consisting of two inner sealed covers (containing Technical bid as Part A and Price bid as Part B super scribing the Name of work, Part Number and Tender reference shall be deposited in the Vendor Complex, BHEL-RC Puram, Hyd-32 addressed to Sr.DGM/SDC & CMM Vendor Complex, BHEL-HPEP, RC PURAM, HYDERABAD-32 so as to reach on or before **11.00 AM** on **Date: 23.08.2022.**
   Bidder can also submit offer through email. Technical offer to be submitted to mail ID **technicalbid_hyd@bhel.in**, and price bid to be submitted to mail ID **pricebid_hyd@bhel.in** only as an attachment. Technical bid will be opened at **13:30 Hrs**. on the same date and further information if any, may be obtained from the office.

2. The tender documents are available in the Web Site of BHEL www.bhel.com. While submitting the tender documents, a demand draft/RTGS/NEFT/Bankers cheque for Rs.1000/- paid against downloading the tender document should be enclosed to the Techno-commercial bid (part-A). The submitted tender documents downloaded from the website without demand draft/ RTGS/NEFT/ Bankers cheque for the value mentioned will be summarily rejected. Corrigendum if any will be published in BHEL web site only. Bidders should regularly visit website(s) to keep themselves updated. The brief scope of the work and information are provided below:

3. The salient features of the tender documents are as follows:

S.No	Description
1.0	Notice Inviting Tender
2.0	Prequalification Requirements
3.0	EMD & Security deposit
2.1	Instruction to bidder
3.0	Special conditions of contract
4.0	Pre-Qualification Criteria -Technical
5.0	Technical specifications
6.0	Schemes & Layout

4. In case, tender documents are submitted by post, BHEL-HPEP shall not be responsible for any delay due to any reasons (including postal delay) either in receiving the Agency's request nor receipt of tender documents by the Agency.

(Signature & Designation of Official)

SIGNATURE OF TENDERER **ACCEPTING AUTHORITY**

1.0 NOTICE INVITING TENDER

TENDER NOTICE REF NO.: HY/TCENGG/3DOFFLOAD/NIT/2022-23/001, Date: 01-08-2022

Name of work	:	**Piping 3D modelling (using Smart 3D version 2019) offloading for Numaligarh Refinery Limited (4 Projects)**
Earnest Money Deposit	:	**Rs. 1,27,540/-**
Approximate Estimated value of work	:	**Rs. 63,77, 280/-**
Cost of Tender documents	:	**Rs.1000/- (through Web)**
Last date for sale of tender documents (Mention date and time)	:	**Date: 22-08-2022 at 14:00 hrs.**
Last date of receipt of tenders (Mention date and time)	:	**Date: 23-08-2022 at 11:00 hrs**
Date, time and place of tender opening (Mention date, place and time)	:	**Date: 23-08-2022 at 13:30 hrs** at Vendor Complex near Admn. Building, BHEL, RC Puram, HYD
Period of Completion (Mention duration of the Contract)	:	**6 Months**

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2. PREQUALIFICATION REQUIREMENTS:

The following conditions have to be satisfied by the tenderer, with documentary proof to be enclosed with tender bid (Technical):

(i) Average annual financial turnover during the last 3 years, ending 31st March 2022 of the previous financial year (should submit balance sheet & P&L account for last 3 years –certified by Charted Accountant), should be at least 30% of the max. allocation (30% of Rs. 63.77 lakhs = Rs 19.13 lakhs). Further, the tenderer fails to submit the figure (s) for 3 years, non-submitted year will be considered as "0" (Zero) for averaging the turnover.

(ii) Particulars of experience / credentials for the works executed of similar nature during not older than 7 years (Completion and experience certificate of the works executed are to be enclosed) ending last day of month previous to the one in which applications are invited should be either of the following:

a. Three similar completed works each costing not less than the amount equal to 40% of the estimated cost (40% of Rs. 63.77 lakhs = Rs. 25.5 lakhs).

OR

b. Two similar completed works each costing not less than the amount equal to 50% of the estimated cost (50% of Rs. 63.77 lakhs = Rs. 31.88 lakhs).

OR

c. One similar completed work costing not less than the amount equal to 80 % of the estimated cost (80% of Rs. 63.77 lakhs = Rs.51.01lakhs).

d. Experience certificate issued by BHEL, RC Puram in case any work executed in BHEL, RC Puram for past three years, any adverse remarks in the experience certificate will be a disqualification factor.

<u>Similar Work Means</u>: Agency Shall have experience in carrying out Piping 3D Modelling, 3D Model review with customer, generation of shop / site isometrics along with bill of materials, Stress analysis and IBR documentation.

(Copy of satisfactory completion certificate of contract of similar work shall be attached)
(If the completion certificates is from private organization the same shall be supported with TDS certificate/payment transaction details along with form 26AS).

(iii) "The offers of the bidders who are on the banned list as also the offer of the bidders, who engage the services of the banned firm shall be rejected. The list of banned firms is available on BHEL website www.bhel.com".

(iv) Valid ESI Code Number and P.F. Code Number

(v) Valid GST registration number.

(vi) PAN card. (In case not available, proof of having applied with acknowledgement from concerned authority).

<u>GST:</u> All the terms & conditions of the contract with respect to Taxes & Duties are subject to the latest taxation laws introduced from time to time (e.g., GST). The terms & conditions will be modified in accordance with the provisions of latest laws (e.g., GST).

3. EARNEST MONEY DEPOSIT:

i. An amount of **Rs.1,27,540/-** towards EMD shall be paid by Demand Draft/RTGS/NEFT/ Banker's cheque drawn on any nationalized bank / scheduled bank in the name of "Bharat Heavy Electricals Limited" payable at Hyderabad and shall be enclosed to the tender bid. No other means of payment shall be accepted. EMD / any money due to the tender by BHEL shall not carry any interest. (RTGS/NEFT details mentioned in Clause No. 4(xi))

ii. Tenders received without EMD as specified above shall be rejected. If EMD accompanies price bid, such bids shall not be considered and will be rejected. No adjustment of EMD shall be made with EMD submitted earlier with other tenders of BHEL or any outstanding amount. If EMD is not in line with amount called for, the EMD as well as the quotations will be returned in unopened condition to the tenderers.

iii. EMD of unsuccessful bidders shall be returned upon award of Contract and request by unsuccessful bidder. EMD of successful bidder shall be converted and adjusted towards the required amount of Security Deposit.

iv. EMD may be forfeited if after opening of tenders, a tenderer revokes his tender or increases his earlier quoted rates or after acceptance of his tender does not commence the work in accordance with the instructions of BHEL

v. The EMD will be forfeited if the accepted tender is withdrawn. If only a part of the work included in the tender had been awarded to the tenderer, proportionate amount of EMD will be retained.

4. SECURITY DEPOSIT

i. Upon acceptance of his tender bid, the successful tenderer must deposit Security Deposit within the time specified in the letter of intent. Security Deposit should be collected from the successful tenderer. The rate of Security Deposit will be as below:

Total amount of 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.

ii. The successful tenderer on receipt of letter of intent can convey his acceptance in writing for conversion of EMD into security deposit.

iii. If the work is awarded, the agency has to pay 50% of SD in advance on contract value before commencement of work after adjusting of EMD amount.

iv. Security Deposit may be furnished in any one of the following forms.

1. Demand Draft in favour of BHEL.
2. Local cheques of scheduled banks, subject to realization .
3. Securities available from India Post such as National savings Certificates, Kisan Vikas Patras etc.
4. Bank Guarantee from scheduled Banks / Public Financial Institutions as defined in the Companies Act subject to a maximum of 50% of the total security deposit value. The balance 50% has to be remitted either by cash or in the other form of security. The Bank Guarantee format should have the approval of BHEL.
5. Fixed Deposit Receipt issued by scheduled Banks / Public Financial Institutions as defined in the companies Act. The FDR should be in the name of the contractor, A/C BHEL, duly discharged on the back.
6. Security Deposit can also be recovered at the rate 10% from the running bills. However, in such cases at least 50% of the Security Deposit should be deposited before start of the work and the balance 50% will be recovered from the running bills.

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

v. Failure by the successful tenderer/bidder to deposit the security deposit amount as mentioned above within the stipulated time, which will include any extension that may be granted by the authorities, will render his earnest money deposit liable to forfeiture and his tender shall be consider as withdrawn. Security Deposit shall not be refundable to the contractor except in accordance with the terms of the contract.

vi. Failure by the successful tenderer/bidder to deposit the security deposit amount as mentioned above within the stipulated time, which will include any extension that may be granted by the authorities, will render his earnest money deposit liable to forfeiture and his tender shall be consider as withdrawn. Security Deposit shall not be refundable to the contractor except in accordance with the terms of the contract.

vii. The Security Deposit will be released along with the final bill or after completion of work/maintenance period for the work if applicable, whichever will be later, subject to the condition that nothing is outstanding against the Contractor.

viii. No interest shall be payable by BHEL on EMD or SD or any money due to the contractor by BHEL.

ix. The Bank account details of BHEL for payment of tender document cost, EMD and Security Deposit through RTGS/NEFT mode is as follows:

BANK ACCOUNT DATA FOR RTGS/NEFT MODE OF PAYMENT

1. Party Code	
2. Option	: RTGS/NEFT
3. Beneficiary Details:	
A) Name of Beneficiary	: BHARAT HEAVY ELECTRICALS LIMITED
B) Address	: RAMACHANDRAPURAM, HYDERABAD- 502032.
C) Bank Name	: STATE BANK OF INDIA
D) BRANCH NAME	: BHELTOWNSHIP, HYDERABAD- 502032.
E) Account No.	: 62048154115
F) Account type	: Current A/c
G) Bank IFSC Code	: SBIN0020075
H) Bank MICR Code	: 500002370

x. The contractor's/ Firms who are entering first time in BHEL, Ramachandrapuram are requested to provide the following NEFT details (Bank official Signature) along with cancelled cheque. This information is required for transactions between BHEL and the Contractor's/Firm's.

(Vendors to furnish this mandate on their Letter Head.)

Ref No:

To Date: Ref No.

Dy. Manager/Finance-CM
Bharat Heavy Electricals Limited
Ramachandrapuram
Hyderabad 502 032

Dear Sir,

Sub: Details for National Electronic Fund Transfer

We request and authorize you to effect payment through NEFT to our Bank account, subject to RBI Guidelines, as per the details given below

A. Sup code (As per PO/SCO) / Staffno	:
B. (Name as per PO/SCO)	:
(Retd Employee to indicate address here)	
C. PAN of Beneficiary	:
D. TIN of Beneficiary	:
E. e-mail address of Beneficiary	:
F. City (of Benefifiary)	:
G. Bank Name	:
H. Branch (of Bank)	:
I. A/c Number	:
J. A/c type (Savings or Current)	:
K. MICR Code of the branch (9 digit)	:
L. IFSC for NEFT (11 char)	:
M. IFSC for RTGS (If different from L)	:

Thanking you,

(Signature with Seal) Authorised Signatory
Authorised Signatory Name
Name Designation
Designation

Certified that the particulars furnished above are correct as per our records

Date (Signature of authorized official of bank)
Bank Stamp

(Attachment to Enquiry No. XXXXXXXXXX Due on Date XX.XX.XXXX for submission by 11.00 hrs to open from 14.00 hrs.)			
INSTRUCTIONS TO BIDDER (ITB)			
NOTE: Bidder to confirm in affirmative by typing "YES" or "Applicable Data" in the response column. Deviations, if any shall be recorded in deviations/comments column (Separate sheet can be attached if needed). Non deviatable clauses are indicated as "NON DEVIATABLE".			
Sl. No.	**DETAILED TERMS & CONDITIONS**	**BIDDER RESPONSE (YES/NO)**	**DEVIATIONS / COMMENT**
1	**SCOPE OF SUPPLY:**		
	Signed & Sealed offers are invited for the Scope of Supply of goods or services or both as detailed in the enquiry. Relevant enclosures/supporting documents / catalogue, if any shall be enclosed to the technical offer.		
2	**DEFINITIONS**		
A	'The Buyer' means BHEL-HPEP, Ramachandrapuram, Hyderabad-502 032 of Bharat Heavy Electricals Limited (A Govt. of India Undertaking) incorporated under the companies Act having its registered office at BHEL House, Siri fort, New Delhi-110049, India and shall be deemed to include its successors and assigns. It may also be referred to as BHEL.		
B	'The Bidder' means the persons, firm, company or organization on whom the Purchase order is placed and shall be deemed to include the bidder's successors, representatives, heirs, executors and administrator as the case may be. It may also be referred to as Contractor, supplier or bidder.		
C	'Contract' shall mean and include the Purchase order incorporating various documents viz., Notice Inviting Tender (NIT), Offer, Letter Of Intent/Acceptance (LOI/LOA), Instruction to Bidders (ITB) and Special Conditions of Contract (SCC), specifications, inspection/quality plan, schedule of prices and quantities, drawings, if any, enclosed by Bidder/ provided by the Buyer or his authorized nominee and the samples or patterns if any to be provided under the provision of the contract. In case of any inconsistency or contradiction between any of the documents, the order of precedence shall be Purchase Order, LOI/LOA followed by Minutes Of Meeting (MOM), NIT, SCC, ITB.		
D	'Parties to the contract' shall mean the bidder and the buyer as named in the main body of the Purchase Order.		
E	'Goods/Material' shall include Works and Services which are incidental or consequential to supply.		
3	**GENERAL INSTRUCTIONS:**		
A	Mode of submission of offer shall be as indicated in SCC		**Non Deviatable**
B	The quotation should be neatly typed and free from over writing/ erasures. Any correction or addition must be authenticated. The offer including annexures and brochures should be submitted in English / Hindi. All Pages of Techno Commercial Bids (Main Pages), ITB, SCC should be signed and Stamped. If there is a conflict in case of bilingual submission, the submission in English will be final. Prices shall be quoted both in figures and words. In case of any discrepancy in value, the prices quoted in words shall be considered for evaluation and establishing L1 Status. Any discount / revised offer / bids submitted by a bidder on his own shall be considered, provided it is received on or before the due date and time of offer / bid submission (Part-1). Conditional discounts shall not be considered for evaluation of tenders.		**Non Deviatable**
C	Incomplete offers are liable for rejection.		**Non Deviatable**
D	Bidders to please note that the Terms & conditions contained in this document and SCC are to be read fully before submission of quotations.		**Non Deviatable**
E	Bidders are advised to comply with ITB and SCC, should there be any deviations (where deviations are permitted), it shall be entered in the deviation column. BHEL reserves the right to reject such offers or load the bid suitably for evaluation.		**Non Deviatable**
F	Offers shall be submitted directly, only by the bidder or by their authorized representative / agent and the offer should be in line with the regulatory guidelines (i.e. A valid Agency agreement between principal bidder and agent / representative shall be attached and the agreement shall cover the scope of services rendered by Agent, Agency Commission and any other information called for as per the regulatory guidelines). OEM / Mill details shall be provided if bidder is not a manufacturer. Bid envelops shall bear the name of Bidder. In case of submission through authorized representative/agent, the name of representative/agent should also be mentioned apart from bidder name.		**Non Deviatable**
G	Offer received after the specified time and date of submission will be rejected. No further correspondence shall be entertained.		**Non Deviatable**
H	Unsolicited offers will not be considered.		**Non Deviatable**
4	**OTHER PARTICULARS (Please indicate applicable data)**		
A	Name of the Bid currency (freely tradable foreign currency for imports and Indian Rupees for indigenous purchase).		
B	Name of the Port of loading and Port of Discharge (applicable to imports).		

5	**BID SUBMISSION PROCEDURE FOR CONVENTIONAL TENDER:**		
A	**For Single Part Bids:**		
	The complete bid shall be submitted in a single sealed cover superscribing the Tender number and due date, addressed to Sr DGM/CMM, Vendor Complex, BHEL, Hyderabad and sent by appropriate mode to above address or dropped in tender box located at vendor complex on or before the specified time and date of submission of offers, preferably in the bidder's envelope. E- mail bids shall be sent to mail ID pricebid_hyd@bhel.in only as an attachment.		**Non Deviatable**
B.	**For two-Part Bids:**		
i	The offer is to be submitted in two parts viz., Techno-commercial Bid - (Part-I), with all technical specification & scope including bill of material etc., Earnest Money Deposit (EMD)(wherever applicable) and unpriced bid with all applicable Commercial Terms and Conditions, rates of agency commission, duties, taxes and other charges, Signed and Stamped ITB and SCC, except the price, shall be kept in a separate sealed cover, superscribing enquiry No. (Techno-Commercial Bid) and due date AND Price Bid (Part-II), containing ONLY the price (including agency commission, if any) and the applicable duties/taxes/other charges shall be kept in a separate sealed cover superscribing Enquiry no. (Price bid) & due date. Both the above covers (Part –I & II) shall be kept in a Third cover superscribing Enquiry no. & due date. Bidder can also submit offer through email. Technical offer to be submitted to mail ID technicalbid_hyd@bhel.in, and price bid to be submitted to mail ID pricebid_hyd@bhel.in only as an attachment. Interchanging the information in the mails may lead to rejection of the offer. Bidder shall have no claim on e-mail offers sent to any other e-mail ID. In case of e-mail offers, the mail subject should contain Enquiry Number, Due date and Bidder name. Bidder address including contact details shall be mentioned in the content of the mail. Without these details, the offer is liable for rejection. All techno commercial terms & conditions mutually agreed prior to price bid opening shall prevail and supersede any terms and conditions specified otherwise in price bid.		**Non Deviatable**
ii	The bidders whose bids are techno commercially not accepted will be informed and EMD shall be returned wherever submitted.		
iii	Bidders will be allowed to submit the impact on their quoted prices due to changes in technical scope, specifications, and commercial terms/conditions as specified in NIT which in the opinion of BHEL , warrant changes in prices.		**Non Deviatable**
C	Bids shall be opened on due time and date in the presence of bidders who may like to be present. Only one representative of each bidder shall be permitted to attend the bid opening. Only the price bids of bidder (in case of two part bid) whose techno commercial bids are accepted will be opened later on a specified date.		**Non Deviatable**
6	**DELIVERY TERMS**		
A	**Indigenous Purchase**		
	a. Terms of Delivery for dispatches to BHEL Hyderabad (HPEP) shall be FOR Destination. b. Terms of Delivery for Direct Dispatch (DD) items shall be Ex Works. i. Incase specified in SCC that insurance is in customer/BHEL scope, price quoted shall include Freight charges up to Destination. ii. Otherwise, price quoted shall include Freight and Insurance upto Destination. However, beneficiary for insurance shall be BHEL.		
B.	**Imports**		
	The goods shall be delivered on FCA capital airport basis in case of freight by Air and CIP basis in case of freight by Sea.		
7	**Documentation for Payment**		
A	**Indigenous Purchase**		
	Following documents shall be submitted immediately on dispatch of material to BHEL HPEP / Site a. Original Tax Invoice (Refer ITB clause no 11 for Tax Compliance) b. Packing List - clearly showing number of packages, gross weight and net weight. c. Test/Warranty/Guarantee certificates, O&M Manual (If specified in SCC) d. Insurance intimation/declaration certificate e. Pre-dispatch Inspection report /Third Party Inspection Certificates. f. Consignee copy of LR signed & stamped by Customer/Site representative for DD Items g. e-waybill h. Any other documents as specified in SCC. Softcopies of the above documents shall be uploaded in Pradan portal https://hpep.bhel.com/mm immediately after dispatch of the material.		**Non Deviatable**

B **Imports**

i) Bidder shall inform BHEL the readiness of material along with packing details 30 days in advance from the date of delivery.
ii). Bidder shall also upload the soft copy of the dispatch documents consisting of BL / AWB, Invoice, delivery note, packing list, country of origin & Test certificates and other documents as specifically indicated in the SCC in PRADAN Portal (https://hpep.bhel.com/mm) within Five days from the B/L date for sea shipment and One day from AWB date for Air shipment and sent to email ids: mssea@bhel.in, msair@bhel.in, cmmfe@bhel.in.

iii) AWB/BL must contain the information of BHEL GST no., and PAN no.

iv) **Air Shipments:**
Bidder shall ensure the following
a) Port of discharge -- Mumbai/Chennai/Hyderabad (as indicated in SCC).
b) Consignee shall be BHEL, Hyderabad. Material shall be air freighted through cargo mode only and not through Courier.
c) Upon handing over the cargo to the forwarder, bidder shall ensure the acknowledgement receipt with wordings" Cargo handed over in sound condition for Air freighting".
Note: Warehouse receipt will not be considered for penalty calculations.
d) In case of CIF/ shipments, bidder shall also inform BHEL the information about discharge port agent details and cargo arrival information within one day from the date of Shipment.
e) Following dimensions of single package may be noted.
i). Maximum dimension of the cargo(ODC) -- 125" x 88" x 63"
ii). Maximum weight of the cargo -- 3.5 MT.
If any package dimension or weight exceeds the above set limits, it will be treated as Over Dimension Cargo (ODC) or Over Weight Cargo and bidder shall inform BHEL 30 days in advance to the delivery date to enable BHEL to finalize the freight forwarder.
f). If package falls under Hazardous category, bidder shall communicate BHEL 30 days in advance period with document support.

v) **Sea Shipments:-**
bidder shall ensure the following
a). Port of discharge -- Nhavaseva/Mumbai/Chennai.
b). Place of Delivery / Final Destination for CIP shipments - Nhavaseva CFS / Chennai CFS.
c). In case of FOB shipments, bidder shall handover the material to BHEL nominated forwarder and obtain the cargo receipt.
d). If the material cannot be containserised in 20 or 40 GP containers, an advance information of 30 days prior to the delivery date shall be communicated to BHEL for necessary arrangements and finalisation of freight forwarder.
e). **For CIP shipments**
1. In case of FCL shipments, Detention free period must be 14 days.
2. Bidder shall also inform BHEL the information about discharge port agent details and cargo arrival information within 5 days from the date of Shipment.
3. No charges for the services rendered till place of destination will be payable by BHEL. Incase liner / forwarder insist for charges, not in the scope of BHEL, the same will be adjusted from bidder account.
4. In case of CIF shipments -- Bidder must select a forwarder/liner whose discharge port published tariff for THC and other services is available. Any charges over and above the published tariff will not be borne by BHEL or will be adjusted from the bidder's bill.
5. bidder must insure the cargo for 110% of material value including the freight amount.
(vi). Recovery charges for non-submission of documents: -
Bidder shall submit all the required documents to BHEL as prescribed in the Purchase order and NIT.

If BHEL incurs any charges such as Penalty, demurrage, container detention, wharfage, storage, Ground rent etc., due to non - compliance / non - submission of documents prescribed in Purchase Order/ NIT/Letter of credit, the same shall be recovered from the bidder as under:
1. EUROPE/USA/Black Sea/ Far East/Middle East/South East sector
A. **For FOB Sea Consignments:-**

Penalty for late submission / negotiation of documents beyond 14 days shall be as under:

Sl. no	Period (From Date of Bill of Lading)	Recoverable Charges	Recoverable Charges per day per container	
		LCL per week/ Break bulk cargo per day	20FT Container	40FT Container
i	Upto 14th day	Nil	Nil	Nil
ii	15th day onward	USD 10	USD 110	USD 200

	B. **For CIP Sea Shipments: -** Bidder shall provide rates for detention charges after free period at the time of offer itself in case of engagement of 20FT Container and 40FT category. In case of late presentation of documents to the bank recovery will be effected from the Bidder as per the rates quoted by the Bidder at the time of offer in this regard. In case of Break bulk cargo and LCL, Demurrage charges shall be recovered at the rate of USD 1 per Ton per day and storage charges at the rate of USD 10 per week respectively shall be charged as late presentation charges. (vii) Description of items in invoice, packing list, BL / AWB or LR shall be same as PO item description. Bidders shall ensure that invoice shall contain PAN nos. of both bidder and BHEL along with other tax related numbers. BHEL PAN AAACB4146P and BHEL TAN HYDB00086C Any other additional documents sought by the statutory authorities, the same shall be produced by the bidder on priority basis. (viii) Bidder shall provide package details including number of packages, gross weight, net weight etc. (ix) The bidder shall provide the following documents at the time of submission of offer: a) No Business Connection in India declaration issued by the bidder as per the format specified. (or) b) (i) No Permanent Establishment in India declaration issued by the bidder as per the format specified. (ii) Tax Residence Certificate issued by the bidder's tax authorities. (iii) Form 10F, as attached in Annexure V, to be issued by the bidder. c) In case the bidder has a Business Connection in India as per Section 9 of Income Tax Act or significant economic presence in India as per rule 11 UD of IT Act or Permanent Establishment in India as per Article 5 of Double Taxation Avoidance Agreement between India and the bidder's country, the bidder shall provide a withholding tax order issued by the Indian Income Tax authority for recovery of applicable tax.		
8	**Delivery Schedule**		
	The tendered goods shall be delivered within the period stipulated in NIT/ SCC as accepted. Inordinate delay/early supply are liable for rejection/Hold on payment.		**Non Deviatable**
9	**Pricing Terms**		
	Quoted price shall be inclusive of Packing & Forwarding and shall remain firm and valid during the execution of PO. Offers with PVC will be rejected outright except in cases where specifically called for in the SCC.		**Non Deviatable**
10	**PRICE VALIDITY :**		
	Unless otherwise specified, offer shall be valid for a period of 90 days from the date of bid opening (Technical bid /part-I in case of two part bid). However the prices quoted for spare parts of the Main equipment shall be kept valid for a period as specified in SCC.		**Non Deviatable**
11	**Taxes & Duties (RATE TO BE INDICATED by the bidder against the space provided)**		
A	**Indigenous Purchase** i) Only valid GST registered bidders will be considered for the tender. The GSTIN of the bidder should be clearly mentioned in the offer. ii) If bidder is exempted from GST registration under any provision of the GST Law, a declaration with due supporting documents should be furnished for considering the offer. iii) Bidder to quote the applicable taxes in the following manner: - Harmonized System of Nomenclature (HSN) of Goods - Services Accounting Code(SAC) of Services. - IGST/CGST/SGST/UTGST: Rate of Tax to be quoted as extra in % against the space provided iv) Bidders to ensure correct applicability of IGST/CGST/SGST/UTGST based on the Inter / Intra state movement of goods/services. v) In case Bidder has opted for GST Composition Scheme, the same may be stated explicitly both in their technical and price bids. An undertaking to the effect that any change in the status of the bidder will be intimated. vi) Any other taxes & duties not covered anywhere above may be indicated separately. **Taxes deducted at source:** - TDS as per the extant statutes shall be deducted. - In case bidder does not provide PAN details, higher rate of tax shall be deducted as per the Act. - Concessional certificates, if any, should be provided well in time for lower deduction of tax.		**Non Deviatable**

	Terms & Conditions to be complied 1. All invoices (incl. Credit Notes, Debit Notes) to contain BHEL HPEP GSTIN ie 36AAACB4146P1ZG. Invoices submitted should be in the format as specified under GST Law. All details as mentioned in Invoice Rules including Dealer GST registration number (GSTIN), invoice number with date of issue, quantity, rate, value, taxes with nomenclature – CGST, SGST, UGST, IGST mentioned separately, HSN Code / SAC Code etc. 2. Reimbursement of GST amount will be made only upon completion of the following: i. Bidder declaring such invoice in their GSTR-1 Return/ IFF ii. Receipt of Goods or Services and Submission of Tax invoice by BHEL iii. The tax invoice is reflected in the GSTR2B of BHEL, HPEP (buyer). Payment of GST will be made only if it is matching with data uploaded by the Bidder in GST portal. 3. In case of discrepancy in the data uploaded by the bidder in the GSTN portal vis-a-vis the tax invoice or in case of any shortages or rejection in the supply, then BHEL will not be able to avail the tax credit. The same would be available in PRADAN Portal for the bidder's information. Bidder has to rectify the data discrepancy in the GSTN portal or issue credit note or debit note (details also to be uploaded in GSTN portal) for the shortages or rejections in the supplies or additional claims for processing of such invoices. 4. In cases where invoice details have been uploaded by the bidder but failed to remit the GST amount to GST Department within stipulated time, then GST on the invoices in default will be recovered from the bidder along with the applicable interest. 5. In case GST credit is delayed/denied to BHEL due to non/delayed receipt of goods and/or tax invoice or expiry of timeline prescribed in GST law for availing such ITC, or any other reasons not attributable to BHEL, such GST amount will be recoverable from bidder along with interest levied/ leviable on BHEL. 6. Under GST regime, BHEL has to discharge GST liability on LD recovered from bidders. Hence applicable GST shall also be recoverable from bidders on LD amount. For this Tax Invoice digitally signed will be issued by BHEL indicating the respective supply invoice number. The same can be downloaded from PRADAN Portal. 7. GST TDS deducted as per GST Act, is uploaded in GSTN portal along GSTR7. Bidders can directly download the GST TDS Certificate from the GSTN Portal. 8. Bidders to note that Rules & Regulations pertaining to E-way bill system are to be strictly adhered to, as and when notified by Govt. authorities.		
B.	**Foreign Purchase (Imports)**		
	The offered price shall be inclusive of all the Taxes and duties as applicable in country of export / country of dispatch for the quoted price. Taxes deducted at source: a. In case of goods or services subject to Income tax in India, such tax as per the extant statute shall be recovered. b. In case bidder does not provide necessary documents for beneficial taxation (Refer clause 7-B-(ix) a-c of ITB), the TDS deduction shall be at the maximum percentage stipulated as per the provisions of Income Tax Act.		**Non Deviatable**
12	**Payment Terms: Unless otherwise specified in SCC, following shall be the terms of Payment.**		
A	**Indigenous:** a. Micro & Small Enterprises (MSEs) - 100% Direct EFT payment within 45 days b. Medium Enterprises - 100% Direct EFT payment within 60 days c. Non MSME Bidders - 100% direct EFT Payment within 90 Days Note A. Above due date is reckoned from the date of Receipt of material or 15 days from the date of submission of complete set of documents as per PO whichever is later. Payment will be made on acceptance of Material. B. MSEs (covered under MSME Act) need to register and renew periodically and update the same with BHEL C. The taxes that are reimbursed are limited to applicable taxes as on the Purchase Order delivery date or the amount actually paid whichever is less. D. Adherence to the above time schedule of payment is contingent upon Bidder complying with GST provisions and availment of Input Tax Credit by BHEL before the date of payment. E. In case of packaged items, 10% of supply value will be retained till completion of total supplies. F. Bidders to comply with **clause 11** on GST requirements **Inland Letter of Credit (ILC)** In case Bidder opts for ILC Payment, the LC Usance period shall be 120 days **with all charges to bidder's account and loading of 0.50%.**		
B	**Imports:** i) 100% payment (less Indian Agency Commission, if any) shall be through Wire Transfer with a credit period of 60 days - Cash Against Documents (CAD) ii) In case Bidder opts for Letter of Credit payment, the LC Usance period shall be 90 days with respective bank charges to respective accounts and loading of 0.50% iii) Indian Agency commission if payable and so specified in the Purchase order shall be paid in Indian Rupees, considering the SBI TT selling exchange rate, as on the date of payment after successful completion of the contract.		

C	**Conditions for both Inland & Foreign LC:** a. LC validity period will be 90 days and for any extension, applicable charges will be to bidder's account. b. LC will be opened 7 working days after receipt of request along with successful pre dispatch inspection completion report / material readiness intimation with Material Test Certificate (MTC), prior to the scheduled / agreed delivery date.		**Non Deviatable**
D	**Conditions for both Indigenous & Foreign Bidders:** a. In case Bidders insist for lesser Credit period, loading of 0.60% for every 15 days reduction will be applicable. b. In case PBG as required is not furnished, Payment will be released deducting the BG amount, which will be paid after expiry of warranty period against submission of supplementary claim. c. Payment does not imply in any respect whatsoever a waiver of Buyer's right to performance of the Order. Buyer is entitled to set off claimable debts against claimable liabilities with the bidder by means of a setoff Note.		**Non Deviatable**
E	Wherever EMD is applicable, the EMD will be paid back to unsuccessful bidders within fifteen days after award of the contract. Successful bidder's EMD will be retained till submission of Performance Bank Guarantee (PBG). Tender Fee wherever applicable is not refundable. No interest shall be payable by BHEL on earnest money or security deposit or any money to the contractor by BHEL.		**Non Deviatable**
13	**Penalty clause:**		
	In the event of delay in supply /part-supply of goods, Penalty as detailed below is leviable a. Penalty of 0.5% per week or part there of shall be levied, limited to a max of 10% (ten percent) of delayed portion value / order value (as specified in SCC). b. Penalty applicable for delay in documentation is as per SCC. c. Date Reckoned for Penalty - Indigenous Orders with delivery terms FOR HPEP: C Note date. - Indigenous Orders (Others): Date of e-waybill. - Imports: For CIP/CIF Orders: IGM date - Imports: For FOB Orders: AWB / BL date - Imports: For FCA/Ex Work Orders: Date of acknowledgement from Freight Forwarder. d. In case of Deviation to above Penalty clause, loading applicable to the extent to which not agreed by Bidder. e. Timelines as mentioned in the Annexure 1 will be considered for reckoning delivery. Penalty amount so determined along with applicable GST (for Indigenous orders) thereon shall be recovered. Imposition, recovery or settlement of this penalty shall not affect BHEL's right to performance, compensation and termination of the order.		
14	**Excess materials** supplied beyond tolerance limit as specified in PO will not be paid and bidder may raise credit note for the excess/unaccepted material as per GST law.		**Non Deviatable**
15	**Rejected materials**, if any, shall be collected by the bidder within 90 days of such communication to the bidder. Beyond this period the bidder forfeits their right to the materials.		**Non Deviatable**
16	**Guarantee / Warranty Period:** Wherever required, and so provided in the specifications/SCC/Purchase Order, the bidder shall guarantee that the goods supplied shall comply with the specifications laid down, for materials, workmanship and performance. a. Guarantee period shall be 12 months from the date of commissioning or 18 months from the date of supply whichever is earlier. b. In case erection & commissioning is involved, guarantee period shall be 12 months from the date of commissioning. c. In case of equipment bought as a package which are intended to be incorporated in installations or systems, the guarantee period shall be 12 months from the date of commissioning of such equipment. The guarantee period shall be extended by the period during which the goods are not in compliance. If the delivery is found to be non-complaint, bidder shall replace, repair or re-execute the as requested by BHEL. If the bidder defaults on his obligations, buyer has the right to proceed to replace, repair or re-execute at the bidder's expense. A guarantee period as described above shall apply afresh to replaced, repaired or re-executed parts of a delivery. **Loading for deviation:** In case warranty specified in SCC is over and above the period mentioned in b & c above; loading will be 1% per annum for the deviation in warranty end period, on the contract value. Expected commissioning period is as indicated in SCC.		**Non Deviatable**

17 **PERFORMANCE BANK GUARANTEE (PBG) (Applicable in case mentioned in SCC)** — **Non Deviatable**

In case enquiry specifically spells out PBG requirement, PBG is to be submitted by Bidder in requisite format as per Annexure VII.
Further detailing on PBG as specified in SCC.
The PBG shall be for the performance of the goods and shall remain binding not withstanding such variations, alterations or extensions of item as may be made, give, conceded or agreed to between the Bidder and BHEL under these Terms and conditions or otherwise.

NOTE: Deviations (Commercial as well as Technical) from the tender specifications and conditions are generally not acceptable. However, deviation if any, shall be brought out clearly with proper justification in the offer. The deviation, if considered by BHEL, shall be loaded for comparison, while evaluating the offer. If a bidder unconditionally withdraws any deviation before price bid opening, the same shall not be loaded. Loading criteria in respect of major commercial conditions where deviations if any are accepted shall be as per clause No.18.
The Bidders may specifically note the following.

18 **Evaluation and Loading Criteria:**

i) Evaluation Currency for this tender shall be “INR”.
ii) Evaluation of prices shall be done item-wise unless otherwise specified in the SCC.
iii) Evaluation shall be on the basis of delivered cost, i.e. “Total Cost to BHEL” w.r.t the finalized technical scope and commercial conditions (after considering incidence of applicable taxes and duties and loading).
iv) In the course of evaluation, if more than one Bidder happens to occupy L1 status, effective L1 will be decided by soliciting discounts from the respective L1 Bidders. In case more than one Bidder happens to occupy the L1 status even after soliciting discounts, the L1 Bidder shall be decided by a toss/draw of lots, in the presence of the respective L1 Bidders or their representatives. Ranking will be done accordingly. BHEL decision in such situations shall be final and binding.

I**NDIGENOUS**
a. Bidder shall ensure to indicate the applicable taxes against each line item, failing which the same will be considered as inclusive/NIL.
b. Ex-works offers received (as against FOR Destination mentioned in enquiry) shall be loaded by 2% of Ex-works value.
c. GST and any other charges quoted will be added to the base price. However, in case input credit is available for GST (SGST, CGST/IGST), the same shall be excluded for arriving at “Total Cost to BHEL"

IMPORTS
For evaluation of offers in foreign currency, exchange rate (TT selling rate of State Bank of India) as on the date of bid opening (Part-I, in case of two-part bids) shall be considered. If the relevant day happens to be a bank holiday, then the forex rate as on the previous bank (SBI) working day shall be taken.
In case of foreign Bidders, the quoted CIP price shall be loaded by the following factors to arrive at “Total Cost to BHEL":
- Import duty as applicable on the date of Part-I bid opening.

- Loading will be as per the table below

	Ex Works	FOB/FCA	CIF/CFR	CIP
Foreign Inland freight and insurance	2%			
Marine freight and marine insurance	3%	3%		
Destination Port handling charges	0.50%	0.50%	0.50%	
clearing charges & inland freight and insurance	2%	2%	2%	2%

COMMON LOADING FOR IMPORTS & INDIGENOUS that will be added for arriving the "Total Cost to BHEL"
A. Loading on Deviated Penalty clause shall be 10% or to the extent to which the bidder has opted for deviation.
B. Loading for payment terms as per clause 12 of ITB
C. Loading for deviation in Warranty & PBG as per clause 16,17.

19 Procurement directly from the manufacturers/ suppliers shall be preferred. However, no agent shall be allowed to represent more than one manufacturer/ supplier in the same tender. Moreover, either the agent could bid on behalf of the manufacturer/ supplier or the manufacturer / supplier could bid directly but not both. In case bids are received from both from the manufacturer/ supplier and the agent, bid received from the agent shall be ignored.

20 **RIGHT OF REJECTION /NON- PLACEMENT OF PO:** BHEL reserves the right to accept or reject any or all bid/s in full or part without assigning any reason whatsoever.

21 **INTEGRITY PACT**
Bidders shall have to enter into Integrity Pact with BHEL as per Annexure VI - for Tender value of rupees two crores and above and shall be signed by the authorized signatory along with the offer, failing which Bidder’s offer will be rejected.

22 **Public Procurement**

A **Make in India**
For this Procurement, the local content to categorize a bidder as a Class I local bidder / Class II local bidder / Non-Local bidder and purchase preference to Class I local bidder, is as defined in Public Procurement (Preference to Make in India) order No P-45021/2/2017-PP(BE-II) dated 04-06-2020 issued by DPIIT as amended from time to time.
Proforma for self-certification for minimum local content and auditor’s certification is given in Annexure III.

