

performance/discharge by the Contractor of its obligations under the Contract during the Contract Validity Period.

**NOW THEREFORE THIS BOND WITNESSETH AS FOLLOWS:**

1. The Insurer hereby irrevocably and unconditionally guarantees and secures (as primary obligor and not merely as Insurer) to EIL (as beneficiary) the payment in full of all amounts at any time that may be due, owing or payable to EIL from the Contractor for the failure of the Contractor to duly and punctually perform all of its obligations under the Contract (the "Bond Obligation"), without any demur, reservation, protest or recourse, immediately on receipt of a demand from EIL.

The Insurer further agrees that this Surety Bond does not limit the number of claims that may be made by EIL against the Insurer up to the value of Bond Amount.

Payment made hereunder shall be made free and clear of and without any deductions so that EIL receives the full Bond Amount due hereunder.

2. The Insurer's liability under this Surety Bond shall not exceed.....(Bond Amount in figures & words) and this Surety Bond shall be valid upto. ....(expiry date). Insurer is liable to pay to EIL the demanded amount only upon receipt of written claim or demand from EIL on or before..... (not less than 2 months from expiry date).
3. The Insurer shall, pay to EIL sums not exceeding the Bond Amount, within 5 (five) Business Days of receipt of a written demand from EIL stating that the Contractor has failed to meet its performance obligations under the Contract. The Insurer shall not be required to go into the veracity of any breach or failure on the part of the Contractor or status /stage of the contract or validity of demand so made by EIL and shall pay the amount specified in the demand notwithstanding any direction to the contrary given or any dispute whatsoever raised by the Contractor or any other Person. The Insurer's obligations hereunder shall subsist until all such demands are duly met and discharged in accordance with the provisions hereof.
4. The obligations of the Insurer herein are absolute and unconditional, irrespective of the value, genuineness, validity, regularity or enforceability of the Contract or the insolvency, bankruptcy, reorganization, dissolution or liquidation of the Contractor or any sanctions on the Contractor or any change in ownership of the Contractor, or the pendency of any suit or other legal proceedings including arbitration or conciliation pending before any court, tribunal or arbitrator or conciliator(s) relating thereto or any purported assignment by the Contractor or any other circumstance whatsoever which might otherwise constitute a discharge or defence of a Insurer or a surety.

Further, this Surety Bond is in no way conditional upon any requirement that EIL first attempt to procure the Bond Amount from the Contractor, or any other Person, or resort

to any other means of obtaining payment of the Bond Amount, prior to make any recourse to this Surety Bond.

5. EIL shall be entitled to treat the Insurer as the principal debtor. The obligations of the Insurer under this Surety Bond shall not be affected by any act, omission, matter or thing which would reduce, release or prejudice the Insurer from any of the Bond Amount or prejudice or diminish the Bond Amount in whole or in part, including (whether or not known to it, or EIL):

(a) any time or waiver granted to, the Contractor or any other Person;

(b) any incapacity or lack of powers, of the Contractor or any other Person;

(c) any variation of the Contract

(d) any unenforceability or illegality or invalidity of any obligation of any Person under the Contract or of the Insurer under this Surety Bond or of any Person under any other document or Surety Bond, to the extent that each obligation under this Surety Bond shall remain in full force as a separate, continuing and primary obligation, and its obligations be construed accordingly, as if there were no unenforceability or illegality or invalidity;

(e) the partial or entire release of any Insurer or other Person primarily or secondarily liable or responsible for the performance, payment or observance of any of the Contractor's obligations during the Contract Period; or by any extension, waiver, or amendment whatsoever which may release the Insurer or

(f) any part performance of the Contract by the Contractor or by any failure by EIL to timely pay or perform any of its obligations under the Contract.

6. If, and to the extent that, for any reason the Contractor enters or threatens to enter into any proceedings in bankruptcy or reorganization or otherwise, or if, for any other reason whatsoever, the performance or payment by the Contractor of the Bond Amount becomes or may reasonably be expected to become impossible, then the Bond Amount shall be promptly paid by the Insurer to EIL on demand.

7. The Insurer further represents and warrants to EIL that:

(a) it has the power to execute, deliver and perform the terms and provisions of this Surety Bond and has taken all necessary action to authorize the execution, delivery and performance by it of this Surety Bond;

(b) No actions / omissions of the Insurer shall affect the legality, validity, binding effect or enforceability of this Surety Bond.

- (c) the Insurer has duly executed and delivered this Surety Bond, and this Surety Bond constitutes its legal, valid and binding obligation enforceable in accordance with its terms
8. If any one or more of the provisions contained in this Surety Bond are or become invalid or unenforceable in any respect, the validity and enforceability of the remaining provisions shall not in any way be affected or impaired thereby, and the Insurer shall enter into good faith negotiations with EIL to replace the invalid or unenforceable provision.
  9. The Insurer further agrees that to fulfill the Contractor's liability during the contract period, if requested by the Contractor in writing, the insurer shall issue Amendment to this Surety Bond, as and when required, incorporating the extended date of validity and/or other amendment.
  10. Any notice, request, demand or claim or other communication to be given or made under this Surety Bond shall be in writing addressed to the Insurer and may be transmitted to the insurer either by post or by email address as set opposite its signature hereunder. The Insurer shall pay the amount immediately upon receipt of such written demand from EIL which suffices all requirements for payment to EIL under this Surety Bond.
  11. This Surety Bond shall be governed by, and construed in accordance with, the laws of India. The Insurer irrevocably agrees that any legal action, suit or proceeding arising out of or relating to this Surety Bond may be brought in the courts in Delhi.
  12. Neither party shall assign or transfer any or all parts of its interest herein to any other person without express written consent of the other party.
  13. All related parties have agreed to the terms and conditions of this Insurance Surety Bond which conform with the principle of utmost good faith.

**IN WITNESS WHEREOF** the **Insurer** has set its hand hereunto on the day, month and year first hereinabove written.

Signed and delivered by its constituted attorney  
(Signature of a person authorized to sign on behalf of the Insurer) insert  
name of Insurance Company] Insurer by hand

Name:

Designation;

Address:

Email:

**INSTRUCTIONS FOR FURNISHING UNCONDITIONAL AND IRREVOCABLE INSURANCE SURETY BOND TOWARDS SECURITY DEPOSIT**

1. The Unconditional Insurance Surety Bond shall be from an Indian Insurance Company (Insurer) registered with Insurance Regulatory and Development Authority of India (IRDAI).
2. The Insurance Surety Bond by Indian Bidders will be given on non-judicial stamp paper of appropriate value to be purchased in the name of the issuing insurance Company.
3. Insurance Surety Bond is not applicable for Foreign Bidders.
4. Insurance Surety Bond required to submit in Indian Currency only.
5. Matter to be mentioned in covering letter to be submitted by vendor along with insurance surety bond.

|   |   |  |               |  |
|---|---|--|---------------|--|
| 1 | Insurance Surety Bond No                        |  |               |  |
| 2 | Insurance Surety Bond Amount                    |  |               |  |
| 3 | Date of execution of Insurance Surety Bond      |  |               |  |
| 4 | Expiry date of Insurance Surety bond            |  |               |  |
| 5 | Expiry date of claim period of Insurance Surety |  |               |  |
| 6 | Bidder Name                                     |  |               |  |
| 7 | Tender No.                                      |  |               |  |
| 8 | Nature of Insurance Surety Bond                 | Earnest Money Deposit / Security Deposit |               |  |
| 9 | Insurer Details                                 | A  | Insurer Name: |  |
|   |   | B  | Address:      |  |
|   |   | C  | Email Id:     |  |
|   |   | D  | Phone No:     |  |

**ANNEXURE-XI  
TO  
SPC  
(TAXES & DUTIES)**

---

## A. Price basis w.r.t inclusion/exclusion of taxes and duties

1. The quoted price(s) shall be inclusive of all the taxes and duties except GST (i.e. IGST or CGST and SGST/UTGST applicable in case of interstate supply or intra state supply respectively) and GST compensation cess, (if applicable) leviable on sale of finished goods/services.
2. In case of foreign bidders, bidders shall submit their prices on FOB international sea port of exit basis/CFR on destination port basis \*Note-1 (INCOTERM XXXX \*Note-2), unless otherwise stated in the bid document. FOB/CFR \*Note-1 prices quoted shall be inclusive of all applicable taxes upto FOB international sea port of exit/CFR on destination port basis \*Note-1.
3. Transportation charges (if applicable) upto respective project site shall be exclusive of GST.
4. Site work prices, if applicable shall be inclusive of all taxes and duties except GST. All necessary registrations, if required, for carrying out the site activities shall be done by the bidder and costs towards the same shall be included in quoted site work prices.
5. Prices of per diem supervision charges, training/AMC, HAZOP Study etc. (as applicable) shall be exclusive of GST. However, GST shall not be applicable on training provided at foreign bidder's work/training facilities in any territory other than India.

## B. TAX CLAUSES

### 1. Goods and Services Tax

- a. The supplier/contractor will be liable to register with the respective tax authorities and to submit self-attested copy of such registration certificates and the supplier/contractor will be responsible for procurement of goods/services in its own registration (GSTN).
- b. Supplier/Contractor shall be required to issue tax invoice in the form and manner prescribed under GST Act read with Rules thereunder including E-Invoicing provisions so that input tax credit under GST can be availed by EIL. In the event that the supplier/contractor fails to provide the Tax Invoice/F-Invoice in the form and manner prescribed under the GST act read with GST invoicing rules thereunder, EIL shall not be liable to make any payment on account of GST against such invoice.
- c. In case supplier/contractor is not subject to E-Invoicing provisions under the GST Laws as amended from time to time, then a declaration to this effect shall be furnished by the supplier/contractor in format prescribed in Annexure A along with the Invoice.

- d. GST shall be paid to supplier/contractor against receipt of Tax Invoice/E-Invoice and, on auto-population of input tax credit on GSTN portal. In case of non-receipt of Tax Invoice/E-Invoice and/or non-auto-population of input tax credit on GSTN portal, EIL shall with hold the payment of GST.
- e. The supplier/contractor shall always comply with the requirements of applicable laws and provide necessary documents as prescribed under the rules and regulations, as applicable from time to time. In particular, if any tax credit, refund or any other benefit is denied/delayed to EIL or any interest/penalty is charged to EIL due to any non-compliance/ delayed compliance by the supplier/contractor under the GST Law (including but not limited to failure to upload the details of the sale on GSTN portal, failure to pay GST to the government or due to non-furnishing or furnishing of incorrect or incomplete documents, non-filing of GST return by the supplier/contractor), the supplier/contractor shall be liable to reimburse EIL for all such losses and other consequences including but not limited to the tax loss, interest and penalty. EIL shall be entitled to recover such amount from the supplier/contractor by way of adjustment from the next invoice, encashment of BG or by way of any other means either of same project or any other project of the EIL.
- f. In case of any Advance including Mobilization/Secured/Other Advance is granted to supplier/contractor as per the provisions of Contract, then the supplier/contractor shall issue a Receipt Voucher / GST Invoice in the form and manner prescribed under GST Act read with Rules thereunder including e-invoicing provisions.
- g. In case of any Price Variation as per the provisions of Contract, the supplier/contractor shall issue an Invoice in the form and manner prescribed under the GST Act read with Rules thereunder including e-invoicing provisions.
- h. GST payable under reverse charge for specified services/goods under GST Act read with Rules thereunder, if any, shall not be paid to the supplier/contractor but will be directly deposited by EIL to the appropriate Government Tax Authority. If the same has already been reimbursed / paid to the supplier/contractor for any reason whatsoever, then EIL shall be entitled to deduct/set off /recover such amount against any amounts paid/payable by EIL to supplier/contractor.
- i. Where EIL has the obligation to discharge GST liability under reverse charge mechanism and EIL has paid or is liable to pay GST to the government on which interest/penalty becomes payable as per GST law for any reason which

is not attributable to EIL or Input Tax Credit w.r.t. such payment is not available to EIL for any reason which is not attributable to EIL, then EIL shall be entitled to deduct/set off /recover such amount against any amounts paid/payable by EIL to contractor/supplier.