B	Any Bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with competent authority. GOI website https://www.mea.gov.in/ to be referred for latest details of competent authority and exemptions . Proforma for self-certification for compliance is given in Annexure IV.
C	**Startups:** For Start-ups duly registered with DPIIT (Copy of certificate to be provided), condition of prior turnover and prior experience in Public Procurement may be relaxed subject to meeting of Quality and Technical Specifications. Startups are exempt from paying EMD.
23	**Benefits earmarked for Purchase from Micro & Small Enterprises (MSEs) – Indigenous Purchase**
A	All Micro and Small Enterprises (MSEs) as defined in MSE Procurement Policy are exempt from Paying EMD. NSIC/UDYAM registered bidders shall submit NSIC/UDYAM Certificate along with bid documents. Date to be reckoned for determining the deemed validity will be the last date of Technical bid submission. Non- submission of such document will lead to consideration of their bid, at par with other bidders and MSE status of such bidders shall be shifted to Non- MSE Category till the bidder submits these documents.
B	In tender, MSEs quoting price within price band of L1+15% shall also be allowed to supply a portion of requirement by bringing down their price to L1 price in a situation where L1 price is from someone other than a MSE and such MSE shall be allowed to supply at least 25% of total tendered value. In case of more than one such MSE, the supply shall be shared proportionately. Out of these 25% minimum 3% shall be earmarked for MSEs owned by women and 6.25% for MSEs owned by SC/STs who submit the relevant documents.
C	If an enterprise falling under MSME category as defined in the Act, graduates to a higher category from its original category or beyond the purview of the Act, it shall continue to avail all non-tax benefits of its original category notified by the Ministry of Micro, Small and Medium Enterprise for a period of three years from the date of such graduation to the higher category.
D	BHEL HPEP is registered with RXIL (TReDS) platform. MSME bidders are requested to get registered with RXIL (TReDS) platform to avail the facility as per the GOI guidelines.
24	Inspection Measuring and Test Equipment (IMTE) used by the Bidder/ Contractor or sub-contractor shall be calibrated, maintained and controlled. Calibration shall be valid and IMTE maintained in sound condition during usage.
25	ISO-9001, ISO14001 and OHSAS 18001 shall be complied
26	If BHEL registered supplier is not quoting against this NIT, supplier shall send regret letter positively with valid reasons for not participating. Repeated lack of response on the part of supplier may lead to deletion of such registered supplier from BHEL's approved supplier's list as per BHEL SEARP Guidelines.
27	**Risk Purchase clause:** In case bidder fails/delays to supply whole or part of the ordered items or supplies defective items or fails to fulfil any other terms and conditions given in Purchase Order/Contract, BHEL has the right to terminate the order/contract or withdraw balance scope of work/supply and make the purchase of such material / services from elsewhere at the risk and cost of the defaulted bidder. The bidder is liable for the additional expenditure / difference in Cost, if any, including consequential losses which BHEL may sustain by reason of risk purchase in addition to the applicable LD as per the order/contract. Non-performance of contract attracts penal provisions in line with BHEL guidelines for Suspension of Business Dealings (SBD).
28	Any other terms and conditions of the bidder attached / referred against the tender enquiry will not be considered.
29	All drawings, patterns and tools supplied by BHEL or made at BHEL's expense are BHEL's property. These cannot be used or referred to any other party and must be used only in the execution of BHEL's orders.
30	Any amount payable by the bidder under any of the conditions of this contract shall be liable to be adjusted against any amount payable to the bidder under any other work / contract awarded by BHEL HPEP or any other BHEL Units. This is without prejudice to any other action as may be deemed fit by BHEL.
31	The bids of the bidders who are on the banned list and also the bids of the bidders, who engage the services of the banned firms, will be rejected. The list of firms banned by BHEL is available on BHEL web site: www.bhel.com
32	**Ordering and confirmation of order**
	The bidder shall send the order acceptance within one week from the date of LOI/Purchase order or such other period as specified/agreed by the Buyer. Buyer reserves the right to revoke the order placed if the order confirmation differs from the original order placed. Buyer shall be legally bound, only if agreed for any deviation explicitly in writing. The acceptance of deliverables or supplies by Buyer as well as payments made in this regard shall not imply acceptance of any deviations. The Purchase order will be deemed to have been accepted if no communication to the contrary is received within one week (or the time limit as specified /agreed by the Buyer) from the date of P.O. Buyer, is at liberty to send signed P.O. through electronic media such as e-mail and the receipt of which shall be treated as receipt of order.
33	**Execution**
	The whole contract is to be executed in the most workman like manner, substantial and approved as per the contracted terms.
34	**Progress Report**
	The bidder shall render such report as to the progress of work and in such form as may be called for by the Buyer from time to time. The submission and acceptance of such reports shall not prejudice the rights of the buyer in any manner. Bidder shall communicate to BHEL immediately, the change of address, ownership, contact person(s), the mobile numbers and e-mail of the dealing person concerned. Milestones shall be periodically updated by bidder through PRADAN Portal **(https://web.bhelhyd.co.in/mm/).** Non updation will adversely affect service rating of bidder performance.

35	**Non-disclosure Obligations**
	Drawings, technical documents or other technical information received by one party shall not without the consent of the other party, be used for any other purpose than that for which they were provided. They may not, without the consent of the submitting party, otherwise be used or copied, reproduced, transmitted or communicated to third parties. All information and data contained in general product documentation, whether in electronic or any other form, are confidential and binding only to the extent that they are by reference expressly included in the contract. The bidder shall, as per agreed date/s but not later than the date of delivery, provide free of charge any information and/or drawings which are necessary to permit the Buyer to erect, commission, operate and maintain the product. Such information and drawings shall be supplied as specified in technical specification. All intellectual properties, including designs, drawings and product information etc. exchanged during the formation and execution of the contract shall continue to be the property of the submitting party. The bidder shall provide Buyer with all information pertaining to the delivery in so far as it could be of importance to Buyer. The bidder shall not reveal confidential information to its own employees not involved with the tender/contract and its execution and delivery or to third parties, unless Buyer has agreed to this in writing beforehand. The bidder shall not be entitled to use the Buyer's name in advertisements and other commercial publications including website without prior written permission from Buyer. In the event of violation of the confidentiality as agreed, BHEL will take legal action as deemed fit. Non-disclosure agreement to be entered as per **Annexure- II** wherever applicable.
36	**Inspection and Testing**
A	The goods and stores shall be manufactured by approved quality system and each part/component may be inspected and tested by the Buyer prior to shipment and shall comply with relevant requirements. Buyer has the right to inspect at any stage during manufacture/ delivery.
B	Buyer or his authorized representative shall be entitled at all reasonable times during execution to inspect, examine and test at the bidder's premises the material and workmanship of all stores to be supplied under the contract, and if the part of the stores are being manufactured at other premises, the bidder shall obtain for buyer or his authorized representative permission to inspect, examine and test as if the said stores are being manufactured at the bidder's premises. Such inspection, examination and testing, if made shall not release the bidder from any obligation under the contract. For indigenous bidders all costs related to first inspection request shall be borne by the buyer and the cost of subsequent inspections due to non-readiness of material/rework/ rejections shall be borne by the bidder. In case of imports all inspection charges including third party inspections if any shall be borne by the bidder. The cost of inspection staff/third party specified by the Buyer shall be borne by bidder unless otherwise specifically agreed. If the contract provides for tests on the premises of the bidder or any of his sub-contractor/s, bidder shall be responsible to provide such assistance, labor, materials, electricity, fuels, stores, apparatus, instruments as may be required and as may be reasonably demanded to carry out such tests efficiently. Cost of any type test or such other special tests shall be borne by the bidder unless otherwise specifically agreed in the contract. The Bidder shall give the authorized representative of the buyer reasonable notice in writing of the date on and the place at which any stores will be ready for inspection/ testing as provided in the Contract. Annexure – I, may strictly be complied with for the time lines. Any delay in submission of the documents by the bidder will not alter the delivery date.
37	**Quality and Condition of the Deliverables**
	The bidder shall be responsible for compliance with applicable technical, safety, quality, environmental requirements and other regulations in relation to products, packaging and raw and ancillary materials.
38	**Packaging and Dispatch**
	The bidder shall package the deliverables safely and carefully and pack them suitably in all respects considering the peculiarity of the material for normal safe transport by sea/air/rail/road to its destination suitably protected against loss, damage, corrosion in transit and the effect or tropical salt laden atmosphere. The packages shall be provided with fixtures/hooks and sling marks as may be required for easy and safe handling by mechanical means. Special packaging conditions/ environmental conditions as defined in the NIT shall be fully complied. Each package must be marked with consignee name, address, P.O. number, Package Number, gross weight & net weight, dimensions (Lx B x H) and bidder's name. The packing shall allow for easy removal and checking of goods on receipt and comply with carrier's conditions of packing or established trade practices. Packing list for goods inside each package with P.O. item No. & quantity must also be fixed securely outside the box to indicate the contents. If any consignment needs special handling instruction, the same shall be clearly marked with standard symbols/instructions. Hazardous material should be notified as such and their packing, transportation and other protection must conform to relevant regulations.
39	**Contract variations; Increase or decrease in the scope of supply**
	Buyer may vary the contracted scope during execution due to exigencies of project requirement. If the bidder is of the opinion that the variation has an effect on the agreed price or delivery period, Buyer shall be informed of this immediately in writing along with technical details, and in the event of additional work, submit a quotation with regards to the price and period involved, as well as the effect this additional work will have on the other work to be performed by the bidder. Wherever unit rates are available in the contract, the same shall be applied to such additional work. The bidder shall not perform additional work before buyer has issued written instructions/amendment to the purchase order to that effect. The work which the bidder should have or could have anticipated in terms of delivering the service (s) and functionality (ies) as described in this agreement should be executed by the bidder without any price implication. In case of no change in the scope / technical specifications, bidder shall endeavor to keep the material ready and intimate the same to BHEL within the contractual delivery date, failing which, the delay if any will be attributed to supplier, and any upward price variation thereof for delivery at a later date is not admissible.
40	**Rejected/Short shipments/ warranty/guarantee replacements**
	In case of any short shipment during initial supply which is subsequently dispatched by the bidder or any guarantee / warranty replacements shall be dispatched on "DDP-Delivered duty paid BHEL stores" basis for imported items and "FOR-BHEL Stores/designated destination" basis for indigenous items.
41	**Export Administration Regulations**
	If a delivery includes such technology and / or supply that is subjected to the export regulations the bidder shall obtain due permissions, approvals, license etc.

42	**Force Majeure**
	The bidder shall not be considered in default if delay occurs due to causes beyond their control such as Acts of God, Natural calamities, Fire, Frost, Flood, Civil War, civil commotion, riot, Government Restrictions. Only those causes that have duration of more than seven days shall be considered cause of force majeure. Notification to this effect duly certified by local chamber of commerce/statutory authorities with supporting documents shall be given by the bidder to BHEL by registered letter/courier service immediately without loss of time. In the event of delay due to such causes the delivery schedule shall be extended for a length of time equal to the period of Force Majeure or at the option of BHEL the order may be cancelled. Such cancellation would be without any liability whatsoever on the part of BHEL. In the event of such cancellation the bidder shall refund any amount advanced or paid to the bidder by BHEL and deliver back any material issued to him by BHEL and release facilities, if any provided by BHEL.
43	**Non-waiver of Defaults**
	If any individual provision of the contract is invalid, the other provisions shall not be affected.
44	**Settlement of Disputes**
	Except as otherwise specifically provided in the contract, all disputes concerning questions of the facts arising under the contract, shall be decided by the Buyer, subject to written appeal by the bidder to the buyer, whose decision shall be final. Any disputes of differences shall to the extent possible be settled amicably between the parties thereto, failing which the disputed issues shall be settled through arbitration The bidder shall continue to perform the contract, pending settlement of disputes(s).
45	**Conciliation clause**
	CONCILIATION CLAUSE FOR CONDUCTING CONCILIATION PROCEEDINGS UNDER THE BHEL CONCILIATION SCHEME, 2018: The Parties agree that if at any time (whether before, during or after the arbitral or judicial proceedings), any Disputes (which term shall mean and include any dispute, difference, question or disagreement arising in connection with construction, meaning, operation, effect, interpretation or breach of the agreement, contract or the Memorandum of Understanding, penalty deduction, time extension), which the Parties are unable to settle mutually, arise inter-se the Parties, the same may, be referred by either party to Conciliation to be conducted through Independent Experts Committee to be appointed by competent authority of BHEL from the BHEL Panel of Conciliators. The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and as provided in Procedure in http://www.bhel.com/index.php/story_details?story=2454 . The Procedure together with its Formats will be treated as if the same is part and parcel hereof and shall be as effectual as if set out herein in this ITB
46	**ARBITRATION (WITH SOLE ARBITRATOR)**
	Except as provided elsewhere in this Contract, in case amicable settlement is not reached between the Parties, in respect of any dispute or difference; arising out of the formation, breach, termination, penalty deduction, validity or execution of the Contract; time extension, or, the respective rights and liabilities of the Parties; or, in relation to interpretation of any provision of the Contract; or, in any manner touching upon the Contract, then, either Party may, by a notice in writing to the other Party refer such dispute or difference to the sole arbitration . Sole arbitrator to be appointed by Head of the Unit - BHEL , HPEP .
	The Arbitrator shall pass a reasoned award and the award of the Arbitrator shall be final and binding upon the Parties.
	Subject as aforesaid, the provisions of Arbitration and Conciliation Act 1996 (India) or statutory modifications or re-enactments thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceedings under this clause. The seat of arbitration shall be Sangareddy / Hyderabad, Telangana. The language of arbitration shall be English and the documents shall be submitted in English.
	The cost of arbitration shall initially be borne equally by the Parties subject to the final apportionment of the cost of the arbitration in the award of the Arbitrator.
	Subject to the arbitration in terms of clause 45, the courts at Sangareddy, Telangana State shall have exclusive jurisdiction over any matter arising out of or in connection with this contract. Notwithstanding the existence or any dispute or differences and/or reference for the arbitration, the Contractor shall proceed with and continue without hindrance the performance of its obligations under this Contract with due diligence and expedition in a professional manner except where the Contract has been terminated by either Party in terms of this Contract.
	ARBITRATION FOR CONTRACT WITH PUBLIC SECTOR ENTERPRISE (PSE) OR A GOVERNMENT DEPARTMENT
	In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs/ Port Trusts inter se and also between CPSEs and Government Departments/Organizations (excluding disputes concerning Railways, Income Tax, Customs & Excise Departments), such dispute or difference shall be taken up by either party for resolution through AMRCD as mentioned in DPE 0M No 4(1)/2013-DPE(GM/FTS 1835 dated 22-05-2018
47	**Applicable Laws and jurisdiction of Courts**
	This agreement shall be construed and interpreted in accordance with the laws of India and shall have exclusive jurisdiction of Sangareddy/Hyderabad courts, Telangana, India.
48	**BHEL-Fraud prevention policy shall be adhered to.**
	The Bidder along with its associate/ Collaborators/ Sub-contractors/ sub-bidders/ 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. List of nodal officers is hosted on BHEL Hyderabad website https://hpep.bhel.com/.
49	**Suspected Cartel Formation**
	The Bidder declares that they will not enter into any illegal or undisclosed agreement or understanding, whether formal or informal with other Bidder(s). This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process. In case , the Bidder is found having indulged in above activities, suitable action shall be taken by BHEL as per extant policies / guidelines .

Note: Purchase officer has to fill Annexure-I while sending enquiry

(Attachment to Enquiry No. XXXXXXXXXX Due on Date XX.XX.XXXX					
Special Conditions of Contract (SCC)					
Sl.No	**ITB Clause No.**	**Clause**	**Available Options**	**BHEL requirements**	**Bidder response**
1	3	Mode of Submission	Conventional / E-Procurement		
2	5	Type of Bid	Single part / Two Part / Three Part		
3	6	Indigenous purchase - Destination	BHEL, RCPuram, Hyderabad / Site		
4			Destination in case of Site		
		Mode of Shipment	Air / Sea		
5		Imports purchase - Destination	Mumbai / Navasheva / Hyderabad / Others		
6		Freight	Customer / BHEL / Vendor		
7		Insurance	Customer / BHEL / Vendor		
8		**Basic Custom Duty**	Project Imports/ Concessional Duty / Merit Duty / Nil / Others _____Duty Structure		
9	9	Price validity	_____ days		
		Optional Spares price validity	_____ Months / years from the date of _____		
10	8	Delivery Period	___ weeks / ___ Months (Staggered delivery to be detailed)		
11	18	Evaluation basis	Itemwise / Total		
12	Others	Quantity Split	Splittable / Non-Splittable		
13			(Tabulation for splitting to be detailed)		
14	9	Price Variation Clauser (PVC)	Applicable / Not applicable		
15	12	Payments Terms			
16		Tender cost	Applicable / Not applicable		
17		Earnest Money Deposit (EMD)	__% of tender value / Not applicable		
18		E & C Supervision Charges	Applicable / Not applicable		
19			If applicable , max 2% of Total contract value .		
20		Bank Guarantee against milestone payment	(If envisaged to be detailed with %)		
21	Others	Contract execution Bank Guarantee	__% of PO Value to be submitted after receipt of PO / Not Applicable		
22	17	Performance Bank Guarantee			
	7	Additional documentation for payment	Test / Warranty / Guaranty / O&M Manual etc.,		
24	13	Max Penalty applicable on	Delayed portion / Order value		
25	Others	Contract Specific Penalty Clause	including Documentation delay , Performance , E&C etc., to be detailed , considering Project , Unit , Set , etc.,		
26	16	Guarantee / Warranty Period	Applicable Clause a/b/c		
27		Contract Specific Guarantee / Warranty Period	Specific period if any to be detailed		
28	Others	Expected commissioning period	___ months from the date of supply		
29	48	Detailed Billing Breakup (BBU)	Applicable / Not applicable		
30			(If applicable , Bidder shall provide detailed billing break-up in respect of the major items/components (stipulated in the tender) as part of offer .)		
31	Others	Customer approval of vendor	Applicable / Not applicable		
32		Drawing approval	Applicable / Not applicable		
33		QAP approval	Applicable / Not applicable		
34	36	Inspection by	BHEL / BHEL TPI / Vendor TPI / Customer		
35	Others	Financial / Commercial PQC	Applicable / Not applicable		
36			if Applicable to be detailed		

Annexure-I			
Major Activity timelines shall be considered for indegenous purchases			
S No	Activity	Agency	Timeline
1	PO acknowledgement	Vendor	_____days from PO
2	Submission of Drawings and QP	Vendor	_____days from PO
3	Approval of Drawings and QP	BHEL/Customer	_____days from PO
4	Raising of Inspection Call	Vendor	_____days from PO
5	Inspection completion	Self/BHEL/Third party inspection agency	_____ days from inspection call date
6	Despatch Instructions	BHEL	_____days from inspection report
7	Reciept of Material	Vendor	_____days from Despatch instructions

Above is illustrative only.Purchase department can add more activities depending on nature of prodcut/contracts

However absence of this annexure in NIT will entail non processing of delivery extention cases in case of delay in supplies of goods owing to reason attributable to BHEL.

(To be executed on Non- Judicial Stamp Paper for an appropriate value.
To be stamped as an agreement)

(For Suppliers on Unit's / Division's PMD)

ANNEXURE-II

Framework Confidentiality Agreement Cum Undertaking

This Agreement made on this the _____ day of (month) _____ 20 ___ ("Effective Date") by and between M/s. BHARAT HEAVY ELECTRICALS LIMITED, having registered office at "BHEL House", Siri Fort, New Delhi – 110049 (India), acting through its _____ Unit (hereinafter may be referred to as "BHEL" or "the company").

And

M/s. _____ (address) _____ represented by authorized representative Sri _____ (herein after referred to as the "Supplier").

The supplier and the company may, unless the context otherwise requires, hereinafter be collectively referred to as "Parties" or singly as the "Party".

RECITALS

Whereas, BHEL is engaged in the design, engineering, manufacturing, construction, testing, commissioning and servicing of a wide range of products, systems and services for the core sectors of the economy, viz. Power, Transmission, Industry, Transportation, Renewable energy, Oil & Gas and Defence and providing associated services to varied customers in relation to which BHEL / its affiliates own valuable information of a secret and confidential nature.
Whereas the Company may, in connection with contract(s) (as defined hereunder) placed or to be placed upon the supplier, or otherwise, from time to time, make available, Technical Information as is defined hereunder.

And Whereas BHEL is willing to provide such Technical Information to the Supplier from time to time and the Supplier understands and acknowledges that such Technical Information is valuable for the Company and as such is willing to protect confidentiality of such information, subject to the terms and conditions set out hereunder.

Now therefore, in view of the foregoing premises and in consideration of the mutual covenants and agreements hereinafter set forth, the parties agree as under:

1. Definitions:

Unless the context so requires, in this Agreement, the following terms will bear the meaning ascribed to the said term in this clause.

A. **"Contract"** means the contract entered into with a supplier and includes a Purchase Order, or a Work Order for procurement of any goods or for provision of any services.
B. **"Effective Date"** means the date of this Agreement as mentioned in the preamble of this Agreement.
C. **"Supplier"** includes a Contractor or a Vendor of the Company whether for supplying of goods or for providing any services under a Contract or both.
D. **"Technical Information"** includes Drawings, and / or Product Standards and / or Specifications and / or Corporate / Plant Specifications and / or Technological Process Sheets and / or Technical Data Sheets and / or Jigs & Fixtures and / or Pattern & Dies and / or Special Gauges and / or Tools etc. Belonging to or wherein the Company has acquired from a third party a right of user and includes any improvement thereto from time to time whether carried out by the Company or by the Suppliers.
E. **"Intended Purpose"** means the purpose for which the Technical Information is provided to the supplier under or in connection with a contract.
F. **"Improvement"** includes any modification made to, or adaptation of, the Technical Information which enhances or is calculated to enhance the performance (Whether in terms of effectiveness or in terms of efficiency or both) of the product and / or the service to be provided by the Supplier under a Contract.

2. This Agreement shall come into force / deemed to have come into force, as the case may be, on the Effective Date; or, on the first date when the Technical Information or any part thereof is provided by BHEL to the supplier; whichever is earlier.

3. **Agreement deemed to be incorporated in each contract:** Unless and to the extent otherwise stipulated in the Contract, the conditions of this Agreement are deemed to be incorporated in all Contracts which may be entered into between the Company and the Supplier. Further, unless otherwise stipulated, the obligations under this Agreement are and will be independent of the obligations under the Contracts and such obligations of the Supplier hereunder will remain of full effect and validity notwithstanding that the period of validity of the Contract has expired by efflux of time stipulated therein; or, the contract has been discharged by performance or breach; or, the termination of the Contracts for any reason whatsoever.

4. Ownership:

4.1 The Company may, from time to time, make available to the Supplier, Technical Information on a non-exclusive basis by way of loan.

4.2 The Supplier acknowledges and agrees that all Technical Information and copies thereof that are or may be provided by the Company to the Supplier, are and shall remain the property of

BHEL or that of the concerned entity from whom BHEL has obtained the Technical Information and such Technical Information are and shall constitute trade secrets of the BHEL. Nothing in this Agreement or in any disclosures made hereunder by or on behalf of the Company shall be construed as granting upon the Supplier any patent, copyright or design or any other intellectual property rights of whatsoever description that subsists or may hereinafter exist in the Technical Information. Furthermore, nothing in this Agreement or in any disclosures made hereunder by or on behalf of the Company shall be construed as granting upon the supplier any license or right of use of such patent, copyright or design or any other intellectual property rights of whatsoever description which may now or hereafter exist in the Technical Information except for use of the Technical Information strictly in accordance with this Agreement and the contract and / or as directed in writing by the Company, solely for the Intended Purpose under the Contract.

4.3 Neither party is obligated by or under this Agreement to purchase from or provide to the other party any service or product and that any such purchase / sale of any product and / or service by one party to the other party will be governed by the Contract if any, that may be entered into by and between the Company and the Supplier.

4.4 The Supplier is / has been made well aware and acknowledges that the Technical Information being / which may be shared with it by the Company has been either generated by the Company by incurring huge investment and cost or obtained from foreign collaborators under Technical Collaboration Agreement (TCA) with stringent confidentiality conditions.

4.5 The supplier agrees and undertakes to adhere to confidentiality requirements as applicable to BHEL under a TCA and also ensure that the confidentiality requirements are adhered to by all its concerned employees or sub-contractors /suppliers (where permitted to be engaged by BHEL). Any damages, losses, expenses of any description whatsoever, arising out of or in connection with a breach of the confidentiality requirements under a TCA owing to any act or omission on the part of the supplier or its employees or sub-contractors / suppliers that is claimed by a foreign collaborator from the Company shall be wholly borne by the Supplier and it shall keep BHEL fully indemnified in this behalf. The demand by the Company shall be conclusive upon the Supplier who shall thereupon forthwith pay to the Company without demur, dispute or delay the amount as demanded without demanding any further proof thereof.

4.6 The Supplier agrees and undertakes that unless so decided and advised by the Company in writing all rights / title to any Improvement to the Technical Information shall vest in the Company. The Supplier undertakes and agrees to inform forthwith to the Company of any such Improvement made to the Technical Information and transfer all drawings / documents or other materials connected with such Improvement to the Company and also agrees to fully cooperate with the Company for protecting the Company's interests in such Improvements

in the Technical Information including but not limited to obtaining necessary protection for the intellectual property rights in such improvement, if so desired by the Company. If a question arises whether a modification amounts to improvement to the Technical Information, the same shall be decided by the Company and such decision shall be final and binding upon the supplier.

5. Use and Non – Disclosure:

5.1 Unless otherwise stipulated by the Company, all Technical Information made available to the supplier, by the Company shall be treated as Confidential irrespective of whether the same is marked or otherwise denoted to be Confidential or not.

5.2 The Supplier undertakes and agrees that the Technical Information in its possession shall be held in strict confidence and will be used strictly in accordance with this Agreement and solely for the Intended Purpose under the Contract. Use of the Technical Information for any other purpose other than Intended Purpose is prohibited.

5.3 In particular, the Supplier shall not use Technical Information or any Improvement in its possession for the manufacture or procurement of the product(s) or components or parts thereof or use the Technical Information or any portion thereof or any modification or adaptation thereof in any form to provide any product and / or service to any third party, without the prior written consent of the Company.

5.4 The Supplier shall not disclose any of such Technical Information to any third party without the prior written consent of the Company. The Supplier agrees that without prior written consent of the Company, the supplier shall not disclose to a third party about the existence of this Agreement, or of the fact that it is / was in possession of or has experience in the use of any Technical Information nor shall the Supplier share in any manner whatsoever, with a third party, the name or details of any Contract(s) awarded by the Company to it or performed by the Supplier or the scope of work thereof or share any document or correspondence by and between the Company and the supplier in or in connection with this Agreement or such Contract(s). Notwithstanding what is stated elsewhere, the overall responsibility of any breach of the confidentiality provisions under this Agreement shall rest with the Supplier.

5.5 This Supplier undertakes and agrees not to make copies or extracts of and not to disclose to other any or all of the Technical Information in its possession, except as follows:

(a) The Supplier may disclose the Technical Information to such of its officers and employees strictly to the extent as is necessary for such officer or employee for the Intended Purpose, provided that the Confidential Information (or copies thereof) disclosed shall be marked

clearly as the confidential and proprietary information of Company and that such officers and employees shall similarly be bound by undertakings of confidence, restricted use and non-disclosure in respect of the Technical Information. The Supplier shall be responsible for any breach of such confidentiality provisions by such officers and employees.

(b) With the prior written consent of Company, the supplier may disclose for the Intended Purpose such Technical Information as is provided for in such consent to such of its professional advisers: consultants, insurers and subcontractors who shall be similarly bound by undertakings of confidence, restricted use and non-disclosure in respect of such Technical Information.

(c) The Supplier shall not be prevented to make any disclosure required by (i) order of a court of competent jurisdiction or (ii) any competent regulatory authority or agency where such disclosure is required by law, provided that where the supplier intends to make such disclosure, it shall first consult Company and take all reasonable steps requested by it to minimize the extent of the Technical Information disclosed and to make such disclosure in confidence and also shall cooperate with the Company in seeking any protective order or any other remedy from proper authority in this matter.

6. <u>Exceptions:</u>

The Obligations of the Supplier pursuant to the provisions of this agreement shall not apply to any Confidential Information that:

a) was / is known to, or in the possession of the Supplier prior to disclosure thereof by the Company;
b) is or becomes publicly known, otherwise than as a result of a breach of this agreement by the Supplier.
c) is developed independently of the Disclosing party by the Supplier in circumstances that do not amount to a breach of the provisions of this Agreement or the Contract;
d) is received from a third party in circumstances that do not result in a breach of the provisions of this Agreement.

7. The Obligation of maintaining confidentiality of the Technical Information on each occasion, shall subsist for the entire duration during which the Technical Information / equipment is in possession of the Supplier and shall thereafter subsist for a further period of _____ years from the date when the complete Technical Information has been returned in portions on different dates, the period of ____ years will be reckoned from the date when the last portion of the Technical Information has been returned. Notwithstanding the expiry of the confidentiality obligation, the obligation of the Supplier under clause 5.4 shall continue to subsist for a further period of _____ years.

8. <u>Warranties & Undertakings</u>:

a) The Supplier undertakes to ensure the due observance of the undertakings of confidence, restricted use and non-disclosure by its persons to whom it discloses or releases copies or extracts of the Technical Information.

b) The Supplier shall keep the Technical Information or improvement made therein properly segregated and not mix up the same with any other material / documents belongings to him / it or to any other third party.

c) The Supplier further undertakes that he / it shall not hypothecate or give on lease or otherwise alienate or do away with any of the Technical Information and / or equipment of the Company, made available to him / it, and undertakes that he / it shall hold the same as a trustee, in capacity of custodian thereof and use / utilise the same solely for the purpose of executing the contract awarded by the Company.

d) The Supplier further undertakes that he / it shall return all the equipment and / or Technical Information as far as practicable in the same condition in which the same was made available to him / it by the Company together with any Improvement thereon and the documents connected with such Improvement, to the Company forthwith upon completion of the scope of work or contract for which such Technical Information was provided by the Company to it or as directed by the Company together with a confirmation by way of an affidavit or in such manner as directed by the Company that it has not retained any equipment and / or Technical Information / improvement thereof. In case any such equipment and / or Technical Information or thereof shall remain in his possession or is not capable of being returned, the retention and use of such Technical Information or improvement thereto shall continue to be governed by this Agreement.

e) The Supplier undertakes to indemnify the Company for all the direct, indirect and / or consequential losses, damages, expenses whatsoever including any consequential loss of business, profits suffered by the Company owing to breach by the Supplier of its obligations under this Agreement and / or the confidentiality requirements, if any, contained in the Contract and that the Supplier hereby agrees that the decision of the Company in all such or any such matter/s shall be final and binding on the Supplier. On mere written demand of the Company, the Supplier shall forthwith and without demur or delay pay to the Company any such sum as determined by the Company as the amount of loss or damage or expense which has been suffered by the Company. The Supplier agrees that the Company shall be entitled to withhold and appropriate any amount payable to the Supplier under any Contract then existing between the Company and the Supplier, in case the Supplier fails to make payment, in terms of the written demand, within 7 days thereof. Without prejudice to the forgoing actions, in respect to any breach of this Agreement, the Company shall be entitled to take

any other action against the Supplier as per applicable laws, the Contract, Company's applicable policies, guidelines rules, procedures, etc.

9. Without prejudice to any other mode of recovery as may be available to the Company for recovery of the amount determined as due as per Clause 9 (f) hereinabove, the Company shall have a right to withhold, recovery and appropriate the amount due towards such losses, damages, expenses, from any amount due to the Supplier in respect of any other Contract (s) placed on him / it by any department / office / unit/ division of the said Company.

10. <u>Arbitration & Conciliation:</u>

Except as provided elsewhere in this contract, in case amicable settlement is not reached between the parties, in respect of any dispute or difference; arising out of the formation, breach, termination, validity or execution of the contract; or, the respective rights and liabilities of the parties; or, in relation to interpretation of any provision of the contract; or, in any manner touching upon the contract, then, either party may, by a notice in writing to the other party refer such dispute or difference to the sole arbitration of an arbitrator appointed by head of the BHEL unit issuing the contract.

The Arbitrator shall pass a reasoned award and the award of the Arbitrator shall be final and binding upon the parties.

Subject as aforesaid, the provisions of Arbitration and Conciliation Act 1996 (India) or statutory modifications or re-enactments thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceedings under this clause, the seat of arbitration shall be at Hyderabad.

The cost of arbitration shall be borne as per the award of the Arbitrator.

Subject to the arbitration in terms of clause 55, the courts at Sangareddy, Telangana State shall have exclusive jurisdiction over any matter arising out of or in connection with this contract.

Notwithstanding the existence or any dispute or differences and / or reference for the arbitration, the contractor shall proceed with and continue without hindrance the performance of its obligations under this contract with due diligence and expedition in a professional manner except where the contract has been terminated by either party in terms of this contract.

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

In the event of any dispute or difference relating to the interpretation and application of the provisions of the contract, such dispute or difference shall be referred by either party for arbitration to the sole arbitrator in the Department of Public Enterprises to be nominated by the secretary to the Government of India in–charge of the Department of Public Enterprises. The Arbitration and Conciliation Act, 1996 shall not be applicable to arbitration under this clause. The award of the arbitrator shall be binding upon the parties to the dispute, provided, however, any party aggrieved by such award may make further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs, Ministry of Law and

justice, Government of India. Upon such reference the dispute shall be decided by the Law secretary or the special Secretary or Additional secretary when so authorized by the Law secretary, whose decision shall bind the parties hereto finally and conclusively. The parties to the dispute will share equally the cost of arbitration as intimated by the arbitrator.

11. <u>Governing Law & Jurisdiction:</u>

This agreement shall be construed and interpreted in accordance with the laws of India and shall have exclusive jurisdiction of Sangareddy/Hyderabad courts, Telangana, India.

SIGNATURE

WITNESSES

1

Name:

Address:

2

Name:

Address:

Annexure - III

Proforma for self-certification by Supplier for minimum local content on their letter head for tender value less than Rs 10 Crore

"We _____ (Name of Manufacturer) undertake that we meet the mandatory minimum Local Content (LC) requirement i.e. _____ (to be filled as notified in the policy) for claiming Purchase Preference linked with Local Contents under the Govt. policy against tender no. _____."

Auditor's certification with respect to minimum local content on the letter head of Statutory Auditor for tender value above Rs.10 crore

"We _____ the statutory auditor of M/s _____ (name of the bidder) hereby certify that M/s_____ (name of manufacturer) meet the mandatory Local Content requirements of the Goods and/or Services i.e. _____ (to be filled as notified in the policy) quoted vide offer No._____ dated _____ against BHEL's tender No._____ by M/s _____ (Name ofthe bidder)."

Annexure - IV

Proforma for self-certification by Supplier for Compliance to Clause No 20 (B)

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and I certify that M/s…. (Name of firm) is **not from such a country/is from such a country (**delete whichever is NOT applicable**)** and has been duly registered with the Competent authority (delete if NOT applicable) . I hereby certify M/s ….. fulfills all requirements in this regard and is eligible to be considered . (where applicable , valid registration by the competent authority shall be attached)

Sd/-
Authorised Signatory with Stamp

Annexure V

(On Company Letter Head)

FORM NO. 10F
[See sub-rule (1) of rule 21AB]
Information to be provided under sub-section (5) of section 90 or sub-section (5) of section 90A of the Income-tax Act, 1961

I……. son/daughter of Mr ……. in the capacity of……. (Designation) do provide the following information, relevant to the previous year **2021-22** in case of …….. for the purposes of sub-section (5) of section 90/section 90A:-

Sl.No.	Nature of information	Details
(i)	Status (individual; company, firm etc.) of the assesse	Company
(ii)	Permanent Account Number (PAN) of the assessee if allotted	
(iii)	Nationality (in the case of an individual) or Country or specified territory of incorporation or registration (in the case of others)	……
(iv)	Assessee's tax identification number in the country or specified territory of residence and if there is no such number, then, a unique number on the basis of which the person is identified by the Government of the country or the specified territory of which the assessee claims to be a resident	……

(v)	Period for which the residential status as mentioned in the certificate referred to in sub-section (4) of section 90 or sub-section (4) of section 90A is applicable	**2022-23**
(vi)	Address of the assessee in the country or territory outside India during the period for which the certificate, mentioned in (v) above, is applicable	…….. ……. ……

I have obtained a certificate to in sub-section (4) of section 90 of sub-section (4) of section 90A from the Government of……. (name of country or specified territory outside India)

Signature:…….
Name:…….
Address:…….
Email ID:……
Contact Number…….
Permanent Account Number:…….

Verification

I……. do hereby declare that to the best of my knowledge and belief what is stated above is correct complete and is truly stated. Verified today the……. day of……..…….

In case the M/s Bharat Heavy Electricals Limited, HPEP, Ramachandrapuram, Hyderabad is declared as an assessee in default due to any misstatement or incorrect declaration, we indemnify M/s Bharat Heavy Electricals Limited from any ensuing consequences thereunder.

Signature of the person providing the information

Place:…….

(On Company Letter Head)

No Business Connection or Permanent Establishment Certificate

Date

To

Bharat Heavy Electricals Limited
Ramachandrapuram, Hyderabad
India - 502032

Sir,

Sub: No Business Connection or Permanent Establishment declaration for FY **2021-22**

This is to certify that …… (Name of the supplier) is a company incorporated in ……(country) and does not have any business connection in India as per the provision of Section 9 of the Income Tax Act 1961 or any Permanent Establishment as defined in Article 5 of the India and …….(country) DTAA.

We hereby certify that we will notify BHEL in case of any change in the status as certified above.

For ……

Authorised Signatory

(Note – Please refer definition of the Business Connection on reverse and Permanent Establishment in the relevant DTAA)

"Business connection" as defined in Section 9 of the Income Tax Act the shall include any business activity carried out through a person who, acting on behalf of the non-resident,—

(a) has and habitually exercises in India, an authority to conclude contracts on behalf of the non-resident or habitually concludes contracts or habitually plays the principal role leading to conclusion of contracts by that non-resident and the contracts are—

(i) in the name of the non-resident; or

(ii) for the transfer of the ownership of, or for the granting of the right to use, property owned by that non-resident or that non-resident has the right to use; or

(iii) for the provision of services by the non-resident; or

(b) has no such authority, but habitually maintains in India a stock of goods or merchandise from which he regularly delivers goods or merchandise on behalf of the non-resident; or

(c) habitually secures orders in India, mainly or wholly for the non-resident or for that non-resident and other non-residents controlling, controlled by, or subject to the same common control, as that non-resident:

Provided that such business connection shall not include any business activity carried out through a broker, general commission agent or any other agent having an independent status, if such broker, general commission agent or any other agent having an independent status is acting in the ordinary course of his business :

Provided further that where such broker, general commission agent or any other agent works mainly or wholly on behalf of a non-resident (hereafter in this proviso referred to as the principal non-resident) or on behalf of such non-resident and other non-residents which are controlled by the principal non-resident or have a controlling interest in the principal non-resident or are subject to the same common control as the principal non-resident, he shall not be deemed to be a broker, general commission agent or an agent of an independent status

For the removal of doubts, it is hereby clarified with explanation-2A, that the significant economic presence of a non-resident in India shall constitute "business connection" in India and "significant economic presence" for this purpose, shall mean—

(a) transaction in respect of any goods, services or property carried out by a non-resident in India including provision of download of data or software in India, if the aggregate of payments arising from such transaction or transactions during the previous year exceeds such amount as may be prescribed; or

(b) systematic and continuous soliciting of business activities or engaging in interaction with such number of users as may be prescribed, in India through digital means:

Provided that the transactions or activities shall constitute significant economic presence in India, whether or not,—

(i) the agreement for such transactions or activities is entered in India; or

(ii) the non-resident has a residence or place of business in India; or

(iii) the non-resident renders services in India:

Thresholds for the purposes of significant economic presence.

11UD. (1) For the purposes of clause (a) of Explanation 2A to clause (i) of sub-section (1) of section 9, the amount of aggregate of payments arising from transaction or transactions in respect of any goods, services or property carried out by a non-resident with any person in India, including provision of download of data or software in India during the previous year, shall be two crore rupees;

(2)For the purposes of clause (b) of Explanation 2A to clause (i) of sub-section (1) of section 9, the number of users with whom systematic and continuous business activities are solicited or who are engaged in interaction shall be three lakhs.

INTEGRITY PACT

Between

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

and

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

Preamble

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

_____

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

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

Section 1 – Commitments of the Principal

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

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

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

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

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

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

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

2.1.1 The Bidder(s)/ Contractor(s) will not, directly or through any other person or firm, offer, promise or give to the Principal or to any of the Principal's employees involved

in the tender process or the execution of the contract or to any third person any material, immaterial or any other benefit which he / she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

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

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

2.1.4 The Bidder(s)/ Contractor(s) will, when presenting his bid, disclose any and all payments he has made, and is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

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

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

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

Section 4 – Compensation for Damages

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

4.2 If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to section 3, the Principal shall be entitled to demand and recover from the Contractor liquidated damages equivalent to 5% of the contract value or the amount equivalent to Security Deposit/Performance Bank Guarantee, whichever is higher.

Section 5 – Previous Transgression

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

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

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

6.1 The Bidder(s)/ Contractor(s) undertake(s) to obtain from all subcontractors a commitment consistent with this Integrity Pact and report Compliance to the Principal. This commitment shall be taken only from those sub-contractors whose contract value is more than 20 % of Bidder's/ Contractor's contract value with the Principal. The Bidder(s)/ Contractor(s) shall continue to remain responsible for any default by his Sub-contractor(s).

6.2 The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors.

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

Section 7 – Criminal Charges against violating Bidders/ Contractors /Sub-contractors

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

Section 8 –Independent External Monitor(s)

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

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

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

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

8.5 As soon as the Monitor notices, or believes to notice, a violation of this agreement, he will so inform the Management of the Principal and request the Management to discontinue or take corrective action, or heal the situation, or to take other relevant action. The Monitor can in this regard submit non-binding recommendations. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.

8.6 The Monitor will submit a written report to the CMD, BHEL within 8 to 10 weeks from the date of reference or intimation to him by the Principal and, should the occasion arise, submit proposals for correcting problematic situations.

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

8.8 If the Monitor has reported to the CMD, BHEL, a substantiated suspicion of an offence under relevant IPC / PC Act, and the CMD, BHEL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Vigilance Office, the

Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

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

8.10 The word 'Monitor' would include both singular and plural.

Section 9 – Pact Duration

9.1 This Pact begins and shall be binding on and from the submission of bid(s) by bidder(s). It expires for the Contractor 12 months after the last payment under the respective contract and for all other Bidders 6 months after the contract has been awarded.

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

Section 10 – Other Provisions

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

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

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

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

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

For & On behalf of the Principal

(Office Seal)

For & On behalf of the Bidder/ Contractor

(Office Seal)

Place----------

Date----------

Witness: _____

(Name & Address) _____

_____

Witness: _____

(Name & Address)_____

_____

Annexure VII

BANK GUARANTEE FOR PERFORMANCE SECURITY

Bank Guarantee No:

Date:

To

NAME

& ADDRESSES OF THE BENEFICIARY

Dear Sirs,

In consideration of the Bharat Heavy Electricals Limited [1] (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at _____ through its Unit at……..(name of the Unit) having awarded to (Name of the Vendor / Contractor / Supplier) having its registered office at_____[2] hereinafter referred to as the 'Contractor/Supplier', which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns), a contract Ref No……dated ……[3] valued at Rs……[4] (Rupees ----------)/FC……(in words……..) for ……[5] (hereinafter called the 'Contract') and the Contractor having agreed to provide a Contract Performance Guarantee, equivalent to ……% (…. Percent) of the said value of the Contract to the Employer for the faithful performance of the Contract,

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

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

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

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

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

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

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

This Guarantee shall remain in force upto and including…….. [6] and shall be extended from time to time for such period as may be desired by Employer.
This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor/Supplier but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof.

Unless a demand or claim under this guarantee is made on us in writing on or before the ……[7]we shall be discharged from all liabilities under this guarantee thereafter.

We, …… BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.
Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed…… [8]
b) This Guarantee shall be valid up to ……[9]

c) Unless the Bank is served a written claim or demand on or before _____[10] all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

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

For and on behalf of
(Name of the Bank)

Dated…….
Place of Issue…….

[1] NAME AND ADDRESS OF EMPLOYER I.e Bharat Heavy Electricals Limited

[2] NAME AND ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.

[3] DETAILS ABOUT THE NOTICE OF AWARD/CONTRACT REFERENCE

[4] PROJECT/SUPPLY DETAILS

[5] BG AMOUNT IN FIGURES AND WORDS

[6] VALIDITY DATE

[7] DATE OF EXPIRY OF CLAIM PERIOD

[8] BG AMOUNT IN FIGURES AND WORDS.

[9] VALIDITY DATE

[10] DATE OF EXPIRY OF CLAIM PERIOD

Note:

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

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

   a. **From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India)** can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.

   b. **From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor country's Bank)**

   b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by **any of the Consortium Banks only** will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank (BHEL's Consortium Bank). It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.

b.2 **In case, Foreign Vendors intend to provide BG from** Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at **sl.no. b.1** will required to be followed.

b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time). In case, of Foreign Vendors, the BG Format provided to them should clearly specify the same.

b.4 The BG should clearly specify that the demand or other document can be presented in electronic form.

ANNEXURE-A

Special Conditions of the Contract (SCC)

This is a mandatory document to be filled and attached to technical bid for evaluation

(Otherwise your bid will be disqualified)

NOTE :

1) Vendor has to **choose drop down button** against "Supplier confirmation" coloumn.

2) For any deviation, please write in "Deviation / Remarks, if any" column.

3) Vendor has to submit this ANNEXURE-A along with their technical bid, failing which their offer will be not evaluated.

4) Commercial Conditions quoted in any place other than this format , including stated in Vendor's General Terms and conditions enclosed, if any, shall be summarily ignored and be invalid for evaluation of the Preferred Bidder.

5) Bidders to please note that the terms & conditions contained in ITB (Instructions To Bidder) are to be read before filling this ANNEXURE-A.

6) Bidders to please note that the Terms & Conditions contained in Special Conditions of the Contract (SCC) will supersede the Terms and conditions of ITB (Instructions To Bidder).

Sl. No	Terms & Conditions	Supplier confirmation	Deviations / Remarks, if any
1	**Price Validity:** Unless otherwise specified, offer shall be valid for a period of 180 days from the date of bid opening (Technical bid / Part-I in case of two part bid).		
2	2) If the job is awarded, the successful bidder's price shall be kept firm till 12 months from the date of LOI or till completion of project, whichever is later. Offers with PVC will be outrightly rejected except in cases where specifically called for in the NIT.		
3	Bonus and Over Run Compensation (ORC) are not applicable		
4	**PAYMENT TERMS:** • **For Indian vendors:** Payments will be made to ESC (Engineering Sub Contractor) against ESC's invoices. All payments will be made within below given days after submission of original documents to BHEL for processing. Payment for engineering will be controlled based on milestone payments as per clause V of TC-6-7586. 95 % of order value will be paid during execution of job based on milestone payments mentioned below. 5% balance amount of order value will be paid 9 months after submission of documentation of 90% model review or after completion of site erection whichever is earlier. For MSEs-45 Days. For Medium Enterprises-60 Days. For Non MSME-90 Days. • **For Foreign vendors**: 100% payment on CAD basis with credit period of 120 days. **NOTE: In case BHEL considers any deviation in payment terms, the bids shall be loaded with 18% interest per anum for L1 evaluation.**		
5	**Delivery period:** *The project Engineering completion shall be 6 months from the date of PO*	**6 Months** **from the date of PO**	
6	**Penalty:** In the event of delay in supply of services, penalty of 0.5% per week or part there of shall be levied on the undelivered portion subject to a maximum of 10% of the order value. **NOTE: For any deviations to the penalty clause, the offer shall be loaded @ 10% or to the extent to which it is not agreed to by the vendor.**		
7	**Taxes & Duties** (Data to be indicated by the bidder) **a) Indigenous Purchase:** **i) Applicable GST :** (To be quoted in %) **ii) GST registration number** **iii) HSN Codes** **NOTE: Bidders are requested to provide their GST registration number.** **Offers of those who do not provide the above information are liable for rejection.** Bidders to ensure correct applicability of GST based on the Inter / Intra state movement of goods.		

Sl. No	Terms & Conditions	Supplier confirmation	Deviations / Remarks, if any
8	**REVERSE AUCTION :** BHEL reserves the right to go for Reverse Auction (RA) after 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 Reverse Auction, only those bidders who have given their acceptance to participate in RA will be allowed to participate in RA. 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. Start price/percentage for Reverse Auction will be as per the BHEL RA guidelines. OMI-195 is applicable wherever necessary.		
	Furnish the following details:		
	a) Name of the participating person		
	b) Telephone number		
	c) Fax Number		
	d) E-mail address		
	e) Mobile Number		
9	Bidder should strictly confirm to BHEL drawings (if any), specifications.		
10	In the technical bid/ price bid, ESC to fill/quote the details as given in price format only (i.e Lumpsum price only is to be quoted for each project as per TC-6-7586).BHEL will not entertain any other expenses/assumptions written separately in the price format than		
11	Splitting of order quantity is applicable in this enquiry. This order has 4 projects. Vendors, other than L1 vendor, shall be asked to match the price of L1 vendor. Upon agreement by vendors, the quantity of order will be distributed to L1- 2 projects, L2- 1 project and L3- 1 project in the order of priority L1,L2 & L3 in case of more than three qualified vendors. In case, if two or three qualified vendors, distribution shall be L1 – 2 Projects and L2 - 2 Projects. In case of disagreement by any party/parties within this counter offers or if less number of parties are qualified, all 4 projects will be transferred to L1.		
12	All four projects 's offers shall be evaluated each project wise and order shall be placed accordingly on Techno commercially qualified L1 bidder of each project.		
13	BHEL reserves the right to increase / decrease the quantity indicated and to cancel the item / items of the enquiry.		
14	BHEL may choose for placing repeat order for additional quantity, as and when required, with the acceptance of vendor.		
15	Bidders to confirm that they read the terms & conditions in ITB (Instruction To Bidder) and confirmed.		

PRE-QULAIFICATION CRITERIA (PQC) FOR PIPING 3D MODELLING OFFLOADING

1.0 Scope

This PQC is applicable for vendors participating in open tender for piping 3D Modelling/deliverables being offloaded to Engineering Sub Contractor (ESC) by Steam Turbines & Compressors Engineering of BHEL Hyderabad.

2.0 Pre-Qualification Criteria (Technical)

Clause wise response of vendor is necessarily to be submitted for technical evaluation of technical bid

Sl. No.	Description	Vendor's Response	Details of Documents enclosed, if any
1.	The bidder must have during last 07 years (01st Apr 2015 to 31st Mar 2022) experience of having successfully completed similar work (preferably steam turbine /compressor power / process piping based on ANSI B31.1 & B31.3) of designing and 3D modelling of piping in SP3D software in Central/ State Govt. department/ Autonomous Bodies/ Public Sector Undertakings/ reputed private organizations. The copies of Purchase/ Work Orders/ Satisfactory Completion certificates are required to be enclosed with the technical bid for evaluation purpose. Name & Address of the service receiver for whom the service provider has rendered the similar service earlier to be given so that BHEL shall have the right to know the credentials of the bidder about his past service.		
2.	The firm/ agency should have its office preferably in Hyderabad for better coordination during the execution of the work. Contact details and address of firm's/company's office in Hyderabad to be provided in the tender. Vendor should have Video conferencing facility for conducting 3D model review meeting with BHEL.		
3.	The bidder shall be a professional agency engaged in design and 3D modelling business with full- fledged office set-up. For this proof shall be submitted and BHEL team may visit the party site/office to assess the capability.		
4.	Bidder to confirm that they will meet all the requirements of BHEL specification provided with the enquiry.		

Sl. No.	Description	Vendor's Response	Details of Documents enclosed, if any
5.	The bidder shall have the valid and sufficient no. of licences of the softwares (S3D, CAESAR II, Autocad etc.) being used for this enquiry.		
6.	Timely completion of the work is essence of the contract. The work as detailed in this tender shall be executed and completed in all respects in accordance with the tender document and to the complete satisfaction of BHEL. Hence Each project shall have one project manager.		

Record of revisions

Rev. No.	Date	Revision Details	Revised	Approved
00	28.07.2022	Issued first.		C L Thorat

Technical Specification For Engineering Services of Piping Engineering using SMART 3D VERSION 2019 software

I.INTRODUCTION

The purpose of this specification is to specify requirements of 3D Modeling/deliverables being offloaded to Engineering Sub Contractor (ESC) by Turbines & Compressors Engineering of BHEL.

II. SCOPE OF SUPPLY

The ESC shall use only SMART 3D VERSION 2019 software packages to develop the plant layout module to generate deliverables like Equipment layouts, piping layouts, isometrics, stress analysis and supports detailing from 3D modeling. For more details, refer to enclosed document TC-6-7586 as mentioned in the enquiry.

III. REFERENCE DRAWINGS

For reference drgs/docs, refer to enclosed document TC-6-7586 as mentioned in the enquiry.

IV. SCOPE OF WORK OF ESC IN THE PROJECT

ESC shall model the power plant in 3D using SMART 3D VERSION 2019 software and deliver the following deliverables. The model shall have detailed 3D models of piping, equipment, structural etc.

ESC to confirm the requirement the of M/s NRL specification "PROJECT DATA AND INFORMATION HANDOVER SPECIFICATION, document no.: NR0ZZZZ-IF-SPE-0001-Rev P2" and "SMART 3D SPEICIFITAION, Document no.: TP-1ZZZA-PI-SPE-0006 Rev A1".

1. Layout Engineering:

A. Plot Plan/ Equipment Layout/ Area Layouts:
Preliminary Plot plan/equipment layout (pdf copy) drawing shall be provided by BHEL to ESC as an input. Plot Plan and Equipment Layout drawings are to be further revised taking care of changes in the equipment GA drawings, locations, comments received from BHEL's Customer/ Consultant, during the execution of the project. Area layouts are to be developed for different areas of Plot plan based on input details provided by BHEL.
Based on these equipment layouts and P&IDs, ESC shall carry out piping engineering with close interaction as and when required with BHEL engineers.

B. Piping Layouts

Complete utilities like Cooling Water, Lube oil, Governing oil, N_2, seal gas system & Steam & condensate system for the entire scope of BHEL contract with Customer shall be prepared by ESC based on Plot plan and P&IDs. Piping Layout shall cover all lines per P&IDs, the details of equipment supplied by BHEL are to be modelled on the Piping layout for checking of interference and clashes are to be avoided. **Lines of less than 2" shall also be shown in piping layout.** Since the Plot plan, P&IDs, piping etc. may undergo several revisions during the progress of the Engineering work, necessary changes as applicable in the piping layout etc. shall also be taken care by ESC without any commercial or any other implications.

3D model will be reviewed by BHEL's Customer & Consultant to Customer during the execution of the project. Same may be done at Consultant/BHEL office. Model Review shall be done in 4 phase i.e 30%,60%,90% & final 100%. ESC shall attend the model review meeting at their own expenditure along with BHEL representative if required.

2. Material Take Off

ESC shall prepare system wise "Material Take Off" list (MTO) for piping system in two phases. In the first phase, ESC shall furnish the MTO within three weeks of placement of order based on initial PLOT PLAN and P & IDs. In the second phase, ESC shall furnish additional MTO / Revised MTO within three weeks after finalization of piping layouts/Isometrics. This MTO shall include pipes, pipe fittings, valves, flanges, fasteners (stud nuts), gaskets etc.

After finalization of isometrics, ESC shall once again reconcile the MTO with the MTO prepared at first and second phases to identify any shortages or surplus and furnish to BHEL.

3. Isometrics

Isometrics drawings (In Autocad) are to be prepared for all pipes of diameter 1 1/2" & above. (Isometric for Below 1 1/2" line shall also be provided if customer seeks). Bill of material in the Drgs. & also in specified format of BHEL (showing Part No./BHEL Material Code of all Items, Tag-No. of valves and instrumentations, etc.) shall be prepared by ESC. Isometric drawings should also indicate the design data and erection notes (e.g. references to standard edge preparations, Hydraulic testing, Radiography requirement etc) & along with the terminal point hook-up details.
ESC shall make two sets of isometric drawing, one for site fabrication and other for shop fabrication. Shop fabrication drawing should contain all the information like material quantity, BHEL material code, design data and fabrication notes for IBR and Non IBR pipes which will be used for pipe spool fabrication.

4. **Stress Analysis**
should be carried out wherever it is required for various piping systems to ensure safe working of various interconnected systems & equipment on CAESAR II 2018 version 10.

5. IBR Documentation

ESC shall also prepare & submit complete IBR documentation in line with the IBR & project requirements. This document should contain, but not limited to, stress analysis input, output, isometric, support design and drawings & Bill of Materials.

6. Hangers and Support Documents

ESC shall prepare the "Hanger & support schedule", detailed Support arrangement sketches and the BOM for hangers & support systems of piping including consolidated raw materials.

V. DOCUMENTATION:

- Initial submission as check print for BHEL (Rev-A,B etc) : Through email
- Submission to BHEL final revision 00 : Through email
  (Rev.0 & Subsequent revisions till finalization)
- A4 size Color prints of 3D model views covering total plant : 1 set
- Final drawings and documents in spiral bound form A3 size : 1 set hard copy
- Soft copy of final documentation on CD's. : Two CDs
- Soft copy of final 3D model : to be loaded on BHEL server

Notes:

1. Engineering charges shall include charges for the above documents
2. During detail engineering stage, BHEL may like to exchange technical documents and drawings through electronic media (Internet), E-mail. ESC should ensure that he has compatible workstation at his engineering office for this purpose.
3. ESC may have to furnish the files of the drawings of the project by E-Mail or in the form of a CD, as and when requested by BHEL during the engineering work.

VI. GENERAL INSTRUCTIONS

1. All specifications drawings and documents and bill of material (BOM) shall be prepared in the formats as directed by BHEL.

2. Since speedy delivery of documents is essential for a tight project schedule, it shall be responsibility of ESC to ensure timely delivery of all documents.

3. BHEL shall have the right to remove from work (in the engineering work) or at project site any of the employees of ESC who in the opinion of BHEL is not suitable to perform work assigned to him or on account of improper conduct or negligence in duty.

4. ESC shall include revision/modification cost of drawings/documents that can be anticipated for completion of the project of such a nature based on his experience.

5. ESC shall familiarize fully with the standard/ procedures/ practice/ quality requirements of BHEL / Customer and also the site conditions, to avoid any dispute at later date and after order placement.

6. BHEL shall not pay any amount, other than the fee specifically agreed, towards any cost incurred by ESC by way of salaries to his employees (income and taxes) insurance of any nature, benefits/bonus to the employees, etc. BHEL's liability is limited to the amount contracted for the services to be rendered under the scope of work defined.

7. ESC shall not commit any expenditure on behalf of BHEL without BHEL's consent in writing, during the execution of the work defined in the scope.

8. ESC shall bear all expenses/fee penalties if it infringes on patents/licenses of any persons/organizations or in case of suits, court proceedings, damage claims etc., due to any reason whatsoever.

9. ESC shall ensure that it possesses the latest revisions of various national and international standards, codes of practices, statutory & environmental regulations etc. - as applicable, for execution of the engineering work. BHEL shall not provide any such documents to ESC. Engineers of ESC assigned for this project shall have familiarity on relevant documents as mentioned above for their use and applications.

10. ESC shall maintain at their own cost the personal accidents policy, life insurance and / or any such insurance required in respect of their personnel deputed to outstation visits for the given contract.

11. BHEL reserves the right to terminate or suspend the contract or withdraw part of the scope of the work at any stage of its execution, if it found that ESC has not met its obligation for the performance / progress is not up to the expected standards and overall work is likely to suffer. In such an event, BHEL shall give one-month notice in writing. In such case all costs incurred accordingly by BHEL to complete any work forming part of the contract shall be recovered from ESC. In case of such premature termination of contract, BHEL reserves the right to claim damages from ESC including the initiation of judicial proceedings.

12. ESC shall keep all information/data/drawings etc. related to the work as confidential information and shall not divulge or use the information indirectly or directly in any way detrimental to the interest of BHEL. All drawings, documents, manuals, design calculations including all originals prepared or obtained during the work shall remain the property of BHEL and shall be handed over to BHEL on demand.

13. ESC shall comply with the laws and regulations of the country, the state and territories concerned, during the progress of the work.

14. ESC shall submit progress report on the status of the work entrusted to him periodically and as mutually agreed upon.

15. ESC shall be fully responsible for the accuracy and adequacy of engineering services rendered by him. Any modifications / rectification, if required in engineering and design shall be carried out expeditiously by ESC at their own cost. Losses / damages if any due to wrong engineering shall be compensated by ESC and a maximum of 10% of the lump sum engineering fee shall be deducted from the bills of ESC arising out of such errors.

16. ESC shall ensure optimal & economic design while executing the engg. Work, but without sacrificing the customer specification requirements /Statutory regulations/code provisions/safety aspects.

HYDERABAD

PRODUCT STANDARD

TURBINES AND COMPRESSORS ENGINEERING

TC-6-7585

Rev No. 00

RECORD OF REVISIONS

Rev. No.	Date	Revision Details	Revised By	Approved By
00	28.07.22	FIRST ISSUE	-----	CL Thorat

Ref. Doc.

I. SCOPE:

The purpose of this document is to provide project specific information to be used as input by Engineering Sub Contractor (ESC) for preparation of offer for subject enquiry. The ESC shall use only SMART 3D version 2019 software to develop the plant model to generate deliverables like Equipment layouts, piping layouts, isometrics and supports detailing from 3D modeling.

II. INTRODUCTION:

1. BHEL is executing following Gas Compressor projects for M/s Numaligarh Refinery Limited. The project name and consultant details are as follows:

Sl. No	Project Name	Consultant
1	NRL-RPTU-SGC (MCA1071)	Technip India Limited, Mumbai
2	NRL-RPTU-RGC (MCA1072)	Technip India Limited, Mumbai
3	NRL-CCR-RGC (MCA1073)	thyssenkrupp Industrial Solutions (India) Private Limited, Mumbai
4	NRL-DHT-RGC (MCA1074)	Toyo Engineering India Private Limited, Mumbai

III. REFERENCE DRAWINGS FOR ESC:

A	**NRL-RPTU-SGC (MCA1071)**	
S. No.	**Drawing Description**	**NRL-RPTU-SGC (Drawings no.)**
1	Equipment Layout	HY-DG-0-336-00-44921
2	Machinery Arrangement & Foundation	HY-DG-0-336-00-44920
3	P&ID for Process Gas	HY-DG-1-336-00-44901
4	P&ID for Lube Oil System	HY-DG-0-336-00-44902
5	P&ID for Seal Gas	HY-DG-1-336-00-44904
6	P&ID for Cooling water system	HY-DG-3-336-00-44905

B	**NRL-RPTU-RGC (MCA1072)**	
S. No.	**Drawing Description**	**NRL-RPTU-RGC (Drawings no.)**
1	Equipment Layout	HY-DG-0-336-00-44821
2	Machinery Arrangement & Foundation	HY-DG-0-336-00-44820
3	P&ID for Process Gas	HY-DG-1-336-00-44801
4	P&ID for Lube Oil System	HY-DG-0-336-00-44802
5	P&ID for Seal Gas	HY-DG-1-336-00-44802
6	P&ID for Cooling water system	HY-DG-3-336-00-44805
7	Steam and drain P&ID	HY-DG-3-336-00-44804

C	**NRL-CCR-RGC (MCA1073)**	
S. No.	**Drawing Description**	**NRL-CCR-RGC (Drawings no.)**
1	Equipment Layout	HY-DG-0-336-00-44721
2	Machinery Arrangement & Foundation	HY-DG-0-336-00-44720
3	P&ID for Process Gas	HY-DG-1-336-00-44701
4	P&ID for Lube Oil System	HY-DG-0-336-00-44702
5	P&ID for Seal Gas	HY-DG-0-336-00-44704
6	P&ID for Cooling water system	HY-DG-1-336-00-44704

D	**NRL-DHT-RGC (MCA1074)**	
S. No.	**Drawing Description**	**NRL-DHT-RGC (Drawings no.)**
1	Equipment Layout	HY-DG-0-336-00-44521
2	Machinery Arrangement & Foundation	HY-DG-0-336-00-44520
3	P&ID for Process Gas	HY-DG-1-336-00-44501
4	P&ID for Lube Oil System	HY-DG-0-336-00-44502
5	P&ID for Seal Gas	HY-DG-1-336-00-44503
6	P&ID for Cooling water system	HY-DG-3-336-00-44504

M/s NRL/BHEL PMS (will be furnished to successful bidder after award of contract).

IV. SCOPE OF WORK OF BIDDER IN THE PROJECT

All items as mentioned in enclosed Specification TC-6-7585. Scope shall be as indicated in the P & IDs.

Also refer NRL's specification for Scope of work and deliverables (Document: **"PROJECT DATA AND INFORMATION HANDOVER SPECIFICATION, document no.: NR0ZZZZ-IF-SPE-0001-Rev P2**).

V. MILESTONES FOR PAYMENTS

1. Completion of 30% model review: 25%
2. Completion of 60% model review: 25%
3. Completion of 90% model review (Submission of Isometric drawings with BOM/supports, support schedule and spool drawings for shop fabrication, Model in native format along with catalogue and specifications: 40%
4. 10% balance amount of order value will be paid 9 months after submission of documentation of completion of 90% model review or after completion of site erection whichever is earlier.

PRICE FORMAT
(TYPICAL)

Enquiry No: HY/TCEP/**(PROJECT NAME)** /ENQ/01 Date: **dd/mm/yy**
Job: Offloading of Piping Engineering Services for **(PROJECT NAME**) using SMART 3D Version 2019.

Project Name : ----------

Name of the ESC:

S.No	Item	Basic Price Rs	Service Tax Rs	Other Tax Rs	Total Rs
01	Lumpsum Price for Engineering Services of Piping Engineering using SMART 3D Version 2019 Software				

S.No	Item	Draughtsman	Design Assistant	Engineer	Total
01	No. Of Man Hours Considered				
02	Rate in Rs per ManHour				

Notes:

1. No other charges other than specified above will be payable to ESC.
2. Bidder to submit Price for each project.
3. Offers which are incomplete or where separate prices are not indicated are liable for rejection.
4. Percentage of taxes & duties considered may also be indicated.
5. Bidder to fill up the above prices manually, put his seal & signature, and submit the same in a separate sealed envelope along with technical offer.
6. Bidder to fill as '**Quoted** 'in all above fields and submit the same along with technical offer.
7. The price format should be strictly as per above. No other prices/assumptions written separately in the above format are acceptable.
8. **Offers shall be evaluated each project wise and order shall be placed accordingly on techno commercially qualified L1 bidder.**

(Authorized Signatory)

Seal of the Company

RECORD OF REVISIONS

Rev. No.	Date	Revision Details	Revised By	Approved By
00	28.07.22	First issue		C L Thorat

Ref. Doc.

TECHNICAL DOCUMENTATION FRONT SHEET

	NUMALIGARH REFINERY LIMITED	Total pages: 85

NRL EXPANSION PROJECT

PROJECT DATA AND INFORMATION HANDOVER SPECIFICATION

						Digitally signed by Medini Kumar Bora Date: 2021.05.03 16:34:35 +05'30'		
P2	03/05/2021	Approved for Projects use				DB/MKB	RG	GKB
P1	28/09/2020	Approved for Projects use				DB/MKB	RG	GKB
Rev	**Date**	**Reason for Issue**	Prepared	Checked	Approved	Prepared	Review	Review
			Disc. Eng.	Disc. Lead	Contr. Rep	Disc. Eng.	Proj. Eng	Com.Rep. Dept. Head
						NRL		

Contract Number		Disk Ref.
Category	**Code**	**Description**
Facility Area Code	0Z	Common Document
Document Type	SPE	Specification
System Number	00	General
Life Cycle	01	

Originator/ CONTRACTOR	Asset Code	Disc	Document Type	Sequence Number	Revision
NR	**0ZZZZ**	**IF**	**SPE**	**0001**	**P2**

CONTENTS **Page No**

1. EXECUTIVE SUMMARY

Provision of quality data at information handover is critical. This information feeds plant maintenance systems and supports safe and efficient activities throughout the operations and maintenance phase.

Provision of poor quality data (whether incomplete, incorrect or in incompatible formats) will delay completion of the information handover phase, resulting in rework and pushing back time to market. Such overrun may impact on the EPCM/EPC's ability to respect subsequent project and contractual commitments.

Clear communication of information handover strategy at an early stage is therefore essential. All project stakeholders must understand and accept the information handover requirements and ensure that these are clearly defined and documented prior to commencement of project activities.

A standardized approach to project design and execution, through use of COMPANY adopted software preferably which automatically enforces pre-defined rules will ensure data quality at all times. Deliverables will be continuously and automatically checked against requirements, ensuring data integrity and contractual compliance.

This approach enables appointed EPCM/EPCs to streamline activities through reuse of quality data across the design disciplines. It also supports timely handover of quality information to support future project phases, enabling safe and streamlined life cycle activities.

In this document, COMPANY outlines the information handover strategy for delivery of the digital asset. This strategy is based on mandatory use of 'smart' data-centric software which creates updates and maintains intelligent asset information in a standard environment prior to handover in accordance with agreed milestones.

2. INTRODUCTION

2.1 Overview

NRL is going to implement its refining capacity expansion from current 3 MMTPA to 9 MMTPA at its existing location in Assam in next 4 years. The proposed 6 MMTPA capacity addition has been designed to process Arab Mix (70 AH: 30 AL) crude which mix will be imported to Paradeep Port. A Crude Oil Terminal (COT) will be constructed at Paradeep and 02 pipelines - 28" Paradeep Numaligarh Crude Oil Pipeline (PNPL) and 24" Numaligarh Siliguri Product Pipeline (NSPL) will be laid.

Abbreviations & Definitions

Abbreviation	Description
NRL / OWNER / CLIENT /Company	Numaligarh Refinery Limited
NREP	Numaligarh Refinery Expansion Project
NRPT	Numaligarh Refinery Paradeep Terminal
PNPL	Paradeep Numaligarh Crude Pipeline
NSPL	Numaligarh Siliguri Product Pipeline
SMT	Siliguri Marketing Terminal
CTDB	Central Tag Database
DCS	Distributed Control System
PIM	Project Information Manager
P&ID	Piping & Instrument Diagram
TDNS	Technical Document Numbering Specification
IEDDMS	Integrated Electronic Data & Document Management System
MTO	Material Take Off
OEM	Original Equipment Manufacturer
CFIHOS	Capital Facilities Information Handover Specification

UID	Unique Identity Number
Abbreviation	**Description**
MPMC/EPCMs/EPCs/Licensors/BOO	CONSULTANT (who provides expert advice/service in a NREP) Each contractor and Consultant selected by NRL will be responsible for integrated delivery of all engineering data pertaining to their scope. CONTRACTOR/Consultant should load their vendor drawings into IEDDMS and also enter their respective metadata for non-smart documents into an agreed template and then load that into IEDDMS.
MPMC	Managing PMC (shall mean Technip India Limited in NREP).
EPCM	Engineering Procurement and Construction Management
LICENSOR	Party responsible for process technology ownership for any UNIT
EPC	Engineering Procurement and Construction
CONTRACTOR/CONSULTANT	Party whose services are obtained for performing the works specified as part of LSTK / EPCM/EPC packages and responsible for digital handover of engineering data.
LSTK	Lump Sum Turn Key execution of EPC package by the CONTRACTOR/CONSULTANT
BDEP	Basic Design Engineering Package for any UNIT
FEED	Front End Engineering Design
RCM	Resident Construction Manager – CONSULTANT's authorized representative to act for and on behalf of it for all site construction related activities.
SUB CONTRACTOR/CONSULTANT	Party whose services are obtained by CONTRACTOR/CONSULTANT for performing the works specified as part of LSTK / EPCM/EPC packages
VENDOR	Any third party supplying the equipment/materials for setting up the Plant
LLI	Long Lead Item – Any critical equipment / Package recommended by Licensor for Process units and agreed by NRL/ CONSULTANT to be considered as Long Delivery Item from schedule and market delivery point of view
UNIT	Indicates any particular portion of the NREP to be built which can be Process related or Utilities/Offsites related
IM	Interface Management by CONTRACTOR/CONSULTANT with other CONTRACTOR/CONSULTANTS engaged by NRL
BOO	Build Own Operate – A portion of NREP for which NRL is engaging a CONTRACTOR/CONSULTANT on "Build Own Operate " mode to supply the output to be consumed in rest of the UNITs
OEM / IEDDMS Service Provider (Hexagon)	OEM – Original Equipment Manufacturer / IEDDMS Service Provider shall mean Hexagon Capability Center India Private Limited (Software vendor) in NREP

2.2 COMPANY objectives

It is COMPANY's objective to maintain and manage digital asset information throughout the life cycle of the NREP by implementing Integrated Electronic Data & Document Management System (IEDDMS)

To achieve this goal, COMPANY mandates use of Intelligent Engineering authoring tools throughout all project phases. This approach will:

- Facilitate progressive handover and verification of complete and accurate digital records in accordance with CONTRACTOR/CONSULTANT contractual requirements and agreed milestones.
- Facilitate all the Consultants' data be integrated at Owner (NRL) locations. Any inconsistency in data detected at Consultants end shall be corrected by respective Consultants and the same error free data shall be uploaded again into IEDDMS. Consultants shall carry out inconsistencies check at their end and quality data and document shall be transmitted to Owner for review, comments and approval.
- Facilitate review, comments and approval by NRL shall be carried out in the IEDDMS itself.

  IEDDMS Shall trigger email notification to submitter/respective consultant after successful completion of the review or approve by respective user as per workflow.

  Note: The document distribution matrix shall be provided for configuring workflows in IEDDMS.
- Monitor CONTRACTOR/CONSULTANT progress and assess achievement of agreed milestones.
- Support preparation for operations activities, including spare parts evaluation, maintenance planning, and preparation of training plans.
- Provide accurate and accessible information to support safe and efficient operations.

NRL has been using engineering authoring tools mentioned in Table-1 for in-house project management:

Table-1 (NRL software list):

Sl No	Application	Documents /Software	Format
1	Project Scheduling	Primavera latest version	Primavera P6 XER files
2	3D Design	Smartplant 3D 2019 & MS SQL 2016 Enterprise and Windows Server 2016 A multi-discipline 3D model comprised of many components, which facilitate clash free design, produce 2D drawings from the 3D master, performs MTOs etc. 3D Model shall comply with 3D Model Specification.	S3D Data Model, Periodic Catalog and Model Database Backups in MSSQL format. Application level backup along with the complete share content folders containing all the project specific customisations and bulk load files are to be provided.
3	P&ID	Smart Plant P&ID 2019 MS SQL 2016 Enterprise and Windows Server 2016.	Periodic Database backups in MSSQL format. All the project required Reference Data also need to be provided. Application level backup along with the complete reference data containing all the project specific customisations are to be provided.

4	Electrical System Configuration	SmartPlant Electrical 2019 MS SQL 2016 & Windows Server 2016	Periodic Database backups for Smart Electrical 2019 in MSSQL format Application level backup along with the complete reference data containing all the project specific customisations are to be provided.
5	Instrumentation	Smart Plant Instrumentation Version 13.1 MS SQL 2016 and Windows Server 2016	Periodic Database backups for Smart Instrumentation 2019 in MSSQL format. Application level backup along with the complete reference data containing all the project specific customisations are to be provided
6	Datasheets & Line list	Output in searchable/hotspot able PDF/ Excel	
7	Piping Stress Analysis	CAESAR II 2018 version 10	Report files of the calculations and isometrics of high stress lines.
8	Structural Detailing	TEKLA (2018i)	Periodic backup of the Tekla Models with all the associated reference data containing all the project specific customisations are to be provided.
9	Structural Analysis and design	StaadPro V8i	
10	Structural Analysis and design	Staad Foundation advance V8i	
11	All Text Data	Microsoft Words	
12	All Spread Sheet work	Microsoft Excel	

This information is used to create and maintain a current, complete, correct and consistent integrated digital version of the physical plant.

The digital information is managed within a central repository which continuously and automatically enforces pre-defined rules.

It will be accessed and updated by authorized users throughout the project life cycle to ensure on-going asset data integrity, support project team activities and optimize operations.

3. PROJECT EXECUTION PLAN

CONTRACTOR/CONSULTANT must submit a Project Execution Plan (PEP) in accordance with requirements and timelines discussed and agreed following contract award.

The PEP will outline CONTRACTOR/CONSULTANT proposed methodology to address all elements of the contracted scope of work, including delivery of the virtual facility asset as defined in this document.

The PEP will include an Information Management Plan (IMP) detailing how information handover requirements will be addressed. This IMP must include:

- Tools and versions to be deployed
- Deployment plan

- Reference data management
- Organization and resourcing for information management
- Infrastructure plan
- Process for incorporation of sub-CONTRACTOR/CONSULTANT and supplier data and documentation
- CONTRACTOR/CONSULTANT validation and audit plan
- Handover mechanisms and plan
- Validation and certification of information deliverables

The PEP will be submitted for COMPANY review and approval prior to commencement of project activities. All project activities will be conducted in accordance with the COMPANY-approved PEP.

3.1 Documentation Standards:

Following documentations and standards of NRL have to be followed by CONTRACTOR/Consultant in all project related documentations-

Document Number	**Document Title**
NR-0ZZZZ-GE-SPE-0001	Technical Document Numbering Specification
NR-0ZZZZ-GE-SPE-0002	Engineering Tag Numbering Specification
NR-0ZZZZ-PR-PID-0001	NRL P&ID Legend Sheet
NR-0ZZZZ-PR-SPE-0001	Smart Plant P&Id Specification
TP-1ZZZA-EL-SPE-0013	Smart Plant Electrical Specification
TP-1ZZZA-IC-SPE-0001	Smart Plant Instrumentation Specification
NR-0ZZZZ-PI-SPE-0001	Piping Material Specification (PMS)
TP-1ZZZA-PI-SPE-0006	Smart 3D Specification

- Standard Templates for Drawings and Documents as per NRL's specification. In absence of any of the above from Owner's side the bidder will use their own standards and template after due approval from NRL/MPMC.
- Material Code specification for Digital handover and tagging shall be provided by NRL.

The Standard shall serve mainly the following objectives:

i) To ensure that Engineering Electronic information is complete, consistent, and fit for purpose for project engineering, operations and maintenance processes and systems.

ii) To ensure that information is classified according to business standards and requirements.

iii) To ensure that every entity is uniquely identified, described and cross-referenced, where required, each entity is correctly connected.

iv) Provides the necessary data required by the Business users during Brownfields and Greenfield projects.

NRL requirements for the Engineering data is clearly defined in relevant standards which shall be shared with the CONTRACTOR/Consultant so that the handover is done in the defined manner that can be stored for future modifications.

3.2 Definitions

Term	Definition
Information	Engineering and supplier documents, engineering tags, cables and lines and there are associated class library attributes and models.
Information Handover	The handover of Information ownership and management responsibility from the Project to Owner operator NRL.
Document	Information (Printed or Electronic) to be read by people, e.g., Reports, Specifications, Data sheets, Drawings, etc.
Equipment	Equipment is a physical object designed to perform a Tag function.
File	A collection of information stored electronically under a specific name
Metadata	Collection of attributes formats and structure belonging to data or documents. For example, meta-data can describe data elements or attributes, (name, size, data type, etc.); specify formats (length, fields, columns, etc.) and structure (where it is located, how it is associated, ownership, etc.). Metadata may include descriptive information about the context, quality, condition or other characteristics of the data or documents. Metadata templates, formats will be provided by the OEM-M/s Hexagon.
Object	A discrete item that can be selected and maneuvered, such as an onscreen graphic.
Package, Packaged Unit	Preassembled collection of equipment designed to deliver a process function.
Process Unit	Process Units are created to decompose the "high level" Plant function into more granular "sub-functions".
Revision	A code used to identify the content of a document at a certain point in time. It is used to track the evolution of a document during its lifecycle.
Seed	A seed file is term for a template. The advantage of the seed file is that it can be used to standardize all new drawings that you create.
Tag	Tags are created to decompose a "high level" Process Unit function into more granular "sub-functions".
Uncontrolled Document	An Uncontrolled document is a general working document. This includes e-mails and documents stored in 'My Documents' or on network drives.

3.3 Quality Requirements for Data and Information Handover

Handed over Information shall comply with general integrity rules to meet quality and integrity of information. Properties of information for which quality requirements should be assessed include:

3.3.1 **Clarity:** The availability of a clear and shared definition for the information, usage of same codes and terms with the same meaning by creators and users of information.

i) Multiple drawings in a series shall be identified using sheet numbers. Each sheet shall be managed as a separate document and a separate file.

ii) Index sheets that are associated to documents or series of documents shall be issued as individual documents.

Legibility: is the document of sufficient quality to be reviewed - document number and revisions are used in accordance with NRL.

i) Accurate Document Type classification must be applied to ensure the nature of the document is understood before the document is opened, and unexpected content is not contained within the document.
ii) All abbreviations must be listed and expanded within the document.
iii) The file name shall be equal to Document number.