- j. TDS under GST, if applicable shall be deducted from supplier/contractor bills at applicable rates and a certificate as per rules for tax so deducted shall be provided to supplier/contractor.
- k. The supplier/contractor will be under obligation for charging correct rate of tax as prescribed under the respective tax laws. Further the supplier/contractor shall avail and pass on benefits of all exemptions/concessions available under applicable tax laws.
- l. In case bidder is covered under composition scheme under GST law, then bidder shall quote the price inclusive of GST. Further, such bidder should mention "Covered under GST Composition Scheme" in column for GST of relevant price schedule(s). In case subsequently such bidder gets covered under regular GST regime, the prices including GST under regular GST regime shall not exceed the prices quoted by the bidder under composition scheme.
- m. EIL prefers to deal with registered supplier/contractor of goods/services under GST. Therefore, bidders are requested to get themselves registered under GST, if not registered yet. However, in case any unregistered bidder is submitting bid, their prices will be loaded with applicable GST while evaluation of bid as per evaluation methodology of tender document. However, where EIL is entitled for input credit of GST, the same will be considered for evaluation of bid as per evaluation methodology of tender document.
- n. In case of foreign bidders, for supervision/site-work/training, services provided by foreign bidder at project site, GST shall be paid by EIL directly to appropriate Government Tax Authorities, under Reverse Charge Mechanism, if applicable and prices of such services will be loaded with applicable GST while evaluation of bid as per clause E (Evaluation Methodology).
- o. Bidder will be required to quote applicable tax rate (along with applicable HSN/SAC Code) as per provisions of GST Laws for all the line items forming part of the enquiry. Any higher rate of tax actually invoiced in excess of quoted rate of tax (except in compliance with provisions of Statutory Variation clauses) shall be adjusted in basic price.
- p. In case of delay in supply/execution of contract, supplier/contractor shall be liable to raise invoices for reduced value as per Price Reduction Schedule

(PRS) provision of the bidding document. In case the supplier/contractor raises invoices for full value, then supplier/contractor shall issue Credit Note, in the form and manner prescribed under relevant GST Act read with Rules thereunder, towards applicable PRS amount with applicable GST thereon.

In case supplier/contractor fails to submit invoices with reduced value or does not issue Credit Note as mentioned above, EIL shall release payment to the supplier/contractor after giving effect to the PRS clause with corresponding reduction in taxes from invoice(s) of supplier/contractor.

In case any financial implication arises on EIL due to issuance of invoice without reduction in prices or non-issuance of Credit Note by supplier/contractor, the same shall be to the account of supplier/contractor. EIL shall be entitled to recover the amount of such financial implication paid or becoming payable by EIL together with penalty and interest thereon, if any.

- q. E-way bills shall be issued directly by supplier/contractor in all cases except in cases of direct imports by EIL where E-way bill shall be issued by EIL.
- r. In case of applicability of any recovery as per provisions of the contract, EIL shall raise Invoice on supplier/contractor after charging GST at applicable rates as per prevailing provisions of GST Laws.

#### PORT DUTIES

- a. Direct supplies by foreign supplier where, EIL becomes consignee-
  - i. Consignee shall be EIL, bill of entry shall be filed by EIL, all import duties, Social Welfare Surcharge, IGST and GST Compensation Cess etc. as applicable in India shall be paid by EIL .
- b. Imported supplies by Indian/ Foreign suppliers/Contractors as built in import content where goods are cleared by filing into Bill of Entry in the name of EIL(Due to applicability of any Concessional rate or any other custom duty related schemes).
  - i. High seas sale shall be effected between, supplier/contractor and EIL.
  - ii. Bill of entry shall be filed in the name of EIL by supplier/contractor, all import duties, Social Welfare Surcharge, IGST and GST Compensation Cess etc. as applicable in India shall be discharged by EIL.
  - iii. Custom duties, Social Welfare Surcharge, IGST, GST Compensation Cess, etc. as applicable in India on the imported materials shall not be included in the quoted prices by the bidder. All harbour dues/ pilotage fees, port fees, wharfage, unloading costs, demurrage charges etc. incurred in India in respect of any imported goods shall be to supplier's/contractor's account. D.

- 
- iv. Bidder to indicate CIF value of built-in import content and applicable merit rate, Social Welfare Surcharge on custom in the relevant price schedule.
  - v. The supplier/contractor shall be responsible for and shall exercise due diligence in properly classifying the goods and materials, undertaking the payment of custom duties, and/or otherwise complying with all applicable laws w.r.t. import of the goods and materials
  - vi. If the total custom duties (BCD, SWS & IGST) paid or payable on the import of goods into India exceeds the total value thereof calculated as per the CIF value and rates indicated by supplier/contractor as above as increased or decreased for any increase or reduction in applicable rates or CIF valuation, the Supplier/contractor shall pay and bear and/or reimburse to the EIL such excess custom duties.
- c. Imported supplies by Indian suppliers as built in import content where Suppliers/Contractors will become consignee of the goods or by filling into Bill of Entry for Home consumption
- i. Custom duties, Social Welfare Surcharge, IGST, GST Compensation Cess, etc. as applicable in India on the imported materials shall be included in the quoted prices by the bidder (considering the input tax credit of IGST, GST Compensation Cess on imported material) and supplier/contractor shall be responsible for the timely payment of the custom duties to the relevant government authority. All harbor dues/ pilotage fees, port fees, wharfage, unloading costs, demurrage charges etc. incurred in India in respect of any imported goods shall be to supplier's/contractor's account.
  - ii. Bidder to indicate, in relevant price schedule, CIF value of built-in import content and applicable merit rate or concessional rate of basic custom duty (as per applicability), Social Welfare Surcharge on custom duty (considering the input tax credit of IGST, GST Compensation Cess on imported material) included in quoted price, in the price schedule.
  - iii. In case merit rate of custom duty is applicable and bids are invited on the basis of same, however at a later stage concessional rate of custom duty becomes applicable, concessional certificate shall be issued towards import of material against the advance request letter submitted by the domestic bidder and the differential custom duties between concessional rate and quoted merit rate of custom duty by supplier/contractor shall be passed on to the EIL or it shall be recovered by the EIL from the supplier/contractor's invoice.
  - iv. The supplier/contractor shall be responsible for and shall exercise due diligence in properly classifying the goods and materials, undertaking the payment of custom duties, and/or otherwise complying with all applicable laws w.r.t. import of the goods and materials.

D/

- 
- v. Documentation to be furnished for availing the exemption/waiver of custom duty shall be specifically listed in the letter of credit also as a prerequisite for release of payment against shipping documents and this documentation shall necessarily form a part of shipping documents.
  - vi. EIL will not bear any liability towards payment of Safeguard Duty, Anti-Dumping Duty, Protective Duty and applicable IGST including GST Cess on same or Countervailing Duty on subsidized articles or any other such duties of Customs imposed by Government under Customs Tariff Act, 1975.
  - vii. In case custom duty rate as quoted by Foreign bidder is less than Actual rate applicable on due date of submission of price bid and payment of custom duty is on EIL's, differential amount on account of above-mentioned rate variation will be recovered from Foreign bidder.

### 3. INCOME TAX

#### a. Foreign supervisors/suppliers/contractors

Prices of site work, contracts and other services of foreign supplier/contractor shall be gross of income tax i.e., inclusive of Indian income tax at the applicable prevailing rate as per Indian Income Tax Act and Rules there under.

EIL shall deduct withholding tax at source (TDS) as applicable while making payments against each invoice. Certificate for TDS shall be provided to the supplier/contractor.

In case foreign bidder quotes Prices of site work, contracts and other services "net of Income Tax" i.e., exclusive of Indian income tax, EIL shall deposit TDS as applicable after grossing up the sums due while making payments against each invoice at the applicable prevailing rate as per Indian Income Tax Act and Rules thereunder.

Foreign bidder irrespective of fact that whether prices are quoted gross of Income tax or Net of Income tax shall furnish the information required in line with the prevalent provisions of Income tax act read with rules thereunder including but not limited to Tax residency certificate, Form 10F, No permanent establishment declaration, No business connection certificate, No SEP declaration, PAN in India if available.

N

Failing to provide above documents/information, tax will be withheld at rates applicable as per the provisions of Income Tax Act, 1961 read with rules thereunder and the benefit of reduced rates will not be given.

If the non-resident bidder is unable to obtain & submit Tax Residency Certificate to the EIL within a reasonable time, the bidder should furnish Form 10F along with an undertaking to the effect that the bidder is a tax resident of (the specified country) and that they shall obtain and provide the tax residency certificate (TRC) to the EIL before 30 days of submission of first Invoice by them or within 3 months from the date of entering into contract whichever is earlier.

In case of contracts with term exceeding one financial year, the relevant documents like TRC, Form 10 F / Online 10 F, No PE / Business Connection Certificate etc. as applicable, as per Income Tax Act, 1961 must be submitted at the beginning of each financial year and the EIL will not bear additional tax liability (if any) arising from non-submission of documents.

The bidder shall be liable to intimate the subsequent changes (if any) to the information submitted against any of the above particulars, along with full details.

In addition to the above particulars, the bidder should also provide any other information as may be required at a later stage for determining the taxability of the amount to be remitted to the non-residents.

In case, any additional tax liability arises on the EIL due to delay in submission or non-submission of information / documents required as above or change in residential status post submission of documents or change in any document (like TRC, Form 10F etc.) after its submission shall be recovered from the supplier/contractor.

**b. Indian resident supervisors/ suppliers/contractors**

Prices for supply and services of Indian suppliers/ contractors shall be inclusive of income tax.

Tax shall be deducted at source (TDS) by EIL on all sums due to supplier/contractor in accordance with the provisions of Indian Income Tax act read with rules thereunder as in force at the relevant point of time.

EIL shall issue a Tax Deduction Certificate to the supplier/contractor evidencing the tax deducted or withheld and deposited by EIL on payments

made to the supplier/contractor to enable the supplier/contractor to claim the credit of Tax deducted by EIL.

c. INCOME TAX (General Points):-

- i. The supplier/contractor shall also be responsible for ensuring compliance with all applicable provisions of the Direct Tax Laws of India including, but not limited to, the filing of relevant Tax Returns and shall promptly provide all information required by the EIL for discharging any of its responsibilities/liabilities under such laws in relation to or arising out of the Contract. For the lapses/failure, if any, on the part of the supplier/contractor and consequential penal action taken by the Income Tax department, EIL shall not take any responsibility whether financial or otherwise and shall be indemnified by the supplier/contractor.
- ii. The Indian Income Tax Act and Rules made thereunder contains provisions permitting deduction of tax at source (TDS) at lesser rate if the supplier/contractor is able to justify to the Income Tax Authorities such lesser rate of deduction. However, a deduction once made has to be deposited by the EIL with the Income Tax Authorities in India and will not be adjustable by the EIL. It is therefore in the interest of the supplier/contractor that prior to release of any payment due to the supplier/contractor under the Contract that the supplier/contractor obtains from the relevant Income Tax Authorities in India, a certificate specifying the rate of deduction/withholding of Income tax at source, failing which, payment to the supplier/contractor shall be made by the EIL after withholding/deduction at the rate as may be applicable to the supplier/contractor as per provisions of Income Tax Act, 1961.
- iii. TDS on interest recovered on Mobilization/Other Advance will be deposited by the supplier/contractor and same would be reimbursed by the EIL against submission of Form-16A (TDS certificate).

C. INVOICING METHODOLOGY W.R.T. TAXATION

1. In case of domestic / foreign PO's (Other than 2 below) , Invoice/E-Invoice shall be raised by the supplier/contractor in the name of EIL and consignee shall be EIL.
2. In case of package MR's (where title transfer or take over is envisaged to take place at site after completion of site work) and tenders, supplier/contractor shall bring material at project site in their own name and they themselves shall be consignee. As per provisions of contract between EIL and supplier/contractor, Invoice/E-Invoice shall be raised by supplier/contractor to EIL after charging GST.

**D. APPLICABILITY OF TAX CREDIT**

This shall be based on prevalent GST law and upon the percentage of GST input credit available to EIL on case to case basis.

**E. EVALUATION METHODOLOGY W.R.T. TAXES**

Following shall be loaded for evaluation:

1. Applicable Custom Duty, Social Welfare Surcharge etc, (excluding IGST & GST Compensation Cess (if applicable) on imported material which shall be dealt as per bid evaluation methodology given in E2 below) shall be loaded for price bid evaluation in respect of supplies for which bill of entry has to be filled by EIL.
2. GST on which input credit is not available to EIL including GST Compensation Cess (if applicable).
3. Applicable Income tax, in case foreign bidder quotes prices net of taxes.

**F. TAXATION TERMS FOR INDIAN SOURCED SUPPLIES (Applicable in case of foreign supplier)**

Shall be the same as applicable for Indian bidders.

**G. TAX IMPLICATION WHERE FABRICATION YARD IS OUTSIDE THE FACTORY PREMISES, WHEREVER APPLICABLE**

In case of package MRs and tenders, since contractors/suppliers shall bring material at project site in their own name and raise invoice to EIL (as per payment milestone achieved) after charging GST, location of fabrication yard whether inside or outside factory premises will not attract any additional liability.

**H. TAX IMPLICATION WHERE EIL WILL ISSUE FREE ISSUE MATERIAL (FIM) TO CONTRACTORS/SUPPLIERS**

Where EIL issues FIM's to suppliers/contractors, material will be released against delivery challan and such FIM shall be received back in factory premises as per provision of GST.