3.3.2 Consistency: The consistency of information from different sources and whether the information about particular objects consistent in terms of naming, values and relationships.

i) All documents required for handover shall be recorded on a compliant document register as per NRL requirement. All these documents should be part of Master Document Register.
ii) Document title and number shall be identical on the document and document register.
iii) Document title shall be representative of the content of the document.
iv) Document cross references shall be current, correct and consistent.
v) The file name for each file shall be identical (except for the file extension), if a document is delivered in multiple renditions (e.g. doc and PDF)
vi) All documents and equipment items shall be uniquely numbered. The validated relationships of equipment and the supporting documentation must be clear and indicated via cross-referencing of equipment tag numbers and document numbers.
vii) Spares supplied to the Operator at handover will also be supported by spares listings. These listings will provide NRL with sufficient engineering and parts information for the appropriate spares inventory management to be set up in the maintenance and purchasing systems. Spares Listing Template will be provided by Company.

3.3.3 Completeness and Accuracy: CONTRACTOR/Consultant shall ensure complete and accurate information handover to NRL as per NRL Handover Specification.

i) Soft copies of Documents are completed with appendices and attachments.
ii) Scanned images, where used as a last resort, are of an acceptable quality in OCR enabled PDF
iii) NRL would ask all the CONTRACTOR/Consultant to provide the data in OCR enabled PDF's. NRL expects Documents to be digitally signed by CONTRACTOR/Consultant.
iv) Embedded attachment shall not be used (with the exception of the scanned signed front sheet and for the Company / Contractor Logo).
v) Documents shall be issued under NRL approved templates and must contain accurate information.
vi) Hyperlinks may be made between information within the same document but not be between different documents. Document-to-Document relations shall be managed as document references (instead of Document to Document hyperlink).

3.3.4 Right to Reject

i) By breaching any of these rules by Projects or modifications, NRL reserves the right to return the document directly to CONTRACTOR/Consultant to reset the required submission date back to what was in the system prior to receiving the rejected submission.

ii) In case of breach of the rules defined in this specification NRL and NRL authorized IEDDMS Document controller reserves rights to reject submitted information back to the source for correction and this will set new acceptance date.

iii) Any queries on document format, numbering or coding or other integrity rules and requirements shall be raised at the earliest opportunity to NRL IEDDMS and Project document management team. As applicable Company will review, accept or reject the submitted deviations request.

4. DATA TAGGING REQUIREMENT

A Tag is defined as the unique identifier/label of any item within the Plant. Minimum typical Tag categories for the project information handover include, but not limited to the following:

i. Equipment (Process and Non Process)
ii. Instruments & Automation (Process and Non Process)
iii. Telecom Equipment (Process and Non Process)
iv. Piping (Process and Non Process)
v. Electrical Equipment (Process and Non Process)
vi. Cables
vii. Communication Equipment
viii. Civil / Foundations and Concrete Structures
ix. Structural
x. Building/Location
xi. Piping Specialty Item
xii. Pipeline
xiii. DCS function

4.1 Tag Relationships

Minimum typical relationships required to be extracted for the project information handover include, but not limited to the following:

i) All Document types to Tags
ii) Relevant Tags to Buildings
iii) Relevant Tags to Purchase Orders
iv) Relevant Document types to Vendors
v) Relevant Documents to Purchase Orders
vi) Relevant Document to Buildings
vii) Relevant Tags to Tags
viii) Relevant Tags to Plant
ix) Relevant Tags to Area
x) Relevant Tags to Unit

Work Instructions and the templates for managing the Tag Relationship will be provided by Hexagon.

5. DOCUMENTATION REQUIREMENT OF NRL EXPANSION PROJECT

5.1 Documents and 3D Models Handover Requirements

a) NRL will adopt digital tools and technologies for this project for seamless information sharing, review, approval and to enable stakeholders for informed decision making.

b) In order to achieve above objective, NRL shall implement Integrated Electronic Data & Document Management System (IEDDMS) and shall maintain digital document archive during the project, operation and maintenance phase of the units. CONTRACTOR/Consultant shall integrate their authoring tools with the integrated system accordingly from the initial stage of the project till final handover and assist owner in achieving the above objective. All documents and data shall be correlated in the integrated system for seamless flow to client for review, approval and archiving at

any time during project life cycle. All the documents and data that would flow into NRL's IEDDMS should be free from inconsistencies. Such data & documents shall be compatible with software and tools available with NRL as per Table-1(NRL software list) so that NRL can implement any engineering changes required in the data and document during the complete life cycle of the plant. OEM will provide the Seed file for SPF along with the templates, formats for non-smart deliverables, provide support to the contractors for the establishment of the Integrated environment (integration of the smart authoring tools), to develop and run the data validation reports / data inconsistency reports, support in resolving the inconsistency errors and transferring the data to the IEDDMS Platform.

c) The IEDDMS shall be the single integrated platform for both project collaboration and operations forming digital twin. The platform shall be compliant with CFIHOS (Capital Facilities Information Handover Specification) standard. The submittal, transmittal, review, approval and storage of all smart & non-smart engineering and non-engineering data and documents shall be seamless at both end ie. CONTRACTOR/Consultant and NRL. IEDDMS shall be agnostic to any engineering authoring tools. The data from the other authoring tools are to be integrated in the integrated system SPF and the same to be transferred to the IEDDMS tool by the Consultant / Contractors.
d) Owner intends to carry out detailed reviews of the project progress through Primavera project monitoring software which will be required to be integrated with the proposed project documentation and data handover system through specialized agency, so that timely integrated reviews can be carried out.

5.2 Retention

In addition to handed over information the Project itself also is required to retain project records and reports associated with the construction and commissioning of the facilities such as original certificates, quality assurance records and verification reports - except where otherwise required by statutory regulations. Such records shall be maintained and shall be retrievable on request for the contractual retention period. Copies of those parts supplied to the Operator as part of the project handover will be held in electronic as well as in hard copy archive by the Owner Operator.
It will be responsibility of the CONTRACTOR/Consultant to deliver the documents.

5.3 Hard Copy

All hardcopy documents (if any) shall be converted into digital format and shall be scanned to an acceptable standard that is correctly orientated in a PDF format with Optical Character Recognition performed.

5.4 Submission

Information shall be made available by CONTRACTOR/Consultant to NRL, as it becomes available during the project execution. The NRL authorized Operator (CONTRACTOR/Consultant or 3rd party OEM) will validate the Information Set with regards to quality, content and other handover requirements. This process will enable the Project and Operator to collaborate to ensure a timely and quality handover to Owner. Handed over Documentation will be checked against handover requirements to ensure that the information is of the required quality on continuous basis.
NRL IEDDMS Team/NRL Authorised Team will signoff Project Close out Certificate once information required for handover is accepted by NRL.

5.5 Concession

Any queries on scope, status, form, format, numbering, coding of documents or on other integrity rules and requirements of documents required for handover shall be raised at the earliest opportunity to NRL IEDDMS team through Concession/deviation request. NRL EDDMS team shall review the request and may approve or reject the concession request.

6. NRL PROJECT STRUCTURE

NRL will be executing the NREP in a hybrid mode where a single MPMC will coordinate with couple of EPC/LSTK/BOO and EPCM companies working for the NREP. Each Contractor / Consultant is responsible to manage their models and deliverables and data with the support of the OEM.

7. ORGANIZATION AND RESPONSIBILITY

CONTRACTOR/CONSULTANT must appoint a qualified and experienced Information Manager with sufficient information management experience.

The Information Manager will be the single point of contact with COMPANY regarding all aspects of the digital facility delivery. The Information Manager will report to CONTRACTOR/ CONSULTANT's/ Consultant's Project Manager and be responsible for all aspects of the digital facility delivery.

7.1 Audit

COMPANY reserves the right to audit the preparation and validation of digital facility deliverables at any stage of the project.

7.2 Vendor package details

The seamless incorporation of vendor packages within CONTRACTOR/CONSULTANT design is a mandatory requirement.

- Tagging within vendor packages must be consistent and at the same level of detail as outside package limits
- All vendor design documents must be related to the detailed tags within the vendor package.
- All non-SmartPlant vendor design documents must be loaded into IEDDMS Platform as described in this document as minimum.
- All 3D models must incorporate package details and the same as-built tolerances as Reference 3D models inside Smart 3D with the required tagging and attributes
- All P&IDS must be seamlessly complete with package details.
- Instrumentation (SPI) and Smart Electrical databases must be complete, with details of all instrument loops and electrical consumers.

7.3 Electronic dossiers

Vendor data books, fabrication record books, and manufacturer record books must be delivered electronically as compiled dossiers using the electronic dossier capabilities within IEDDMS Platform. Hexagon will provide the work instruction for using this facility.

COMPANY shall issue standard chapter breakdowns for these compiled documents.

7.4 Managing documents against tags, models and assets

In order to reduce the effort in gathering and maintaining documentation, the following principles must be adopted:

- Documentation defining the engineering design intent (e.g. PFDs, P&IDs, process data sheets, Line Schedule) must be cross referenced to all relevant tags. It is not acceptable to just cross reference the vendor package tag.
- Documentation describing the model/type of equipment procured for a tagged location (e.g. manufacturer data sheet, catalog extract, spare parts list, assembly drawings, maintenance instructions, inspection

instructions, installation instructions) must be cross-referenced to the manufacturer model/type. NOTE: This documentation shall be provided only once and the manufacturer model/type linked to all relevant tags.

- Documentation relevant only to a specific instance of equipment (e.g. pump performance curve, noise certificate, PO, name plate details, inspection report) must be linked to the equipment/asset. NOTE: The equipment/asset shall be always linked to the manufacturer model/type and - unless deemed a spare - the tagged location where it is installed.

7.5 Mandatory software

In order to maintain accurate and integrated information, NRL will deploy the NRL IEDDMS platform to manage and maintain a central repository of asset data.
CONTRACTOR/Consultant will inform NRL/MPMC of their Engineering authoring tools, version etc. at the beginning of the project.

7.6 Data ownership

CONTRACTOR/CONSULTANT is responsible for the quality and integrity of all project data and documentation throughout project execution.

CONTRACTOR/CONSULTANT retains full responsibility for all project data and documentation transferred to COMPANY at agreed milestones.

COMPANY will take ownership of all project data and documentation following:

- Successful completion of plant commissioning activities.
- Receipt and acceptance of complete as-built project data and documentation, in accordance with COMPANY-defined formats.

7.7 Data validation

CONTRACTOR/CONSULTANT is responsible for validating all project data and documentation prior to handover to COMPANY. The results of all validation activities will be available for COMPANY inspection and audit. Data validation rules and reports will be customised in the Integration tool by OEM and OEM will support the CONTRACTOR / CONSULTANT to take the reports from the Integration tool and support in resolving the same.
All milestone information and document deliverables will be accompanied by CONTRACTOR/CONSULTANT certification that data has been validated as complete, correct and consistent.
COMPANY will perform formal verification of milestone deliveries as defined in the contract. Findings from this verification shall be sent to the CONTRACTOR/CONSULTANT and the CONTRACTOR/CONSULTANT shall correct findings within 4 (four) weeks and resubmit.

7.8 As-built mark-ups

The final data and document deliverables to COMPANY shall reflect the “as-built” status of the facility as handed over from commissioning and updated to the as-built tolerances stated in the COMPANY handover specification.
Handover of responsibility for care, custody and control for a system/subsystem or any portion of the facility will be accompanied by electronic handover of data and documentation. Where as-built mark-ups are not incorporated, the mark-up will be delivered electronically as a PDF file and cross-referenced to the latest revision. Documentation will be resubmitted as final once the as-built mark-ups have been incorporated.
As-built mark-ups shall be incorporated into source data (such as SP3D models, SPPID, SPI, SPEL etc.) and the final documentation generated as graphical reports from the source system. There shall be no manual CAD work conducted on the deliverables from such systems.

Once all as-built updating is complete, the final handover of design tools shall be performed as described in the handover specification.
Acceptance of receipt of final documentation from CONTRACTOR/CONSULTANT does not imply that COMPANY accepts the final deliverables. Any errors, omissions or inconsistencies in final handover reported within 6 (six) months of acceptance of receipt shall be remedied by the CONTRACTOR/CONSULTANT and resubmitted at no cost to COMPANY. If COMPANY finds errors in the resubmitted deliverables these shall also be corrected at no cost to COMPANY.

8. PROJECT SETUP AND DATA MANAGEMENT

Project setup of CONTRACTOR/Consultant shall be carried out with the help of expert third party agencies if required to ascertain that all the setup is properly segregated. Major steps involved are:

i) MPMC and NRL to Define the Plant Break Down Structure and the same should be uniform across all the EPC's and EPCM's project Executions.
ii) MPMC will create and maintain SEED file of NRL authoring tools, wherever required.
iii) MPMC to assist NRL for finalizing and updating the SEED file incorporating multiple Licensor/ designer's requirement, template.
iv) Each contractor / Consultant to assist NRL in creating directory structure in the server and resolving conflicts with the support of OEM.
v) OEM to assist NRL in creation of Project databases for all disciplines.

vi) Reference database are to be maintained by each Contractor / Consultant for their scope.
vii) If the project consists of multiple units then one project master to be maintained for all the specs & catalogues for ease of maintenance & uniformity. Project master for each Contractor / Consultant to be maintained them.
viii) Any new catalogue requirement is to be created in the project master by the respective parties in their project master.
ix) Each Contractor / Consultant can adopt their own methodology in creating the user logins for their requirements.
x) Each Contractor /Consultant is responsible for setting up the project back-up systems.
xi) Each Contractor / Consultant is responsible for configuration of database files in case authoring tools is being carried out at multiple locations
xii) Other misc. activities required for project creation.
xiii) Completed project databases and Master catalogue shall be maintained at NRL location (central repository).
xiv) Project administrator of each party (CONTRACTOR/Consultant) will create the project database and inform respective disciplines administrators of NRL (Process, Electrical, Piping, Instrumentation and Engineering cell) and EPCM and EPC's.
xv) Each party is responsible for their respective scope for creation / updating and maintenance of all the discipline wise specifications and catalogues as per NRL's requirement.
xvi) The Project (Plant) database name shall be the Project Name. Database name to be used by different Contractor / Consultant to be intimated to MPMC and NRL so that there is no duplicity of database name during restoration of backups from different parties.
xvii) All Contractor/Consultant need to update NRL & MPMC about the database Instance name and Project Setup Naming Convention before the start of the project.

9. PROJECT DESIGN

9.1 Standardization

CONTRACTOR/CONSULTANT must adhere to the COMPANY standardization processes. This standardization includes:

- Adherence to international standards
- COMPANY commodity codes and identification for bulk materials (NRL to define the material codification).
- COMPANY standard specifications

9.2 Non-SmartPlant Deliverables

CONTRACTOR/CONSULTANT must load non-SmartPlant deliverables into IEDDMS platform through an excel file or similar Pdf and native files are required. OEM will provide the excel templates for the Metadata for the Non-Smart plant deliverables and the same shall be used by the Contractor / Consultant. The following minimum metadata is required:

i) Document number
ii) Revision code
iii) Document title
iv) Issue date
v) Document type
vi) Native file name
vii) Pdf file name
viii) Transmittal name

Before loading to the IEDDMS platform, validation results must be reviewed in the data exchange platform.
The resulting deliverables must be loaded into IEDDMS platform, complete with relations:

i) Tag to document;
ii) Asset to document;
iii) Model to document;
iv) Document to document categories;
v) Document to originator;
vi) Document to discipline;
vii) Document to dossier type;
viii) Document to plant break down structure; and work breakdown structure.

~~10. PROCESS DESIGN~~

~~*10.1 Overview*~~

~~CONTRACTOR/CONSULTANT must use SmartPlant P&ID software to create intelligent P&ID drawings including D&IDs for HVAC.~~
~~The resulting P&IDs must be automatically published to COMPANY'S system in accordance with a delivery schedule to be mutually agreed between COMPANY and CONTRACTOR/CONSULTANT.~~
~~CONTRACTOR/CONSULTANT must use COMPANY-approved software version to create non-P&ID deliverables for process design. This software version must be defined in the PEP.~~
~~The resulting deliverables must be loaded into IEDDMS complete with relations: tag to document; asset to document; model to document; document to document categories; document to originator; document to discipline; document to dossier type; document to plant break down structure; and work breakdown structure.~~

10.2 Requirements

#	Requirement	Overview
1	Software version	i. Unless otherwise specified by COMPANY, CONTRACTOR/CONSULTANT must use the NRL approved version and service pack of SmartPlant P&ID (SPPID) software for the creation of all P&ID drawings. This version must be established and consistently applied across all projects. ii. The change of version or service pack is subject to COMPANY approval. Application of required hot fixes subject to prior COMPANY approval. iii. CONTRACTOR/CONSULTANT must use a compatible version of the database used by COMPANY.
2	Format of deliverables	For all SPPID software generated documents and reports, CONTRACTOR/CONSULTANT must either implement COMPANY-provided template, or customize border templates and title blocks to match COMPANY border and title block size. This will include, but not be limited to, COMPANY CAD standards for: i. Fonts ii. Scale iii. Symbols iv. Text size v. Drawing numbering standards etc. vi. Tag numbering standards etc. To avoid re-work, CONTRACTOR/CONSULTANT must first check with COMPANY regarding availability of title blocks and borders.
3	Plant structure	i. Project plant structure must comply with the plant-area-unit hierarchy of the Engineering Manager module. ii. All drawings must be created at unit level only. iii. The plant breakdown structure must be synchronized with SPF and IEDDMS.
4	Symbols and font	It is COMPANY's intention to use own P&ID symbol reference data to the maximum extent possible. This reference data is not limited to: symbols, templates, assemblies, report templates, rules, and insulation specifications. i. CONTRACTOR/CONSULTANT must make every attempt to utilize COMPANY reference data for the creation of all P&IDs. ii. COMPANY must review and approve all CONTRACTOR/CONSULTANT created symbols data, if any. iii. Unless otherwise specified, CONTRACTOR/CONSULTANT must use the SPPID default font for item notes, labels, general

#	Requirement	Overview
		notes etc.
5	Attributes	i. CONTRACTOR/CONSULTANT must create new user-defined attributes based on the project requirement and add same to the data dictionary under the relevant categories after getting approval from Company/MPMC. ii. COMPANY/MPMC must review and approve all CONTRACTOR/CONSULTANT requested attribute data to avoid duplication.
6	Inconsistencies	i. CONTRACTOR/CONSULTANT must either (i) resolve, or (ii) approve all design inconsistencies in the P&IDs/D&ID based on logical decision. ii. CONTRACTOR/CONSULTANT must adhere to engineering design best practice during setup of SPPID consistency rules.
7	Meaningful data	CONTRACTOR/CONSULTANT must provide full and complete attributes for all P&ID/D&ID components to include, but not be limited to: pipe runs, equipment, inline instruments etc. This is to ensure that COMPANY receives complete and meaningful P&ID data in SPPID format.
8	Naming convention	i. CONTRACTOR/CONSULTANT must adhere to COMPANY's tag naming conventions for: a. All P&ID instrument tags. b. All loop tags. c. All equipment tags. d. All line tags. ii. CONTRACTOR/CONSULTANT must adhere to COMPANY's tag naming conventions for all applications used and integrated with SPF. This is necessary to achieve efficient autocorrelation between applications. iii. Every item type used or configured with a naming convention rule must use the same format in all authoring tools.
9	Tag attributes	CONTRACTOR/CONSULTANT must capture: i. All P&ID/D&ID tag-related attributes from equipment data sheets. ii. All P&ID/D&ID related attributes from line designation table (line list).
10	Instruments and loops	CONTRACTOR/CONSULTANT must ensure all P&ID/D&ID instrument tags are associated with the appropriate instrument loops.
11	Accuracy	i. CONTRACTOR/CONSULTANT must follow best design practice for adding P&ID/D&ID face value information (labels, annotations, descriptions, notes, sizes etc.). ii. Prior to delivery, CONTRACTOR/CONSULTANT must remove all temporary drawings, test drawings, test symbols and

#	Requirement	Overview
		assemblies, temporary filters, reports etc. from the SPPID. iii. CONTRACTOR/CONSULTANT must use the SPPID t *Re-create P&ID from database* functionality before final quality control and delivery to COMPANY. iv. CONTRACTOR/CONSULTANT must ensure the delivered SPPID data is free from database exceptions and orphan entries. v. Each and every P&ID must be fit for purpose in the operations and maintenance phase. CONTRACTOR/CONSULTANT must: a. Incorporate vendor package details within the design. b. Show LO/LC, CSO/CSC for valves. c. Show tagging of blinds for isolation (LOTO) purposes. d. Show instrument bridle. e. Show instrument valve and motor control / interlock details. f. Execute all appropriate utilities delivered with the software for the identification and resolution of database issues.
12	As-built	Prior to final delivery, CONTRACTOR/CONSULTANT must ensure all as-built P&ID/D&ID data is fully compliant with COMPANY's as-built requirements.
13	Consistency against 3D model	i. If applicable, CONTRACTOR/CONSULTANT must use SPF for Consistency Report to check the consistency of data. ii. If applicable CONTRACTOR/CONSULTANT must use SPPID Design Validation functionality to validate P&IDs against third party 3D model.

10.3 Deliverables

CONTRACTOR/CONSULTANT must deliver the following:

- SPPID site and plant backup (work share and project disabled), including the complete P&ID reference data (symbols, templates, assemblies, report templates, rules, insulation spec, modified dll's, data map files etc.) used with the P&ID database.
- Documentation specifying:
  - Customizations carried out in reference data
  - Data dictionary
  - Formats
  - Rules
  - Reports
- All developed / modified source code for all dll's created for the SPPID project.

- Documentation specifying approved deviations from standard specifications.
- SPPID data shall be as-built.
- All drawings and reports within or extracted, using SPPID, shall be updated with as-built information.
- CONTRACTOR/CONSULTANT shall use the SmartPlant P&ID "Re-Create P&ID from Database" functionality for each drawing before final handover to NRL.
- CONTRACTOR/CONSULTANT shall ensure that all deliverables, submitted to NRL can be extracted from the restored backups.
- CONTRACTOR / CONSULTANT shall use only the approved version of the SPPID. If the versions are going to be different then,
    - CONTRACTOR/CONSULTANT shall upgrade SPPID data to NRL approved version for the project.
    - CONTRACTOR/CONSULTANT shall be responsible to eliminate any inconsistencies in the upgrade process to the SPPID.
    - CONTRACTOR/CONSULTANT shall submit a database consistency and health check report before and after the upgrade.
    - CONTRACTOR/CONSULTANT shall take responsibility, to validate the data, after upgrade, to the SPPID version approved by NRL. Any inconsistency noticed during the upgrade, shall be documented and provided to NRL.
- CONTRACTOR/CONSULTANT shall facilitate NRL in uploading the data set at NRL's site. CONTRACTOR/CONSULTANT shall resolve any issues, which may arise when NRL is evaluating the data, until the 'Final Acceptance Certification' is obtained.

11. INSTRUMENTATION DESIGN

11.1 Overview

CONTRACTOR/CONSULTANT must use SmartPlant® Instrumentation (SPI) software to create all instrumentation design data, including fire and gas detection and telecoms.
The resulting deliverables must be automatically published to COMPANY'S system in accordance with a delivery schedule to be mutually agreed between COMPANY and CONTRACTOR/CONSULTANT.

11.2 Requirements

#	Requirement	Overview
1	Software version	i. Unless otherwise specified by COMPANY, CONTRACTOR/CONSULTANT must use the latest approved version and service pack of SmartPlant Instrumentation (SPI) for the creation of all automation deliverables. ii. The change of version or service pack is subject to approval by COMPANY. Application of required hot fixes is subject to prior COMPANY/MPMC approval. iii. CONTRACTOR/CONSULTANT must use a compatible version of the database used by COMPANY.
2	Format of deliverables	For all SPI generated documents and reports, CONTRACTOR/CONSULTANT must either implement COMPANY-provided template, or customize border templates and title blocks to match COMPANY border and title block size.

#	Requirement	Overview
		This will include, but not be limited to, COMPANY CAD standards for: i. Fonts ii. Scale iii. Symbols iv. Text size v. Drawing numbering standards etc. vi. Tag numbering standards etc. To avoid re-work, CONTRACTOR/CONSULTANT must first check with COMPANY regarding availability of title blocks and borders.
3	Plant structure	i. Project plant structure must comply with the plant-area-unit hierarchy of SPI and all other Smart applications. ii. All creation and update activities must be done at the lowest level of the adopted plant breakdown structure (PBS).
4	Instrument data sheets	i. CONTRACTOR/CONSULTANT must customize all instrument specification sheets to comply with COMPANY's instrument datasheet standard. ii. To avoid re-work, CONTRACTOR/CONSULTANT must first check with COMPANY regarding availability of these datasheets. iii. COMPANY must review and approve all CONTRACTOR/CONSULTANT-created datasheets.
5	Loop drawings	CONTRACTOR/CONSULTANT must generate all loop drawings using the SPI *Enhanced Smart Loop* functionality. No manual CAD loops or manual adjustment of generated loops is permitted.
6	Vendor package loop details	i. CONTRACTOR/CONSULTANT must seamlessly incorporate loop details within vendor packages e.g. compressor control system, winch / crane system etc. ii. CONTRACTOR/CONSULTANT must register free capacity e.g. wiring terminals where wires are not in use.
7	Hook up	i. CONTRACTOR/CONSULTANT must generate instrument mounting details using the SPI *Hook Up* functionality, ensuring compliance with COMPANY standard. ii. CONTRACTOR/CONSULTANT must customize all required CAD blocks in SmartSketch (SSK) format.
8	Attributes	i. CONTRACTOR/CONSULTANT must use required user-defined fields for relevant categories on getting approval from Company / MPMC. ii. CONTRACTOR/CONSULTANT must submit a summary of used attributes as a separate document.

#	Requirement	Overview
		iii. COMPANY /MPMC must review and approve all CONTRACTOR/CONSULTANT suggested use of User Defined Fields / User Defined Tags (UDF/UDT).
9	Accuracy	i. CONTRACTOR/CONSULTANT must create complete SPI project data to cover all available modules. These include, but are not limited to: index, process data, calculation, instrument specification, wiring, loop drawing, hook-up etc. ii. CONTRACTOR/CONSULTANT must deliver a complete SPI database which enables COMPANY to use SPI to generate required deliverables from the SPI database. iii. CONTRACTOR/CONSULTANT must ensure the delivered SPI data is free from database exceptions. iv. In order to identify and resolve issues, CONTRACTOR/CONSULTANT must run all appropriate utilities delivered with SPI. v. Prior to delivery, CONTRACTOR/CONSULTANT must remove all test data, test CAD blocks, temporary browser views, reports etc. from the SPI data.
10	As-built	Prior to final delivery, CONTRACTOR/CONSULTANT must ensure all as-built SPI data is fully compliant with COMPANY's as-built requirements.

11.3 Deliverables

CONTRACTOR/CONSULTANT must deliver the following:

- A completed SPI database backup including the complete SPI reference data used for this project. The backup when restored at NRL shall be capable of (but not limited to) producing the following documentation:
  - Instrument index
  - Instrument data sheets
  - Loop drawings
  - Cable schedules
  - Instrument BOM
  - Alarm List
  - I/O lists
  - Wire termination reports (JBs, MRs, control system panels, cabinets etc.)
  - Instrument sizing and calculations
  - Process data
  - Hook ups
- Documentation specifying:
  - Customizations carried out in reference data

  - ~~Data dictionary~~
  - ~~Formats~~
  - ~~Rules~~
  - ~~Reports~~

- ~~All developed / modified source code for all dll's created for the SPI project.~~
- ~~CAD blocks, symbols, border templates, and title block Power Soft reports (PSRs).~~
- ~~Customized PSR files for reports and datasheet templates.~~
- ~~Document specifying approved deviations from standard specifications.~~
- ~~Vendor packages loops drawings and loop details.~~
- ~~The above must be provided as electronic deliverables on DVD/Pen Drive.~~
- ~~The above must be provided as hard copy/paper copy deliverables on A3 size B&W paper.~~
- ~~The CONTRACTOR/Consultant shall use Smart Plant Instrumentation (SPI) software for the creation and management of instrumentation database and deliverables.~~
- ~~The CONTRACTOR/Consultant shall customize all border file templates and title blocks for the various SPI generated documents and reports to meet NRL's border and title block size, including applicable NRL's Standards for fonts, scale, symbols, text sizes, drawing and tag numbering standard .~~
- ~~The CONTRACTOR/Consultant shall customize all Instrument Specification sheets to meet the NRL's instrument datasheet standard. The CONTRACTOR/Consultant shall check with the NRL, for the availability of these sheets so as to avoid having to reproduce them.~~
- ~~The CONTRACTOR/Consultant shall store all reference data e.g., custom symbols, title blocks, hook-up templates, in a single shared folder structure that is referenced by all users during the project.~~
- ~~The CONTRACTOR/Consultant shall generate all loop drawings in SPI.~~
- ~~Instrument mounting details shall be generated using the Hook up module and will meet the NRL's standard.~~
- ~~The CONTRACTOR/Consultant shall create required user-defined fields for relevant categories after getting approval from Company / MPMC~~
- ~~The CONTRACTOR/Consultant shall create SPI project data complete in all respects covering the various available modules such as Index, Process data, Calculation, Instrument Specifications, Wiring, Loop drawing and Hook-up.~~
- ~~A completed SPI database, along with all reference data, which will give the NRL a capability of generating required instrument deliverables from within the SPI database using SPI.~~
- ~~The CONTRACTOR/Consultant shall ensure that the delivered SPI data is free of any database exceptions and orphan entries. The CONTRACTOR/Consultant shall run all appropriate utilities as delivered with the software for identifying and resolving database issues.~~
- ~~The CONTRACTOR/Consultant shall AS BUILT the SPI data before its final delivery.~~
- ~~Instrument Index, I/O List, Specification (Data Sheet) Sheet report formats and other such reports, as desired by NRL, shall be customized to match NRL standards.~~
- ~~Title blocks for outputs from the various SPI modules (Instrument Index, Wiring Module etc.) shall be customized to match NRL standards.~~
- ~~Border templates and title blocks for Instrument Loop Drawings and Hook-Up Drawings shall be customized to match NRL standards.~~
- ~~Enhanced Smart Report symbols, for Loop / Hook-Up drawings shall be customized to match NRL standards.~~
- ~~All applicable data for plant items (viz. Instrument, Panel, Cable etc. shall be filled. Please refer mandatory attributes section for attribute data population details.~~

- The CONTRACTOR/Consultant is required to ensure that the relevant instrument tags have association with the appropriate instrument loops.
- Any template / symbol to be used on the project, if not already provided by NRL have to be created by CONTRACTOR/CONSULTANT. Only on approval by NRL and MPMC this has to be implemented by CONTRACTOR/CONSULTANT.
- Drawings shall be intelligent i.e. labels, design value and properties shown. Use of non-intelligent text and graphics shall be minimized.
- Specification (Data Sheet) Sheet, Loop Drawings and Hook-Up drawings from Vendor Packages shall be incorporated in SPI by CONTRACTOR/CONSULTANT as per NRL requirement.

12. ELECTRICAL DESIGN:

12.1 Overview

CONTRACTOR/CONSULTANT must use SmartPlant® Electrical (SPEL) software to create all electrical design data.
CONTRACTOR/CONSULTANT must use COMPANY-approved software to create non-SPEL deliverables including, but not limited to: load study and load flow calculations, calculation of harmonic current and voltages, power system dynamical calculations, UPS battery test report, and capacity test report for emergency generators. This software must be defined in the PEP. The resulting deliverables must be loaded into SPF , complete with relations (tag to document, document to document categories, and work breakdown structure).
The resulting deliverables must be automatically published to COMPANY'S system in accordance with a delivery schedule to be mutually agreed between COMPANY and CONTRACTOR/CONSULTANT.

12.1.1 Requirements

#	Requirement	Overview
1	Software version	i. Unless otherwise specified by COMPANY, CONTRACTOR/CONSULTANT must use the approved version and Service pack of SmartPlant® Electrical (SPEL) for the creation of all electrical data, single line diagrams (SLDs) and schematics. ii. The change of version or service pack is subject to COMPANY approval. The application of required hot fixes is subject to prior COMPANY/MPMC approval. iii. CONTRACTOR/CONSULTANT must use a compatible version of the database used by COMPANY
2	Format of deliverables	For all SPEL generated documents and reports, CONTRACTOR/CONSULTANT must either adopt COMPANY-provided templates, or customize border templates and title blocks to match COMPANY border and title block size. This will include, but not be limited to, COMPANY CAD standards for: i. Fonts ii. Scale iii. Symbols iv. Text size v. Drawing numbering standards etc.

#	Requirement	Overview
		vi. Tag numbering standards etc. To avoid re-work, CONTRACTOR/CONSULTANT must first check with COMPANY regarding availability of title blocks and borders.
3	Plant structure	i. Project plant structure must comply with the plant-area-unit hierarchy of the SPEL *SmartPlant Engineering Manager* module. ii. All drawings must be created at unit level only.
4	Reference data	CONTRACTOR/CONSULTANT must create an electrical reference database and reference data (symbols, schematic blocks, report templates etc.) in compliance with COMPANY standards.
5	Font	CONTRACTOR/CONSULTANT must use the SPEL default font for all deliverables.
6	Attributes	i. CONTRACTOR/CONSULTANT must create new user-defined attributes based on the project requirement, and add same to the data dictionary under the relevant categories on getting approval from the Company/MPMC. This must be done on reference item types and project item types. ii. CONTRACTOR/CONSULTANT must submit a summary of added attributes as a separate document. iii. COMPANY/MPMC must review and approve all CONTRACTOR/CONSULTANT-created symbols data in order to avoid duplication.
7	Naming convention	CONTRACTOR/CONSULTANT must adhere to COMPANY's tag naming conventions for all electrical items e.g. cable, motor, transformer. i. In order to optimize efficiency of autocorrelation between applications, CONTRACTOR/CONSULTANT must adhere to COMPANY's tag naming conventions for all applications used and integrated with SPF. ii. Every item type used or configured with a naming convention rule must use the same format in all authoring tools. .
8	Tag attributes	To ensure COMPANY receives complete and meaningful electrical data, CONTRACTOR/CONSULTANT must fully complete all applicable attributes for all indexed tags.
9	Accuracy	i. CONTRACTOR/CONSULTANT must follow best design practices for establishing SPEL consistency rules. ii. Prior to delivery, CONTRACTOR/CONSULTANT must remove all temporary drawings, test drawings, test symbols and assemblies, temporary filters, reports etc. from the SPEL data. iii. CONTRACTOR/CONSULTANT must ensure the delivered SPEL data is free from database exceptions.
10	As-built	Prior to final delivery, CONTRACTOR/CONSULTANT must ensure all as-built electrical data is fully compliant with COMPANY's as-built requirements.

12.2 Deliverables

CONTRACTOR/CONSULTANT must deliver the following:

- SPEL site and plant backup, including all reference data (reference schema, templates, symbols, schematic blocks, formats, rule etc.) used for this project.
- Load list, Electrical Equipment list, Electrical Equipment Datasheet, Cable Schedule, MTO (Electrical), Motor list, Electrical Signal I/O list, Single line drawings, and consumer list.
- Document specifying all customization carried out on reference data, data dictionary, formats, rules and reports.
- All developed / modified source code for all dll's created for the SPEL project.
- Document specifying approved deviations from standard specifications.
- The above must be provided as electronic deliverables on DVD/Pen Drive.
- The above must be provided as hard copy/paper copy deliverables on A1 size B&W paper.
- The CONTRACTOR/Consultant shall use SmartPlant Electrical (SPEL) software for the creation and management of electrical design data and deliverables.
- The CONTRACTOR/Consultant shall always use the approved (NRL/MPMC approved) software version of SmartPlant Electrical to create all electrical data, SLDs and schematics unless otherwise specified by the NRL/MPMC.
- The CONTRACTOR/Consultant must also use a compatible version of the MS SQL database used by the NRL.
- Border templates and title blocks for all SPEL generated documents and reports should be customized to match the NRL border and title block size, including the applicable NRL SPEL Standards for fonts, scale, symbology, text sizes, drawing and tag numbering standards, etc. The CONTRACTOR/Consultant shall check with the NRL for the availability of the relevant title block and borders so as to avoid having to reproduce them.
- The CONTRACTOR/Consultant shall create an electrical reference database and the reference data (symbols, schematic blocks, report templates, etc.) for use with SPEL drawings that will comply with the NRL standards.
- The CONTRACTOR/Consultant shall create new user defined attributes based on the project requirement in approval with NRL/MPMC. The same shall be added to the data dictionary under relevant categories. A summary of added attribute shall be submitted as a separate document describing such attributes.
- The CONTRACTOR/Consultant shall follow the NRL tag naming conventions for various electrical items like cable, motor, transformer, etc.
- The CONTRACTOR/Consultant shall fill in all attributes, to the fullest extent for all indexed tags. This is to ensure that the NRL receives the complete and meaningful SPEL project database.
- The CONTRACTOR/Consultant shall remove all temporary drawings, test drawings, test symbols, temporary filters, reports, etc. from the SPEL data before delivery.
- The CONTRACTOR/Consultant shall ensure that the delivered SPEL data is free of any database exceptions, orphan entries.
- Border templates and title blocks for the Drawings / Documents shall be followed as per NRL standard template. Any template / symbol to be used on the project, if not already provided by NRL have to be created by CONTRACTOR/CONSULTANT. Only on approval by NRL/MPMC this has to be implemented by CONTRACTOR/CONSULTANT.
- All SLD symbols used in SLD generation shall be shown as per the electrical legend sheets developed for this Project.
- All Schematic symbols used in Schematic generation shall be shown to confirm to project

specifications.

- The CONTRACTOR/Consultant is required to ensure that the relevant Electrical tags have association with the appropriate instrument loops.
- As far as possible content shown on SLD / Schematic drawings shall be intelligent i.e. labels, design value and properties shown. Use of non-intelligent text and graphics shall be minimized.
- Vendor Packages: SLD's, Schematic drawings from Vendor Packages shall be incorporated in SPEL by Responsible CONTRACTOR/CONSULTANT as per NRL requirement.
- CONTRACTOR/CONSULTANT shall confirm exact VENDOR Package Details with NRL after issuance of Package Purchase Order.
- The CONTRACTOR/Consultant shall AS-BUILT the Electrical data before its final delivery base

13. 3D MODELLING SOFTWARE

13.1 Overview

The 3D modelling shall be done in S3D version 2019. The CONTRACTOR/Consultant shall use Smart 3D software and associated software packages for the creation and management of the 3D model, associated database and deliverables.
Contractor/Consultant shall perform the below activities and be responsible for their respective scope of units :

i) The model shall be of the entire unit, when handed over to the NRL. The model shall be structured such that disciplines and where applicable sub-sets of disciplines required by the NRL. The basic S3D SEED file will be provided to all the Contractors/Consultants by MPMC/NRL which is to be used for the Project. All Consultants/Contractors shall provide the Smart plant review file and Navisworks file with the correct co-ordinate system and readable attributes to MPMC for merging the Review file for the entire plant. 3D model shall remain independently for each Contractor/Consultant.

ii) The S3D piping catalogues shall be created by the respective Contractor/Consultant using the NRL Piping Material Specifications

iii) The Plant Breakdown Structure ,System Hierarchy for all disciplines shall be followed as provided in the SEED file and specification provided by MPMC/NRL complying with the project overall plant/area/unit structure

iv) The CONTRACTOR/Consultant shall use their best design practices to determine additional attribute requirements for equipment, pipe runs, etc. and the same shall be provided to MPMC/NRL for approval before adding the same in 3D tool.

v) S3D reference data shall be customized for the NRL piping material classes, piping commodity data, instrument data, etc.

vi) All Pipe supports to be modelled physically for all Large Bore and Small Bore Pipes with secondary steel/concrete pedestal

vii) The CONTRACTOR/Consultant shall assign tags for equipment, nozzles, line number, line ID, , structures , etc., in accordance with the NRL Tag Numbering Philosophy.

viii) Consistency reports showing comparison between 3D model contents and data in SPPID SPI and SPEL shall be submitted as and when required. These reports shall be configured and extracted from Integration tool - SPF. Consistency Report format, template, rule with required customisation in the integration tool will be provided by the IEDDMS service provider to all the Contractors/Consultants.

ix) Errors or conflicts between the scope described here and other NRL documents shall be brought to the attention of NRL for resolution.

x) CONTRACTOR/CONSULTANT shall perform 3D modelling in an integrated environment at SPF level in their own domain with other authoring tools (SPPID, SPI and SPEL). Integration between S3D,SPPID,SPI and SPEL is done at SPF level only and data from S3D,SPPID,SPI and SPEL are published to SPF. No retrieval of data across the authoring tool. i.e, No PID correlation in S3D environment

xi) CONTRACTOR/CONSULTANT shall publish 3D Model, Orthographic drawings with complete annotations, Isometric drawings, Special Pipe support drawings etc and all reports to NRL IEDDMS platform.

xii) The 3D model and drawings shall be dimensionally 100% accurate.

xiii) Working units indicated shall be maintained as specified in NRL documents.

xiv) CONTRACTOR/CONSULTANT shall AS-BUILT the 3D model, drawings & reports and upload the data to IEDDMS before final handover.

xv) Incorporation of site changes during fabrication and erection in 3D Model in order to deliver a complete as built model to Owner

xvi) CONTRACTOR/CONSULTANT shall backup all the share content,bulk load excel files, source codes for symbols, rules, support assemblies etc. along with the S3D backup for handover to NRL.

xvii) Isometrics shall be extracted from 3D model along with Bill of Material and pipe supports with tag numbers.

xviii) Vendor packages: CONTRACTOR/CONSULTANT will be responsible for mapping their respective vendor packages data in the IEDDMS system for the attributes specified in this specification.

xix) Interference Detection (Clash) Report, taking care of Hard-Hard clashes and Hard-Soft clashes for all the disciplines.

13.2 Scope and Extent of Modelling

The objective of this 3D modelling is to deliver to OWNER i.e. M/s NRL a complete 3D model which shall be utilized for all future maintenance, operation, revamping and any debottlenecking of the plant. The 3D Design Reviews through dynamic walk-through shall assist client's operation and maintenance personnel in reviewing the project prior to construction and suggest modifications for efficient operation & maintenance of the plant shall be done in Smart Review or Equivalent software. It shall also be used for frequent review of design by OWNER/CONTRACTOR/CONSULTANT.

All plant engineering activities beginning from Plot plan development, Equipment layout development to generation of Piping GAD, Isometrics drawings, as-built drawings, MTO etc. shall be done using 3D modelling. Any Inconsistency report in line with P&ID to be extracted and the same to be resolved. All plant items listed below shall be modelled for completeness of 3D model and for extraction of deliverables from model.

The items in 3D model shall be made as:

Exact Geometry

The geometry of the object should be exactly as shown in vendor drawings or as per standard drawings as given in codes e.g. Pipes. Flanges. Valves, beams, etc. the geometry of the items to be modelled should be such that it serves the purpose of clash checking as well as identification of object in 3D.

Near Exact Geometry

Special items like bellows, traps, etc. does not call for exact geometry. The provision should be made for clash checking and 3D representation of the item. A box. instead of bellows, traps, etc is not acceptable.

13.3 Modeling Requirements

The 3D modelling system must be able to produce required documents like isometrics, plan and elevation drawings, etc., as well as piping material take-offs. Main objective of the 3D modelling system must be the interference checking and data integrity to reduce the rework during construction to an absolute minimum.

The model shall be capable of executing interference checks and generating reports of hard and soft clashes for resolution. Hard clashes refer to actual physical interference of equipment, while soft clashes refer to interference with required ergonomic space required for maintenance and operation purposes. Equipment and other components and the space allocated shall be modelled to the extent necessary, and as further described below, to ensure the validity of the clash check. Construction tolerances shall be included in interference check. This means that all physical objects that need to be included in drawings, reports and/or interference checking will need to be modelled. The modelling extent is, but not limited to, as given below.

13.4 Data Consistency Check

Modellers shall be responsible for performing a data consistency check on each pipe, equipment, instrument etc. at completion of its respective input and shall correct all errors and or inconsistencies reported. The modellers shall ensure the following (but not limited):

i) Adjacent items are connected
ii) Connection types are compatible
iii) Bores are consistent
iv) No gaps exist in the pipe and all branches are within the network
v) Components are geometrically aligned
vi) All branch connections are made and complete
vii) All vessels connections are made and complete
viii) Tube lengths are acceptable
ix) Elbow angles are acceptable

13.5 Discipline wise scope of modelling is as under:

13.5.1 Piping

a) All equipment's to be modelled with exact geometry including but not limited to : manholes with davits, pipe davits on top platforms, nozzles, stiffener rings, bellows, break-up flanges, lifting lugs/trunnions, Tailing lugs, piping clips etc., for all the equipment's in the plant like, vessels, columns, reactors, receivers, tanks, pumps with motors, air coolers with motors and fans, filters, blow down drums, heat exchangers etc.
b) All process and utility piping, vents and drains including hydrostatic, including all piping components for all sizes as shown on the P&ID. This shall include all pipes, valves, flanges, fittings, reducers, spectacle blinds, drains, temperature/pressure connections, sample points, drip legs, jacketed pipes, handwheels and actuators etc.
c) Valves including hand wheels, actuators, bypass arrangement and motor operators correct in orientation and actual dimensions.
d) Piping accessories like strainers, filters and steam traps with applicable removal volumes
e) Aboveground and Underground piping to be represented in well manner.
f) Pipe supports, spring hangers and trunnions.
g) Insulation – dimensionally correct around all in-line components.
h) Steam tracer piping from and to manifolds and steam trap piping
i) Equipment trim – Valve, blinds, instrumentation, man-ways access, etc.
j) Utility stations.
k) Safety Equipment's -Safety showers/Eye wash stations, Hose Reels
l) Hydrostatic testing Vents and drains
m) Sampling Points, including sample cabinets and sample coolers.
n) Expansion joints, silencers and other special piping items.
o) Spectacle blinds spades and spacers – removal capability.
p) Sloping lines to be modelled.

q) Jacketed & core pipes wherever applicable.
r) Insulation outline.
s) All vents & drains (process & testing) including high point vent & low point drain.
t) Breakable joints if required.
u) Pipelines and components of all sizes.
v) All major process attributes and identification attributes
w) Piping shall carry all attributes in the piping line list and additional attributes associated with construction, inspection and testing requirement.
x) Maintenance areas around equipment's, davit swing areas, swing elbows, sweep areas bundle removal areas
y) Equipment's supports: skirts, support legs/lugs, saddles etc.
z) Above ground (AG) piping, big bore and small bore shall be modelled. This shall include all pipes, valves, flanges, fittings, reducers, spectacle blinds, drains, temperature/pressure connections, sample points, drip legs, jacketed pipes etc.
aa) All in-line instruments like control valves, safety valves, rotameters, orifice plate, flow meter, volume tanks etc including actuators and maintenance space
bb) All piping special items like expansion bellows, slide valves, and special valves with purge/bleed points, Steam traps, strainers etc.
cc) Complete vessel trims with level gauges, level switches, level transmitters, equipment/instrument vents/drains, utility connections, temperature / pressure gauges etc.
dd) Insulation type, Insulation thickness based on operating/design pressure/temperature etc.
ee) Manhole vents piping to atmosphere etc.
ff) Sloped lines (flare lines, sewer lines etc.).
gg) Fire water piping.
hh) Structural steel members used for the pipe supports to be modelled in complete details
ii) Steam supply and condensate recovery stations/manifolds up to the first valves in tracer lines.
jj) Integration of packages like Compressor, Blower, Heater, Refrigeration etc
kk) Preliminary modelling of Packages, like Heater, to be modelled by Piping, However, same shall be replaced by actual Model received from the Package vendor.
ll) Tagging of all line nos., equipment nos., instruments nos., special items, shall be as marked in the P&lDs.
mm) Escape ways, Access ways and Handling Ways to be modelled as soft envelopes and should be used for design review purpose and clash detections
nn) Fixed Handling Devices like Davits, Hoists, Monorails etc.,
oo) Mobile Lifting and transfer devices to be modelled with simple shapes in soft envelopes where it is planned for specific maintenance purpose to ensure that space & access is reserved for these mobile devices.
pp) Firefighting equipment (like Eyewash, Hose reels, Hydrants, Monitors, Dry Risers, Deluge piping around equipment & sprinkler system etc.,)
qq) Fire proofing on Equipment's, instruments if required.
rr) Analyzer Points including analyzer cabinets
ss) Flare header and drain connections

13.5.2 Equipment

i. All Equipment to be modelled with exact geometry showing an accurate dimensional representation of the equipment as per vendor drawings
ii. **Vessels, Columns and Reactors –** Outline complete with all nozzles detailed/identified, special pipe supports, lifting lugs and trunnions, tailing lug, Vessel Clips, platforms (including penetrations and supporting steel), handrails and ladders. Man-ways and hand holes, internals, insulation,

skirts and supports. Identify column drop out zones. Skirt access ways.

iii. **Tanks –** Outline with nozzles detailed/identified, man ways, insulation, stairways, ladders and platforms, handrails and all other tank appurtenances.

iv. **Pumps –** Outline with nozzles connections detailed/identified including vents and drains, drive and coupling and pump driver.

v. **Compressors –** Outline with all equipment nozzles at all interfaces shall be detailed, driver, acoustic enclosure, lube and seal oil skids (as package units), seal oil overhead tank, lube/seal oil headers, local cabinets and panels with doors. All maintenance and component removal volumes including break-out spools.

vi. **Blowers –** Outline with all equipment nozzles at all interfaces shall be detailed/identified, driver, couplings, acoustic enclosure.

vii. **Fired Heaters –** Outline, supports, all nozzles detailed and identified, cross over piping, ducts, stacks, platform, burners and igniters, access doors, tube withdrawal volumes.

viii. **Plate type, Shell & Tube Exchangers –** Outline shell, channel and heads with nozzles detailed and identified, saddles, tube withdrawal volume.

ix. **Air Fin Exchangers** – Outline of bundles, header boxes, all nozzles detailed and identified plenum, fan motors and drives, chimneys. Any platforms, ladders, steelwork provided by Vendors shall be fully detailed. Access ways and lay-down areas.

x. **Package Equipment**: Packaged equipment, irrespective of whether it is designed by the CONTRACTOR/Consultant or its sub-CONTRACTOR/suppliers, shall be modelled on a basis that is consistent with the requirements herein and to the same accuracy and content as CONTRACTOR/Consultant's own designs. Deviation from these requirements by the CONTRACTOR/Consultant or its subcontractor shall require the NRL prior occurrence. Package equipment shall be modelled in sufficient detail to facilitate the review of access to all components and instrumentation for operation and maintenance, ergonomic design, piping, instrument and electrical connections. All interfaces including nozzles, CONTRACTOR/Consultant/sub-contractor scope and equipment tie-ins shall be detailed and identified. As a general requirement, model information for all package equipment shall contain information and details as specified herewith in this document, to ensure overall design integrity of the plant to be maintained and available for review by the NRL.

xi. **General** –

a. Permanent davits, lifting beams and tackle, overhead cranes, ladders, platform (including penetrations and supporting steel), handrails and ladders, safety showers, hose reels, special piping items.
b. Maintenance areas around equipment, davit swing areas, swing elbows sweep areas, tube bundle removal areas for heat exchangers, rotor removal areas, drop out areas to be modelled as soft envelopes and should be used for clash detections.
c. Equipment supports: skirts, support legs/lugs, saddles to be modelled along with the. equipment
d. Insulation type (hot, cold, tracing, jacketed, etc), Insulation thickness
e. Equipment 3D model shall include all attachments like platforms. nozzles, ladders. pipe supports, etc.

xii. The minimum attribute requirements for equipment are equipment number, insulation thickness, design condition (pressure & temperature), material of construction and a description. The minimum required nozzle attributes are tag number, size, pressure rating, end preparation and pipe material class. Requirement of any additional attributes will be confirmed later

xiii. Any other equipment's not mentioned above but important part of process.

13.5.3 Civil /Concrete /Structure

i. **Drainage and sewerage:** All underground Pressurized and gravity Pipes with all special

components, drips, manholes, catch basin, Valve pit, Clean out, Storm water Ditches, Oil Catchers, separators, vents and sumps etc.

ii. **Foundation:** Foundations for all major and minor equipment's / structures shall be modelled, including foundations for standard pipe supports and sleepers. The model shall depict accurate dimensions of the foundation and shall include footing, pedestal, tie-beams (if provided), slabs / rafts, piles etc.

iii. **Concrete Structure**: All beams, walls, columns, up stands, sumps, etc., in dimensionally accurate section, floors with penetrations.

iv. **Structural Steel:** All beams, columns and bracing dimensionally accurate including primary, secondary and tertiary steelwork (including equipment platform, davits and misc platforms) in accurate section and location. Cladding, fireproofing, floor plating/grating (including penetrations and supporting steel), platforms, hand railings, stairways and ladders shall be included. Ladders shall be dimensionally accurate. Space reservations shall be modelled for major connections details (such as; haunches, gusset plates as indicatively) to avoid clashes with piping or cable routes. Stairways shall be dimensionally accurate, with hand railing and access volume. Supports and bracing. Temporary steel work required for transportation only.

v. All civil structural items shall be tagged appropriately as per NRL tagging procedure, which can help identify the plant/unit/area, type of structure, etc.

~~vi. **Underground conduits:** Outline modelled~~

~~vii. **Buildings:** Outlines including foundations, wall column, beams, roof and slabs, accesses and HVAC air intakes etc~~

~~viii. Pits and ponds~~

~~ix. Tank dykes, Fire Walls and Curb walls~~

~~x. **Wall and Fences:** Volume outline including foundations~~

~~xi. All culverts, Pipe way Bridges and duct banks~~

~~xii. **Roads:** Outline, shoulders, upper and lower levels including road embankments~~

~~xiii. **Paving:** Outline, upper and lower levels and type~~

~~xiv. Road crossings, protection slabs, identification slabs, anchor blocks, impact walls, crash barriers, etc.~~

~~xv. Topographical survey benchmarks location plan with levels.~~

~~xvi. Above ground pedestals projection. Pedestal to be modeled in single piece from foundation slab to bottom of baseplate/equipment.~~

~~xvii. Any structure not mentioned above but part of the package.~~

~~xviii. All underground cable duct/cable trench: Routing, outline, top and bottom level trenches for electrical and instrument cables (including RCC covers if provided) and direct buried cables~~

13.5.4 Instrumentation:

i) The Instrumentation solution should have features to do basic as well as detail instrumentation engineering.

ii) In-line Instruments – including control valve top work dimensionally accurate for actual items, relief valves, orifice plates (including maintenance volumes). Thermocouple/RTD, analyser probes withdrawal clearance volumes.

iii) All process connections for instrument on piping and equipment.

iv) Offline instruments including transmitters, gauges and local indicators, remote mounted instrumentation including stands, housings and shades.

v) Local panels: Outline and access doors, including access volumes

vi) All aboveground cable ducts and cable trays

vii) Analyser houses and shelters: With HVAC air intake, associated bottle racks and vent stack.

viii) ~~Air accumulators – local or remotely mounted~~

ix) Junction boxes including support frames and access volumes.
x) ~~All underground cable duct/cable trench: Routing, outline, top and bottom level trenches for electrical and instrument cables and direct buried cables.~~
xi) Instrument cable Duct (Instrument ducts are of minimum 400mm width).
xii) Following instrument entities shall be modelled:
   a. Analyser Shelter / House, Analyser Racks/ Cabinets located in the field to be modelled near exact geometry.
   b. Control Room with piping & cable entry points.
   c. Local Control Panels.
   d. Inside details of control Room/ Shelter/ Racks/Cabinets/ Local Control Room are excluded from the scope of modeling.
   e. Prefabricated Assemblies (Hook-ups)
   f. Gas detectors
   g. ~~Closed Circuit Television (CCTV)~~
   h. Instrument Stanchions
   i. Instrument Air lines from the Air Header to the consumer
   j. Instrument Junction Boxes
   k. ~~Input to General Civil / Structures for Instrument Cable Trench (Concrete/Buried), sleeves and Culvert.~~
   l. ~~Communication and security – telephones, CCTV, miscellaneous panels and racks, public address speakers, beacons and sirens.~~
   m. ~~Telecom Devices, Cable Trays & trenches~~
   n. ~~FA system equipment including break glass units in the field.~~

13.5.5 Electrical:

The modelling for electrical facilities shall include the following-

~~i)~~ ~~The software should be capable of automating the generation of deliverables such as Power Installation and Cable routing layouts, Lighting Installation layout, etc.~~
~~ii)~~ ~~MTO for Electrical Bulk Materials such as trays and accessories, lighting, JBs, etc.~~
iii) Outline for Electrical motors, Lighting fixtures, junction boxes, cable routes (like trays, trenches, conduits), local control station, local panel, lighting panel, socket outlets,
~~iv)~~ ~~All transformers, transformer safety cages and access volumes, bus ducts.~~
~~v)~~ ~~Substations with all equipments, panels HVAC etc~~
vi) All aboveground cable ducts and cable trays.
~~vii) Lighting – all lighting fittings and equipment including any supporting towers and structures, switches and lighting control equipment.~~
~~viii)~~ ~~Power and control equipment – Switchgears, bus ducts, motor control stations, miscellaneous panels, UPS equipment and batteries, junction boxes (including supporting frames) and distribution panels.~~
~~ix) Local Control Stations in the field for motor/other equipment's.~~
~~x) Lighting & power panels.~~
~~xi) Light fixture, plugs, sockets, welding receptacle, lighting masts, lighting poles in the field etc.~~
~~xii) Earth strips, earth electrodes and earth plates in the field.~~
~~xiii) Sleeves for cables in the field.~~
~~xiv) Any other item not included above but part of the electrical system to be considered.~~

13.5.6 ~~Fixed Fire Protection and Fire Fighting System~~

~~i)~~ ~~Spray systems~~
~~ii)~~ ~~Fire main piping, hydrants, block valves, fixed water monitors, dry risers and hose reels~~

iii) ~~Fire alarm push buttons~~
iv) ~~Fire, smoke, heat and gas detectors~~
v) ~~Deluge valve manifolds~~
vi) ~~Fire Extinguishers~~
vii) ~~Post indicator valves, valves and valve boxes~~
viii) ~~Fire fighting cabinets~~
ix) ~~Alarm push-button stations~~
x) ~~Any other item not included above but part of the fire fighting system to be considered.~~

13.5.7 Miscellaneous

i) Safety showers and eye wash fountains if any
ii) Safety, access and egress
iii) Volumes of all emergency access and egress corridors
iv) Maintenance volumes and man-ways
v) Bundle removal volumes for exchangers and heaters
vi) Lay-down areas
vii) ~~Radiation volumes for flares~~
viii) ~~Area classification volumes~~
ix) Crane access ways
x) ~~Material handling equipment e.g. Catalyst loading chutes, drums, conveyors. etc. to be modelled in near exact geometry~~
xi) ~~Sprinkler Spray Nozzle Cone Volume~~
xii) Any other item not included above

13.5.8 Others / Miscellaneous Models:

Packaged Units:

i. Packaged units /modular units are to be treated like the main units and all the Skid mounted Equipment's to be modelled with exact geometry.
ii. Skid to be tagged as per NRL tag numbering specification.
iii. All sub-equipment's to be modelled with exact geometry.
iv. Internal Piping of the skid with all inline and online instruments to be modelled.

13.5.9 3D Model requirement for Packages:

(PACKAGE VENDOR will be referred as VENDOR in this section.)

The objective of this section is to establish processes that are to be applied by PACKAGE VENDOR in providing the package 3D model with specified level of details which shall be importable into the main CONTRACTOR's/CONSULTANT's S3D model. It also specifies the minimum level of details required from PACKAGE VENDOR for such 3D models, so that the final integrated model is homogenous in all aspect.

This is applicable to all packaged equipment as defined below under following category.

a) Packaged Equipment

VENDOR shall provide 3D model with specified level of details and CONTRACTOR shall integrate the same into his S3D model.

b) Other skid mounted equipment with interconnecting piping, electrical and Instrumentation in the scope of vendor (for example Compressor / Heater/ Dosing Packages, etc..) where 3D Model is requested by the Contractor from Vendors, Vendor shall provide the 3D model / step files / IFC format files with specified level of details and CONTRACTOR shall integrate the same into his S3D model.

Alternatively, the 3D model of package can be performed by CONTRACTOR with specified level of details using vendor's GAD/Drawings.

Ultimately, it is the responsibility of CONTRACTOR to ensure that 3D Model supplied by VENDOR :

i) are with specified levels of details with tagging as per NRL tagging philosophy and are on par with main units
ii) are free from clash
iii) has proper access, operation, maintenance and handling volumes
iv) are integrated into the main 3D model of CONTRACTOR

Operation, maintenance and construction feasibility of all items supplied by VENDOR shall be checked and ensured by CONTRACTOR. He shall also ensure that interference check, data consistency and other integrity checks are performed before and after integration and all issues are resolved before transmitting the model to OWNER /MPMC for review.

VENDOR 3D MODEL CONTENT:

VENDOR shall include the geometric volume of main and sub components (where applicable) including the following:

a. Main and sub equipment with tagging and labelling in line with the NRL tagging philosophy
b. Equipment including manholes, davits with opening volumes, noise and other enclosure
c. Primary & Secondary Structures and other civil items as applicable.
d. Ladders, platforms, stairways, grating/plating, handrail and other structural items.
e. Handling means, monorails, lifting beams, davit, hatches, special tools etc., including operating volumes of maintenance and handling activity.
f. Main and secondary access, Maintenance access with volumes
g. All Piping including inline and online instruments, valves (with handwheel / levers / gear boxes/ actuators), fittings, specialties and supports within packages/skids.
h. Insulation volume on equipment, piping and instrument
i. Electrical & Instrumentation cable trench / tray with supports up to the skid's edge and highlight interface.
j. Electrical & Instrumentation Junction boxes with opening volumes.
k. Electrical motor, transformer, light fixtures & field distribution boards, local control stations, welding & socket outlets, lighting poles & power JBs.
l. Local control panel, cabinet with opening volumes.
m. Applicable safety systems (eg., deluge system, Eyewash/Safety Shower)
n. Ducting & it's supports
o. Tie-in points (Tie in flanges, cable entry etc.,)
p. Fire proofing of Equipment and Structure.

CONTRACTOR shall not request VENDOR to provide conception/construction level of details in VENDOR 3D model which has no added value for CONTRACTOR engineering i.e.,

- Internal details of equipment
- Construction details such as bolting, gasket, chamfers, springs, welds etc.,

Should VENDOR for his internal work process need to model high level of details, CONTRACTOR shall ensure that all 3D models submitted by vendor are clean and customized 3D models without high level of construction details.
Ultimately it is the responsibility of CONTRACTOR to present the integrated clash free 3D model suitable for review to OWNER/MPMC with specified level of details.

The VENDOR 3D model shall follow the coordinate system of CONTRACTOR 3D model. The datum point of VENDOR 3D model shall be same as datum point specified in GAD/Drawing. If GAD/Drawing does not specify datum point, the datum point of VENDOR 3D model shall be one corner on the package skid, which shall be mentioned in GA Drawing.

Requirement and Format:

VENDOR 3D model shall be supplied together with each revision of General Arrangement Drawing (GAD) in IEDDMS system. For each revision of the VENDOR 3D model, the native format as specified in section above and Review file (.vue, .mdb2) or Navisworks format (.nwd) shall be supplied.

Also, VENDOR will have to provide 3D model to CONTRACTOR at latest 1 month before second and third client model review.

VENDOR is responsible to ensure a full conformity and quality checking between VENDOR 3D model and GAD/Drawing supplied.

For this purpose, CONTRACTOR will only accept the native file formats as defined in **Annexure - IV**

The file size must be kept as minimum as possible to ensure data integrity. VENDOR can split the 3D model file in several files in order to reduce the size of each submitted file. For example, ten files of 10 MB are preferable than 1 file of 100 MB.

As mentioned in earlier paragraph, VENDOR shall reduce the level of details of VENDOR 3D as per CONTRACTOR needs in order to reduce the size of the file. Files must be split and organized by Area and Disciplines.

13.6 3D Model Review Requirements

i. Formal model reviews, of all parts of the Plant design, shall be conducted throughout design development. Scheduled reviews will typically include 30%, 60% and 90% of the design completion for each significant part, (Unit or Sub-Unit), of the Work and when significant changes to the model are to be carried out.
ii. CONTRACTOR/Consultant shall provide individual design tool databases to Company for review.
iii. The CONTRACTOR/Consultant shall prepare checklists for each review, including 30%, 60% and 90% reviews, for NRL review. The review itself will be conducted with the checklist as a guideline.
iv. Each review shall be carried out offline on a set of model files, identified by date/status and retained as a record of the status of the design at the time of review along with any relevant Tag File data.
v. The model software shall be capable of providing the ability, during review, to rapidly move through views of the Plant, with zoom in/out and rotation of object or viewpoint. Views shall be configured to limit the depth of view. Walk through simulation, point to point measurement and elevation checks shall be performed on demand. The data stored for each component shall be readily available on screen on demand.
vi. The software shall provide facilities to be able to tag elements with review comments, be able to return to the same view at a later date and also be able to export review comments to a database. All Tags shall be retained by date and each given a unique Tag number for the duration of the project.
vii. The 3D Model for review shall have facilities to key in the comments directly into the model review display.
viii. 100% Model review with Plant completely modelled with all disciplines and as close as possible with the physical plant

13.7 30 % Model Review Scope:

The objective of the 30 % model review is, to freeze a basic plot layout consolidating the Equipment, Piping and Platform Layouts and getting agreement on the proposed design to enable the CONTRACTOR/Consultant to proceed to detail design. The focus of a 30 % model review is on accessibility, escape, safety, layout, human factors engineering, maintainability and construction.

The items listed below should be included in the 30 % model review

1	Location and orientation of all equipment with nozzles (incl. supporting method, lifting lugs, insulation) and all space consumers (incl. pulling volumes and future extensions)
2	Structures (steel and concrete inclusive fire proofing)
3	Platforms incl. stairs and ladders for equipments, buildings, structures and shelters. Essential for operation maintenance and escape.
4	Critical lines from line list (Lines determine the location of equipment and large size pipe determine the plot layout).
5	Plot determining piping / ducts (including all 6 in. and larger, routing only, underground as well as above ground)
6	Utility station locations
7	In-line instruments (preliminary information)
8	Blast walls
9	Bund walls
10	Maintenance access ways (All including their clash volumes) essential for main access/ operation/ influence on safety. This includes a representation of main maintenance equipment and trolleys and trucks as applicable. Reserve envelopes / volumes for: maintenance areas, equipment removal, tower dropouts, lay-down areas, radiation for flares, hazardous area classification.
11	Major piping that influences equipment positions (underground as well as above ground).
12	Concrete slabs, paving, grading and roads (different load bearing capacities shall be recognised), and plot limits/plant boundary limits
13	Relevant floor slopes, where the fall is >50 mm (2 in) over the floor width
14	Package units, its location and orientation (basic shapes and main components recognizable inside these package units, the escape ways shall be defined).
15	Escape routes on grade and elevation (including their volumes)
16	Pipe racks and main pipe support structures, sleeper ways, culverts, etc.
17	Outline of underground electrical and instrumentation trenches
18	Main electrical and instrumentation cable trays / racks /ducts
19	Main panels – outline
20	Main steel and bracing allocations
21	Underground sewer systems and collecting and separation systems drainage / sewage, Site and drainage contours, Storm Water Drains
22	Buildings with Primary shapes , e.g. control room, analyser houses, switch rooms
23	Maintenance areas like Drop zones/ bundle pulling areas/ laydown areas
24	Mobile crane aprons (based on available cranes and on lifting study)
25	Relevant Cranes, Hoisting equipment, lifting beams, monorails (+travel path), maintenance cranes
26	Major pipe-chases in structure and buildings (reserved areas for future piping)
27	Major wall and floor openings for equipment travel
28	Unit and/ or equipment safety distances, area classification requirements
29	Constructability volume (incl. location of lifting slings at any time during lifting).
30	Main Firefighting equipment including Firewater hydrants, monitors (and hose reels)
31	Firewater lines incl. valves and hydrants
32	Equipment status (filled in attribute)
33	Define separation distances within the plot to be taken into account
34	Interfaces for future extensions and space for future equipment to be taken into account

35	Area classifications requirements been taken into account
36	Location of battery limit to be specified (by unit or complex)
37	Sufficient area for catalyst, solids or bag filter handling
38	Dykes, Gates, Fencing, Ground slopes / elevations, retaining walls if any, envelopes for evaporation ponds.

13.8 60% Model Review

This review is 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 and approved by OWNER before 60% model review

The 60 % model review shall be carried out and closed out prior to issuing the piping isometrics for construction. 60% model review will cover : all piping & equipment and those missed out in 30% model review. The 3D modeling shall also cover all the Electrical equipment's of ISBL and Electrical equipment's located in sub-station. The items listed below should be included in the 60% model review,

1	The actions resulting from the 30 % model review
2	Location of spading points (incl. handling)
3	Process and utility lines (2 in. and above) incl. supports, flow measurements and associated instrumentation
4	All other piping largely completed
5	Equipment to latest information, including orientation of nozzles and trims such as stand pipes / level gauges / transmitters etc
6	Nozzle & Manway orientation/locations (including swing space of covers)
7	Ladders, stairs and platforms, handrails with detailing as applicable
8	Valving (position, orientation, etc.)
9	Control valves with access and maintenance means.
10	Platforms for valves/equipment and its operation, instrument access and maintenance access
11	Permanent cranes, hoisting beams, pad eyes, etc. (based on material handling study)
12	Hoisting equipment, lifting beams, monorails and davits
13	Final dimensions of table tops, structures and steel constructions
14	Secondary steelworks and bracing, tankage bunds and retaining walls, pit & trenches
15	All Equipment Foundations and other Secondary foundations – outlines
16	Eye wash and safety shower locations
17	HVAC Equipment incl. large size ducting
18	Pipe supports locations and types (physically supported), for piping 3 in. and above and all critical piping. (Supports for stress critical systems shall be based on stress analysis calculations).
19	Secondary supports such as trunnions, supporting steel, brackets, etc. (for clash check purposes)
20	Local operation panels, all instrumentation on equipment
21	Fire fighting systems (hydrants, monitors, water spray systems, hose reels, dry risers, deluge piping etc.)
22	In-line Instruments based on final vendor data
23	Instrument transmitters and outlines of junction boxes, secure instrument air vessels; panels and cabinets inclusive stands, safety critical sensors / switches
24	Withdrawal volumes for instruments

25	PSV Locations
26	Electrical equipment such as outdoor panels, major lighting towers
27	Above/ underground electrical + instrument cable trays –drops to all users
28	Above-ground instrumentation and electrical tray routing
29	Buildings, substation, (incl. crane and HVAC) with detailing as applicable like doors, windows, ceiling, floors, cladding, walls and other major architectural items
30	Package units shall be modelled (equipment, piping, associated instruments, etc.) based on package vendor general arrangement drawings
31	All HAZOP comments incorporated
32	steam tracing manifolds with associated piping, Jacket and Core Piping.
33	Operating vessels for Remote Operated Valves (ROVs), (hydraulic and pneumatic)
34	Fireproofing
35	Pits and trenches
36	Battery limit valves layout
37	All access ways and maintenance access
38	Silencers and other inline equipment like Desuperheaters
39	Fire and gas detectors, CCTV, Part of instrument Junction Boxes, All major instrument and communication equipment
40	Volume tanks, instrument air manifolds, fire proofing boxes for actuators.
41	All Underground Systems, Drain network system (AG & UG), Man Hole and Associated Vents

13.9 90% Model Review

The focus of a 90 % model review is to review the model on the added details such as the location of junction boxes, instrumentation, sample point locations and steam manifolds (e.g. smothering and tracing). Review will includes complete field instrumentation system including final control element/ cable duct/tray / junction box /instrument locations - tapings -Hook ups / Analyzer Shelter Location Etc. Consultant shall ensure that 3D model shall be developed & demonstrated with dynamic walk through facility to check any interference, requirement of operation/ maintenance of instrument/equipment's. Consultant also to ensure that facilities of viewing/modifying the 3D model to be available at NRL site. The 3D modelling shall also cover all the Electrical equipment's of ISBL (Including Lighting illumination levels in designated areas) and Electrical equipment's located in substation.

The third & final model review is intended to confirm the results of the other outstanding details of the 60% model review. The design and model must be substantially completed & clash free.

Following will be covered in 90% review:

1	Any late or special items
2	Any change since the previous reviews
3	All remaining utility piping and associated instruments
4	Comments incorporated.
5	Model shall be in accordance with the latest issue of the P&IDS, line list, structural, civil, instruments and equipment vendor drawings etc.
6	Auxiliary piping for equipment-compressor skids, pump coolers/ seal piping

7	Remaining process and utility piping 40 mm (1 ½ in) and below
8	All stress reviews completed
9	All sizes of valve (position and orientation), instruments and supporting shown
10	All cable trays incl. tray supports
11	Instrument junction boxes, local control panels and instrument support stands
12	All auxiliary equipment and electrical motors shown
13	All sprinkler systems shown
14	Final lighting
15	Transmitter boxes
16	Sample stations
17	In-line instruments final
18	All minor civil structural items, like standard pipe supports / foundations, Grade Pipe Supports, lighting pole foundations, fencing, etc. as per 3-D modelling requirements shall be completed.
19	All applicable architectural items for buildings, structures & shelters
20	HVAC equipment and connected ducts
21	Utility Station and its piping
22	Any other scope not included above.

13.10 100% Model Review :

Plant completely modelled with all disciplines and as close as possible with the physical plant.

Milestones for Model Review :

Model review shall be done accordingly to the Milestones as referred above (30%/60%/90%/100%). CONTRACTOR/Consultant shall notify the date and venue of the various 3D Model reviews to OWNER / MPMC. CONTRACTOR /Consultant shall furnish the review model at least 2 weeks prior to schedule model review.

Documents Required before 3D Model Review:

CONTRACTOR/Consultant shall furnish the following documents to OWNER / PMC.

- Compliance statement on milestones as defined.
- Compliance statement on tag points of previous model reviews
- List of items not modelled.

13.11 Ownership of Project Data

Once the Final Handover is completed to NRL, NRL shall retain full ownership of the project data after the handover and can provide this project data to any other party for future modification projects .NRL owns the responsibility of the Data.

13.12 Creation of Areas/ Model Files and Design Databases:

This activity shall be carried out by CONTRACTOR/CONSULTANT on finalization 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 modelling ease and shall be termed as modelling zones. Organization 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 organizing data properly and facilitate generation of deliverables, reports and interference management.

The complete material specifications and component catalogues developed by the CONTRACTOR/Consultant on SP3D shall be delivered including but not limited to the following.

i) Piping Material Specifications
ii) Insulation Specifications
iii) Bolt specification
iv) Nozzle specifications
v) Complete Piping component catalogues with write-up on naming conventions used for Catalogue
vi) Symbol keys
vii) Any symbol key library developed for special items where predefined Symbols are not available.

13.13 Discipline Interface

i) 3D Systems shall be customized to extract all reports and deliverables (e.g. 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.
ii) CONTRACTOR/CONSULTANT Civil Structural department will match the location & elevations of equipment foundations with respect to the modelled equipment's and resolve any discrepancy in consultation with Project piping team. Any change in equipment location during detail engineering stage shall be communicated to structural department by piping/project department.
iii) Floor / platform penetrations shall be taken / verified from the completed piping area models and shall be modelled by structures so that these are not reported as clashes during interference checking. Coordination for any subsequent change shall be done by piping group.
iv) Structures while modelling secondary members and bracings shall keep the piping model in view and locate these members to clear piping. Resolutions to problems if any, shall be carried out in consultation with piping group.
v) All underground Piping & trenches being modelled shall be checked for interference with structural foundations. Co-ordination with Electrical, Instrumentation & Piping departments of EPC/EPCM for cable trenches, pipe sleeves and road crossings.

13.14 Data Check and Clean-up

i. CONTRACTOR/Consultant shall ensure to meet the following minimum database checks and clean-ups guideline, prior to authoring tools Application data handover.
ii. Authoring tools Applications database is free of any erroneous data.
iii. All authoring tools Applications database inconsistencies shall be resolved prior to handover.
iv. All hyperlinked files shall be removed and converted in embedded objects prior to delivery.
v. Interferences shall be resolved on a regular basis.
vi. Database Integrity checks shall be performed regularly and all inconsistencies shall be resolved.
vii. Temporary files and directories shall be removed prior to delivery
viii. Database Consistency Check and Integrity reports shall run on Database on regular time interval and shall be error free.

13.15 Engineering Data Assurance and Audit

NRL will review and accept Engineering Data on a regular/scheduled basis. This approach will ensure that the NRL's goal for seamless, quality-assured electronic data handover from project to operations is achieved. Engineering Data consistent with the development status of the engineering of the project will be taken-on at scheduled times/milestones during the project cycle as determined by the NRL/CONTRACTOR/CONSULTANT. The main purpose is to assure engineering Data is developed, updated and delivered as per NRL requirements to reduce the impact of deviations prior to final handover of engineering data.

A Data Quality assurance audit will be conducted by CONTRACTOR/CONSULTANT to ensure engineering applications are configured as per NRL standard. Data Quality assurance audit findings will be systematically maintained and shall be closed out within stipulated time period. CONTRACTOR/Consultants has to develop milestones schedule of engineering data deliverables which will be reviewed and approved by NRL or NRL representative. Approved schedule will be the basis for the Data assurance audit Schedule.

14. PROJECT INTEGRATION

#	Requirement	Overview
1	General	i. Integration platform (Smart Plant Foundation) at CONTRACTOR/Consultants location to be configured to use the Consolidated Data Ware model instead of the Data Ware Shared model. This will allow inconsistency checking and reporting to be done from within SPF. ii. Retrieval and navigation of published information must be done from within SPF, not the authoring tools. iii. NRL IEDDMS will be used for viewing and master tag management. Information authoring must be done within the tools. iv. All tags created outside authoring tools must be created inside an integrated platform authoring domain and published. This approach must be defined in the Project Execution Plan (PEP). v. OEM shall provide the seed file for the SPF along with the data validation rules developed for NREP. OEM will provide the required templates in excel format for loading the non-smart tools data. vi. OEM shall support the consultants / contractors a. in hosting the SPF at Consultant/Contractor premises, b. integration of the smart authoring tools with SPF with necessary schema mappings. c. configuring the data validation rules in SPF, d. publishing data from Smart Authoring tools to SPF e. resolving the errors while publishing data from Smart authoring tools to SPF, f. taking inconsistency report in SPF

#	Requirement	Overview
		g. resolving the inconsistency error in authoring tools h. publishing the data to the IEDDMS platform hosted by NRL and defining the workflows in IEDDMS platform. vii. OEM to provide the detailed workflows and work instructions for the above activities.
2	Inconsistency reporting	i. Inconsistency reports must be created and verified periodically and shared with COMPANY. The inconsistency report should check and report on inconsistent property values across tool domains. ii. All properties published by authoring tools must be included in the inconsistency report. If a tag contains identical information for all properties, it should not be listed in this report. iii. Inconsistency reports must be communicated back to the designers as part of the handover. This responsibility should be assigned to the person acting in the role of project information manager.
3	Naming conventions	i. All authoring tools must be configured to use the same naming conventions. This will allow auto correlation of objects to be done by name.
4	Plant Breakdown Structure	The same Plant Breakdown Structure (PBS) must be applied to all authoring tools. This PBS must be defined in Integrated platform, published to the CDW domain, and retrieved in the authoring tools.
5	Publishing	i. The designer must publish frequently. Intermediate versions must be used to share information. ii. The designer must decide whether the version or revision is ready for the data exchange process. iii. In the case of minor changes, a new version must be published. In the case of major changes, a new revision must be created for publishing. iv. Versions will not be shared with COMPANY. Revisions must be shared with COMPANY. *It is strongly recommended to review changes in the ToDo list before accepting them: please note that auto update on retrieve should be disabled.*
6	Handover	Handover of documents and files must be controlled using: i. Document workflows ii. IEDDMS Submittals and external transmittal functionality

#	Requirement	Overview
		The following work process is strongly recommended: i. CONTRACTOR/CONSULTANT requests COMPANY permission to issue a new revision or create a new document. ii. New revisions and documents are linked to a transmittal and sent to COMPANY for approval. iii. COMPANY creates an internal transmittal based on information received from CONTRACTOR/CONSULTANT. This is distributed internally to collect comments from several disciplines. iv. COMPANY creates an external transmittal. COMPANY links documents and files requiring CONTRACTOR/CONSULTANT update to the transmittal, and issues to CONTRACTOR/CONSULTANT. v. CONTRACTOR/CONSULTANT updates existing documents and files and adds new documents and files and will add new documents and files to the transmittal for return to COMPANY. vi. COMPANY reviews the submitted documents and files. a. Correct documents and files are published in IEDDMS and linked to the transmittal to ensure traceability. b. Incorrect documents and files are rejected. COMPANY will create a new external transmittal to send these documents and files back to CONTRACTOR/CONSULTANT for correction.
7	Attributes	i. CONTRACTOR/CONSULTANT must create new user-defined attributes (based on the project requirement) in the relevant authoring tool schemas and by OEM for SPF schema with the prior approval from the MPMC/Company/OEM ii. OEM must create proper publish / retrieve mapping for created attributes based on the project requirements. iii. COMPANY / MPMC /OEM must review and approve all CONTRACTOR/CONSULTANT-created attributes and tool data mapping.