**I. STATUTORY VARIATION (IN CASE OF MRS & TENDERS)**

No variation on account of taxes and duties, statutory or otherwise, shall be payable to Supplier/Contractor except for the following:

1. GST: If after the due date of submission of price bid and upto the contractual delivery/completion period (\*Note 4), any increase/decrease occurs in the applicable rate of GST, the variation in such GST shall be to EIL's account and shall be adjusted (increase / decrease) to / from the

Supplier's/Contractor's invoices based on the documentary evidence.

Any increase in GST after the contractual delivery/completion period (\*Note 4) shall be to Supplier's/Contractor's account. However, any decrease in the rate of GST shall be passed on to EIL.

For calculating Statutory Variations ceiling amount as declared by the Bidder in price schedule shall only be considered.

2. Basic Custom Duty (BCD) & Social Welfare Surcharge (SWS): If after the due date of submission of price bid and upto the XX (\*Note-3) of contractual delivery/completion period (\*Note 4), any increase/decrease occurs in the applicable rate of BCD & SWS on materials imported, the variation in such BCD & SWS shall be to EIL's account and shall be adjusted (increase/decrease) to/from the Supplier's/Contractor's invoices based on the documentary evidence.

Any increase in rate of BCD & SWS on materials imported after the XX (\*Note-3) of the contractual delivery/completion period (\*Note 4) shall be to Supplier's/Contractor's account. However, any decrease in the rate of BCD & SWS on materials imported shall be passed on to EIL.

For calculating Statutory Variations in BCD/SWS, ceiling amount of CIF Value and rate of custom duty as declared by the Bidder in relevant price schedule shall only be considered.

Note: Indian supplier/contractor to consider input tax credit of IGST and GST Compensation Cess if any (in case of import of raw Materials / components) in their quoted prices. Hence, Statutory variations on same in case of imported materials from outside India in Supplier's/Contractor's name (i.e., for Indian Bidders) shall be to Supplier/Contractor account.

3. Any new output taxes, duties, cess, levies notified or imposed after the due date of submission of price bid but upto the contractual date of delivery/completion (\*Note 4) shall be to EIL's account. These shall be reimbursed against documentary evidence. However, in case of delay attributable to supplier/contractor, any new output taxes, duties, cess, levies notified or imposed after Time for Completion, defined as above, shall be to supplier's/Contractor's account.

## J. TAX INDEMNITY

Any omission/ errors of interpretation of applicability of taxes, duties, cesses and levies, whatsoever named, howsoever named, as are payable to any government, local or statutory authority in India or in any country other than India by the supplier/contractor shall be to supplier's/contractor's account.

---

If any fine/penalty/any other levy is required to be met by the EIL arising out of any non-compliance/fault/fraud/willful suppression/misstatement of facts/information/documents, whatsoever, of any applicable laws of India or any country other than India by the supplier/contractor/their personnel/sub-contractors/agencies, the same shall be recovered from any amount payable to the supplier/contractor under this contract or under any other contract of the EIL.

If any tax is paid / required to be paid by supplier/contractor in pursuance of any demand of any law enforcement agency/Tax Authority on account of non-compliance/fault/fraud/willful suppression/misstatement of facts/information/documents, whatsoever, of any applicable laws of India or any country other than India by the supplier/contractor/their personnel/sub-contractors/agencies, the same shall be to supplier's/contractor's account only.

GENERAL:

1. \*Note-1: Not applicable being Indigenous enquiry
2. \*Note-2: Applicable INCOTERM is defined in ITB
3. \*Note-3: Time Period as defined in SPC cl. no. 9.3
4. \*Note-4 Contractual delivery/completion period shall include extended contractual delivery/completion period for the reasons attributable to EIL or due to Force Majeure condition.-----



# ENGINEERS INDIA LIMITED

## GENERAL PURCHASE CONDITIONS (INDIGENOUS)

**INDEX**

|      |  |           |
|------|--|-----------|
| 1.0  | DEFINITIONS .....  | 3         |
| 2.0  | REFERENCE FOR DOCUMENTATION .....  | 3         |
| 3.0  | CONFIRMATION OF ORDER .....  | 3         |
| 4.0  | SALES CONDITIONS .....   | 3         |
| 5.0  | COMPLETE AGREEMENT .....   | 4         |
| 6.0  | INSPECTION-CHECKING-TESTING.....   | 4         |
| 7.0  | OFFICIAL INSTITUTIONAL TESTING .....   | 4         |
| 8.0  | TRANSIT RISK INSURANCE .....   | 5         |
| 9.0  | DELIVERY DATES.....  | 5         |
| 10.0 | DELAYED DELIVERY .....   | 5         |
| 11.0 | DELAYS DUE TO FORCE MAJEURE.....   | 5         |
| 12.0 | REJECTION, REMOVAL OF REJECTED GOODS AND REPLACEMENT .....                             | 6         |
| 13.0 | TRANSFER OF PROPERTY FROM THE SELLER TO THE PURCHASER .....                            | 7         |
| 14.0 | PRICE .....  | 7         |
| 15.0 | TERMS OF PAYMENT.....  | 7         |
| 16.0 | RECOVERY OF SUMS DUE.....  | 7         |
| 17.0 | CHANGES .....  | 8         |
| 18.0 | CANCELLATION.....  | 8         |
| 19.0 | PATENTS AND ROYALTIES .....  | 8         |
| 20.0 | CONTROL REGULATIONS .....  | 9         |
| 21.0 | CONTRACT CUM PERFORMANCE BANK GUARANTEE (CPBG).....                                    | 9         |
| 22.0 | GUARANTEE.....   | 9         |
| 23.0 | NON-WAIVER.....  | 10        |
| 24.0 | NON ASSIGNMENT.....  | 10        |
| 25.0 | SELLER'S DRAWING AND DATA REQUIREMENT .....  | 10        |
| 26.0 | TECHNICAL INFORMATION .....  | 10        |
| 27.0 | PROGRESS SCHEDULE & EXPEDITING .....   | 11        |
| 28.0 | SELLER'S LIABILITIES.....  | 11        |
| 29.0 | PURCHASER'S MATERIAL.....  | 12        |
| 30.0 | HEADINGS .....   | 12        |
| 31.0 | ARBITRATION .....  | 12        |
| 32.0 | JURISDICTION .....   | 12        |
| 33.0 | LIMITATION TO LIABILITY .....  | 12        |
| 34.0 | SETTLEMENT OF DISPUTE BETWEEN GOVERNMENT DEPARTMENT/ PUBLIC SECTOR<br>UNDERTAKING..... | 13        |
|      | <b><u>ANNEXURE – I TO GPC (LIST OF BULK ITEMS)</u></b> .....                           | <b>14</b> |

## 1.0 DEFINITIONS

- 1.1 The following expressions used in these General Purchase Conditions (GPC) and the Purchase shall have the meaning indicated against each of these:

The **PURCHASER / OWNER** means Engineers India Limited, a company incorporated in India having its registered office at Engineers India Bhawan, 1, Bhikaiji Cama Place, RK Puram, New Delhi-110066 and shall include its successors and assignees.

**“GOODS/MATERIALS”**: Goods and/or materials shall mean any of the Articles, Materials, Machinery, Equipment, Supplies, Drawings, Data and other property and all services including but not limited to design, delivery, installation, inspection, testing and commissioning specified to complete the order.

**“SELLER”**: Seller shall mean the Person, Firm or Corporation to whom the Fax of Acceptance / Purchase Order is issued.

**“Purchase Order”**: Purchase Order shall mean the Order placed on the Seller for supply of material/services and shall include the general conditions, bidding conditions, specific conditions, material requisition/Purchase requisition, drawings, Price schedule and subsequent amendments mutually agreed upon. It may also be referred as **order** or **contract**.

**Contractual Delivery Date”**: Contractual Delivery Date is the date on which goods shall be delivered F.O.T dispatching point/destination in accordance with the terms of the Purchase Order. The contractual delivery date/period is inclusive of all the lead time for engineering, procurement of raw materials, manufacturing, inspection, testing packing and any other activities whatsoever required to be accomplished for effecting the delivery at the agreed delivery point.

**“Procurement co-coordinators / Managers”**: Purchaser’s authorized representative appointed as procurement coordinators / manager.

**“INSPECTORS”**: Inspectors deputed / authorized by Purchaser including Third Party Inspection Agency.

**CLIENT**: Client means Project Owner.

## 2.0 REFERENCE FOR DOCUMENTATION

- 2.1 Purchase Order / Purchase Requisition number must appear on order confirmation, correspondence, drawings, and invoices, shipping notes, packing and / or any documents or paper connected with the Order.

## 3.0 CONFIRMATION OF ORDER

- 3.1 The Seller shall acknowledge the receipt of the Fax of Acceptance (FOA) / Purchase Order (PO) within seven days following the date of the FOA / Purchase Order and shall thereby confirm his acceptance of the FOA / Purchase Order without any exceptions. This acknowledgment will bear on both FOA / Purchase Order and General Purchase Conditions.

## 4.0 SALES CONDITIONS

- 4.1 With Seller’s acceptance of provision of the Purchase Order, he waives and considers as

cancelled any of his general sales conditions.

## 5.0 COMPLETE AGREEMENT

5.1 The terms and conditions of the Purchase Order shall constitute the entire Agreement between the parties hereto. Changes will be binding only if the amendments are made in writing and signed by an authorized representative of the Purchaser.

## 6.0 INSPECTION-CHECKING-TESTING

6.1 The equipment, materials and workmanship covered by the Purchase Order are subject to inspection and testing at any time prior to shipment and/or despatch and to final inspection within a reasonable time after arrival at the place of delivery. Inspectors shall have the right to carry out the inspection and testing which will include the raw materials at manufacturer's shop, at fabricator's shop and at the time of actual despatch before and after completion of packing.

6.2 All tests, mechanical and others as specified in the Purchase Requisition and particularly those required by codes will be performed at Seller's expenses and in accordance with Inspector's instructions. The Seller will also bear the expenses concerning preparation and rendering of tests required by Boiler Inspectorate or such other statutory testing agencies or by Lloyds Register of Shipping and Industrial Services as may be required.

6.3 The salaries and fees of Inspectors and their travelling, lodging and boarding expenses will not be borne by the Seller unless inspection becomes anfractuous due to any omission or commission on the part of the Seller. Before shipping or despatch, the equipment and/or materials will have to be checked and stamped by Inspectors who are authorized also to forbid the use and despatch of any equipment and/or materials which during tests and inspection fail to comply with the specification, codes and testing requirements.

6.4 The Seller shall:

- a) Inform Procurement Coordinator/Managers at least eight days in advance of the exact place, date and time of rendering the equipment or materials for required inspection.
- b) Provide free access as required to Inspectors during normal and / or extended working hours to Seller's or his/its sub-Supplier's works and place at their disposal all useful means of performing, checking, marking, testing, inspection and final stamping.

6.5 Even if the Inspections and tests are fully carried out, Seller would not be absolved to any degree from his responsibilities to ensure that all equipment and material supplied comply strictly with requirements as per agreement both during manufacturing, at the time of delivery, inspection, on arrival at site and after its erection or start-up and guarantee period as stipulated in Clause 22 (GUARANTEE).

6.6 The Seller's responsibility will not be lessened to any degree due to any comments made by Procurement Coordinators/Managers and Inspectors on the Seller's drawings or specifications or by inspectors witnessing any chemical or physical tests. In any case, the equipment must be in strict accordance with the Purchase Order and/or its attachments failing which the Purchaser shall have the right to reject the goods and hold the Seller liable for non-performance of contract.

## 7.0 OFFICIAL INSTITUTIONAL TESTING

7.1 In addition to testing and inspection by Inspectors mentioned above, Lloyds register Industrial services or similar institutional agencies like Boiler-Inspectorate may be

assigned for official testing of all coded equipment. The Seller shall ensure that all Procedures for preparation and Performance of test prescribed by such institution shall be complied scrupulously.

- 7.2 The Seller is required to send to such institutions as may be designed by the Purchaser at least three sets of fabricated / manufactured drawings for each equipment and calculations. All manufacturer's mill test certificates and analytical reports from material laboratories in respect of all raw material and components employed shall have to be presented to such Institution's Inspectors in the number of copies required. Seller shall be responsible for any delay in submission of necessary certificates. The Seller shall maintain close liaison with procurement co-ordinators and Institution's Inspectors to maintain Schedule and delay, if any, in this process will not be taken into consideration as a cause of Force Majeure.

#### 8.0 TRANSIT RISK INSURANCE

- 8.1 The Purchaser against its/ Client's Open General Policy (The name of the Insurance Co. will be conveyed subsequently) shall cover transit Risk Insurance. The Seller shall advise the dispatch particulars to the Insurance Company under advice to the Procurement Coordinators / Managers before shipment.

#### 9.0 DELIVERY DATES

- 9.1 Time of delivery as mentioned in the Purchase Order shall be the essence of the agreement and no variation shall be permitted except with prior authorization in writing from the Purchaser. Goods should be delivered securely packed and in good order and condition at the place and within the time specified in the Purchase Order for their delivery. The Purchaser reserves the right to defer the period of delivery in writing.

#### 10.0 DELAYED DELIVERY

- 10.1 The time and date of delivery of materials/ equipment as stipulated in the Purchase Order shall be deemed to be the essence of the agreement. For any delay in delivery of equipment / materials or part thereof beyond the delivery date stipulated, the Purchaser may:

a) **FOR BULK ITEMS:** Accept delayed delivery at prices reduced by a sum equivalent to one half of one percent (1/2%) of the total value of delayed item/quantity for every week of delay or part thereof, limited to a maximum of five percent (5%) of the total order value.

b) **FOR ITEMS OTHER THAN BULK ITEMS(WITH OR WITHOUT SITE WORK):** Accept delayed delivery at prices reduced by a sum equivalent to one half of one percent (1/2%) of the total order value for every week of delay or part thereof, limited to a maximum of five percent (5%) of the total order value.

- 10.2 The invoice shall be raised after equivalent reduction in the Invoice value before presenting to Purchaser/ Bank for payment. The acceptance of delayed delivery is without prejudice to Purchaser's right of cancelling the purchase order wholly or in part for any delay exceeding the period of maximum price reduction and the Seller shall be liable for all consequences thereof.

#### 11.0 DELAYS DUE TO FORCE MAJEURE

- 11.1 In the event of causes of Force Majeure occurring within the agreed delivery terms, the

delivery dates can be extended by the Purchaser on receipt of application from the Seller without imposition of price reduction. Only the following shall be considered as force majeure:

- a) Act of terrorism;
  - b) Riot, war, invasion, act of foreign enemies, hostilities (whether war be declared or not), civil war, rebellion, revolution, insurrection of military or usurped power;
  - c) Ionizing, radiation or contamination, radio activity from any nuclear fuel or from any nuclear waste from the combustion of nuclear fuel, radioactive toxic explosive or other hazardous properties of any explosive assembly or nuclear component;
  - d) Epidemics, earthquakes, flood, fire, hurricanes, typhoons or other physical natural disaster, but excluding weather conditions regardless of severity; and
  - e) Freight embargoes, strikes at national or state-wide level or industrial disputes at a national or state-wide level in any country where Works are performed, and which affect an essential portion of the Works but excluding any industrial dispute which is specific to the performance of the Purchase Order.
- 11.2 For the avoidance of doubt, inclement weather, third party breach, delay in supply of materials (other than due to a nationwide transporters' strike) or commercial hardship shall not constitute a Force Majeure event.
- 11.3 The Seller must advise the Purchaser by a registered letter duly certified by a statutory authorities, the beginning and the end of the delay immediately, but in no case later than 10 days of the beginning and end of each cause of Force Majeure condition as defined above.
- 11.4 The extension of time shall be the sole remedy of the Seller for any delay under this clause and the Seller shall not be entitled in addition to or in lieu of such extension to claim any damages or compensation on any account whatsoever whether under the law governing contracts or any other law in force, and the Seller hereby waives and disclaims any and all contrary rights.
- 11.5 In case force majeure conditions persists for period exceeding 02 (Two) Months, the Purchaser reserves the right to cancel the Purchase order or part of it.
- 12.0 REJECTION, REMOVAL OF REJECTED GOODS AND REPLACEMENT**
- 12.1 In case the testing and inspection at any stage by Inspectors reveal that the equipment, material and workmanship do not comply with the specification and requirements, the Seller at his/its own expense and risk shall remove the same within the time allowed by the Purchaser. The Purchaser shall be at liberty to dispose of such rejected goods in such a manner, as he may think appropriate. In the event the Seller fails to remove the rejected goods within the period as aforesaid, all expenses incurred by the Purchaser for such disposal shall be to the account of the Seller. The freight paid by the Purchaser, if any, on the inward journey of the rejected materials shall be reimbursed by the Seller to the Purchaser before the rejected materials are removed by the Seller.
- 12.2 The Seller shall have to proceed with the replacement of that equipment or part of the equipment at Purchaser's stores / site, if so required by the Purchaser, without claiming any extra payment. The time taken for replacement in such event will not be added to the contractual delivery period.
- 12.3 Any rejection, removal of rejected goods/material and replacement shall be applicable

only up to guarantee period or extended guarantee period as applicable.

### 13.0 TRANSFER OF PROPERTY FROM THE SELLER TO THE PURCHASER

13.1 The transfer of property shall be deemed to have taken place as follows subject to the provisions herein contained:

- a) F.O.T. despatch point: On handing over the equipment to the carrier against receipt and such receipt having been passed over to the Purchaser.
- b) F.O.T. Project Site: on receipt of material at Project site.
- c) Equipment sent freight/ carriage paid to the Refinery site: On receipt of goods at site.
- d) Equipment erected by the Seller: on acceptance at job site.
- e) Equipment commissioned by the Seller: On taking over by the Purchaser for regular operation after test run at maximum capacity for specified period satisfactorily performed.

However, where the sale to or purchase by the Seller is deemed to take place in the course of inter-state trade or commerce or by endorsement/transfer of Railway receipt or Truck/Lorry or any receipt during transit, the sale to the OWNER of the same material shall similarly be deemed to take place by endorsement/transfer during transit in the course of inter-state trade or commerce in respect of which the OWNER will furnish the Seller/Supplier, wherever applicable, Form "C" to qualify to concessional rate of tax.

### 14.0 PRICE

14.1 Unless otherwise agreed to in the terms of the Purchase Order, the price shall be:

- a) Firm and not subject to escalation for any reasons whatsoever till the execution of entire order even though it might be necessary for the order execution to take longer than the delivery period specified in the order.
- b) Inclusive of adequate road worthy packing and forwarding charges upto effecting delivery at F.O.T. despatch point in all cases whenever F.O.T destination delivery terms are agreed to but exclusive of transit insurance.

14.2 Exclusive of Central/State Sales Tax, Excise Duty and or such imposts which are leviable by law on sales of finished goods to Purchaser and/or Octroi duty, if any, leviable at destination/ project site. The nature and extent of such levies shall be shown separately.

### 15.0 TERMS OF PAYMENT

15.1 Payment terms shall be as specified in the Enquiry / Purchase Order.

### 16.0 RECOVERY OF SUMS DUE

16.1 Whenever any claim against the Seller for payment of sum of money arises out of or under the contract, the Purchaser shall be entitled to recover such sums from any sum then due or which at any time thereafter may become due from the Seller under this or any other contract with the Purchaser including right to en-cash the PBG. In the event of encashment of PBG, the same shall be re-stored to its original amount by the Seller and should this sum be not sufficient to cover the recoverable amount, the Seller shall pay to the Purchaser on demand the balance remaining due.

## 17.0 CHANGES

- 17.1 The Purchaser has the option at any time to make changes in quantities ordered or in specifications and drawings. If such changes cause an increase or decrease in the price or in the time required for supply, a claim under this provision must be raised by Seller with documentary evidence/back-up documents/calculations within 7 days from the date the intimation for change is received from Purchaser. Seller shall execute the change only after receipt of change order.

## 18.0 CANCELLATION

### 18.1 CANCELLATION FOR DEFAULT

- 18.1.1 The Purchaser reserves the right to cancel the Purchase Order or any part thereof and shall be entitled to rescind the Purchase Order wholly or in part by a written notice of 10 days to the Seller if:

- a) The Seller fails to comply with the terms of the Purchase Order.
- b) The Seller fails to adhere to delivery schedule of manufacturing and fails to deliver the goods on time and/or replace the rejected goods promptly.
- c) The Seller becomes bankrupt or goes into liquidation.
- d) The Seller makes a general assignment for the benefit of creditors.
- e) A receiver is appointed for any of the property owned by the Seller.

- 18.1.2 Upon receipt of the said cancellation notice, the Seller shall discontinue all work on the Purchase Order and matters connected with it.

- 18.1.3 The Purchaser in that event will be entitled to procure the material in the open market and recover excess payment over the Seller's agreed price, if any, from the Seller reserving to itself the right to forfeit the /Contract Performance Bank Guarantee (CPBG), if any.

### 18.2 CANCELLATION FOR CONVENIENCE

- 18.2.1 The PURCHASER may, by written notice of 10 days sent to the SELLER, Cancel the CONTRACT, in whole or part, at any time for his convenience. The notice of cancellation shall specify that cancellation is for the PURCHASER's convenience, the extent to which performance of work under the CONTRACT is cancelled and the date upon which such cancellation becomes effective.

- 18.2.2 The GOODS that are complete and ready for shipment within 30 days after the SELLER's receipt of notice of cancellation shall be purchased by the PURCHASER at the CONTRACT terms and prices. For the remaining GOODS, the PURCHASER may opt:

- a) to have any portion completed and delivered at the CONTRACT terms and prices, and /or
- b) to cancel the remainder and pay to the SELLER an agreed amount for partially completed GOODS and for materials and parts previously procured by the SELLER.

## 19.0 PATENTS AND ROYALTIES

- 19.1 On acceptance of this order, the Seller will be deemed to have entirely indemnified the Purchaser and Procurement Coordinators/Managers from any legal action or claims

regarding compensation for breach of patent rights which the Seller deems necessary to apply for manufacturing the ordered equipment and/or materials or which can in any way be connected in the manufacture.

## 20.0 CONTROL REGULATIONS

20.1 The supply, despatch and delivery of goods shall be arranged by the Seller in strict conformity with the statutory regulations including provision of Industries (Development and Regulation) Act, 1951 and any amendment thereof as applicable from time to time. The Purchaser disowns any responsibility for any irregularity or contravention of any of the statutory regulations in manufacture or supply of his stores covered by this order.

## 21.0 CONTRACT CUM PERFORMANCE BANK GUARANTEE (CPBG)

21.1 Within 30 days from the date of issue of Purchase order, the Seller shall furnish Contracts cum performance guarantee in the form of Bank Guarantee as per the purchaser's proforma for an amount equivalent to 10% of the order value. This shall be 5% in case of bulk items (as listed in Annexure 1 to GPC).

21.2 The proceeds of the CPBG shall be appropriated by the Purchaser as compensation for any loss resulting from the Seller's failure to complete his obligations under the Contract without prejudice to any of the rights or remedies the PURCHASER may be entitled to as per terms and conditions of CONTRACT.

21.3 This CPBG shall also govern the successful performance of Goods and Services during the entire period of Contractual Warrantee/Guarantee.

21.4 The CPBG shall be denominated in the currency of the CONTRACT.

21.5 The Contracts cum Performance Guarantee shall be valid for the duration of 2 months beyond the expiry of Warrantee/Guarantee period. The Bank Guarantee will be discharged by PURCHASER not later than 2 months from the date of expiration of the Seller's entire obligations, including any warrantee obligations, under the CONTRACT.

21.6 In case of Reinforcement Bar, Structural steel, CPBG will be required for 5% of order value having validity up to Contractual delivery period + 2 months claim period.

21.7 In case of limited enquiries, CPBG shall not be required for orders up to Rs. Twenty Five (25) Lakhs in case of Pipes, Fittings, Flanges, Gaskets and Fasteners and for orders up to Rs. Ten (10) Lakhs for all other items. However, in case of NIT, CPBG shall be required for all orders irrespective of order value.

21.8 Bank Guarantee(s) shall be issued through Indian Nationalized Bank/ Indian Scheduled bank (other than Co-operative Banks) / Indian branches of foreign banks registered with Reserve Bank of India as a scheduled foreign bank.

21.9 It will be the responsibility of the Seller to keep the Bank Guarantee fully subscribed. Any shortfall in the value of the Bank Guarantee as a result of encashment by the Purchaser either in full or in part in terms of Seller's Performance shall be replenished by the Seller within two weeks thereof.

## 22.0 GUARANTEE

22.1 The Seller shall guarantee that any and all materials used in execution of the Purchase Order shall be in strict compliance with characteristics, requirements and specifications and that the same shall be free from any defects. Checking of the Seller's drawings by the Purchaser/Purchaser's representatives and their approval and permission to ship or

despatch the equipment and materials granted by Inspectors shall not relieve the Seller from any part of his/its responsibilities of proper fulfilment of the requirements.