15. PROJECT EXECUTION

15.1 IEDDMS Architecture in NRL

IEDDMS workflow proposed by Hexagon given in the Appendix V.

In the proposed IEDDMS setup at consultant's premises, system Hardware, network connectivity from consultants authoring tool to IEDDMS integration facility to be provided by respective consultants.

15.1.1 NRL's Responsibility in IEDDMS Management

a. Hosting of IEDDMS hardware at its data centre at Numaligarh s and providing access to Consultants and other stakeholders for document management, review, approval and transmittal related roles.
b. NRL will ensure back up at regular intervals for all applications & database hosted at NRL as per methodology defined by the OEM. OEM shall provide schedule of automatic database backups script to NRL DB administrator. The backup interval/schedule shall be defined and agreed as per requirement.
c. To review / approve documents hosted in IEDDMS by Consultants.

15.1.2 CONTRACTOR/CONSULTANT Responsibility

i) OEM will be responsible to consolidate information from all LSTK's and EPCMs who are executing project and maintain IEDDMS for Company to collaborate, communicate and monitor project progress.
ii) NRL / MPMC will create seed files for engineering authoring tools for storing data in IEDDMS platform. It will provide those seed files to participating LSTK's and EPCMs to deliver consolidated data consistently throughout the project.
iii) CONTRACTOR/Consultant's will load their respective consolidated data to IEDDMS platform. Contractor / Consultant's to make all the required IT infrastructure (hardware and software and required licenses) for connecting to the NRL hosted IEDDMS platform.
iv) CONTRACTOR/Consultants will use SPF at their locations to integrate their data and then push the consolidated data into NRL hosted IEDDMS.
v) LSTK's/EPC will publish data from SPF at their locations to NRL hosted IEDDMS staging server where document review, approval and communication will be done. Review and approval workflow is at the discretion of CONTRACTOR/Consultant & Company.
vi) IEDDMS has inbuilt standard workflows such as shown in the image above which can be used. All LSTK and EPCMs can be granted internet access to IEDDMS staging server to follow comments and make changes accordingly.
vii) CONTRACTOR/Consultant must ensure to provide all engineering tools data backups in complete and the integration tool backup at different review stages. OEM will assist NRL to restore those backups at NRL location.
viii) Every CONTRACTOR/Consultant will deploy and maintain servers on their premises where the engineering authoring tools and Integration tool (SPI, SPEL, SPPID, S3D, SPF, Tekla etc.) will be hosted. They must use, Seed file, Handover specifications etc., decided by MPMC / Company. All these tools will operate in an integrated environment to maintain data consistency at their respective locations.
ix) NRL/AWS will be responsible to maintain servers used for IEDDMS. The IEDDMS software (SDX) shall be maintained by OEM and provide access to Company and Contractors/Consultants. NRL/ MPMC will monitor project through this system. IEDDMS server should comply to globally accepted industry handover specification e.g., CFIHOS. IEDDMS server should be capable to define

document acceptance standards, do document validation and provide features to perform project review and communication. MPMC will make sure that EPCs deliver all necessary data and meet quality standards. In case of a service provider being appointed to consolidate data; service provider will collect data from EPCM/EPC and load into the IEDDMS server.

x) Company can access IEDDMS server during project execution to be aware of the status and can initiate communication through that medium itself. Company will maintain another data warehouse in its server to store native file data submitted by EPCs/EPCM and to store the respective native databases (SPP&ID, SPI, SPEL,S3D, TEKLA and SPF) given by CONTRACTOR/Consultants.

xi) Company will have own rights of IEDDMS server after project handover.

xii) MPMC to coordinate the handover of the LSTK's design tools (SPP&ID, SPI, SPEL, S3D, Tekla) backup's to Company. It is the responsibility of the LSTK' contractors to provide the design tool backups which are Error free and cleared TODO list entries

15.1.3 EPCM's/ EPC's Responsibility

EPCM's and EPC's will maintain servers where engineering authoring tools (SPI, SPEL, SPPID, SP3D) and integration tool (SPF) will be hosted. EPCM/EPC must use Seed file, Handover specifications etc., approved by NRL. All these tools will operate in an integrated environment to maintain data consistency. This integrated working environment can be used as a document management system and can be configured accordingly. EPCM / EPC will load data in the central IEDDMS server hosted at NRL at each review cycle. IEDDMS server will have segregate project configuration to accommodate data coming from EPCM / EPC.
EPCM / EPC to make sure that data is delivered in the format accepted by system. It will be the discretion of EPCM /EPC to own responsibility for any data related faults. EPCM / EPC to ensure that EDDMS is up to date with project data as handed over by them.

i) CONTRACTOR/Consultant is responsible to ensure all Data originated by the Subcontractor and Manufacturer/Suppliers comply with the NRL's Data requirements.

ii) CONTRACTOR/Consultants shall be responsible for any additional effort or costs associated with ensuring the Data supplied by the Subcontractor complies with the NRL's requirements without any loss of information & impact on Schedule.

iii) In order to link Non-Smart deliverables to the NRL IEDDMS, CONTRACTOR/Consultant must submit all documents with required Metadata attributes which are delivered in Excel files. Metadata Templates shall be provided by OEM.

iv) For vendors non-smart data mapping respective CONTRACTOR/Consultant will be responsible for mapping all requirements or may engage any 3rd party for data mapping and integration.

15.2 Review and Transmittal Workflows of Engineering Data

Transmittals are used to distribute a controlled set of documents in the system to a specific set of recipients. The term transmittal refers to the report used to record and track the distribution of the documents. Incoming and outgoing transmittals with appropriate workflow and email integration shall be part of the Data integration platform.

i) Drawing review and transmittal process will be automated in the integration platform which will be hosted by NRL, all stakeholders will be given access to use the platform and transmit documents to Owner, EPCM or PMC for validation and comment.

ii) This platform shall facilitate the creation of an information portal for rapid acquisition and viewing of both unstructured and structure information. Additionally, User will have role-based access to engineering data submitted for Review and comment.

iii) NRL/MPMC/OEM will map and manage the complete interface and user base for document control, review and transmittal requirements of the project.

iv) The exchange of engineering documents managed by document control mechanism in the integrating platform for engineering data.

v) Typically, engineering documents are created and go through an internal release process before they are shared with other stakeholders in the projects for formal review and approval. This formal review and approval process, getting the owners approval before issuing a document for construction. Entire cycle will be managed electronically in the integration platform by the respective contractor / consultant with the support of OEM or authorized 3rd party service provider engaged by NRL.

vi) The proposed Data integration platform shall provide a web-based submission, validation, distribution, and review of data and document deliverables. A data centric "digital twin" of the facility can be viewed and navigated to locate relevant data and documentation in context.

vii) Review/Transmittal/Submission request will arrive as email in concerned users' mailbox as per pre-defined matrix. User will be able to provide comment /mark up/annotations etc. in the drawing and submit for review.

viii) Entire audit trail of document will be available in the solution.

15.3 Engineering Data Assurance and Audit

NRL will review and accept Engineering Data on a regular/scheduled basis. This approach will ensure that the NRL's goal for seamless, quality-assured electronic data handover from project to operations is achieved. Engineering Data consistent with the development status of the engineering of the project will be taken-on at scheduled times/milestones during the project cycle as determined by the NRL/MPMC. The main purpose is to assure engineering Data is developed, updated and delivered as per NRL requirements to reduce the impact of deviations prior to final handover of engineering data.

A Data Quality assurance audit will be conducted by MPMC to ensure engineering applications are configured as per NRL standard. Data Quality assurance audit findings will be systematically maintained and shall be closed out within stipulated time period. CONTRACTOR/Consultants has to develop milestones schedule of engineering data deliverables which will be reviewed and approved by NRL or NRL representative. Approved schedule will be the basis for the Data assurance audit Schedule.

15.4 Quality control

Contractors shall be provided an option to check Inconsistency reports at any point in time during course of project. Inconsistency reports must be verified by contractor periodically and shared with COMPANY. The inconsistency report should check and report on inconsistent property values across tool domains.

IEDDMS platform must be used a minimum of once a month to control the quality of data. The resulting report(s) must be submitted to COMPANY on a monthly basis.

CONTRACTOR/CONSULTANT will ensure the following data quality control steps are completed prior to handover. COMPANY will not accept final handover without completion of these steps.

- Data inside IEDDMS platform and all authoring applications must be completely correlated.
- All authoring integration to do lists and Smart 3D quality control lists must be empty.
- All documents and data must be published into IEDDMS platform.
- All documents published into IEDDMS platform.
- All documents, data and 3D models must be as-built.
- The final tool inconsistency reports are empty, or all remaining points are approved by COMPANY.
- The final Data Validator report is empty, or all remaining points are approved by COMPANY.

  All the documents that are needed to be published into IEDDMS shall be finalized with the contractor / consultant. Publishing frequency to be agreed between NRL/Consultants / Contractors considering the

engineering development / Schedule. The system shall provide an option, to load the documents in IEDDMS without inconsistency reports in the initial revisions.

16. PROJECT HANDOVER

16.1 Overview

CONTRACTOR/CONSULTANT's must provide all requested asset information in the required format, and in accordance with a delivery schedule to be mutually agreed between COMPANY and CONTRACTOR/CONSULTANT's. This will enable timely preparation for operational activities, and support COMPANY's stated objective of maintaining and managing an accurate digital record of the asset throughout operations and maintenance.

Information handover includes, but is not limited to: plant breakdown structure; documents; tags; relevant relationships with documents and vendor; and specific sets of attributes etc. as described below.

CONTRACTOR/CONSULTANT must therefore ensure full compliance with required format and content; to avoid re-work, CONTRACTOR/CONSULTANT must confirm these requirements with COMPANY prior to commencing any design activities.

In the handover stage the information, which consists of the documents, tags and relationships between document to Tags and documents to Vendor etc. will be submitted along with the original/native electronic format and hard copy documents, the CONTRACTOR/Consultant must submit full minimum/mandatory Meta-data describing such documents as specified by NRL in the scope

As a minimum Standard, a typical document for the project information Handover include (but is not limited to the following and requirement may add/change during project execution phase):

i) Document Retention Code – Ref to Appendix I
ii) Document Handover - Ref to Appendix II
iii) Supplier Document – Ref to Appendix III

16.2 Requirements

CONTRACTOR/CONSULTANT must use intelligent tools to generate all drawings and deliverables supported by the SmartPlant suite solutions.

CONTRACTOR/CONSULTANT's must ensure quality of data delivered from sub-CONTRACTOR/Consultants, suppliers and vendors. CONTRACTOR/CONSULTANT is responsible for correcting any data inconsistencies and omissions identified during this process.

All validated documentation (including vendor documentation) must be loaded into IEDDMS platform, complete with related tag, asset, model, document category, originator, discipline, dossier type, plant break down structure and work breakdown structure relationship.

CONTRACTOR/CONSULTANT must deliver the integrated system to COMPANY using Smart Plant Foundation and then load the data into IEDDMS platform. This approach must be defined in the Project Execution Plan (PEP) and approved by COMPANY.

CONTRACTOR/CONSULTANT must transfer validated data to COMPANY's system.

Information transfer to the COMPANY IEDDMS platform and COMPANY maintenance Operations environment will be automatic, and in accordance with a delivery schedule to be mutually agreed between COMPANY and CONTRACTOR/CONSULTANT.

CONTRACTOR/CONSULTANT must provide data in accordance with a progressive delivery schedule to be mutually agreed between COMPANY and CONTRACTOR/CONSULTANT. This will include data handover at the following levels.

Level	Rationale	Milestone
IEDDMS	Progressive handover of engineering data to feed COMPANY operations and maintenance systems.	• Issued for review (IFR)

		• Issued for approval (IFA)
Authoring tool	Provides authoring as-built database to feed COMPANY operations and maintenance systems. This digital database will be updated and maintained throughout the project life cycle.	• Issued for construction (IFC) • As-built • As-accepted
Enterprise level	Final handover of integrated authoring tool and IEDDMS data.	• Issued for construction (IFC) • As-built • As-accepted

16.3 Smart Data Validation

Smart Data Validator must be used to check the quality of data delivered to COMPANY at each handover. Data delivery will take place in accordance with agreed milestones. Data validation rules will be developed and provided by OEM and the same to be configured and used with the support of OEM.

CONTRACTOR/CONSULTANT must include proposed data validation rules by OEM within the Project Execution Plan (PEP). This document will be submitted for COMPANY review and approval in accordance with agreed timelines, and prior to commencement of project activities. All data validation activities will be conducted in accordance with the COMPANY-approved PEP.

CONTRACTOR/CONSULTANT must deliver an Excel / CSV report for every object type for delivery to COMPANY. If requested, the following separate Excel / CSV reports must also be delivered:

- Relationships between objects
- Engineering properties

For every object type, validation rules must be configured to detect:

i. Data violations:
   a. Naming format
   b. Illegal characters
   c. Inconsistent values for properties or relations,
   d. Non-valid units of measure
   e. Illogical values e.g. max operating temperature higher than max design temperature
   f. Valid relation to existing plant breakdown structure (PBS) objects in IEDDMS platform Core; check for existence of the plant breakdown structure- related object,
   g. Valid classifications defined in IEDDMS platform; check for existence of the related classification object.
   h. Check for existence of any other related object.
   i. All the possible validation criteria like illogical values etc. shall be provided to OEM for configuring data validation rules.

ii. Target system schema violations:

i. Missing mandatory relations

ii. Missing mandatory property definitions

iii. Invalid property values (Enum list and UoM list)

iv. Cardinality violations for relations

iii. The default validation report is an indication of the quality of the delivered data by CONTRACTOR/CONSULTANT, and must be part of the handover. This report is configured to report:

i. Validation summary of number of errors found for every object type

ii. Details for each error, to include:

a. Name and Unique Identity Number of the object in SDV

b. Error message

c. Error type

d. Name of csv file processed

e. Severity

f. Property or relation name in Data validator Engine

g. Line number in csv file

h. Propagation information (if applicable)

i. Additional info (if applicable)

j. Column name

k. Rule name

l. Mapping action

m. Value

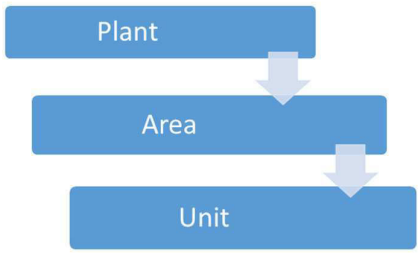
16.4 Integration Handover of data to IEDDMS

CONTRACTOR/CONSULTANT's will transfer data from CONTRACTOR/CONSULTANT's environment to COMPANY's IEDDMS environment in accordance with agreed timelines.

All CONTRACTOR/CONSULTANT schematics data will be aligned with COMPANY standards, as defined prior to project activities.
Additional fields and data will be remapped within IEDDMS platform to align cross references between CONTRACTOR/CONSULTANT and COMPANY information. For example, CONTRACTOR/CONSULTANT may work on a project plant breakdown structure, whereas COMPANY will focus on a site plant breakdown structure.

16.5 General requirements

#	Requirement	Overview
1	Plant hierarchy	It is COMPANY's objective to build an asset-centric information management system. To achieve this objective, the plant hierarchy (plant breakdown structure) must be clearly defined at the start of the project. The plant hierarchy will drive: • Data classification

#	Requirement	Overview
		• Location of plant equipment • Retrieval of relevant documents • Retrieval of additional asset information, as required during operations and maintenance Plant hierarchy will subsequently provide one of the main user-entry points into the system, and will facilitate "drill-down" type functionality as a means of navigating the plant. The plant breakdown structure (PBS) will present the structure and relevant data correlations between the elements that define equipment locations (e.g. plant, unit, train, system, sub-system, area, etc.). The PBS is typically defined as follows (Hierarchy7): 
2	Documents and deliverables	CONTRACTOR/CONSULTANT must use intelligent design tools to generate drawings and deliverables. Handover requirements include, but are not limited to: • Drawings (architectural, structural, civil, mechanical, electrical, plot plans and elevations, HVAC, BFD, etc…) • Piping & instrumentation diagram (P&ID) • Process flow diagram (PFD) • Instrument indexes • Instrument loop diagram (ILD) • Instrument specification sheet • Calculation sheet • Process data sheet • Dimensional data sheet • Equipment data sheet • Vendor procedures • Isometric drawings • Vendor documents • Purchase orders • Safety documentation (safety case, safety manual and

#	Requirement	Overview
		statutory documents) • Operating procedures • Maintenance procedures • Work instructions • Check lists • Forms • Engineering deliverables (design data not updated to reflect as-built condition) • As-built deliverables (representing accurate record of the plant) • Construction records • Commissioning records • Loop and logic diagrams • Instrument data sheets • Instrument connection and wiring list • Instrument hoop-up diagrams • Instrument wiring layout • Instrument air piping layout • Control room panel layout • Cable schedules for electrical and instrumentation cables • System panel layouts (DCS) • Additional requirements, as defined by COMPANY
3	Tags	i. Tagged items are classified as process or non-process tags. ii. Process tags are defined in SmartPlant engineering tools and published to SPF. iii. Non-process tags (not created in Design tools) must be loaded into SPF. This will be achieved with a bulk load utility which is heavily dependent on metadata provided in Excel spread sheets. iv. Handover tag categories include, but are not limited to: a. Equipment (either process or not) b. Instruments (either process or not) c. Piping (either process or not) d. Electrical equipment e. Cables

#	Requirement	Overview
		f. Communication devices and equipment g. Civil h. Structural i. Vendor package tags j. Building/location k. Additional requirements, as defined by COMPANY
4	Tag to document correlation	i. All tags and documents created with SmartPlant tools will maintain their relationships. ii. Tags and documents created by other applications will utilize metadata in Excel spread sheets to establish relevant relationships. In this case, CONTRACTOR/CONSULTANT must capture and register the relationship in the Excel spread sheets. iii. Handover must include, but not be limited to, the following minimum relationships between tags and documents: a. All document types to tags b. Relevant tags to buildings c. Relevant tags to purchase orders d. Relevant document types to vendors e. Relevant documents to purchase orders f. Relevant document to buildings g. Relevant tags to tags (parent/ child and tag from/to references) h. Relevant tags to plant i. Relevant tags to area j. Relevant tags to unit k. Additional requirements, as defined by COMPANY
5	Attributes	i. CONTRACTOR/CONSULTANT's scope of handover will include attribute data. ii. Attributes must be delivered in defined attribute classes.

16.6 Attribute classes

Properties in the following attribute lists must align with IEDDMS tag properties.

16.6.1 Object class: equipment

Attribute name	Comments
Equipment tag number	
Equipment name	
Equipment type	

Attribute name	Comments
Equipment description	
Material of Construction	
Design Pressure	
Design Temperature	
Size/dimension	
Gross weight	
Service description	
Affiliate ID	
Area	
Unit number	
Manufact name	
Manufact model number	
Manufact serial number	
Manufact part number	
Year of construction	
Month of construction	
Vendor name	

16.6.2 Equipment Relations with following attributes:

Attribute name	Comments
PO number	
Vendor documents	

16.6.3 Object class: piping

Attribute name	Comments
Pipe line number	
Piping type	
Piping description	
Line service code	Service code as per COMPANY's numbering system.
Size	
Line class	Line class as per COMPANY's numbering system.
Gross weight	
Insulation type	
Insulation thickness	
Unit number	Unit number as per COMPANY's numbering system.
Manufact name	
Manufact serial number	
Manufact part number	
Year of construction	
Month of construction	
Vendor name	
Revision	
Fluid code	Fluid code as per COMPANY's numbering system.
Line sequence number	
Sequence number suffix	
Line from	
Line to	

Attribute name	Comments
Fluid name	
Fluid phase	
Corrosion allowance	mm
Max operating pressure	kg/cm² G
Min operating pressure	kg/cm² G
Max operating temperature	degrees Celsius
Min operating temperature	degrees Celsius
Max design pressure	kg/cm² G
Min design pressure	kg/cm² G
Max design temperature	degrees Celsius
Min design temperature	degrees Celsius
Normal operating pressure	kg/cm² G
Normal operating temperature	degrees Celsius
Trace heating (min. Temp)	degrees Celsius
Test fluid	
Vacuum	
Test pressure	kg/cm² G
Radiographic test	
Penetrant test	
Hydro test	
Ultrasonic test	
Heat treatment	
Hardness	
Cleaning class	
Code regulation	
Insulation code	
Painting code	
Painting color	
P&ID drawing number	
Isometric drawing number	

16.6.4 Piping Relations with following attributes:

Attribute name	Comments
Drawing number	
Equipment tag number	
Instrument tag number	
Calculation sheets	
General documents	
Vendor documents	
Specifications	

16.6.5 Object class: instruments

Attribute name	Comments
Instrument tag number	
Instrument name	
Instrument type	
Instrument function	

Instrument description	
Size/dimension	
Gross weight	
Service description	
Unit number	
Manufact name	
Manufact model number	
Manufact serial number	
Manufact part number	
Year of construction	
Month of construction	
Vendor name	

16.6.6 Instrument Relations with following attributes:

Attribute name	Comments
Equipment tag number	
Pipe line number	
Po number	
Drawing number	
Calculation sheets	
General documents	
Equipment data sheets	
Instrument data sheets	
Procedures	
Vendor documents	
General documents	
Spare parts list	
Specifications	

16.6.7 Object class: buildings

Attribute name	Comments
Building number	
Building name	
Building code	
Sequence number	
Suffix	
Unit number	

16.6.8 Building Relations with following attributes:

Attribute name	Comments
PO number	
Drawing numbers	
Calculation sheets	
General documents	
Vendor documents	
Specifications	

16.6.9 Object class: drawing

Attribute name	Comments
Affiliate ID	
Drawing number	Drawing number as per COMPANY's numbering system.
Title1 type of drawing	i.e. engineering flow diagram
Title2 drawing description	
Title3 others	
Discipline identifier	Discipline code as per COMPANY's numbering system.
Drawing type	Drawing type code as per COMPANY's numbering system.
Drawing size	
Sequence number	Sequence number portion of the drawing number.
Project name	
Project number	
Scale	
Sheet number	
Area	Area code associated to the drawing.
Revision	
Revision date	
Status	
State	
Revision description	
Unit number	
Drawn by	
Checked by	
Approved by	
Filename	Drawing's electronic filename

16.6.10 Drawing Relations with following attributes:

Attribute name	Comments
Equipment tag numbers	
Instrument tag numbers	
Building numbers	
Pipe line numbers	
Original file name	
Reference files	

16.6.11 Object class: isometric drawing

Attribute name	Comments
Affiliate ID	
Isometric drawing number	
Line number	
Drawing type	
Piping class	
Drawing size	

Attribute name	Comments
Project name	
Scale	
Sheet number	
Area	
Revision	
Revision date	
Status	
State	
Title1	
Title2	
Title3	
Revision description	
Discipline identifier	Discipline code as per COMPANY's numbering system
Sequence number	Sequence number portion of the drawing number
Service	Service number portion of the drawing number
Unit number	
Line class	
Painting code	
Insulation code	
Test fluid	
Test pressure	kg/cm^2 G
Radiographic test	
Penetrant test	
Hydro test	
Ultrasonic test	
Heat treatment	
Operating pressure	kg/cm^2 G
Operating temperature	degrees Celsius
Design pressure	kg/cm^2 G
Design temperature	degrees Celsius
Drawn by	
Checked by	
Approved by	
P&ID reference number	
Piping layout ref number	
Filename	Drawing's electronic filename

16.6.12 Isometric drawing Relations with following attributes:

Attribute name	Comments
Equipment tag number	
Instrument tag number	
Pipe line number	
Original file name	
Reference files	

16.6.13 Object class: equipment data sheets

Attribute name	Comments
Data sheet number	
Document symbol	
Discipline identifier	
Sequence number	
Suffix	
Sheet number	
Revision	
Issue date	
Status	
Title	
Description	
Unit number	
Vendor name	
PO number	
Revision description	
By	
Checked by	
Approved by	
Filename	Document's electronic filename

16.6.14 Equipment datasheet Relations with following attributes:

Attribute name	Comments
Equipment tag number	
Instrument tag number	
Pipe line number	
Original file name	

16.6.15 Object class: instrument data sheets

Attribute name	Comments
Data sheet number	
Document symbol	
Discipline identifier	
Group number	
Sub group number	
Sequence number	
Suffix	
Sheet number	
Revision	
Issue date	
Status	
Description	
Unit number	

Attribute name	Comments
Revision description	
By	
Checked by	
Approved by	
Filename	Document's electronic filename

16.6.16 Instrument datasheet Relations with following attributes:

Attribute name	Comments
Equipment tag number	
Instrument tag number	
Pipe line number	
Original file name	
Reference file	

16.6.17 Object class: specifications

Attribute name	Comments
Specification number	
Discipline identifier	
Unit number	
Sequence number	
Suffix	
Sheet number	
Revision	
Issue date	
Status	
Description	
Revision description	
By	
Checked by	
Approved by	
Filename	Document's electronic filename

16.6.18 Specification Relations with following attributes:

Attribute name	Comments
Vendor name	
PO number	
Equipment tag number	
Instrument tag number	
Pipe line number	
Original file name	
Reference files	

16.6.19 Object class: vendor documents

Attribute name	Comments
Vendor document number	
Document symbol	
Discipline identifier	Discipline code as per COMPANY's numbering system
Document type	Document type code as per COMPANY's numbering system
Sequence number	Sequence number as per COMPANY's numbering system
Sheet number	
Revision	
Issue date	
Status	
Description	
Unit number	
Vendor name	
Po number	
Original document no	
Original revision no	
Revision description	
By	
Checked by	
Approved by	
Filename	Document's electronic filename

16.6.20 Vendor document Relations with following attributes:

Attribute name	Comments
Equipment tag number	
Instrument tag number	
Pipe line number	
Original file name	

16.6.21 Object class: vendor drawings

Attribute name	Comments
Affiliate ID	
Drawing number	
Title1 Type of drawing	
Title2 drawing description	
Title3 others	
Discipline identifier	Discipline code as per COMPANY's numbering system.
Sequence number	Sequence number as per COMPANY's numbering system.
Document type	Document type code as per COMPANY's numbering system.

Attribute name	Comments
Drawing size	
Project name	
Scale	
Sheet number	
Area	
Revision	
Revision date	
Status	
State	
Revision description	
Unit number	
Drawn by	
Checked by	
Approved by	
Filename	Drawing's electronic filename.

16.6.22 Vendor drawing Relations with following attributes:

Attribute name	Comments
Equipment tag number	
Instrument tag number	
Building numbers	
Pipe line numbers	
Original file name	
Cable tag number	
Electrical tag number	
Reference file	

16.6.23 Object class: electrical equipment

Attribute name	Comments
Electrical tag number	
Equipment name	
Equipment type	
Equipment description	
Size/dimension	
Voltage number	
Service description	
Gross weight	
Affiliate ID	
Area	
Unit	
Manufacturer name	
Manufact model number	
Manufact part number	
Year of construction	
Month of construction	
Vendor name	

16.6.24 Electrical equipment Relations with following attributes:

Attribute name	Comments

PO number	
Drawing number	
Calculation sheets	
General documents	
Equipment data sheet	
Vendor documents	

16.6.25 Object class: communication equipment

Attribute name	Comments
Communication tag number	
Equipment name	
Equipment type	
Equipment description	
Size/dimension	
Building number	
Voltage number	
Service description	
Gross weight	
Affiliate ID	
Area	
Unit	
Manufacturer name	
Manufact model number	
Manufact part number	
Year of construction	
Month of construction	
Vendor name	

16.6.26 Communication equipment Relations with following attributes:

Attribute name	Comments
PO number	
Drawing number	
Calculation sheets	
General documents	
Equipment data sheet	
Vendor documents	

16.6.27 Object class: cables

Attribute name	Comments
Cable tag number	
Cable name	
Cable type	
Cable description	
Number of cores	
Cross sectional area	mm^2
Size/Dimension input cable	length in meters
Building number	
Voltage number	
Service description	

Attribute name	Comments
Gross weight	
Affiliate ID	
Location	
From tag	
From location	
From gland	
From termination drawing	
To tag	
To location	
To gland	
To termination drawing	
Type of signal carried	
System cable is part of	
Area	
Unit	
Manufacturer name	
Manufact model number	
Manufact part number	
Year of construction	
Month of construction	
Vendor name	

16.6.28 Cables Relations with following attributes:

Attribute name	Comments
PO number	
Drawing number	
Calculation sheets	
General documents	
Equipment data sheet	
Vendor docum	

16.6.29 Object class: standard check lists

Attribute name	Comments
Checklist number	
Description	
Prepared by	
Reviewed by	
Authorized by	
Dept code	
Issue date	
Discipline identifier	Discipline code as per COMPANY's numbering system.
Sequence number	Sequence number as per COMPANY's numbering system.

Attribute name	Comments
Document type	Document type code as per COMPANY's numbering system.
Date of approval	
Frequency	
Review date	
Unit number	
Document title	
Revision	
Status	
Filename	Document's electronic filename.

16.6.30 Standard check lists Relations with following attributes:

Attribute name	Comments
SOP number	
WI number	
Form number	
Original file name	
Reference files	

16.6.31 Object class: spare parts

Attribute name	Comments
SPR number	
Equipment tag number	Tag number associated with the spare parts.
Manufact name	
Vendor name	
Size/dimension	
Part description	
Material specification	
Drawing number	
Manufact part number	
Spare part manufact name	
Manufact model number	

16.6.32 Spare parts Relations with following attributes:

Attribute name	Comments
Equipment tag number	
Instrument tag number	
Pipe line number	
Electrical tag number	
Drawing number	
Cable tag number	
General documents	
Vendor documents	
PO number	

17 RETENTION CODES

Technical and supplier document requirements at the information handover.

17.1 Appendix -I: Retention code

Retention Code	Requires As-building	Requires Handover	Description of Requirement
0	Yes	Yes	Documents that are required to operate the asset and that must be maintained by operations through the assets life cycle. They must be handed over in native digital format (as built) status code for storage and use in an Electronic Document Management System.
2	No	Yes	Documents that are required to operate the asset and that must be maintained by operations through the assets life cycle
4	No	Yes	Documents that are not required to operate the asset on a daily basis and do not need to be maintained by operations through the asset life cycle.

17.2 Appendix –II - Engineering Document Handover Requirements

Document Type	Document Type Description	Ret Code	Native Reqd.
Agreed Comments and Exceptions	Details any Comments and Exceptions to the Procurement Terms and Conditions of the Rotating Equipment Initiative.	2	
Alignment Sheet	A multi-function drawing used for the design, operation and maintenance of the pipeline	0	Y
Analysis		2	
Area Protection Drawing	Structural and module layout drawings detailing the passive fire protection i.e. firewall/boundary fire protection ratings.	2	Y
Block Diagram	Detailing the relationships in single line form between items of equipment, control panels, distribution boards, communications systems. Shows power and instrumentation control signal paths, interconnecting cable sizes and cable numbers.	0	Y
Basis of Design	Document outlining the basis for the design of the facility and comprising all process design philosophies i.e. environmental philosophy, drainage philosophy, ventilation philosophy, spading/isolation philosophy, plant availability/down time assessment and relief/blow down philosophy etc. The philosophies detail the reasoning and assumptions made in plant design and are required as reference documents for the optimization/modification of plant.	2	Y
Bill of materials	Bill of Material	2	
Bill of Quantities	Bill of Quantities	2	
Functional and Technical Requirements		2	
Calculation	All calculations etc. carried out to Size and select equipment in design, to ensure and demonstrate safe operation of plant within the design limits. Design calculations for all process conditions and process equipment selection. Including Sizing	2	Y

	data for the relief and blow down systems. HP/LP interfaces, Set of calculations verifying plant and equipment protection downstream of pressure letdown locations (the register of safety related devices refers to it). Details of any surge and dynamic analysis carried out to verify design of process plant.		
Corrective Action report	Corrective Action report	4	
Construction Change Notice	Construction Change Notice	2	
Construction Commissioning Procedure	Construction Commissioning Procedure	2	
Concession Request	Concession Request	2	
Cause and Effect Diagram	The logic of alarm and trip systems shown in matrix form detailing the relationships between input variations on the output. Required for an understanding of the alarm and protection systems and for fault finding and modifications.	0	Y
Cause and Effect Change Notice		2	
Chart	A sheet of information in the form of a table, graph or diagram e.g. organograms	4	
Cable Rack Layout	Shows the physical location of all Cable Racks	2	Y
Certificate		2	
Commissioning Test Procedure	Commissioning Test Procedure	2	
Data		4	
Data Sheet	Engineering CONTRACTOR/Consultants design data sheet, Contains the service conditions and process parameters, and any other technical requirements of the function of the equipment to allow Vendors and third parties to select correct equipment which will then be accompanied by the detailed vendors specific data sheet.	2	
Design Change Notice	Design Change Notice	4	
Decision Paper	Decision Paper	2	
Ducting Flow Diagram	Details Major items of Equipment and Main Flow Ducting	0	Y
Define Financial Memorandum		4	
Define Financial Memorandum		2	
Duct Fabrication Drawing		2	Y
Ducting and Instrumentation Diagram	Showing in Schematic form the equipment, ducting and instrumentation of the HVAC systems.	0	Y
Design Proposal		2	
Dossier		4	
Data Query Form parties		4	

Design Brief	Design Brief	4	
Decision Support Package	Decision Support Package	4	
Design Report	Audit report on variances from design found at the as built/post construction stage of the Project along with their justification and reasons for acceptance. Document to be referenced when modifications carried out.	2	
Detail Drawing	Dimensioned drawings of equipment and supplier technical and installation details, mounting arrangements, or any specific details shown for clarity. Details of any diversions to the primary pipeline route. Details of temporary works carried out in the construction of the pipeline. All details of the fibre optic routing adjacent to the pipeline routing	0	Y
Special Piping Items Datasheet		2	Y
Deviation Request		4	
Engineering Change Request		4	
Execute Financial Memorandum		2	
Earthing Layout Drawing	Shows the Physical location of all earth and grounding points	0	Y
Electrical Load List/Schedule	Details the Electrical load requirements of all users	0	Y
Engine Performance Curves		2	
Emergency Response Plan		2	
Electrical Termination Diagram	Also known as termination diagrams. For Instrument, telecom's and electrical equipment, panels, junction boxes, etc. identifies all connections and cable terminations at input/output rails. Required for removal/hook up purposes and modifications. To include vendor interfaces	0	Y
Engineering Technical Practice	A review and assessment of a projects ability to comply to a group and segment defined Engineering Technical Practice.	4	
Bid Evaluation Plan	Details how Supplier bids will be reviewed	4	
Fire and Gas Detector Layout	Shows the physical location of all equipment. Shows the exact position of detectors/alarms and for detectors, shows their orientation and fire area covered	0	Y
Functional Logic Diagram	Provides an overview in graphic form of the “and”, “or” and other logic functions of the shutdown and control systems and the sequence in which initiation events occur. Required for trip testing, system fault finding, maintenance testing and modifications	0	Y
Firefighting/Life Saving/Escape Route	Drawing detailing access routes and means of escape in emergency and the location of all lifesaving equipment (escape sets, first aid boxes, showers etc.).	0	Y
Fire Protection General Arrangement	Shows general arrangement and locations of firefighting equipment and associated items on skids and within panels and cabinets	0	Y

Form	A proforma that requires populating	4	Y
Functional and Technical Requirements		2	
Fire Zone Evaluations Chart	Detailing the detection and protection requirements within each fire zone. Held for reference only as these charts are superseded by Cause and effects.	4	
General Arrangements/Elevation	Drawings which provide plan and/or sectional views, highlighting the routing of dimensioned pipe-work. To include general arrangements of special pipe supports (	0	Y
Guidelines	Self-Explanatory	2	
Hazardous Area Drawing	Drawing showing hazardous area classification and sources of hydrocarbon	0	Y
High Consequence Area	An area of detail that is greater than a pipeline alignment sheet and typically covers major pipeline crossings.	0	
Heat Tracing Route		0	Y
Hook-up	Shows the instrument impulse, pneumatic and electronic connections and pipe-work including valves, fittings, flanges and support details with associated material take-off list. Used for removal/hook up purposes and modifications.	0	Y
Safety plan		2	
Index	Index	2	
Instrument Layout Drawing	Shows the physical location of all Instrumentation	0	Y
Installation Diagram	Reference diagrams	4	Y
Instruction		2	
Interface Documents	Interface documents and drawings	4	Y
Isometric	Isometric views of pipe run detailing configuration, orientation and necessary details (dimensions, material requirements) for manufacture and assembly.	0	Y
Inspection Test Plan		2	
Key Plan	Keys to the symbols on layout diagrams	0	Y
Equipment and Layout Drawing	Shows the physical location of all major Equipment and layout of the above ground installations (AGI) such as pump stations etc.	0	Y
Lifting General Arrangement	For all mechanical handling activities that will take place during Operations. Details for removing plant and equipment for maintenance purposes, lifting/handling equipment to used, load paths and lay-down areas.	0	Y
Linelist	Line list	0	Y
Location Map		2	
Loop Diagram	Details the interconnection and relationships between all elements of a control loop, from sensing element through to controlling element, and cabling and wiring details for the associated instruments. Includes junction box, marshalling cabinet and control panel terminations and power supply details. The drawing enables maintenance persons to	0	Y

	function test, maintain and fault find instrument loops without needing to refer to numerous related wiring diagrams.		
Small Lighting and Power layout	Shows the physical location of all lighting and small power items.	0	Y
List	List	4	
Manual	Manual	2	
Matrix	Matrix	4	
Master Document Register		2	
Master Equipment List	Not required as a document this is handed over as data	4	Y
Engineering Memorandum		2	
Material Movement Request		4	
Management of Change		4	
Model 3D		0	Y
Minutes of Meeting	Minutes of Meeting	4	
Materials Selection Guide	Details reasons and assumptions made in the choice of materials for construction of structure, plant and equipment. Corrosion Control Philosophy Forecast of plant condition based on hazards, operability and corrosion effects. Must be in place before start up and is basis for corrosion monitoring programme.	2	
Material Take Off	Not required, project documentation	4	
Maintenance training plan		2	
Non-Conformance Report	Non-Conformance Report	4	
Nodal Diagram	Node Detail	0	Y
Operating Guide Manual		2	
Package contents Listing	Package contents Listing	4	
Project Change Notice		4	
Project Execution Plan	Project Execution Plan	4	
Process Flow Diagram	Details connectivity of major items of equipment, primary lines and control valves.	0	Y
Philosophy	Details the reasoning and assumptions made in plant design and are required as reference documents for the optimization/modification of plant	2	
Piping and Instrumentation Diagram	Showing in schematic form the equipment, piping, valves, tagged instruments, piping specification (& breaks) and line numbering for the process, utilities systems.	0	Y
Policy	Policy	2	
Plan	Describes the planned activities and processes to perform a	2	

	task.		
Planned Maintenance Routine		2	
Purchase Order		4	
Pipeline Crossing	Documents/Spread sheets holding the details of the type of crossing i.e. Road, rail, etc. Is it above or below the pipeline	0	Y
Plot Plan	Shows the physical location of all Equipment.	0	Y
Procedure	All procedures used during the project, during design and build, typically covers design procedures, operating and commissioning procedures, weld procedures etc.	2	
Process Map		2	
Piping and Instrument Diagram Revision Note		4	Y
Preparedness Response Scheme		2	
Pipe Support Detail	Detailed Drawing of the pipe supports	0	Y
Pipe Support Location Drawing	Drawings which provide plan and / or sectional views, highlighting the routing of dimensioned pipework	0	Y
Pipe Support Study	All Studies undertaken by the design CONTRACTOR/Consultant or third parties containing pipe stress evaluation results and recommendations (including calculations, stress isometrics, support type and acceptable load criteria) for specific critical piping configurations.	2	
Roles and Responsibilities	A description of the activities and accountabilities of a person, team or company.	4	Y
Root Cause Failure Analysis		2	
Record		4	
Register	Listing and detailed description of SIL or other integrity protection devices including relevant basis and design information and service conditions. All items on this register must be flagged in the Master Equipment List and on P & IDs. and Hazard Databases.	0	Y
Report	All reports undertaken by the design CONTRACTOR/Consultant or third parties involved in the design, operability or modification to the facilities, including HAZOP's, HAZID,s etc	2	Y
Room Layout	Shows the physical location of all Equipment.	0	Y
Route Maps	Pipeline Route Map	0	Y
Route Overview	Pipeline Route Overview Map	0	Y
Schedule	A dated plan of activities	4	Y
Electrical Schematic/ Interconnection Diagram	Gives a pictorial representation of the main elements and functions of a control circuit for electrical, instrument, and telecoms equipment with input/output sources (switches, relays etc.) and their relationships. Details Interconnections to other systems	0	Y