- 22.2 The Seller will guarantee that all materials and equipments shall be repaired or replaced as the case may be, at his own expense, in case the same have been found to be defective in respect of material, workmanship or smooth and rated operation within a period 15 months after the equipment/ material have been put in service or 30 months from the date of shipment, whichever is earlier. Repaired or replaced equipment/ materials shall be similarly guaranteed by the SELLER for a period of fifteen (15) months from the date of replacement/ repair subject to a maximum of 30 months from the date, the main equipment/ material have been put in service. All expenses for such replacement/ repair of equipment/ material shall be to the account of the Seller including freight, if any.
- 22.3 Acceptance by the Purchaser or its Inspectors of any equipment and materials or its replacement will not relieve the Seller of its responsibility of supplying the equipment/materials strictly according to the specification and according to the guarantees agreed by the Seller.

### 23.0 NON-WAIVER

- 23.1 Failure of the Purchaser / Procurement Coordinators/ Managers to insist upon any of the terms or conditions incorporated in the Purchase Order or failure or delay to exercise any rights or remedies herein or by law or failure to properly notify Seller in the event of breach, or the acceptance of or payment of any goods hereunder or approval of design shall not release the Seller and shall not be deemed a waiver of any right of the Purchaser / Procurement Coordinators/Managers to insist upon the strict performance thereof or any of his or their rights or remedies as to any such goods regardless of when goods are shipped received or accepted nor shall any purported oral modification or revisions of the order by Purchaser/ Procurement Coordinators/Managers act as waiver of the terms hereof.

### 24.0 NON ASSIGNMENT

- 24.1 The Seller without obtaining prior written consent of the Purchaser shall not assign the Purchase Order to any other agency.

### 25.0 SELLER'S DRAWING AND DATA REQUIREMENT

- 25.1 The Seller shall submit drawings, data and documentation in accordance with but not limited to what is specified in the requisition and/or in the Seller drawings and data form attached to the Purchase Requisition and as called for in Clause 26 (PROGRESS SCHEDULE & EXPEDITING). Types, quantities and time limits of submitting this must be respected in its entirety failing which the Purchase Order shall not be deemed to have been executed for all purposes including settlement of payment since the said submission is an integral part of Purchase Order execution.

### 26.0 TECHNICAL INFORMATION

- 26.1 Drawings, specifications and details shall be the property of the Purchaser and shall be returned by the Seller on demand. The Seller shall not make use of drawings and specifications for any purpose at any time save and except for the purpose of the Purchaser.
- 26.2 The Seller shall not disclose the technical information furnished to or gained by the Seller

under or by virtue of or as a result of the implementation of the Purchase Order to any person, firm or body or Corporate authority and shall make all endeavors to ensure that the technical information is kept CONFIDENTIAL. The technical information imparted and supplied to the Seller by the Purchaser shall at all times remain the absolute property of the Purchaser.

#### 27.0 PROGRESS SCHEDULE & EXPEDITING

- 27.1 Template for progress reporting is available on EIL eDMS portal. SELLER within 2 weeks of award shall submit to PURCHASER, his Delivery schedule regarding the documentation, manufacture, testing, supply, erection and commissioning of the GOODS.
- 27.2 For items other than bulk, the Delivery schedule will be in the form of a network or a bar chart clearly indicating all main or key events regarding documentation, supply of raw materials, manufacturing, testing, delivery, erection and commissioning.
- 27.3 SELLER shall update the template online on monthly basis to keep PURCHASER updated on the progress of the execution of Order and achievement of targets set out in time bar chart.
- 27.4 The Procurement Co-coordinator/ Managers shall have the right to inspect SELLER's premises with a view to evaluating the actual progress of work on the basis of SELLER's Delivery schedule.
- 27.5 The Procurement Co-coordinator/ Managers shall have free access to Seller's shop and/or sub-Supplier's shop at any time and they shall be provided all the necessary assistance and information to help them perform their job.
- 27.6 Irrespective of such inspection, in case of any delay, Purchaser cannot be held responsible. However, if delay is expected, at the earliest possible date, SELLER shall advise Purchaser, of anticipated delay in the progress.
- 27.7 Notwithstanding the above, in case progress on the execution of order at various stages is not as per phased Delivery schedule and is not satisfactory in the opinion of the PURCHASER which shall be conclusive or SELLER shall neglect to execute the order with due diligence and expedition or shall contravene the provisions of the order, PURCHASER shall be entitled to take action in accordance with the provisions of the Order.

#### 28.0 SELLER'S LIABILITIES

- 28.1 The Seller's workmen or employees shall under no circumstances be deemed to be in Purchaser's employment and the Seller shall hold himself responsible for any claims which they or their heirs, dependents or personal representatives may have or make for damages or compensation for anything done or committed to be done in the course of carrying out of the work covered by this Purchase Order, whether arising on Purchaser's premises or elsewhere and agrees to Indemnify the Purchaser against any such claim or claims if made against the Purchaser and all cost (as between attorney and client) of proceedings, suits or action which the Purchaser may incur or sustain in respect of the same. The Seller shall also procure and keep in force at his own cost comprehensive automobile Liability insurance for adequate coverage in respect of all his vehicle/s visiting or plying in project premises. The Seller shall also be responsible for compliance of existing laws in respect of their workmen and employees.

**29.0 PURCHASER'S MATERIAL**

- 29.1 Purchaser's materials shall be delivered to the Seller after the Seller submits the Bank Guarantee for Indemnifying the full value thereof strictly in the manner and as per Performa of Bank Guarantee approved by the Purchaser.
- 29.2 Wherever possible, the material shall be consigned to goods depot to be specifically confirmed by Seller. The Seller at his responsibility and cost shall arrange Loading/Unloading and any handling from the destination.
- 29.3 The Seller shall give a firm and binding list of Purchasers issue of materials which shall be duly reviewed & approved by EIL and the desired schedule of its delivery to shop floor strictly in accordance with the sequence of fabrication vis-a-vis the contractual delivery period.
- 29.4 Unused materials or scrap from material supplied by the Purchaser to the Seller shall be returned by the Seller to the Purchaser or if the Purchaser so directs the Seller may dispose of the same by sale or otherwise on such terms and conditions as the Purchaser may stipulate and the Seller shall pay to the Purchaser the sale proceeds of the material so disposed off by sale deducting there from expenses incurred by the Seller on such sale, the quantum of such deduction to be mutually agreed upon in advance between the Purchaser and the Seller.

**30.0 HEADINGS**

- 30.1 The headings of the conditions hereof shall not affect construction thereof.

**31.0 ARBITRATION**

- 31.1 Any dispute or difference between the parties hereof arising out of any notified claim of the SELLER included in his final bill and /or arising out of any amount claimed by the OWNER (whether or not the amount claimed by the OWNER or any part thereof shall have been deducted from the Final bill of the supplier or any amount paid by the OWNER to the SELLER in respect of the work) shall be referred to arbitration in accordance with the UNCITRAL Rules as adopted in India by the Arbitration & Conciliation Act, 1996.
- 31.2 The venue of the arbitration shall be New Delhi.
- 31.3 Notwithstanding the existence of any dispute or arbitration in terms hereof or otherwise, the Seller shall continue and be bound to continue and perform the works to completion in all respects according to the
- 31.4 Contract (unless the Contract or works be determined by the Owner or by the Seller under the provisions of the Contract), and the Seller shall remain liable and bound in all respects under the Contract.

**32.0 JURISDICTION**

- 32.1 The Seller hereby agrees that the Court situated at New Delhi alone shall have the jurisdiction to hear and determine all action and proceedings arising out of this contract.

**33.0 LIMITATION TO LIABILITY**

- 33.1 Notwithstanding anything contrary contained herein, the aggregate total liability of Seller, excluding his liability towards infringement of patent, trade mark or industrial design rights, breach of Confidentiality, Anti-Bribery, Corruption and Conflicts of Interest, under the contract or otherwise shall be limited to 100% of value of Purchase order. However,

neither party shall be liable to the other party for any indirect and consequential damages, loss of profits or loss of production.

**34.0 SETTLEMENT OF DISPUTE BETWEEN GOVERNMENT DEPARTMENT/ PUBLIC SECTOR UNDERTAKING**

- 34.1 In the event of any dispute or difference relating to the interpretation and application of the provisions of the contracts, 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 a further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs, Ministry of Law & Justice, Government of India. Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary/Additional Secretary, when so authorized by the Law Secretary, whose decision shall bind the Parties finally and conclusively. The Parties to the dispute will share equally the cost of arbitration as intimated by the Arbitrator.

## ANNEXURE- I TO GPC (LIST OF BULK ITEMS)

## **LIST OF BULK ITEMS**

### **A. PIPING**

1. Pipes
2. Fittings
3. Flanges (all kinds / types)
4. Gaskets
5. Bolts/Nuts
6. Strainers
7. Spring Hangers
8. Sample Cooler
9. Gate, Globe, Check Valves (Std Valves)
10. Steam Traps
11. SS/CR Manifold
12. Piston Valve (Steam Tracing)
13. Ball/Plug/Needle/Butterfly valves (Except high performance butterfly valve)
14. Static mixers
15. High Performance Butterfly Valves
16. Motor Operated Valves; Gate, Ball, Butterfly, Plug Vales
17. Hose Pipe
18. O-Lets
19. Dual Plate Check Valves
20. Cryo-LTCS: Gate, Globe, Check, Ball Valves
21. Diaphragm Valves
22. Sight Glass

### **B. PIPELINE ENGINEERING**

1. Assorted Pipes
2. Flanges
3. Fittings
4. Hose & Hose Coupling

### **C. ELECTRICAL**

1. LT Cable
2. FLP Lighting Fixtures and Control Gears
3. Communication Cables
4. Junction Box

### **D. INSTRUMENTATION**

1. Pressure Gauges
2. Draft Pressure Gauges

3. Differential Pressure Gauges
4. Orifices Plates and Flanges
5. RTD, Temperature Gauges & Thermo-wells (Bimetallic, Filled System)
6. Temperature Elements & Thermo-wells
7. Copper Tubes (Bare, Coated)
8. SS Tubes
9. Instrument Tubing
10. Instrument Valves and Manifolds
11. Junction Boxes and Cable Glands
12. Signal Cable
13. Thermocouple Extension Cables
14. Tank Level Inst. (Float Operated)
15. Gauge Glass Cocks
16. Tube Fittings (SS & Brass)
17. Magnetic Level Gauges
18. Optical Fiber Cables and associated items
19. Pressure Relief Valves (Thermal Relief)
20. Variable Area Flowmeter (Indicator)
21. Rupture disc
22. Solenoid Valves
23. Displacer Level Instrument

स्वदेशी सामग्रियों के लिए  
पैकिंग, मार्किंग, शिपिंग और दस्तावेज विनिर्देश

PACKING, MARKING, SHIPPING AND  
DOCUMENTATION  
SPECIFICATIONS FOR INDIGENOUS MATERIALS

| 2          | 20.04.2024 | ISSUED FOR COMPLIANCE | DDC         | DRC            | CGM & HOD<br>(Shipping) |
|------------|------------|-----------------------|-------------|----------------|-------------------------|
| 1          | 10-09-2018 | ISSUED FOR COMPLIANCE | DDC         | DRC            | ED (SCM)                |
| 0          | 05-12-2012 | ISSUED FOR COMPLIANCE | DDC         | DRC            | GM (I)                  |
| Rev.<br>No | Date       | Purpose               | Prepared by | Reviewed<br>by | Approved<br>by          |

**Abbreviations:**

|            |   |                               |
|------------|---|-------------------------------|
| CM         | - | Centimeters                   |
| EIL        | - | Engineers India Limited       |
| E-way bill | - | Electronic Way Bill           |
| Kg         | - | Kilograms                     |
| FTL        | - | Full Truck / Trailer Load     |
| KGS        | - | Kilograms                     |
| L.R.       | - | Lorry Receipt                 |
| GR.        | - | Goods Receipt                 |
| mm         | - | Millimetre                    |
| MT         | - | Metric Ton                    |
| NO. / NOS. | - | Number / Numbers              |
| P.O.       | - | Purchase Order                |
| RCM        | - | Resident Construction Manager |

**Document drafting Committee Members:**

Shri Ashish Mathur, Sr.Manager (SCM-Shipping)

*Ashish*  
18.4.24

Shri T.Ravi , Sr.Manager (SCM-Shipping)

*T.Ravi*  
18.4.24

Shri Kiran Suvarna, Manager (SCM-Shipping)

*Kiran Suvarna*  
22/4/24

**Document review Committee Members:**

Shri Krishna Kumar, Sr.Manager (SCM-(Inspection))

*K.Kumar*  
12/05/2024

Shri G.Suresh , C.G.M (SCM-Inspection)

*G.Suresh*  
12/6/24

Shri Chandra Shekhar, Sr.G.M (SCM-Inspection)

*Chandra Shekhar*  
12/6/24

## 1. GENERAL

### 1.1 Purpose

This specification details the minimum requirements for the preservation, packing, marking, shipping and documentation of Products, materials and equipment as specified in the respective Purchase Orders or Contracts. This specification forms an integral part of the Purchase Order or Contract issued. However, whenever specific instructions are detailed in the Purchase Order / Purchase Requisition and are in conflict with this specification, particular instructions mentioned in the individual Purchase Order /Purchase Requisition or Contract shall prevail over this general specification.

### 1.2 Requirements and Conditions

The following requirements are intended as minimum requirements, and compliance to these requirements in no way absolves or relieves Supplier of any responsibility or obligation outlined in the Purchase Order. Supplier shall ensure compliance to the preservation, packing, marking, shipping and documentation guidelines specified in this document.

In all circumstances, the packing will be designed and constructed in order to support materials during transportation as well as to prevent the materials from damage due to impact, extreme climatic conditions, sun and rain. It must be ensured that the materials and equipments are delivered to the job site by sea, road or air, in good condition.

The Supplier shall, at its own cost, ensure items to be transported are carefully packed and protected in accordance with best practice, having due regard to the climatic conditions encountered during the passage, method of carriage and handling / loading / unloading processes. In addition to any of the measures detailed within this Specification, the Supplier shall apply any other measures that, in its experience, are required to safeguard the particular item. The Supplier shall obtain the approval of EIL / Owner for any variation to the packing, marking and shipping requirements outlined in this Specification.

### 1.3 Responsibility and liability

Supplier shall be held responsible for any damages and / or losses of all and any kind that may occur by not respecting these specifications. Owner / EIL reserves the right to reject any packing when the packing does not conform to these specifications / instructions and / or when the packing does not ensure perfect protection of the goods and materials. Supplier is responsible for the weights and dimensions declared and the marking of the packages. Supplier will be held responsible in the event goods and materials becoming useless, broken or damaged as a result of poor packing and / or stowing or due to corrosion because of insufficient or inadequate protection. All direct and indirect costs resulting thereof will be back charged to Supplier.

## 2. CLEANING AND PRESERVATION

### 2.1 Cleaning

All equipment, materials and parts shall be thoroughly cleaned inside and outside and shall be free from grease, oil, weld spatter, rust and all other foreign matter prior to preservation.

## 2.2 Preservation

Articles may be exposed to severe environmental or climatic conditions, moisture and dust. All materials and equipment shall be packaged suitable to prevent damage and deterioration during transportation and storage. Where damage occurs due to inadequate packaging of items, the liability for costs associated with rectification of the damage will be to the Supplier's account. All metals subject to corrosion shall be treated with a corrosion preservative suitable for the purpose intended. Products susceptible to corrosion must be packaged in a dry non-corrosive environment for the duration of shipment and storage, for a minimum of 1 year or any other higher duration specified in the PO/PR. All bright and machined parts shall be coated with a recognized rust preventative suited to the particular application concerned. All internal parts of machinery shall be treated with lubricant containing rust and oxidation inhibitors to protect equipment from any possible damage. Such lubricants shall be compatible with those which will subsequently be used in service and shall be identified by appropriate tagging. Electrical equipment and instrumentation shall be packed with a suitable desiccant. Delicate equipment such as instruments, electrical switchboards and panels etc. shall be packed for protection to eliminate the effects of vibration.

Wherever necessary, desiccant packs shall be kept to avoid excessive moisture in the packing.

## 3. PACKING

### 3.1 General

The instructions herein shall be considered as general directives and minimal requirements, which are applicable to the packing of all equipment and materials. The Supplier is responsible for the correct and adequate packing of the equipment and materials so that these equipment and materials will arrive at destination undamaged and the packing itself in such a condition that it will be suitable for a minimum of 1 year storage or as specified otherwise.

### 3.2 Packaging Materials

All packaging together with packaging and protective materials shall be new, maintain its integrity and perform its intended function while being transported, handled and stored.

The quality of packing shall provide maximum protection against damage, breakage and pilferage during transport, storage and multiple handling, including handling by hoisting, lifting devices and / or forklift trucks. Material used for packaging, packing, wrapping, sealers, moisture resistant barriers and corrosion preservatives shall be of recognized brands and grades and shall conform to the best world standards.

Packaged Products showing any damage, defect or shortage resulting from improper & inadequate packaging, packaging materials or packing procedure or having concealed damage or being short at the time of unpacking shall be subject to rejection and be replaced at the Supplier's cost

### 3.3 Packing requirements

#### 3.3.1 Wooden Boxes and Crates

Interior support board shall be of strength to withstand multiple handling. Tops of crates shall be one piece wherever possible to avoid seepage through cracks; otherwise a top coating is required. Waterproof lining shall be used for sides, ends and top of crates, proper venting of cargo boxes containing machinery is required, as well as sufficient use



of desiccants. Crates shall be diagonally braced on all faces and suitable for hooks, slings and forklifts. Heavy items shall be secured with wood braces. Fragile items shall be cushioned. Material packed in large boxes shall be layered between plywood sheets to maintain load integrity during transit. Banding shall be used on all boxes to prevent distortion / deformation of the box.

### 3.3.2 Pallets

When equipment and/or materials are packed on pallets (wood or synthetic), these should be solid double deck pallets that provide adequate load support during transportation and storage (under not always ideal conditions). The pallets should have a dynamic load capacity, enough to carry the mass loaded on the pallet. Where feasible, the top surface of the pallet must be flat. The pallet design must enable safe handling by forklift, cranes etc. and storage on rough surface. Pallets shall be covered with wrapping. All corners, horizontal and vertical shall be protected with cardboard protection strips. The pallet must be tied on all sides with steel or synthetic straps.

### 3.4 Packaging

All equipment and materials shall be properly fixed (by bolts, clamps, supporting beams, etc.) in such a way that internal movements and / or loosening is impossible. Under the top cover (roof) depending on the case and crate length, sufficient number of strong beams shall be placed and properly fixed in order to allow stacking of the cases and crates avoiding any compression. Equipment parts and materials which may be subject to damage by vibration and /or shock must be protected using shock-absorbing material. All equipment and materials which may be damaged by moisture shall be packed in airtight bags in which sufficient desiccant material (e.g. silica gel) is placed. All openings on the equipment must be closed with wooden / metal or plastic covers to prevent damage to the openings and interiors. Fragile and loose parts easily damageable pertaining to the equipment must be securely and properly packed in a separate case.

### 3.5 Waterproofing

Cases including the cover shall be internally lined with a strong type of waterproof paper or plastic foil. Equipment and materials shall always be packed in a foil (polyethylene or aluminum) for extra (double) protection against rainfall. Those foils shall be applied in such a way that they are self draining.

### 3.6 Hazardous cargo

The hazardous materials shall be packed in accordance with and in cognizance to the applicable rules, regulations and tariff of all Governmental Authorities and other Governing bodies. Hazardous materials shall always be packed and documented separately from any other material. It shall be the responsibility of the seller of hazardous materials to designate the materials as hazardous and to identify each material by its proper commodity name and its hazardous materials class code. Safety and emergency procedures shall be displayed outside the package. Any certificates required for transportation or for statutory authorities as applicable, needs to be provided before shipment of the goods.

## 4. GUIDELINES FOR PACKING GOODS

In subsequent paragraphs details of different types of packing for different types of goods are defined. Supplier shall make packing details / procedure based on the applicable guidelines

Chemicals in powder form, catalysts, refractories & like materials etc. shall be packed in drums only.

#### 4.1 Pipe

All pipes 2" included and below shall be packed in crates.. Pipes over 2" up to 6", shall be bundled and banded in bundles of uniform length. Bundling is carried out with U-IRON or traversal planks, joined with threaded connecting rods with locknuts.. Bundle weight shall not exceed 2,000 kg. All pipes are to be capped and ends sealed with waterproof tape (tape is not necessary if end caps are of the pre-shrunk or self-sealing type). Pipes larger than 6" shall be shipped as single lengths with the ends capped. End caps are to be of the recessed type to enable the use of soft faced hooks, but still completely sealing the end and also protecting the weld. All stainless steel / non-ferrous piping must be packed separately in wooden crates. Any banding of bundles is to be with the same material. The bundling and packing of pipe and instrument tubing shall enable the safe discharge of pipe on site using clamps and forklifts. All pipes shall be supported along their lengths to prevent bending / flexing during transport. During loading / unloading slings shall be applied to the center of the load as well as on each end to prevent bowing.

Pipe and rigid conduit smaller than DN50 diameter shall be bundled in units not to exceed 1000 kg. Threaded and coupled pipe shall be equipped with plastic thread protectors. All material shall be segregated and shipped by generic material type to prevent cross contamination. Where wire rope or chains are used, adequate padding shall be used at points of contact with pipe. Care must be taken to prevent any chafing of pipes against each other or against the metal structures of the vehicle during transportation. Where necessary, such metal structures must be padded with planks or plastic tubes. Skids and dunnage must be used between the bundles in transit as well as in the storage of coated pipes.

#### 4.2 Pipe Fittings, Flanges, Valves and Gaskets

All pipe fittings, flanges and valves up to 6", are to be packed in cases / crates. For items over 6", these may be fixed securely to a pallet base and enclosed in a crate, for protection. All flange faces / bevel ends shall be suitably protected with plastic caps / end protectors. Where valves have actuators attached, rigidity must be ensured for the valve and actuator. The vulnerable parts of the actuator are to be completely protected within a wooden crate. Empty spaces shall be filled with expanded PU foam to restrict movement in the crate. All stainless steel fittings, flanges and valves of all sizes, must be packed separately in wooden crates. Any strapping is to be with the same material. Gaskets are considered fragile and shall be treated as such. Individual gasket sizes shall be boxed and labeled separately.

All threaded fittings and pipes should be greased and provided with plastic caps.

#### 4.3 Steel Structure and Plates

Structural steel sections and plates shall be strapped in bundles of convenient size and weight for handling. Rolled and shaped plates shall be provided with suitable bracing to eliminate distortion during transit, and shall be bundled in uniform lengths. Each bundle shall be marked with a metal tag, hard stamped, secured under steel wrapping.

#### 4.4 Itemized Equipment

Units or parts belonging to main equipment but separately packed shall be clearly marked for easy identification with the main equipment to which they relate.

All gasket face of flanges, machined working surfaces and threaded parts of all equipment shall be covered with rust preventive tape or by application of oil based alkyd primers or zinc bases epoxies or thin zinc silicate coatings specially formulated for the preservation of CS and Alloy Steels. All flanged connections of vessels shall be protected by metal plates correctly casketed by wooden plugs or plastic caps suitably secured in position.

Vessels shall, where possible, be packed on skid constructions and secured with adjustable steel straps. Manholes and other major openings shall be protected with cover flanges or metallic plates firmly secured. Smaller openings shall be closed with plastic plugs / caps.

All vessel internals and items not installed by Supplier at works including accessories such as small parts, bolts, nuts, gaskets, etc. shall be packed in wooden cases separately for each vessel or apparatus and marked with the same item number as the vessel / apparatus in order to protect all parts from loss or damage in transit. Internals, bolts and gaskets for service / testing operations shall be supplied with the vessels / items by Supplier and all internals shall be boxed separately and marked according to marking procedure. Each item shall be supplied correctly and identified for field installation by others.

All vessels / heat exchangers or items of such construction shall be dried, thoroughly cleaned inside and be free of all dirt and loose foreign materials. The equipment shall be filled with Nitrogen. Make up arrangement for loss of Nitrogen along with a pressure gauge shall be installed.

All commissioning spare parts shall be packed separately and marked with the relevant main item number.

Pumps, compressors, rotating equipment, turbines and motors will require specific packing and preservation as per the relevant Technical Specification. For skidded equipment openings, flange faces, threaded connections, wires, valve stems, and other component parts that may be subjected to mechanical damage or corrosion shall be adequately protected. This protection shall be applied to all components, both those removed and boxed and those remaining in place on the skid assembly. Each skid shall have one box strapped to it containing a complete set of drawings together with a manual covering installation and operating instructions and other pertinent instructions required for reassembly of components that were disassembled for shipment.

#### 4.5 Control Panels and Electrical Devices

Equipment such as control panels, instruments and electrical devices shall be packed in an interior moisture / vapor-proof barrier with silica gel or comparable desiccant. Desiccants shall be bagged to avoid dispersing in containers. The quantity of desiccant shall be calculated in accordance with the manufacturer's recommendations. Equipment must be secured to the case with bolts, blocks or straps. Adequate precautions (for example, shaft locks to prevent longitudinal / rotational movement of rotor shafts in motors) shall be included in the packaging of all equipment which has plain, ball or roller bearings so as to minimize the risk of bearing damage.