Schematic Diagram	Gives a pictorial representation of the main elements and functions of a control circuit for electrical, instrument, and telecoms equipment with input/output sources (switches, relays etc.) and their relationships. Details logic functions of the circuit. also used to schematically represent piping and hydraulic control circuits.	0	Y
Standards		2	
Shutdown Matrix	Defines how to safely shutdown an asset or part of an asset.	0	Y
Supplier Document Requirement Listing	A listing of the suppliers document suite for package and bulk equipment. Will form the basis of the list of supplier engineering documents to be handed over to operations	4	
Site Engineering Query	Records of Queries raised by construction and commissioning teams	4	
Structural Beam Penetration	Structural Beam Penetration	2	Y
Structural Fabrication Drawing	Structural Fabrication Drawing	0	Y
Site Instruction	Site Instruction	4	
Site Survey		2	
Sketch	Sketch	2	Y
Service Level Agreement	Service Level Agreement	4	
Single Line Diagram	Detail the main equipment items (switchboards, transformers etc.) and their relationships within the platform electrical distribution system including details of fault levels and current and voltage ratings.	0	Y
Standard Operating Guidelines	Comprises operating information and procedures needed for the safe and efficient operation of the process plant and utilities. Shall include Steady State, start-up, Shutdown & transient Operations	2	
Statutory Operations Manual		2	
Statement of Requirements	Statement of Requirements	4	
Scope of Work	Scope of Work	4	
Structural Primary Arrangement	Arrangement Drawings of Jacket and topsides Primary structures in plan, elevation and sectional view	0	Y
Structural Primary Detail	Detail Drawings of primary structures in plan, elevation and sectional view	0	Y
Specification	All design and Build specifications, describing in detail the functionality, configuration, materials and the standards which are applied to the various plant areas, packages, Piping, Special Piping, Cabling, equipment selection, Materials and purchasing.	2	
Pipelines Special Section Drawings	An area of detail that is greater than a pipeline alignment sheet and typically covers major pipeline crossings.	0	Y
Structural Reaction Diagram	Structural reaction diagram showing main loads imposed on the structure	2	Y

Structural Secondary Arrangement	Arrangement drawings of secondary structures in plan, elevation and sectional view.	0	Y
Structural Secondary Detail	Detail drawings of secondary structures in plan, elevation and sectional view	0	Y
Safety Sign Layout	Shows the physical location of all Safety signs	2	Y
Standard Detail Drawing	Dimensioned drawings of equipment and supplier technical and installation details, mounting arrangements, or any specific details shown for clarity.	2	Y
Pipelines Strip Maps		0	Y
Studies	All Studies undertaken by the design CONTRACTOR/Consultant or third parties involved in the design, operability or modification to the facilities.	4	
Scope Variation Impact Form	Form used by Procurement for the purchase of additional items on an existing Purchase Order	4	
Technical Change Note		4	
Template	Self-Explanatory	4	
TEN	Technical Note	4	
Technical Engineering Query	Technical Engineering Query	4	
Technical Bid Evaluation	Technical Bid Evaluation	4	
Telecoms Layout	Shows the physical location of all telecom equipment. Shows the exact position of speakers, phones, warning lights, data and communications points, remote access units etc. shows the orientation of PA speakers and areas covered	0	Y
Topographical Plan		4	Y
Terms of Reference	Terms of Reference	4	
Topographic Map	Topographic Map	4	Y
Typical Pipelines Drawing	Typical Pipelines Drawing	2	Y
Utility Flow Diagram	Details the connectivity of Major utilities systems and primary lines	0	Y

17.3 Appendix -III - Supplier Document Handover Requirements

Note 1- Native format is only required for individual packages where applicable. Packages should be agreed with NRL Project team and PMC.
Note 2- Native file format in not required but input and output file (formulas) are required including all codes and standards and agreed deviations

Doc Desc	Ret Code	Native Reqd	Format Reqd
SUPPLIER DOCUMENT REGISTER (SDR)	2		
FABRICATION / PRODUCTION SCHEDULE	4		
PROGRESS REPORTS	4		
BOUGHT OUT ITEMS LIST	4		
TABLE OF CONTENTS (All SDRL 'R' Type Manuals)	2		

PURCHASER PROVIDED ITEMS LIST	2		
DOCUMENT CROSS REFERENCE TABLE	2	Y	Excel
SPECIAL DOCUMENTS	4		
GENERAL ARRANGEMENT DRAWINGS	2	See note1	
ACCEPTABLE NOZZLE LOADS	2		
INTERFACE AND CONNECTION SCHEDULE	2	Y	
FOUNDATION LOADING DIAG AND SUPPORT DETAILS	2		
HAZARDOUS AREA CLASSIFICATION DRAWING	2	See note1	
SPECIAL	2	Y	
PIPING AND INSTRUMENT DIAGRAMS (P&IDs)	2	Y	Smart
ONE LINE ELECTRICAL DIAGRAMS	2	Y	Smart
SCHEMATIC DIAGRAMS	2	Y	Smart
UTILITIES SCHEDULE	2	Y	MSOffice
WEIGHT DATA SHEETS	4		
EQUIPMENT DATA SHEETS	2	Y	
NOISE LEVEL DATA SHEETS	4		
SCHEDULE OF CERTIFIED ELECTRICAL EQUIPMENT	4	Y	Excel
DETAILED DESCRIPTION OF OPERATION	2		
HVAC DUCTING & INST. DIAGRAMS & FLOW DIAGRAMS	2	Y	Smart
PROCESS FLOW DIAGRAMS (PFDs), HEAT AND MASS BALANCE	2	Y	ACAD/PDF/Excel
ELECTRICAL POWER SUPPLIES DATA SHEET	4		
ENCLOSURE VENTILATION REQUIREMENTS	2		
INSTRUMENT INDEX	4	Y	Excel
INSTRUMENT DATA SHEETS	2	Y	PDF
CAUSE AND EFFECT CHARTS	2	Y	PDF / Excel
INSTRUMENT / ELECTRICAL LOGIC DIAGRAM	2	Y	Smart
VDU SCREEN DISPLAY GRAPHICS	2		
BLOCK DIAGRAM	2	Y	Smart
NO LONGER REQUIRED - TAGGED ITEM DATA BASE	4		
VALVE INDEX	4		
VALVE DATA SHEETS	2		
SUPPLIER MASTER TAG LIST	4	Y	Excel
LINE (PIPING) LIST	4	Y	Excel
FUNCTIONAL DESIGN SPECIFICATIONS	2		
BILL OF MATERIALS / MASTER EQUIPMENT LISTS	2		
TORQUE TABLES	2		
TECHNICAL AND SAFETY BULLETINS	2		
SUPPLIER TAG LISTING GENERIC ATTRIBUTES	4	Y	Excel
3D MODEL	4	Y	SP3D
HOSE REGISTER	2	Y	Excel
SIL CERTIFIED EQUIPMENT DOCUMENTS	4	Y	
ALARN RESPONSE MANUAL (ARM)	4	Y	Excel
MISCELLANEOUS DATA	2	Y	MSOffice
CROSS SECT DRG / EXPL VIEW DIAG WITH PARTS LIST	2		
MECHANICAL SEAL DRAWINGS	2		
SHAFT ALIGNMENT DRAWINGS	2		

NAME PLATE FORMAT DRAWINGS	2		
SUB ASSEMBLY ARRANGEMENTS	2		
DETAILED FABRICATION DRAWINGS	2	Y	PDF / Native Files
INTERNAL DETAILS DRAWINGS	2	Y	PDF / Native Files
MISCELLANEOUS DRAWINGS	2	Y	PDF/ Native Files
ELECTRICAL / INSTRUMENT PANEL DETAIL DRAWINGS	2	Y	Smart
ELECTRICAL / INSTRUMENT INTERCONNECTION BLOCK DIAGS	2	Y	Smart
INTERNAL WIRING DIAGRAM	2	Y	Smart
CABLE SCHEDULE	2	Y	Excel
INSTRUMENT HOOK UP DETAILS	2	Y	Smart
INSTRUMENT LOOP DIAGRAMS	2	Y	Smart
INSTRUMENT PLC DATA COMMUNICATION PROTOCOL	2		
DETAILED DESIGN SPECIFICATION	2		
FIELD BUS / HART DIAGNOSTIC DATA	2		
MISCELLANEOUS DETAILS	2	See note2	
PRESSURE VESSEL / TANK MECHANICAL CALCULATIONS	2	See note2	
PROCESS / UTILITY CALCULATIONS	2	See note2	
STRUCTURAL STEEL CALCULATIONS	2	See note2	
FOUNDATION SUPPORT CALCULATIONS	2	See note2	
SYSTEM HEAD LOSS CALCULATIONS	2	See note2	
LATERAL CRITICAL SPEED CALCULATIONS	2	See note2	
TORSIONAL CRITICAL SPEED CALCULATIONS	2	See note2	
BEARING LIFE CALCULATIONS	2	See note2	
THRUST BEARING SIZE CALCULATIONS	2	See note2	
EMISSION CALCULATIONS	2	See note2	
ACOUSTIC ANALYSIS FOR RECIP COMPRESSORS	2		
HYDRAULIC CALCULATIONS	2	See note2	
EXCHANGER THERMAL RATING CALCULATIONS	2	See note2	
INSTRUMENT CALCULATIONS	2	See note2	
ENCLOSURE VENTILATION SYSTEM CALCULATIONS	2	See note2	
EXHAUST DUCT CALCULATIONS	2	See note2	
COUPLING SELECTION CALCULATIONS	2	See note2	
LUBE AND SEAL OIL SYSTEM SIZING CALCULATIONS	2	See note2	
ANTI SURGE VALVE SIZING	2	See note2	
PULSATION DAMPER DESIGN CALCULATIONS	2	See note2	
ROTOR / SHAFT SYSTEM UNBALANCED RESPONSE ANALYSIS	2	See note2	
PIPING STRESS ANALYSIS	2	Y	PDF & Native File (CAESAR)
CRANE FAILURE MODE ANALYSIS	2	Y	PDF & Native File
EMERGENCY SHUTDOWN VALVE (ESD)	2	Y	PDF & Native File
RELIEF VALVE AND BURSTING DISC CALCULATIONS	2	See note2	
ELECTRICAL PROTECTION STUDY/SETTING SCHEDULE	2		
CURRENT AND POTENTIAL (CT / VT) TXFMR CURVES	2		
MOTOR PERFORMANCE CURVES	2		
COMBUSTION GAS TURBINE PERFORMANCE CURVES	2		

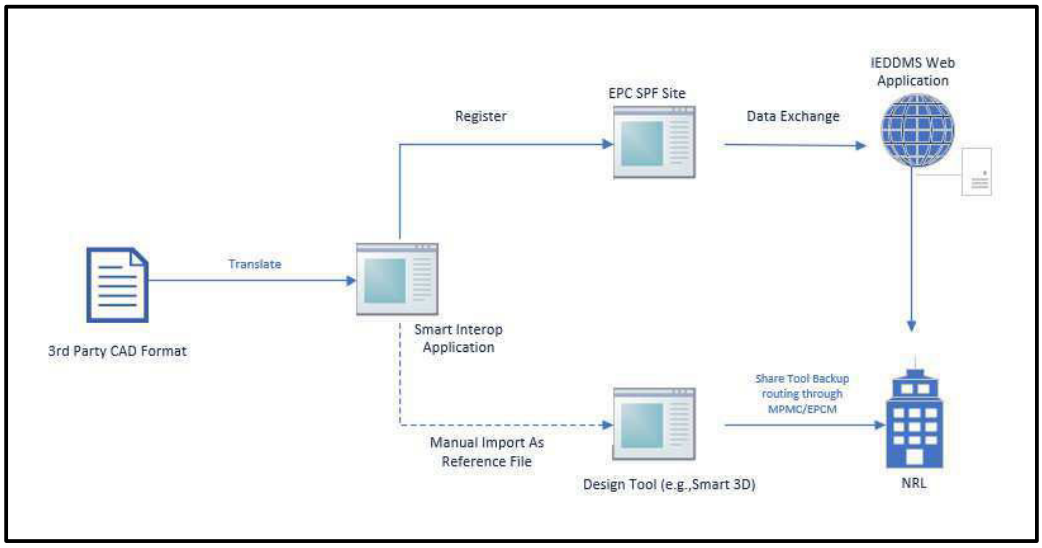
CENTRIFUGAL PUMP PERFORMANCE CURVES	2		
ROTARY PUMP CURVES	2		
CENTRIFUGAL COMPRESSOR PERFORMANCE CURVES	2		
FAN PERFORMANCE CURVES	2		
ENGINE PERFORMANCE CURVES	2		
GENERAL PERFORMANCE DATA	2		
SPEED / TORQUE STARTING CURVES	2		
RECIPROCATING PUMP PERFORMANCE CURVES	2		
LIGHTING PERFORMANCE DATA	2		
BATTERY CHARGE / DISCHARGE CALCULATIONS	2	See note2	
POWER SYSTEM ANALYSIS DATA	2	Y	PDF & Native File
RELIABILITY / AVAILABILITY DATA AND CALCULATIONS	2	Y	PDF & Native File
PERFORMANCE GUARANTEE	2		
SHORT CIRCUIT CALCULATIONS	2	Y	PDF & Native File
DETAILED DESIGN REPORTS	2		
TECHNICAL NOTES	2		
MOTOR THERMAL WITHSTAND (THERMAL DAMAGE) CURVE	2		
POWER REQUIREMENT CALCULATIONS	2	Y	PDF & Native File
OVER /UNDER PRESSURE PROTECTION AND RELIEF DETAILS	2	See note2	
CATHODIC PROTECTIONN CALCULATION	2		
MISCELLANEOUS CALCULATIONS	2	See note2	
ERECTION AND INSTALLATION PROCEDURES	4		
UNPACKING AND PRESERVATION PROCEDURE	4		
PACKING, MARKING AND PRESERVATION FOR SHIPPING PROCEDURES	4		
PRE-COMMISSIONING / COMMISSIONING PROCEDURES	2		
ERECTION FASTENERS SUMMARY LIST	4		
S HANDLING AND LIFTING REQUIREMENTS	2		
TRANSPORT DRAWINGS	4		
SLINGING/LIFTING ARRANGEMENT (IF SUPPLIER RESPONSIBLE FOR PROVIDING GEAR)	2		
STORED ENERGY AND HAZARDOUS MATERIALS REGISTER	2	Y	Excel
HARMONISED SYSTEM (HS) CODES FOR CUSTOMS TARRIFS REGISTER	4	Y	Excel
SHIPPING DOCUMENTATION AND HAZARD DECLARATION STATEMENT	4		
MISCELLANEOUS INFORMATION	4		
QUALITY MANAGEMENT SYSTEM (CERTIFICATE)	4		
QUALITY PLAN	2		
INSPECTION & TEST PLAN	2		
PRESSURE TEST PROCEDURES	4		
PERFORMANCE / ACCEPTANCE TEST PROCEDURE	2		
HEALTH, SAFETY, SECURITY AND ENVIRONMENTAL PROVISIONS)	4		
NO LONGER REQUIRED – PART OF H08 DOCUMENT	4		
NO LONGER REQUIRED “Ex” COMPLIANCE PLAN	4		

SAFETY INSTRUMENTED SYSTEM MANAGEMENT PLAN	2		
RELIABILITY PLAN (SUBSEA ONLY)	2		
HUMAN FACTORS AND WORK ENVIRONMENT CHECKLIST	4		
SEISMIC ANALYSIS	4		
MISCELLANEOUS PROCEDURES	4		
LUBE OIL AND OPERATING FLUIDS SCHEDULE	2		
RECOMMENDED STARTUP, INSURANCE AND ONE YEAR OPERATIONAL AND COMMISSIONING SPARES COMBINED SUBMISSION	2	Y	Excel
LIFECYCLE COSTING OR MAJOR COMPONENTS, SPARE PARTS AND HIGH COST CONSUMABLES	4		
MISCELLANEOUS DATA	4		
PERFORMANCE TEST REPORT / RESULTS	2		
FACTORY ACCEPTANCE TEST REPORT (FAT)	2		
VIBRATION REPORT	2		
NOISE REPORT	2		
WEIGHING REPORT AND CERTIFICATE	2		
DIMENSIONAL REPORT	2		
FIRE TEST REPORTS / CERTIFICATES	2		
EX EQUIPMENT CERTIFICATES	2		
HAZOP/HAZID REPORTS	2	Y	PDF / Native Files
REGISTER OF SAFETY RELATED DEVICES	4	Y	Excel
TYPE TEST / APPROVAL CERTIFICATES	2		
SOFTWARE VALIDATION DOCUMENT	2		
EX CERTIFICATE SPECIAL CONDITIONS REVIEW	2		
ESTIMATED WEIGHTS REGISTER	4		
MISCELLANEOUS REPORTS	4		
MATERIAL TEST CERTIFICATE	4		
WELDER PERFORMANCE QUALIFICATION CERTIFICATES	4		
NON DESTRUCTIVE EXAMINATION (NDE) OPERATOR QUALIFICATIONS	4		
PRODUCTION TEST RESULTS (Inc. Welding)	4		
NON DESTRUCTIVE EXAMINATION (NDE) RECORDS	2		
HEAT TREATMENT RECORDS	2		
MATERIAL TRACEABILITY RECORDS	2		
NAME PLATE RUBBINGS / PHOTOS	4		
ELECTRICAL EQUIPMENT TYPE TEST REPORTS	4		
ROUTINE TEST CERTIFICATE. - ELECTRICAL EQUIPMENT	4		
MEASUREMENT OF RESISTANCE	4		
PAINTING / INSULATION INSPECTION REPORT	4		
EX DETAILED INSPECTION REPORTS	2		
BPEX DATA	2		
PACKAGE TRIAL LIFTING REPORT	4		
PACKAGED PUMP ALIGNMENT REPORT	4		
MISCELLANEOUS REPORTS	4		
PRESSURE TEST CERTIFICATES	4		
INSTRUMENT TEST AND CALIBRATION CERTIFICATES	4		

LIFTING EQUIPMENT TEST CERTIFICATES	2		
VESSEL & EXCHANGER CODE DATA REPORTS	4		
CERTIFICATE OF COMPLIANCE	4		
RELEASE NOTES	4		
THIRD PARTY RELEASE NOTE/WAIVERS	4		
DEVIATION DECISION REQUESTS (Concession records)	2		
MATERIAL 'SHE' DATA SHEETS	4		
LIFTING EQUIPMENT REGISTER	4	Y	Excel
VESSEL & EXCHANGER REGISTER	4	Y	Excel
DECLARATION OF CONFORMITY – NO LONGER REQUIRED	4		
MISCELLANEOUS DATA	4		
WELD PROCEDURE SPECS (WPS) & QUALS (WPQ)	4		
NON DESTRUCTIVE EXAM PROCEDURES (NDE)	4		
MANUF PROCEDURES INCLUDING HEAT TREATMENT	4		
SURFACE PREPARATION AND PAINTING PROCEDURE	4		
CORROSION AND CATHODIC PROTECTION	4		
MISCELLANEOUS DATA	4		
MATERIAL CERTIFICATES - BULK ITEMS	4		
MATERIAL CERTIFICATES - PACKAGE WELDED INTERFACES	4		
MISCELLANEOUS CERTIFICATES	2		
DESPATCH DOSSIER	4		
OPERATING AND MAINTENANCE MANUAL	2		
CERTIFICATION DATA BOOK (OPERATIONS)	2		
MANUFACTURING RECORDS	4		
EX INSPECTION TECHNICAL FILE	2		
RELIABILITY ASSURANCE DOCUMENT (SUBSEA ONLY)	2		
ISOMETRICS	0	Y	PDF/NATIVE FILE
PIPING BILL OF MATERIALS	0	Y	PDF/EXCEL

18 Appendix – IV : Handling 3rd Party CAD formats in IEDDMS for NREP

IEDDMS for NREP uses of Smart Integration philosophy of Hexagon PPM tools for design, engineering data exchange and handover. However, it has been envisaged in IEDDMS that during execution of NREP, EPC(M) might receive 3rd party CAD formats files (e.g., Vendor Packages) which should also be shared with NRL. This section outlines the process to handle such file formats.



Working with 3rd Party CAD formats

Hexagon PPM's Intergraph Smart Interop Publisher (SIP) translates 3rd party CAD formats and provide the files which can be used for display in the Smart Authoring tools and in SPF. For web viewing, Smart Interop Publisher can translate 3D and 2D files for display in web-based portal applications provided by Hexagon. The translation creates a consistent object label display between target applications.

File Format for NREP Project

The basic process of translating source files to Smart Models is the same, whereas the prerequisites, recommendations, and translation settings can vary from one format to another. SIP supports popular file formats from IFC, MicroStation V8, Navisworks, CADWorx, AutoPlant, CIS/2. Out of the Box product provides mapping files for standard object classes and properties for these formats. Additionally, tool supports Custom Mapping of classes and properties for additional attributes.

For more information on supported versions and file formats visit this link.

https://docs.hexagonppm.com/r/en-US/Intergraph-Smart-Interop-Publisher-Help/Version-16/434545

19 Appendix – V : IEDDMS Workflow proposed by Hexagon

IEDDMS Solution:
Introduction:

NRL with support of Hexagon (OEM) shall set up an integrated system as depicted in the block diagram below for seamless exchange of data and document between EPCM/EPC/MPMC and Owner. Consultant/Contractor shall integrate their authoring tools with the integrated system accordingly from the initial stage of the project till final handover.

All documents and data shall be correlated in the integrated system for seamless flow of the same in to the IEDDMS platform for OWNER/MPMC for review, approval and archiving at any time during project life cycle. All the final documents and final data that would flow into NRL's IEDDMS should be free from inconsistencies.
Consultant/Contractor shall utilize the software & tools as per the bid, during the entire project life cycle for generating data and documents so that NRL can implement any engineering changes required in the data and document during the complete life cycle of the plant.

NRL/Hexagon/MPMC will advise EPCM/EPC on the frequency of data uploading at integrated platform.
Progressive Database backup of authoring tools from respective EPC/EPCM to be handed over to NRL/Hexagon at a pre-defined frequency.

Handover Plan:

The complete as built data and documents shall be handed over to NRL through integrated platform which will reside in NRL IEDDMS platform. Additionally, database backups and documents shall also be handed over at 30%, 60%, 90% as milestone delivery. During progressive and final handover, the consultant/contractor will provide all electronic documents along with native & PDF files to the owner apart from maintaining it on NRL IEDDMS solution.

Consultant/Contractor to nominate single point of contact and document controller to collaborate with Hexagon/MPMC/Owner for seamless integration of electronic data management and handover system.

Hexagon along with MPMC/EPCM and NRL will define the database structure, resolving conflicts among all stakeholders for seamless implementation of document management, workflow management, seamless review and transmittal management and provide the same to Contractor/Consultant for final handover to NRL.

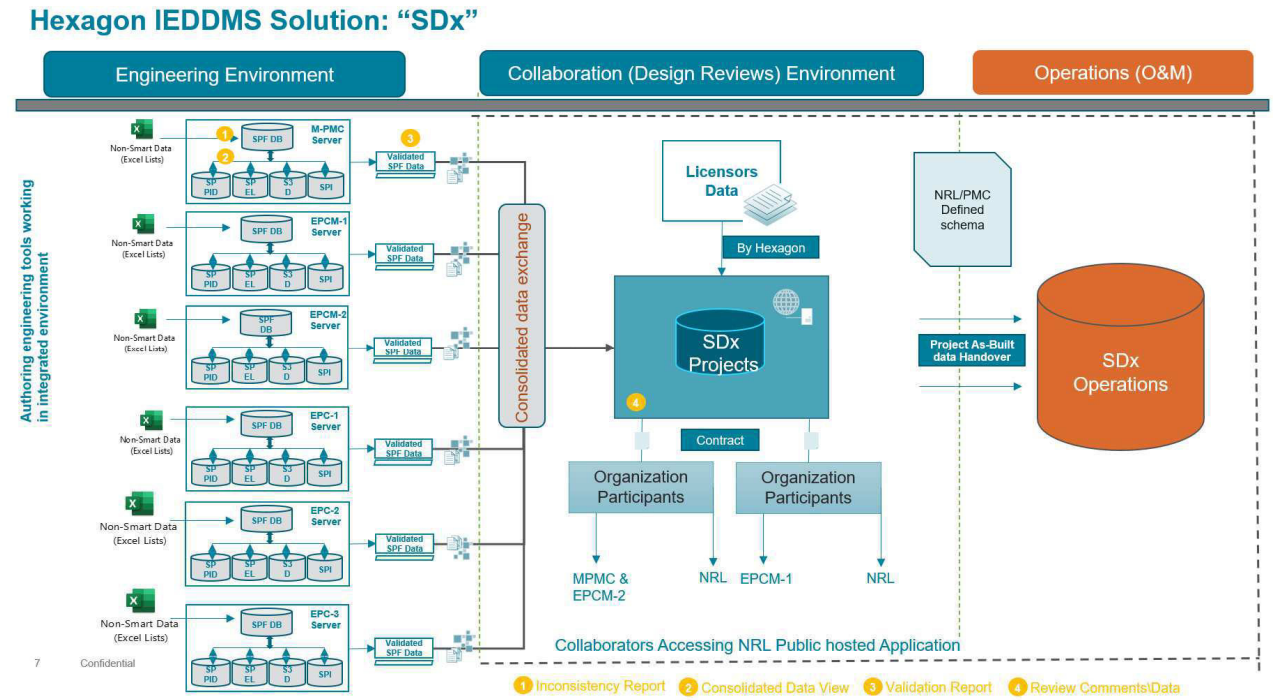
MPMC/EPCM/EPC shall mention the Material Code specification (SAP Code) as per client's ERP system for Digital handover and tagging. (wherein they need to mention the NRL Material code/SAP Code also on the documents for Digital Handover and Tagging).

NRL will host the integrating platform and Hexagon's responsibility will be to integrate the data, interference avoidance identification of inconsistencies and set up review / approval workflow channels.

Hexagon will provide the format and templates to the Consultant/Contractor. Hexagon will not do conversion of bidders format to NRL compatible format. It is the responsibility of the Contractor/Consultant to make sure that the output of their authoring tools are compatible with the authoring tools available with the owner through the integrating platform. NRL/MPMC will not provide any authoring tools, integration tool to the Consultants/Contractors and the Consultants/Contractors are required to use their NRL specified authoring tools and integration tool. NRL /MPMC will not provide any Hardware and Licenses required implementation of the

authoring and integration tools. Consultant / Contractors to use their Hardware and licenses as per the project requirements.

WORKFLOW:



The above diagram explains the proposed IEDDMS solution for the Document review and handover.
The proposed architecture contains 3 environments

1. Engineering Environment
2. Collaboration Environment
3. Operations Environment

Engineering Environment:

Each box on the left side is an integrated engineering environment at each of MPMC/EPCM/EPC location. At each of these locations all the smart plant tools i.e. SPPID, SPEL, SPI, S3D and integrated SPF are installed. SPF acts as a datahub where all the data coming from the tools is consolidated and the consolidated data is pushed to the collaboration environment. The proposed solution also supports Publishing/loading of the non-smart data in the form of excel publish. Where all the subcontractors or the vendors must fill in the data in the provided format and submit the data using the excel publish. Format will be provided to the successful bidder.
No integration across Smart Plant tools SPPID, SPEL, SPI, S3D is envisaged in this project. Integration and Correlation of data are to be taken care in the SPF (Integration tool).

Data Publishing:

Once the engineers are done with their drawings/ models they have to publish the data from the engineering tools to the SPF using the smartplant >> publish option.

Prerequisites for the data publish:

The following prerequisites must be met before the data is being published to SPF

- All the tools and SPF should have same PBS including the casing.
- Tool must be registered with SPF Plant before the data is being published.
- The PBS must be correlated between the tool and SPF.

Data Consolidation:

Once the data is being published from the tools, if there is any tag data coming from more than 1 smartplant tool or Excel or any Non smart plant tool, then it will be consolidated, inconsistency reports will be generated on the tag level/ document level / the Plant level.

Note: Data Consolidation happen on the Tag name basis. So, the Consultant/Contractors must make sure to use same tag naming formats across the tools.*

Consultants/Contractors must make sure the data is consistent and is free from any validation errors before the consolidated data(Tag data from multiple tools will be stamped on new object called Consolidated Object) is pushed/handed over to the IEDDMS system though the Data Exchange.

Data Exchange Process:

Consolidated data without any inconsistencies will be handed over to the IEDDMS/ Collaboration environment using the process called Data Exchange. Hexagon Resources at the EPC/EPCM/MPMC location will configure the data exchange to push from Engineering environment to the IEDDMS environment. Data is validated against the predefined rules at the IEDDMS system before it is being pushed. Any validation errors at this stage must be corrected by the Consultant / Contractors and they must trigger the exchange process again.

Note: Consultants / Contractors once the inconsistencies are resolved, must trigger the data exchange process on the document.*

Excel Publish Process:

Non-Smart data once received from the sub-contractors/vendors in the format given in delivered templates will be loaded/published into the SPF. Here if any data errors, the data publish will fail and the data needs to be corrected and published again.

Once the data is published, then the data will be consolidated with the tags coming from other tools and if any inconsistencies, they need to be fixed and resubmitted.

Once the data is free from inconsistencies, then it need to be pushed to IEDDMS environment and is validated against the predefined rules in IEDDMS environment and if any errors, the data need to be corrected and republished again.

Submittal Process:

Any non-smart data in the form of drawings/ Vendor data can also be submitted to the IEDDMS system directly using the Submittal process.

Here in submittal process, the MPMC/EPCM/EPC must list down all the Planned documents that they are going to submit to the IEDDMS, in the predefined format and should load them to the IEDDMS environment using the MDR submittal process.

Once the Planned documents are loaded, Users can register for interest (Review/Consolidate/information) on the planned documents and once the actuals are submitted, the registered users will get notified of the Document and they can start reviewing the document.

Any Tags corresponding to the Submitted documents can also be loaded using the same submittal process called MTR and the relation between the tags and documents will be established using the TDR file which contains the tags and the documents that they are related to.

The Validation rules and Document review Process will be same for both the documents that loaded directly into the IEDDMS system and the documents that are loaded using the Data exchange process.

Collaboration Environment:

This is IEDDMS environment that is hosted at the NRL cloud and the defined users who will exchange the data or load the data will be given access to this environment. Here in this environment, the Documents will be reviewed by the Document reviewers of MPMC/OWNER based on the Disciplines and Document types. The auto assignment of Document reviewers can be automated based on requirement.

Document reviewers can open the drawings and comment directly on the drawing by adding a new markup layer on it and create any actions that are needed on the documents. They can comment if any on the Document level also. There also an option to raise any technical queries pertaining to this document. Every review and Technical Query will be notified to users once created.

Once the document is reviewed, Document consolidator will consolidate all the comments from the reviewers and finally approve/ reject the document with comments and the respective engineers will be notified accordingly. The engineers can reply the comments or can fix any changes requested and will re submit the document in the next revision until the document is finally approved.

Once the document is approved, they will be pushed to the Operations environment.

Operations Environment:

This environment resides at the NRL location and only the dedicated team from NRL will have access to this environment. All the Documents that are finalized will be moved to this environment and the Tag data will be used during the operation phase of the plant.

Training:

Representatives from all Contractors/Consultants (EPC/EPCM/MPMC/OWNER) will be provided training on the above work process for the NREP Project by Hexagon.

TECHNICAL DOCUMENTATION FRONT SHEET

	NUMALIGARH REFINERY LIMITED	Total pages: 27

NRL EXPANSION PROJECT

SMART 3D SPECIFICATION

			Written By	Checked By	Approved By			
A1	12-12-2020	ISSUED FOR REVIEW	KS	AN	TI			
Rev.	Date	Reason for Issue	Prepared	Checked	Approved	Prepared	Review	Review
TechnipFMC			Discipline Engineer	Discipline Lead	Contractor Representative	Discipline Engineer	Project Engineer	Department Head
			TPIL			NRL		
TECHNIP INDIA LIMITED			Category		Code	Description		
			Facility Area Code		1Z	Common Document		
NRL's PO NO: 4300062833-AMA/16.06.2020			Document Type		SPE	Specification		
TP DOC REF: 082176C-ZZZ-JSD-1300-0007-A1			System Number		00	General		
			Life Cycle		01	Disk Ref.:		
This document is copyright and shall not be reproduced without permission of NRL			Originator/ Contractor	Asset Code	Discipline	Document Type	Sequence Number	Revision
			TP	1ZZZA	PI	SPE	0006	A1

Table of Contents

1. Introduction

NUMALIGARH REFINERY LIMITED (NRL) has awarded Project Management Consultancy services (Managing PMC) M/s. Technip India Limited (TPIL) to provide MPMC/EPCM services for Numaligarh Refinery Expansion Project (NREP) from 3 to 9 MMTPA of its Refinery in Numaligarh, Golaghat District, Assam, India.

1.1 Purpose

This document specifies the structure and content of the Smart 3D (S3D) Specifications.

The purpose of the S3D specifications is to enable a baseline installation of each S3D Data base that delivers the typical setup and configuration and provides a standard way of using the software. It also provides templates that will produce deliverables in the standard presentation style. The Specifications is a template or a common starting point for all projects which allows for additional project specific configuration if required.

Any additional configuration to the specifications must take into account how this will affect working in an integrated environment. Additional configuration are to be managed independently with the intimation NRL/MPMC.

1.2 Scope

This document specifies the structure and content of the S3D Specifications for Numaligarh Refinery Expansion project (NREP)

The objective of this 3D modelling is to deliver to OWNER i.e. M/s NRL a complete 3D model which shall be utilized for all future maintenance, operation, revamping and any debottlenecking of the plant.

All plant engineering modelling activities are to be carried out using 3D modelling during detail engineering.

1.3 Objective

The purpose of this standard is to promote uniformity and consistency across the various units to be executed by MPMC/EPCM/EPC and through different contractors. S3D data can then be effectively managed during the project development phase and has value for those in future phases such as operation & Maintenance. This Standard serves mainly the following objectives:

- To ensure that Engineering Electronic information is complete, consistent, and fit for purpose for project engineering, operations and maintenance processes and systems.
- To ensure that information is classified according to business standards and requirements.
- To ensure that every entity is uniquely identified, described and cross referenced, where required, each entity is correctly connected.
- Provides the necessary data required by the Business users during Brownfield's and Greenfield projects.
- Requirements for the Engineering data is clearly defined so that contractor supplies/handover the same in the defined manner which can be stored for future modifications.

2. Database Type and Version

2.1 MSSQL Database Setup

Smart 3D shall be implemented with the following system configuration.

Database Type : MS SQL Server

Database Version : MS SQL Server 2016 (Enterprise Edition)

MSSQL Instance required for S3D shall be created on MSSQL server as per the steps given in Intergraph installation guide. The S3D related database shall reside in this MSSQL instance.

2.2 Software Type and Version

The details as mentioned for Smart 3D software shall be implemented for all sites:

Software Type and Version for all project	
Software Type	Smart 3D 2019
Software Version	Version – 12.01.00.0907 (2019)
S3D Hotfix(HF)	Latest HF as required
Intergraph Smart Licensing	ISL 14.1
Prerequisites	As recommended by Hexagon

3. Setup Guidelines

3.1 S3D Database Architecture

S3D project typically consists of the following three databases and it is corresponding schemas.

Site : Site is the top level object which has a specific Site Database. This Site database holds all the details about the Plant, Catalogue and Report databases. Each Site can contain several databases.
Plant : Database where the user from all disciplines are placing the objects.
Catalog : Database containing all objects that can be placed in the 3D Model.
Report : Databases which contains the data from the Plant database objects. It is used to extract report from the 3D Model without impacting the performances of the Plant database.

3.2 S3D Site, Plant, Database and Schema Naming

The Project setup activity involves creating the Site, Plant and Catalog databases and schemas. The naming conventions to be used for the database and schemas are as given below. S3D project setup to be done by respective EPCMs, EPCs, PMC and BOO as per the guidelines provided by the software vendor / adopting the custom practices followed in their respective firms with the seed files given.

Databases	Name of the Database
Site database Name	NRL_NREP_SDB
Site Schema Name	NRL_NREP_SDB_SCHEMA
Model / Plant Name	NRL_NREP
Model database name	NRL_NREP_MDB
Catalog database Name	NRL_NREP_CDB
Catalog Schema Name	NRL_NREP_CDB_SCHEMA
Report Database Name	NRL_NREP_RDB
Report Schema Name	NRL_NREP_RDB_SCHEMA

3.3 Access Control – Permission, User Group Definitions

Access control to the modelling items are being managed and controlled by the use of the different permission groups at Plant, Catalogue levels. We can either add the users directly to the permission groups or we can have several Windows AD groups created and added to the respective permission groups in Smart Plant. The same windows AD group can be used for the giving access in the SQL and also for the Shared content folders.
The following Permission Groups are to be created at plant and catalogue levels in Smart 3D. The naming conventions for the permission groups are to be as given below. For the Windows AD groups the naming can be adopted as per the conventions followed by the respective contractors.

Smart3D Permission Group	Smart3D Permission Group Description	Active Directory Group(By respective contractors)
NREP_ADMIN	Tool Administrator	
NREP_USERS	All S3D users	
NREP_CSA	Civil Structural Architectural users	
NREP_ELECTRICAL	Electrical Users	
NREP_INSTRUMENTATION	Instrumentation Users	
NREP_PIPING	Piping Users	
NREP_ICUSER	Interference checking Users	
NREP_PUBLISHING	Publishing User	
NREP_SUPERUSER	Model locking Purpose	
NREP_CATALOGADMIN	Catalog Access	

3.4 Shared Content

Shared content folder is the one which contains all the symbols, labels, view styles of drawings and isometrics, report templates, reference 2d and 3d drawings, custom symbol dlls, all discipline catalogue bulk load files etc that are being used for the project. To start, the shared content folder as delivered by the software vendor shall be used. The typical folders of the shared content is as given below. A specific folder “Bulk load files” for the Bulk load files with the sub folders for Admin and discipline wise to be created and maintained for storing all the Bulk load files being used in the project.

All the users should have read access to the shared content and the Admin users should have Full Control of the same. All the modifications or customization being carried out shall be carried out in discussion with the company and to be shared with the Company along with the source codes for the customized files (where ever it is required). The Shared content folder is to be shared along with the database backups submitted to the company.

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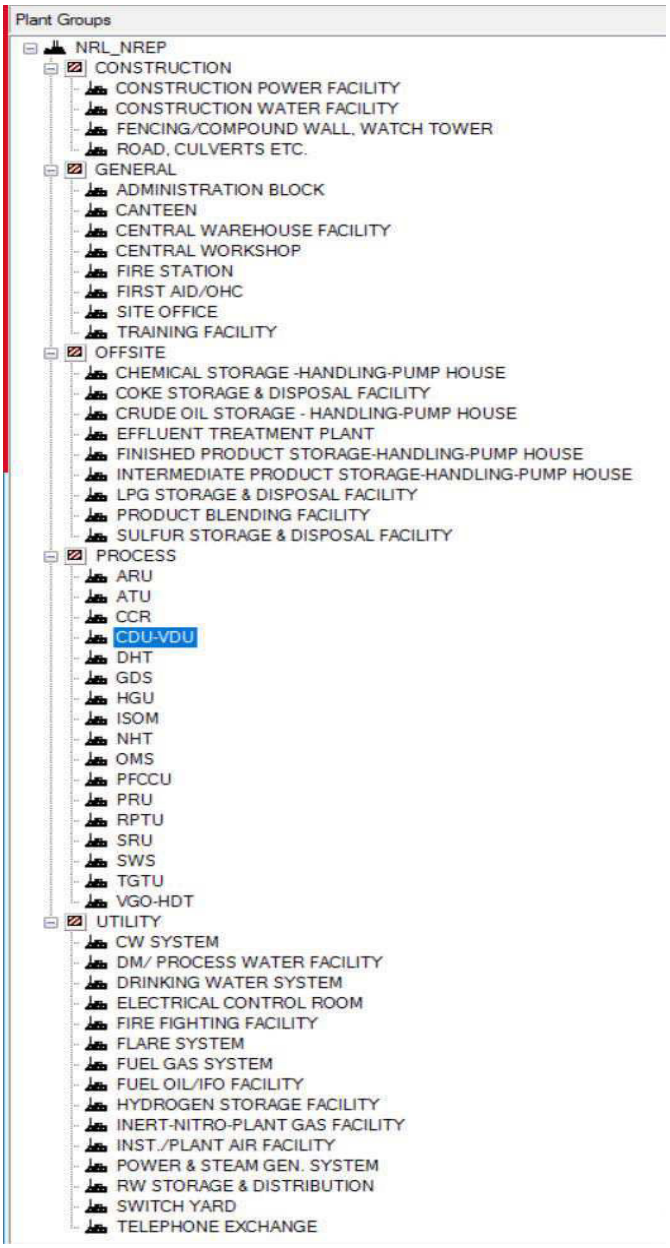
3.5 System Hierarchy - Plant Break Down Structure (PBS)

The Plant Break Down Structure (PBS) System Hierarchy for the 3D, to be followed as per Section 3.2.3 Unit Code given in the NRL document NR-0ZZZZ-GE-SPE-0001#Tech Document Numbering. The PBS for the Plant Area Unit hierarchy is as given below (as taken from SPPID Seed project) :Contractors to use the relevant hierarchy in the defined PBS for their modelling activities pertaining to their units.



For the other System Hierarchies, viz, Equipment system, Piping System, Structural system etc, is as given in Annexure 1.

3.6 Space Hierarchy

Space hierarchy folders are to be used to create model volumes. Volumes representing the Maintenance areas, Escape ways, Saftey zones, drawing volumes, area volumes etc are to be modelled in the respective hierarchy using Space Management Task with proper naming conventions. The space hierarchy is accessible through the “Space” tab of the Workspace Explorer in Smart 3D..

3.7 Work Break Down (WBS) Hierarchy **(In Progress** to be decided after Integration setup)

WBS Hierarchy for the project to be defined later based on the Design Areas defined in the Unit Plot plans. Contractors to follow the default instructions for setting up the WBS and use the default name rules provided by the software vendor. The WBS hierarchy is accessible through the “WBS” tab of the Workspace Explorer in Smart 3D.

3.8 Filters

Standard catalogue and plant filters will be delivered as part of seed project. Any additional filters required for production requirements can be created by the respective contractors S3D admin.

3.9 Surface Style Rules

Surface style rules are required in S3D for the objects to appear consistently in certain colors, textures and formats in your workspace. Surface style rules are based on filters and it can be customized and developed by the contractors as required.

3.10 Unit of Measure:

For UoM refer Basis of Design General Site Data Units of Measurement document.
Reference Doc: **NR-1ZZZA-GE-DAA-0001** (Basis of Design General Site Data Units of Measurement)

3.11 Coordinate System

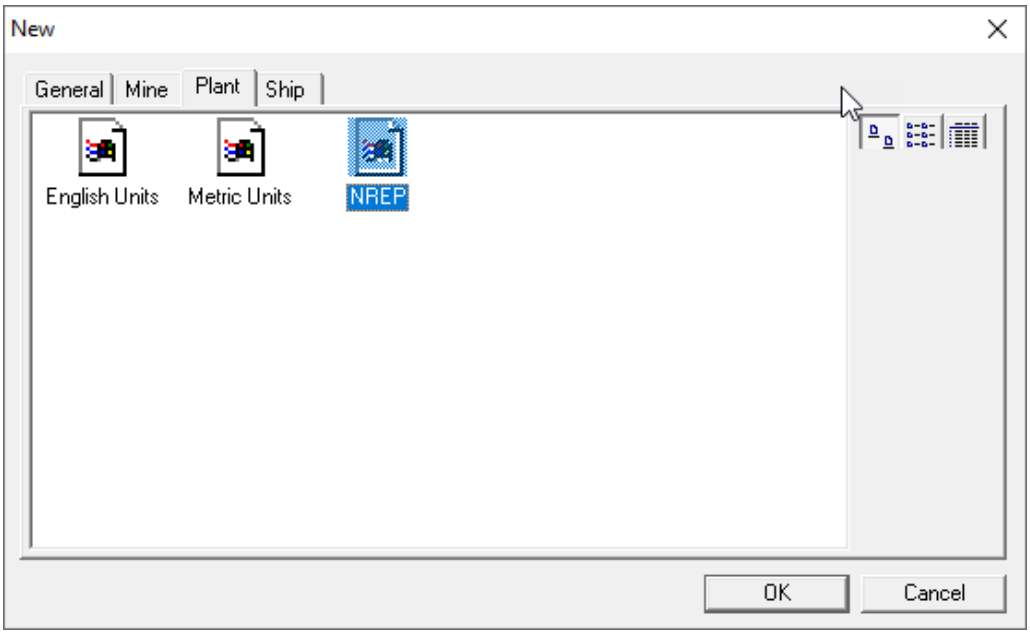
To have the homogeneity in the modelling, one coordinate system as given in the Overall plot plan is to be adopted by all the contractors. For this NREP project, the S3D Global Coordinates (0,0,0) shall be same as that of the Plant origin coordinate (0,0,0) as defined in the Over all Plot plan. This will facilitate the merging of the review files from all units. For Elevations, the Grade Level for the units are to be maintained as defined in the overall / Unit plot plan such that no negative values are being used.

4. S3D Administrative Tasks

4.1 Session Template

Session Templates are to be used for maintaining the uniform settings being followed by all the design teams. Mainly with respect to the UoM. S3D admins to create a session template and to keep the same in the shared content folder.

Users to point the shared location for the workspace template by editing the path under Tools> Options> File Locations> Workspace Templates



4.2 Smart3D Spec and Catalog Management

Smart 3D Specifications and catalogues are to be developed to meet the project requirements. The Smart3D Spec and Catalog will be transferred to Smart3D Software using Smart3D Bulkload utility. Smart3D Catalog admin of respective contractor is responsible to create and update / maintain the Piping, Civil, Electrical and Instrument etc. Specs and Catalogues.

The Smart3D Piping Spec and Catalog are to be developed by the respective EPCMs / EPCs following the NRL's Piping specifications.

Indian structural catalogue to be used in this project, the additional contents provided by the software provider StructCrossSections-INDIA-19.0.xls is to be used.

Cable tray specs in the catalogue are to be used and any new items / missing items can be updated in the catalogue based on the project requirements with the confirmation from MPMC / NRL.

Additional Libraries as provided by the Software Vendor / customized can be used for the for the Equipment, Civil Equipment, Inline components, Cable trays etc. based on the confirmation with MPMC/NRL.

Code list updates required for the catalogue and spec update are to be confirmed with MPMC / NRL before update.

All bulk load Excel files for catalogue and specs, report templates, Source codes for symbols, Rules, Support assemblies etc to be created and maintained as per NRL Requirement. All the bulk load files shall be kept inside the shared content folder viz ..shared content\Bulk Load folder. Discipline wise and date wise sub folders to be created and maintained for ease of traceability.

Any Catalogue updates being carried out after the seed file transfer, contractor has to intimate and provide the relevant bulk load files to MPMC/NRL.

4.3 Code List

By default all the code lists provided by the software provider are to be used without any changes to the default items. Any new items can be added in the respective code list with the user defined code list number range.

For code lists, Commodity option, End Preparation, End Standard, Design Standard, Geometric Industry Standard, Gasket Option, Bolt Option, Material Grade, Piping Commodity type and other code lists. which are likely to be modified during the catalogue update, to avoid duplication, in adding new Code list values EPCMs / EPCs should use the following ranges of code list numbers and to be intimated & provide the relevant bulkload sheets to MPMC/NRL.

Contractors	Code list Range
MPMC	10001 – 11999
EPCM1	12000 – 12999
EPCM2	13000 – 13999
EPC1	14000 – 14999
EPC2	15000 – 15999
EPC3	16000 – 16999
BOO	17000 – 17999

Few more New Code lists will be required for the project, which are to be defined after freezing the custom attributes.
Contractors can create new codelist required for the project execution with the intimation & provide the bulkload sheets to MPMC / NRL.
The following common code lists : Fluidcode, Insulation Purpose are to be maintained as given below.

Fluid Code:

FluidSystem ShortDescription	FluidSystem LongDescription	FluidCode ShortDescription	FluidCode LongDescription	Codelist Number
The numeric value for any new code list entry added by the user should be between 10,001 and 40,000. SmartPlant would reserve all other numeric values.				
Non-Specific				10001
		Undefined	Undefined	11000
Process Service				10010
		AG	AG, Acid Gas (H2S Rich Gas, NH3 Rich Gas, SRU Tail Gas)	11001
		ATF	ATF, Aviation Turbine Fuel	11002
		CD	CD, Coker Distillate	11003
		CRD	CRD, Crude	11004
		LCO	LCO, Light Cycle Oil	11005
		GO	GO, Untreated Gas Oil	11006
		HSD	HSD, High Speed Diesel	11007
		HYD	HYD, Hydrogen	11008
		ISO	ISO, Isomerate	11009

		LPG	LPG, Liquefied Petroleum Gas, C3 ,C4 Stream	11010
		MS	MS, Motor Spirit	11011
		NAP	NAP, Naphtha	11012
		OFG	OFG, Off Gas, PSA Tail Gas	11013
		RPC	RPC, Raw Petroleum Coke	11014
		RE	RE, Reformate	11015
		SLP	SLP, Slop	11016
		SG	SG, Sour Gas	11017
		SUL	SUL, Sulphur	11018
		KO	KO, Kerosene	11019
		UCO	UCO, Unconverted Oil	11020
		VD	VD, Vacuum Distillate	11021
		VR	VR, Vacuum Residue	11022
		CLO	CLO, Clarified Oil	11023
		OHD	OHD, Overhead	11024
		RF	RF, Reactor Feed (HC+H2)	11025
		PL	PL, Reactor Effluent, Separator Liquid	11026
		PG	PG, H2 Rich Gas Service	11027
		VGO	VGO, SR VGO & Hydrotreated VGO	11028
		HCO	HCO, Heavy Cycle Oil	11029
		FCN	FCN, FCC Naphtha	11030
		PR	PR, Propylene	11031
		PP	PP, Poly Propylene	11032
		BZN	BZN, Benzene Rich Cut	11033
		MTO	MTO, Mineral Turpentine Oil	11034
		RCO	RCO, Reduced Crude Oil	11035
		ETY	ETY, Ethylene	11036
		PV	PV, Process Gas / Separator vapor	11037
		PC	PC, Process Condensate	11038
Water Service				10020
		SRW	SRW, Sour water	11039
		STW	STW, Stripped Water	11040
		BFW	BFW, Boiler Feed Water	11041
		CWR	CWR, Cooling Water Return	11042
		CWS	CWS, Cooling Water Supply	11043
		CW	CW, Chilled Water	11044
		DKW	DKW, Drinking Water	11045
		DMW	DMW, Demineralized Water	11046
		FW	FW, Fire Water	11047
		RW	RW, Raw Water	11048

		SW	SW, Service Water	11049
		TW	TW, Tempered Water	11050
		PW	PW, Process Water	11051
Steam and Condensate				10030
		LPS	LPS, Low Pressure Steam	11052
		MPS	MPS, Medium Pressure Steam	11053
		HPS	HPS, High Pressure Steam	11054
		VHS	VHS, Very High Pressure Steam	11055
		CON	CON, Condensate	11056
Air Service				10040
		BA	BA, Breathing Air	11057
		IA	IA, Instrument Air	11058
		PA	PA, Plant Air	11059
		AP	AP, Process Air	11060
Flare Service				10050
		FL	FL, Flare	11061
		AFL	AFL, Acid Flare	11062
Vent Service				10060
		FLG	FLG, Flue Gas	11063
		SV	SV, Open Vent	11064
Blowdown and Drain Service				10070
		BD	BD, Blow Down	11065
		CBD	CBD, Closed Blow Down	11066
		OWS	OWS, Oil Water Sewer	11067
		CRWS	CRWS, Contaminated Rain Water Sewer	11068
		ABD	ABD, Amine Blow Down	11069
		CCBD	CCBD, Caustic Closed Blow Down	11070
		CS	CS, Chemical Sewer	11071
		SS	SS, Storm Sewer	11072
		PE	PE, Process Effluent	11073
Utility Oil Service				10080
		FLO	FLO, Flushing Oil	11074
		FO	FO, Fuel Oil	11075
		HO	HO, Hydraulic Oil	11076
		HTO	HTO, Hot Oil	11077
		LO	LO, Lube Oil	11078
		SO	SO, Seal Oil	11079
Utility Gas Service				10090
		FG	FG, Treated Fuel Gas	11081
		IG	IG, Inert Gas	11082

		LN	LN, Liquid Nitrogen	11083
		NG	NG, Natural Gas	11084
Other Service				10100
		AC	AC, Acid	11086
		CA	CA, Caustic	11087
		SCA	SCA, Spent Caustic	11088
		CT	CT, Catalyst	11089
		REF	REF, Refrigerant	11090
		ETH	ETH, Ethanol	11091
		ME	ME, Methanol	11092
		OC	OC, Other Chemical	11093
		SE	SE, Sewage	11094
		LAM	LAM, Lean Amine	11095
		RAM	RAM, Rich Amine	11096

Insulation Purpose:

InsulationType ShortDescription	InsulationType LongDescription	InsulationPurpose ShortDescription	InsulationPurpose LongDescription	Codelist Number
Acoustic Insulation				10001
		AI	AI	10002
Cold Insulation				10003
		IC	IC	10004
Hot Insulation				10005
		IH	IH	10006
Steam Jacketed				10007
		IJ	IJ	10008
Safety Insulation				10009
		IS	IS	10010
Steam Traced				10011
		IT	IT	10012
Cold Conservation				10013
		CC	CC	10014
Electrical traced				10015
		IE	IE	10016
Passive fire protection				10017
		FP	FP	10018
Heat Conservation				10019
		HC	HC	10020
Heat Conservation with tracing				10021
		HT	HT	10022
No Insulation				10023
		NI	NI	10024

Other code lists such as Heat Tracing Medium, Insulation Thickness and Material will be updated and informed based on the inputs from Engineering Team.

4.4 S3D Modeling contents

For the extend of S3D modelling contents refer to project data and information handover specification Refer Doc : **NR-0ZZZZ-IF-SPE-0001** (Project Data and Information Handover Specification)

4.5 S3D Model tagging and Name Rules

S3D objects to be tagged / Named in accordance to the project naming procedure. Tagging shall be followed as per NRL Engineering Tag Numbering Specification (**NR-0ZZZZ-GE-SPE-0002**) for Numaligarh Refinery Expansion Project (NREP) Projects. Project specific Name rules for pipelines, piperuns and equipments to be defined in accordance to the above mentioned document.

4.6 Importing Shapes using SAT / DGN

Importing of SAT (ACIS R22 and earlier) / DGN files to represent equipment in the S3D model can be performed by the contractor as required. Files used to represent equipment should have a file size less than 5 MB. Any files larger than 5 MB can impact performance in S3D, so it is preferred to use smaller files, each representing a single equipment object. SAT / DGN files should not be highly detailed. For efficient interference and drawing processing, SAT / DGN files should not have a footprint greater than 100 meters.

4.7 Reference Files (Acad / Microstation)

Design files by ACAD / Microstation (3D) shall be brought inside Smart 3D using Insert > File command.
It is recommended to maintain the files in Shared Content folder (…SharedContent\Reference\2D).

4.8 Reference 3D

External model is expected as a set of Graphic (.zvf) and Data (.xml or .drv) files to attach it as Reference 3D (R3D).
It is recommended to maintain the files in Shared Content folder (…\SharedContent\Reference\3D)

4.9 Interference Checking

Interference checking to be configured and used for this project to facilitate the determination of clashes in the model. Contractors to define and configure the interference setup on their respective locations and ensure the delivery of clash free model.

4.10 S3D Model Back Up

The application backup is carried out using the Project Management module in Smart 3D and Intergraph Batch services for scheduled backups. This allows us to back up all the data for the model database and the associated site, catalog databases. The software saves the backup of the site, model, and catalog databases to the folder along with the .bcf file. Reports databases are not backed

up as they can be recreated by using Regenerate Reports Database. The shared content folder structure is also to be backed up along with the application backups.

Backup activities will be performed by the S3D administrator on daily basis and the backups are stored safely. Restoration of the backups will be done based on the requirements.

Application Backup will form the Primary backup for the tool. A secondary backup of the same for storing the backup archives are to be adopted by the contractors based on their company IT policies.

Note : As SQL server backup and restore the project is not supported by the software vendor, use Application level backup using Smart 3D Project Management functionality.

5. S3D Deliverables

Following deliverables are to be prepared on Smart 3D.

- Reports
- Orthographic drawings
  - General Arrangement drawings (Piping)
  - Installation Layouts (Electrical and Instrumentation)
- Piping Isometric Drawings
- Review Files

5.1 Reports (**In progress**)

S3D Reports will be customized by respective contractors as required and in accordance with project requirements. Few sample MTO report templates will be delivered as part of the seed project.

5.2 Orthographic Drawings (**In progress**)

Orthographic Drawings are to be generated using the drawing functionality available inside S3D. To have an identical appearance across all the Units, a common orthographic drawings configuration is to be used for this project. NRL drawing border templates, view styles and related rules for the different type of drawings will be developed and delivered with the seed project.

Draft drawing border template is attached as Annex 2.

All the 2D Drawings are to be modified from Smart3D drawing and reports task and saved in the database to avoid discrepancies between 3D models and 2D drawings.

Apart from the border template change to include the company logo, contractors to raise a change request for any drawing configuration or style modifications to MPMC / NRL and same shall be reviewed and approved. In case of any new styles or rules required, contractors can develop their own view styles on getting approval from MPMC / NRL and share the customized configurations to MPMC / NRL with all the necessary files.

5.3 Piping Isometric Drawings (**In Progress**)

Piping Isometric Drawings are to be generated using the drawing functionality available inside S3D. Isometrics will be generated using the style customized based on the project requirements. This style will be developed as part of the seed project and delivered. Isometric Drawings contents are not be modified by users directly in smart sketch. Any updates that are required, needs to be carried out in 3D and the isometric drawings shall be regenerated in drawings and reports task.

Draft isometric border template is attached as Annex 3.

Apart from the border template change to include the company logo, contractors to raise a change request for any isometric style modifications to MPMC / NRL and same shall be reviewed and approved.

5.4 Review file Generation

Reviews files from the model can be generated using the Drawings and reports task using SPR Direct report template. Contractors to create and maintain their own SPR files for their units using a dedicated Plant filter for their units.

6. Additional Attributes

Additional attributes apart from the default attributes are to be created for the respective objects in S3D project to meet the project requirements.
Following are the minimum additional attribute for S3D was derived based on the Attribute Classes given in section 16.6 of the document **Project Data and Information Handover Specifications NR-0ZZZZ-IF-SPE-001**.

6.1 Equipment Attributes (CPSmartEquipment, CPDesignEquipment)

Attribute Name	Remarks
Equipment type	Additional Attribute
Material of Construction	Additional Attribute
Design Pressure	Additional Attribute
Design Temperature	Additional Attribute
Service description	Additional Attribute
Area	Additional Attribute
Unit number	Additional Attribute
Asset Code	Additional Attribute
Tag Identifier Code	Additional Attribute
System Number	Additional Attribute
Sequence Number	Additional Attribute
Suffix	Additional Attribute
PID Number	Additional Attribute
Circuit Number	Additional Attribute
Fire Zone Identifier	Additional Attribute For F&G Instrument equipment
Building Number	Additional Attribute

6.2 Piping Attributes (CPPipelineSystem, CPMPipeRun, CPRtePipeComponentOCC, CPRtePipeBoltSet, CPRtePipeGasket) :

Attribute Name	Remarks
Piping type	Pipeline, Additional attribute
Unit number	Pipeline, Piperun, Pipecomponents – Additional Attribute
Sequence number suffix	Pipeline, Piperun -- Additional attribute
Normal operating pressure	Pipeline, Piperun – Additional Attribute
Normal operating temperature	Pipeline, Piperun – Additional Attribute
Trace heating (min. Temp)	Pipeline, Piperun – Additional Attribute
Test fluid	Pipeline, Piperun – Additional Attribute
Vacuum	Pipeline, Piperun – Additional Attribute
Test pressure	Pipeline, Piperun – Default Attribute – Test Max Pressure
Painting code	Pipeline, Piperun – Additional Attribute
PID drawing number	Pipeline, Piperun – Additional Attribute
Isometric drawing number	Pipeline, Piperun, Pipecomponents – Additional attribute
Asset Code	Pipeline, Piperun – Additional attribute
System Number	Pipeline, Piperun – Additional attribute
Design Area	Pipeline, Piperun, Pipecomponents – Additional attribute
Stress CN Number	Pipeline, Piperun – Additional Attribute
PWHT Requirement	Pipeline, Piperun – Additional Attribute
Train Number	Pipeline, Piperun – Additional Attribute
Line From	Pipeline – Additional Attribute
Line To	Pipeline – Additional Attribute
Fluid Name	Pipeline – Additional Attribute
Fluid Phase	Pipeline – Additional Attribute
Corrosion Allowance	Pipeline – Additional Attribute
Line List Number	Pipeline – Additional Attribute
Stress Criticality	Pipeline, Piperun – Additional Attribute

6.3 Piping Specialty Component Attributes: (CPRtePipeSpecialityOcc)

Attribute Name	Remarks
Specialty type	Additional Attribute
Specialty function	Additional Attribute
Specialty description	Additional Attribute
Unit number	Additional Attribute
Asset Code	Additional Attribute
System Number	Additional Attribute
Tag identifier code	Additional Attribute
Sequence Number	Additional Attribute
Suffix	Additional Attribute
Design Area	Additional Attribute

6.4 Instrument Component Attributes (CPRtePipeInstrumentOcc)

Attribute Name	Remarks
Instrument type	Additional Attribute
Instrument function	Additional Attribute
Instrument description	Additional Attribute
Unit number	Additional Attribute
Asset Code	Additional attribute
System Number	Additional attribute
Tag identifier	Additional attribute
Sequence number	Additional attribute
Suffix	Additional attribute
Design Area	Additional attribute

6.5 Areas System (CPAreasystem)

Attribute Name	Remarks
Area Code	Additional Attribute

6.6 Areas System (CPUnitsystem)

Attribute Name	Remarks
Unit Number	Additional Attribute
Asset Code	Additional attribute

6.7 Structural System (CPStructuralsystem)

Attribute Name	Remarks
Asset Code	Additional Attribute
Unit Number	Additional Attribute
Design Area	Additional Attribute

6.8 Electrical System (CPElectricalsystem)

Attribute Name	Remarks
Asset Code	Additional Attribute
Unit Number	Additional Attribute
Design Area	Additional Attribute

6.9 Isometric Attributes (Hold)

Attribute Name	Remarks
Line number	Additional Attribute
Piping class	Additional Attribute
Area	Additional Attribute
Status	Additional Attribute
State	Additional Attribute
Discipline identifier	Additional Attribute
Unit number	Additional Attribute

6.10 GAD Drawing Attributes (Hold)

Attribute Name	Remarks
Discipline identifier	Additional Attribute
Sequence number	Additional Attribute
Project number	Additional Attribute
Scale	Additional Attribute
Sheet number	Additional Attribute
Area	Additional Attribute
Status	Additional Attribute
State	Additional Attribute
Unit number	Additional Attribute

6.11 Catalog Attributes: (Hold)

Attribute Name	Remarks
Technip Part Number	Additional Attribute
Company Ident Code	Additional Attribute

Annexure – 1 System Hierarchy for NREP project

HEAD	SYSTEM1	SYSTEM2	SYSTEM3	SYSTEM4	SYSTEM5	SYSTEM5	TYPE	PERMISSION_GROUP
	String	String	String	String	String	String	String from List	String
	CONSTRUCTION						Area System	NREP_Admin
		ConstructionPowerFacility					Unit System	NREP_Admin
		ConstructionWaterFacility					Unit System	NREP_Admin
		FencingCompoundWallWatchTower					Unit System	NREP_Admin
		RoadCulvertsEtc.					Unit System	NREP_Admin
	GENERAL						Area System	NREP_Admin
		AdministrationBlock					Unit System	NREP_Admin
		Canteen					Unit System	NREP_Admin
		CentralWarehouseFacility					Unit System	NREP_Admin
		CentralWorkshop					Unit System	NREP_Admin
		FireStation					Unit System	NREP_Admin
		FirstAidOhc					Unit System	NREP_Admin
		SiteOffice					Unit System	NREP_Admin
		TrainingFacility					Unit System	NREP_Admin
	OFFSITE						Area System	NREP_Admin
		ChemicalStorageHandling					Unit System	NREP_Admin
		CokeStorageAreDisposalFacility					Unit System	NREP_Admin
		CrudeOilStorageHandling					Unit System	NREP_Admin
		EffluentTreatmentPlant					Unit System	NREP_Admin
		FinishedProductStorageHandling					Unit System	NREP_Admin
		IntermediateProduct StorageHandling					Unit System	NREP_Admin
		LpgStorageAndDisposalFacility					Unit System	NREP_Admin
		ProductBlendingFacility					Unit System	NREP_Admin
		SulfurStorageAndDisposalFacility					Unit System	NREP_Admin
	PROCESS						Area System	NREP_Admin
		ARU					Unit System	NREP_Admin
			Electrical				Generic System	NREP_Admin
				CableTray			Electrical System	NREP_Electrical
				ElectricalEquipment			Equipment System	NREP_Electrical
				ElectricalJunctionBox			Equipment System	NREP_Electrical
				Panels			Equipment System	NREP_Electrical
				LocalControlStation			Equipment System	NREP_Electrical
				Receptables			Equipment System	NREP_Electrical
				Sockets			Equipment System	NREP_Electrical
				Lighting			Equipment System	NREP_Electrical
				Misc			Equipment System	NREP_Electrical
			Instrumentation				Generic System	NREP_Admin
				CableTray			Electrical System	NREP_Instrumentation
				InstrumentEquipment			Equipment System	NREP_Instrumentation
				InstrumentJunctionBox			Equipment System	NREP_Instrumentation
				Stantions			Equipment System	NREP_Instrumentation
				LocalControlPanel			Equipment System	NREP_Instrumentation
				Enclosure			Equipment System	NREP_Instrumentation
				FireGas			Equipment System	NREP_Instrumentation
				TelecomSecurity			Equipment System	NREP_Instrumentation
				Misc			Equipment System	NREP_Instrumentation
			CSA				Generic System	NREP_Admin
				Grids			Generic System	NREP_CSA
					PipeRack		Structure System	NREP_CSA

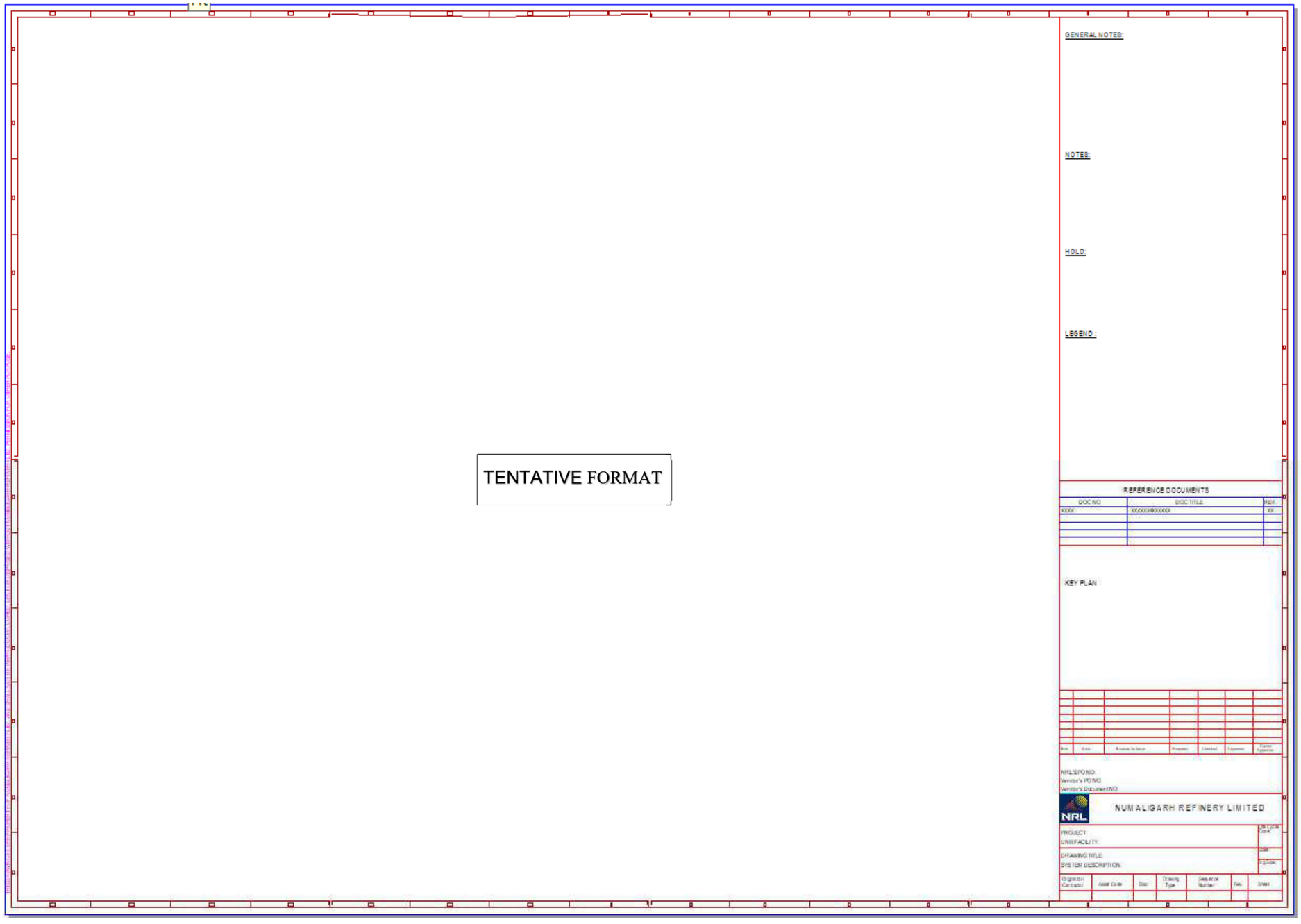
					Structure		Structure System	NREP_CSA
					Shelter		Structure System	NREP_CSA
					EquipmentsPlatforms		Structure System	NREP_CSA
					StructuralPlatforms		Structure System	NREP_CSA
				Piling			Generic System	NREP_Admin
					PipeRack		Structure System	NREP_CSA
					Structure		Structure System	NREP_CSA
					Shelter		Structure System	NREP_CSA
					EquipmentsPlatforms		Structure System	NREP_CSA
					StructuralPlatforms		Structure System	NREP_CSA
				Buildings			Generic System	NREP_Admin
					Electrical		Equipment System	NREP_CSA
					Instrumentation		Equipment System	NREP_CSA
				Foundation			Generic System	NREP_Admin
					PipeRack		Structure System	NREP_CSA
					Structure		Structure System	NREP_CSA
					Shelter		Structure System	NREP_CSA
					Equipments		Structure System	NREP_CSA
					Supports		Structure System	NREP_CSA
				SteelStructure			Generic System	NREP_Admin
					PipeRack		Structure System	NREP_CSA
					Structure		Structure System	NREP_CSA
					Shelter		Structure System	NREP_CSA
					EquipmentsPlatforms		Structure System	NREP_CSA
					StructuralPlatforms		Structure System	NREP_CSA
				ConcreteStructure			Generic System	NREP_Admin
					StructuralPlatforms		Structure System	NREP_CSA
				ConcreteStructure			Generic System	NREP_Admin
					PipeRack		Structure System	NREP_CSA
					Structure		Structure System	NREP_CSA
					Shelter		Structure System	NREP_CSA
					GroundPlatformSupports		Structure System	NREP_CSA
					Sleepers		Structure System	NREP_CSA
					Miscellaneous		Structure System	NREP_CSA
				UnderGround			Generic System	NREP_Admin
					CatchBasin		Equipment System	NREP_CSA
					ManHoles		Equipment System	NREP_CSA
					Pits		Equipment System	NREP_CSA
					Misc(CoDc)		Equipment System	NREP_CSA
				UGNetworkSystems			Generic System	NREP_Admin
					BlowAndDrainService		Generic System	NREP_CSA
						OWS	Piping System	NREP_Admin
						CRWS	Piping System	NREP_CSA
						SS	Piping System	NREP_CSA
						CS	Piping System	NREP_CSA
						ABD	Piping System	NREP_CSA
						BD	Piping System	NREP_CSA
						CBD	Piping System	NREP_CSA
						CCBD	Piping System	NREP_CSA
						PE	Piping System	NREP_CSA
					WaterService		Piping System	NREP_Admin
						FW	Piping System	NREP_CSA
						CWR	Piping System	NREP_CSA
						CWS	Piping System	NREP_CSA
						DKW	Piping System	NREP_CSA

				Electrical			Generic System	NREP_Admin
					DirectBurriedCableTrenches		Structure System	NREP_CSA
					ConcreteCableTrenches		Structure System	NREP_CSA
					DuctBanks		Electrical System	NREP_CSA
					Sleeves		Conduit System	NREP_CSA
				Instrumentation			Generic System	NREP_Admin
					DirectBurriedCableTrenches		Structure System	NREP_CSA
					ConcreteCableTrenches		Structure System	NREP_CSA
					DuctBanks		Electrical System	NREP_CSA
					Sleeves		Conduit System	NREP_CSA
				FinishingSurfaces			Generic System	NREP_Admin
					Paving		Structure System	NREP_CSA
					Roads		Structure System	NREP_CSA
					BundsDikes		Structure System	NREP_CSA
			Piping				Generic System	NREP_Admin
				Equipment			Equipment System	NREP_Piping
				EquipmentTrim			Piping System	NREP_Piping
				PreliminaryStructure			Structure System	NREP_Piping
				Pipelines			Piping System	NREP_Admin
					ProcessService		Piping System	NREP_Admin
						AG	Piping System	NREP_Piping
						ATF	Piping System	NREP_Piping
						CD	Piping System	NREP_Piping
						CRD	Piping System	NREP_Piping
						LCO	Piping System	NREP_Piping
						GO	Piping System	NREP_Piping
						LCO	Piping System	NREP_Piping
						GO	Piping System	NREP_Piping
						HSD	Piping System	NREP_Piping
						HYD	Piping System	NREP_Piping
						ISO	Piping System	NREP_Piping
						LPG	Piping System	NREP_Piping
						MS	Piping System	NREP_Piping
						NAP	Piping System	NREP_Piping
						OFG	Piping System	NREP_Piping
						RPC	Piping System	NREP_Piping
						RE	Piping System	NREP_Piping
						SLP	Piping System	NREP_Piping
						SG	Piping System	NREP_Piping
						SUL	Piping System	NREP_Piping
						KO	Piping System	NREP_Piping
						UCO	Piping System	NREP_Piping
						VD	Piping System	NREP_Piping
						VR	Piping System	NREP_Piping
						CLO	Piping System	NREP_Piping
						OHD	Piping System	NREP_Piping
						RF	Piping System	NREP_Piping
						PL	Piping System	NREP_Piping
						PG	Piping System	NREP_Piping
						VGO	Piping System	NREP_Piping
						HCO	Piping System	NREP_Piping
						FCN	Piping System	NREP_Piping
						PR	Piping System	NREP_Piping
						PP	Piping System	NREP_Piping
						BZN	Piping System	NREP_Piping

						MTO	Piping System	NREP_Piping
						RCO	Piping System	NREP_Piping
						ETY	Piping System	NREP_Piping
						PV	Piping System	NREP_Piping
						PC	Piping System	NREP_Piping
					WaterService		Generic System	NREP_Admin
						SRW	Piping System	NREP_Piping
						STW	Piping System	NREP_Piping
						BFW	Piping System	NREP_Piping
						CWR	Piping System	NREP_Piping
						CWS	Piping System	NREP_Piping
						CW	Piping System	NREP_Piping
						DKW	Piping System	NREP_Piping
						DMW	Piping System	NREP_Piping
						FW	Piping System	NREP_Piping
						RW	Piping System	NREP_Piping
						SW	Piping System	NREP_Piping
						TW	Piping System	NREP_Piping
						PW	Piping System	NREP_Piping
					SteamAndCondensate		Generic System	NREP_Admin
						LPS	Piping System	NREP_Piping
						MPS	Piping System	NREP_Piping
						HPS	Piping System	NREP_Piping
						VHS	Piping System	NREP_Piping
						CON	Piping System	NREP_Piping
					AirService		Generic System	NREP_Admin
						CON	Piping System	NREP_Piping
					AirService		Generic System	NREP_Admin
						BA	Piping System	NREP_Piping
						IA	Piping System	NREP_Piping
						PA	Piping System	NREP_Piping
						AP	Piping System	NREP_Piping
					FlareService		Generic System	NREP_Admin
						FL	Piping System	NREP_Piping
						AFL	Piping System	NREP_Piping
					VentService		Generic System	NREP_Admin
						FLG	Piping System	NREP_Piping
						SV	Piping System	NREP_Piping
					UtilityOilService		Generic System	NREP_Admin
						FLO	Piping System	NREP_Piping
						FO	Piping System	NREP_Piping
						HO	Piping System	NREP_Piping
						HTO	Piping System	NREP_Piping
						LO	Piping System	NREP_Piping
						SO	Piping System	NREP_Piping
					UtilityGasService		Generic System	NREP_Admin
						FG	Piping System	NREP_Piping
						IG	Piping System	NREP_Piping
						LN	Piping System	NREP_Piping
						NG	Piping System	NREP_Piping
					OtherService		Generic System	NREP_Admin
						AC	Piping System	NREP_Piping
						CA	Piping System	NREP_Piping
						SCA	Piping System	NREP_Piping
						CT	Piping System	NREP_Piping

						REF	Piping System	NREP_Piping
						ETH	Piping System	NREP_Piping
						ME	Piping System	NREP_Piping
						OC	Piping System	NREP_Piping
						SE	Piping System	NREP_Piping
						LAM	Piping System	NREP_Piping
						RAM	Piping System	NREP_Piping
		ATU					Unit System	NREP_Admin
		CCR					Unit System	NREP_Admin
		CDU-VDU					Unit System	NREP_Admin
		DHT					Unit System	NREP_Admin
		GDS					Unit System	NREP_Admin
		HGU					Unit System	NREP_Admin
		ISOM					Unit System	NREP_Admin
		NHT					Unit System	NREP_Admin
		ONS					Unit System	NREP_Admin
		PFCCU					Unit System	NREP_Admin
		PRU					Unit System	NREP_Admin
		RPTU					Unit System	NREP_Admin
		SRU					Unit System	NREP_Admin
		SWS					Unit System	NREP_Admin
		TGTU					Unit System	NREP_Admin
		VGO-HDT					Unit System	NREP_Admin
	UTILITY						Area System	NREP_Admin
		CWSystem					Unit System	NREP_Admin
		DMProcessWaterFacility					Unit System	NREP_Admin
		DrinkingWaterSystem					Unit System	NREP_Admin
		ElectricalControlRoom					Unit System	NREP_Admin
		FireFightingFacility					Unit System	NREP_Admin
		FlareSystem					Unit System	NREP_Admin
		FuelGasSystem					Unit System	NREP_Admin
		FuelOil IFOFacility					Unit System	NREP_Admin
		HydrogenStorageFacility					Unit System	NREP_Admin
		InertNitroPlantGasFacility					Unit System	NREP_Admin
		InstPlantAirFacility					Unit System	NREP_Admin
		PowerAndSteamGenSystem					Unit System	NREP_Admin
		RwStorageAndDistribution					Unit System	NREP_Admin
		SwitchYard					Unit System	NREP_Admin
		TelephoneExchange					Unit System	NREP_Admin

Annexure – 2 Drawing Template A1:



Annexure – 3 Isometric Drawing Template