#### 4.6 Instruments

Instruments shall be thoroughly clean, dry and free from rust and individually wrapped using polythene sheets / U foam / Thermocol sheets depending upon the items and then packed in wooden boxes. The left out spaces and top of the boxes should be filled with rubberized coir to get proper cushioning effect. Special attention shall be paid for arresting movements of their operating mechanism during transportation. Silica gel or

desiccant (with recognized brands / grades) shall be strapped inside but shall not come into contact with the paintwork.

#### 4.7 Cables

All electric cables to be packed in new cable drums made of steel and painted with epoxy resin paint. Cable ends to be carefully protected before packing. Polythene sheet should be wrapped over the cables and sealed properly. Cable drum can be put in wooden crates for ease in handling and transportation.

#### 4.8 Saddles, Supports, Spiders and Lifting Equipment

All items which cannot be transported without independent supports must be supplied with Shipping saddles suitable for land and / or ocean transit. Such transport saddles are to be included within the scope of supply. Supplier is to advise of any requirement for lifting beams or other specialized lifting equipment and will include provision for use of such equipment for loading purposes. The Supplier is responsible for ensuring that all modules and oversize items are adequately braced and where required, plastic wrapped suitable for transport. Modules and oversize items shall be packaged to prevent damage during transport.

#### 4.9 Assortment Of Package / Spare Parts for Erection and Commissioning

Equipment and / or parts of different item numbers shall not be packed together in the same package. Small goods such as accessories, spare parts for erection and commissioning and special tools shall be packed separately in respective inner boxes with tags or labels attached there, being clearly indicating their contents. In case such accessories, spare parts and special tools are packed in separate boxes / crates, item no. of main equipment shall be clearly mentioned in Main Shipping Mark for easy identification.

### 5. MARKING

#### 5.1 General

The purpose of the marking is to identify the packages and detail the weight and dimensions to assure efficient and correct handling during transport and upon arrival at destination.

#### 5.2 Marking Instructions & dispatch details

Packages and crates will be marked with indelible black paint. Marking must be perfectly legible. All packages shall be clearly and properly marked in English language if not otherwise specified.

The shipping marks, shall be stenciled on two sides and one end marked with clear characters at least 5 centimeters high (where crate size permits, otherwise use optimum size for each package dimension).

The texts shall be printed by means of stamps, stencil-plates or electronically. The use of stickers is not allowed, unless securely covered by plastic. Bundles shall be marked by embossing on two metal tags bearing the shipping marks and placed on each side of the package and securely attaching them to the goods. Paint shall be used on metal surfaces.

Labels or tags to be clearly visible and shall be of a quality to remain visible and remain attached during transit, handling and storage for a minimum period of 12 Months.



Crates containing fragile articles must be packed with special precaution against risk of breakage and must be stenciled on all sides "FRAGILE - HANDLE WITH CARE". Where crates are not to be overturned, Supplier must show on the crates, clear and readily visible identification, to ensure they are kept in the correct position.

Packages / equipment of 2,000 kg or more must be marked with slinging points on all sides, in addition to the centre of gravity marks.

Number packages consecutively i.e. 1 of 10, 2 of 10, etc. Do not duplicate package numbers. SUPPLIER is responsible for any loss or damage caused by incorrect marking.

All cases/crates shall also be marked with the appropriate international standard graphic symbols for handling.

As a minimum, all cases/crates are to be marked clearly on all four sides with:

**"HANDLE WITH CARE" "RIGHT SIDE UP" "KEEP DRY"**

In the case of packages with a single gross weight totaling 2,000 kg and / or a height of more than 1m, the centre of gravity shall be clearly marked with the symbol on two adjoining sides. For all items of equipment with an eccentric centre of gravity, this symbol shall be marked at the bottom, side and top of the package.

The slinging and lashing points shall be marked with a chain symbol.

When packing in cases / crates, these packages shall also have metal corners at the slinging points.

External front and rear sides of the boxes shall be planed for writing instructions. To facilitate identification, the required colour coding as per the specifications shall be carried out on each package and on corners of pipes & plates.

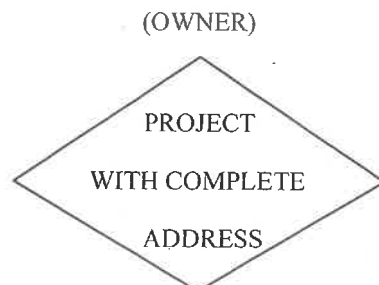
In case of bundles or other packages wherever marking cannot be stenciled, the same shall be embossed on metal or similar tag and wired securely at minimum two convenient points and both ends shall be protected / covered with gunny bags upto 18" (Eighteen Inches). In case of loose pipes, sticker of above markings should be pasted on inner wall corner of each pipe on both sides

Dispatch details such as consignor / consignee address, contract and case details, stacking instructions shall be written on one side of the boxes. One copy of packing slip wrapped in polyethylene bag covered with aluminum packing slip holder to be nailed on the external surface of the box. A packing list and preservation instructions shall be enclosed in a clear weatherproof plastic re-sealable envelope stapled to the box such that the receiver may determine contents without opening the container. An additional packing list is to be enclosed in a clear waterproof plastic re-sealable envelope stapled inside the container. Stapling of the envelopes shall not prevent removal of the documents.



### 5.3 Shipping Marks

Each package shall be marked on three sides with proper paints / indelible waterproof ink as follows:



PURCHASE ORDER NO. -----

NET WEIGHT ----- KGS. GROSS WEIGHT ----- KGS.

DIMENSIONS ----- X ----- X ----- CMS

PACKAGE NOS. (SL. NO. OF PACKAGE) OF (TOTAL NO. OF PACKAGES)

TAG / ITEM NO. -----

SUPPLIER'S NAME-----

The details of the Owner / Project are defined specifically in the Purchase Order / Contract.

### 5.4 Storage Code

The type of storage required is required to be specified, on each packaging in RED colour as follows:

- X Crates or packages to be stored outdoor without covers
- XX Crates or packages to be stored under tarpaulin
- XXX Crates or packages to be stored in covered or enclosed premises
- XXXX Crates or packages which must be stored in air-conditioned premises

### 6. SHIPMENT

Dispatch of material shall be made in accordance with the relevant terms of Purchase Order. Name of the owner, Project, location and other relevant information shall be as per the relevant annexure(s) to the Purchase Order / Contract.

Any change in mode of transport shall be resorted to only after prior approval in writing from EIL / Owner. Supplier shall ensure dispatch of equipment / materials immediately

after they are inspected and released. All consignments should be booked in the name of 'owner' and not under 'self' basis.

#### 6.1 Dispatch By Road:

- a) The Materials shall be dispatched on Door-Delivery basis (smalls or FTL) through a registered transporter.

However, in case, the transporter is nominated by EIL / Owner, the goods shall be dispatched through the same only.

- b) The supplier shall ensure with Transport Company the delivery of materials within a reasonable and minimum transit period. A complete set of dispatch documents (Delivery Challan / Invoice / Packing List / Test Certificate / L.R. / E-way Bill number etc.) shall be sent to concerned officials of EIL / Client (as specified elsewhere in RFQ/PO).

#### 6.2 Shipment By Air:

Whenever supplier is instructed by EIL/ Owner to airfreight any material, the supplier shall take prompt action for the same. Immediately after air-shipment is effected, the vendor shall intimate by e-mail, the details of Airway Bill number and date, the flight No., Number of packages etc. to concerned officials of EIL / Client (as specified elsewhere in RFQ/PO).

#### 6.3 Destination:

The consignments should be dispatched to the Consignee / Address as detailed in the Purchase Order.

#### 6.4 Advance Information:

Immediately after a shipment is made supplier shall intimate Underwriter, other concerned officials of EIL / Client (as specified elsewhere in RFQ/PO) vide mail regarding particulars of materials, value, Purchase Order No., date of dispatch, L.R. number, E-way Bill No., truck no., name of Transport Company.

#### 6.5 Transmission of Dispatch Documents :

Supplier shall, within 48 hrs. of the dispatch of the materials depending upon the payment terms of the Purchase Order, either negotiate through Owner's / EIL's Bankers (as applicable) or forward directly, by Courier the complete set of dispatch Documents to Owner / EIL. as applicable in line with the PO terms & conditions. The supplier shall be responsible for any delay in clearance of the consignment at destination and consequent wharfage / demurrage, if any, due to delay in transmittal of the required documents.

### 7. TRANSIT RISK INSURANCE

All equipments / materials will be insured for transit risk by (Owners) unless otherwise specified. The insurance cover will be provided from warehouse-to-warehouse.

**PREAMBLE TO QUOTATION OF PRICES (INDIAN BIDDER)**

**RFQ NO. LT/C213-001-PA-MR-5010/03**

**ITEM: PUMP-CENT.HOR(SPP)**

|                                   |   |
|-----------------------------------|---|
| <b>Name of Bidder : M/s _____</b> |   |
| 1                                 | Bidder confirm that he has noted the contents of the Preamble to the Price Schedule, Price Schedule, RFQ, Material Requisition etc and quoted his prices accordingly without any deviation.   |
| 2                                 | Scope of supply including testing, inspection, documentation etc. shall be strictly as per Material Requisition and other documents which are part of the Bidding Document.   |
| 3                                 | Bidder's quoted prices are for complete scope as per MR and are inclusive of drawing and documentation charges for all supplies and services as per MR.   |
| 4                                 | Bidder to clearly indicate 'Quoted' / 'Not Quoted' against each item in the price column in the Price Schedule and submit the same in unpriced bid. Bidders to submit Price in the Price Schedule in their Priced Bid.  |
| 5                                 | Bidder must quote the price in enclosed Price Schedule formats only. The formats shall not be changed and/or retyped.   |
| 6                                 | Quoted prices are firm and fixed till complete execution of the entire order and no variation on any account is allowed, unless otherwise categorically specified in RFQ documents.   |
| 7                                 | Price Basis: On FOT Dispatch Point Basis inclusive of Packing and Forwarding (P&F) charges and all other Taxes and duties. excluding freight charges and GST.   |
| 8                                 | Bidder to note that evaluation shall be done on Group wise basis.   |
| 9                                 | Following shall be considered for the Price Evaluation, including GST (after effecting Input Tax Credit) and all other Taxes and duties.<br>a) Supply Price on FOT Dispatch Point basis<br>b) Transportaion Charges<br>c) Mandatory Spares<br>d) Supervision Charges<br>e) Loading on account of Guarnateed Power consumption   |
| 10                                | Bidder to furnish quotation for Two Years Operation and Maintenance Spares as per MR provisions in the enclosed <b>Annexure-A1</b> . Separate list shall be provided by the Bidder in the format enclosed herewith with itemized cost. Ordering of these spares may be done by the Purchaser separately at a later date and not alongwith main equipment. <b><u>The price of Two Years Operation and Maintenance Spares shall not be considered for commercial (price) evaluation.</u></b>  |
| 11                                | i) Bidder to quote per diem supervision charges as per provisions of the MR in <b>Annexure-A2</b> . <b><u>These prices shall be considered for evaluation.</u></b><br><br>ii) Per- diem charges quoted by the bidder shall be in accordance with the "Terms & Conditions for Supervision Services" enclosed with the RFQ.<br>iii) For each pump package, the supervisory cost of 05 man-days shall be considered for the purpose of commercial comparison (i.e. a total of 10 man-days for Group A1 and 10 man-days for Group A2).<br><br>However, the actual payment for supervision services shall be based on actual days consumed at site.<br><br>iv) Bidder to furnish quotation for Overtime Rates for Supervision as per MR provisions in the enclosed <b>Annexure-A2</b> . <b><u>These prices shall not be considered for evaluation.</u></b> |
| 12                                | Bidder to submit the Guaranteed Power Consumption for Pumps in <b>SP-2</b> .  |
| 13                                | In case of any discrepancy in the item description, quantity, etc. in the price schedule format vis-a vis the details provided in MR , the MR details shall prevail.  |
| 14                                | Bidder to quote MR item Group supply price in Price schedule format SP-1. Item wise % breakup is mentioned in BDS   |

**NOTES:**

- Bidders are mandatorily required to enter their name in the each page of excel file file of Price Schedule provided in the e-tender portal for submission of price bid.
- Bidder to upload excel file of the priced copy of price schedule format.

BIDDER'S SIGNATURE: \_\_\_\_\_  
 COMPANY'S NAME: \_\_\_\_\_  
 SEAL: \_\_\_\_\_

Validate

Print

Help

[Item Wise BoQ](#)

Name of Item: PUMP-CENT.HOR(SPP)

Bidding Document No: LT/C213-001-PA-MR-5010/03

|  |  |
|--|--|
| Name of the Bidder/ Bidding Firm / Company : |  |
|--|--|

**PRICE SCHEDULE (SP-1)**

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only )

| NUMBER # | TEXT #                                  | TEXT #                | NUMBER # | TEXT # | TEXT #                                  | NUMBER #  |
|----------|---|-----------------------|----------|--------|---|---|
| Sl. No.  | Item Description                        | Item Code / Make      | Quantity | Units  | Quoted Currency in INR / Other Currency | TOTAL PRICE (In Figures) (excluding GST) To be filled by bidder |
| 1        | Supply as per MR item no. 01.00         |                       |          |        |   |   |
| 1.01     | MR Item Group A1                        | 01-PA-CF-003 A / B    | 1.00     | LS     | INR                                     |   |
| 1.02     | MR Item Group A2                        | 01-PA-CF-003 C / D    | 1.00     | LS     | INR                                     |   |
| 2        | Total Freight Charges upto Project Site |                       |          |        |   |   |
| 2.01     | For MR Item Group A1                    | {03}01-PA-CF-003 A /B | 1.00     | No.    | INR                                     |   |

|      |  |                           |      |     |     |  |
|------|--|---------------------------|------|-----|-----|--|
| 2.02 | For MR Item Group A2                                       | {03}01-PA-CF-003 C /<br>D | 1.00 | No. | INR |  |
| 3    | <b>Supply of Mandatory Spares as per MR item no. 04.00</b> |                           |      |     |     |  |
| 3.01 | For MR Item Group A1                                       | {04}01-PA-CF-003 A        | 1.00 | Lot | INR |  |
| 3.02 | For MR Item Group A2                                       | {04}01-PA-CF-003 C        | 1.00 | Lot | INR |  |

Validate

Print

Help

Use BoQ

Name of Item: PUMP-CENT.HOR(SPP)

Bidding Document No: LT/C213-001-PA-MR-5010/03

|   |  |
|---|--|
| <b>Name of the Bidder/ Bidding Firm / Company :</b> |  |
|---|--|

**GUARANTEED POWER CONSUMPTION FOR PUMPS (SP-2)**

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only )

| NUMBER # | TEXT #                       | TEXT #           | NUMBER #                           | TEXT # | NUMBER #  |
|----------|------------------------------|------------------|------------------------------------|--------|---|
| Sl. No.  | Item Description             | Item Code / Make | Number of Operating Units for Pump | Units  | BIDDER'S GUARANTEED POWER CONSUMPTION (Pump Shaft BKW, Per Pump package) (0% +veTol.) |
| 1        | GUARANTEED POWER CONSUMPTION |                  |                                    |        |   |
| 1.01     | WASH WATER PUMP              | 01-PA-CF-003 A/B | 1.00                               | BKW    |   |
| 1.02     | RECYCLE WATER PUMPS          | 01-PA-CF-003 C/D | 1.00                               | BKW    |   |

**PRICE SCHEDULE FOR TWO YEARS OPERATION AND MAINTENANCE SPARES (FOR INDIAN BIDDERS)**

RFQ NO. LT/C213-001-PA-MR-5010/03

ITEM: PUMP-CENT.HOR(SPP)

Name of Bidder : M/s \_\_\_\_\_

| SL. NO.   | ITEM CODE/<br>TAG NO. | DESCRIPTION OF SPARE PARTS   | QTY | UOM | UNIT PRICE ON FOT DESPATCH POINT BASIS INCLUDING P&F<br>(EXCLUDING GST)<br>(INR) |
|---|-----------------------|--|-----|-----|--|
| 04.00   |                       | <b>TWO YEARS OPERATION AND MAINTENANCE SPARES AS PER MR:</b><br>Itemized price list for supply of Two years operation & Maintenance Spares (Over and above Mandatory spares) as per Vendor recommendation as per MR. |     |     |  |
|   |                       |  |     |     |  |
|   |                       |  |     |     |  |
|   |                       |  |     |     |  |
|   |                       |  |     |     |  |
|   |                       |  |     |     |  |
|   |                       |  |     |     |  |
|   |                       |  |     |     |  |
|   |                       |  |     |     |  |
|   |                       |  |     |     |  |
|   |                       |  |     |     |  |
|   |                       |  |     |     |  |
|   |                       |  |     |     |  |
| <b>GST rate extra on Two Years Operation and Maintenance Spares<br/>(IN TERMS OF %)</b>   |                       |  |     |     | _____ %  |
| <b>Freight charges (inclusive of all taxes &amp; duties but exclusive of GST) from Vendors work/ shop to project site in terms of percentage of FOT Despatch point price of Two Years Operation and Maintenance Spares:</b> |                       |  |     |     | _____ %  |
| <b>GST rate extra on Freight charges<br/>(IN TERMS OF %)</b>  |                       |  |     |     | _____ %  |

- NOTE:
- 1 Qty/UOM to be specified by the bidder
  - 2 For 2 years O&M spares, validity of prices shall be Clause no. 9.2 of SPC.

**SCHEDULE OF PRICE FOR SUPERVISION (FOR INDIAN BIDDERS)**

ITEM: PUMP-CENT.HOR(SPP)

RFQ NO. LT/C213-001-PA-MR-5010/03

NAME OF BIDDER:

| Item SL. No. as per MR | Tag No.  | Description of Items as per MR | Currency | Per Diem charges (Per person) for 8 hours work on normal working day excluding GST thereon. | Overtime Rate/Hour beyond normal 8 hours work on normal working day excluding GST thereon. | Overtime Rate/Hour for work on weekly off days/holidays (as applicable to Site excluding GST thereon). |
|------------------------|--|--------------------------------|----------|---|--|--|
| 1                      | 2  | 3                              | 4        | 5   | 7  | 8  |
| 8                      | <b>Supervision of erection, testing and commissioning of items specified at item 1.00 of MR, as specified at SI.No. 08.00 of MR.</b> |                                |          |   |  |  |
| 8.001                  | [[08]01-VV-00-001A (N).01]   | For MR Item Group A1           | INR      |   |  |  |
| 8.003                  | [[08]01-VV-00-001A (N).02]   | For MR Item Group A2           | INR      |   |  |  |

**Note:**

|   |  |
|---|--|
| 1 | Per diem charges quoted by the bidder shall be in accordance with the "Terms & Conditions for Supervision" enclosed with the RFQ.  |
| 2 | Per- diem charges quoted by the bidder shall be in accordance with the "Terms & Conditions for Supervision Services" enclosed with the RFQ. For each pump package, the supervisory cost of 05 man-days shall be considered for the purpose of commercial comparison (i.e. a total of 10 man-days for Group A1 and 10 man-days for Group A2).<br><br>However, the actual payment for supervision services shall be based on actual days consumed at site. |
| 3 | Bidder to note that apart from above quoted price, no price for supervision shall be quoted elsewhere.   |

### Material Requisition (Top Sheet)

|                           |                    |                          |                             |
|---------------------------|--------------------|--------------------------|-----------------------------|
| <b>Item Description :</b> | PUMP-CENT.HOR(SPP) |                          |                             |
| <b>Item Code :</b>        | 04AB               | <b>Destination :</b>     | As per Commercial Documents |
| <b>Item Category :</b>    | II                 | <b>Delivery Period :</b> | As per Commercial Documents |

**Requisition Number** (Always quote this Number given below as reference)

|                |                       |                                 |                      |                |             |             |                   |              |
|----------------|-----------------------|---------------------------------|----------------------|----------------|-------------|-------------|-------------------|--------------|
| C213           | 001                   | PA                              | MR                   | 5010           | A           | 10/04/2026  | 80                | 42           |
| <b>Job No.</b> | <b>Unit/<br/>Area</b> | <b>Main<br/>Cost<br/>Centre</b> | <b>Doc.<br/>Code</b> | <b>Sr. No.</b> | <b>Rev.</b> | <b>Date</b> | <b>Divn.</b>      | <b>Dept.</b> |
|                |                       |                                 |                      |                |             |             | <b>Originator</b> |              |

**Notes :**

1. This sheet is a record of all the Revisions of this Requisition.
2. Vendor shall note the item category and shall submit his offer in line with the requirements included in attached 'Instructions to Vendors'.
3. The nature of the Revision is briefly stated in the 'Details' column below, the Requisition in its entirety shall be considered for contractual purposes.

| Rev. | Date       | Prepared By                 | Checked By      | Approved By | Details         |
|------|------------|-----------------------------|-----------------|-------------|-----------------|
| A    | 10/04/2026 | Vaibhav Ratnakar<br>Satpute | Mahesh Easwaran | Tarun Kumar | ISSUED FOR BIDS |

**This is a system generated approved document and does not require signature.**

| Sr. No.  | Tag No./Item Code/<br>[ID.No.] | Description  | Quantity          | Delivery Location |
|----------|--------------------------------|--|-------------------|-------------------|
| 01.00    |                                | Design, engineering, manufacture, procurement of materials and bought out components, assembly at shop, inspection, testing at manufacturer's works, packing & delivery of the following, including supply of all commissioning spares (Note-1) & special tools and tackles (Note-2) & documentation as per the enclosed EIL standard specifications, instructions to vendors, job specification, data sheets etc. and other codes and standards attached or referred. |                   |                   |
| ▶ 01.001 | A1 01-PA-CF-003 A              | <b>WASH WATER PUMP</b>   | <b>1 No</b>       |                   |
| ▶ 01.002 | A1 01-PA-CF-003 B              | <b>WASH WATER PUMP</b>   | <b>1 No</b>       |                   |
| ▶ 01.003 | A2 01-PA-CF-003 C              | <b>RECYCLE WATER PUMPS</b>   | <b>1 No</b>       |                   |
| ▶ 01.004 | A2 01-PA-CF-003 D              | <b>RECYCLE WATER PUMPS</b>   | <b>1 No</b>       |                   |
| 02.00    |                                | Deleted  |                   |                   |
| 03.00    |                                | Transportation from Vendors work / shop to of the following as per the commercial part of RFQ  |                   |                   |
| ▶ 03.001 | A1 {03}01-PA-CF-003 A          | <b>For Item SL. No. 01.001</b>   | <b>1 No</b>       |                   |
| ▶ 03.002 | A1 {03}01-PA-CF-003 B          | <b>For Item SL. No. 01.002</b>   | <b>1 No</b>       |                   |
| ▶ 03.003 | A2 {03}01-PA-CF-003 C          | <b>For Item SL. No. 01.003</b>   | <b>1 No</b>       |                   |
| ▶ 03.004 | A2 {03}01-PA-CF-003 D          | <b>For Item SL. No. 01.004</b>   | <b>1 No</b>       |                   |
| 04.00    |                                | Supply of Mandatory Spares (Note-3)  |                   |                   |
| ▶ 04.001 | A1 {04}01-PA-CF-003 A          | <b>For Item SL. No. 01.001</b>   | <b>1 Lot</b>      |                   |
| ▶ 04.003 | A2 {04}01-PA-CF-003 C          | <b>For Item SL. No. 01.003</b>   | <b>1 Lot</b>      |                   |
| 05.00    |                                | Quotation for Two Years Operation and Maintenance Spares (Note-4)  |                   |                   |
| 05.001   |                                | <b>Quotation for Two Years Operation and Maintenance Spares, as per vendor recommendation</b>  | <b>1 Lot</b>      |                   |
| 06.00    |                                | Deleted  |                   |                   |
| 07.00    |                                | Deleted  |                   |                   |
| 08.00    |                                | Supervision of erection, testing and commissioning of items specified at item 1.00 above (Note-5)  |                   |                   |
| ▶ 08.001 | A1 {08}01-PA-CF-003 A          | <b>For Item SL. No. 01.001</b>   | <b>1 per diem</b> |                   |
| ▶ 08.003 | A2 {08}01-PA-CF-003 C          | <b>For Item SL. No. 01.003</b>   | <b>1 per diem</b> |                   |

| Sr. No.  | Tag No./Item Code/<br>[ID.No.] | Description   | Quantity | Delivery<br>Location |
|----------|--------------------------------|---|----------|----------------------|
| 09.00    |                                | Drawings and documents as per attached Vendor Data requirement for all supplies and services covered above in Sr.Nos.1.00 to Sr.No.8.00 | Lot      |                      |
| 10.00    |                                | Deleted   |          |                      |
| 11.00    |                                | Deleted   |          |                      |
| 12.00    |                                | Deleted   |          |                      |
| 13.00    |                                | Deleted   |          |                      |
| 14.00    |                                | Deleted   |          |                      |
| 15.00    |                                | Deleted   |          |                      |
| 16.00    |                                | Deleted   |          |                      |
| 17.00    |                                | Deleted   |          |                      |
| 18.00    |                                | Technical Loading as per doc.#<br>C213-001-80-42-LP-5010 (Note-6)   |          |                      |
| ▶ 18.001 | A1 {18}01-PA-CF-003 A          | For Item SL. No. 01.001   | 1 No     |                      |
| ▶ 18.003 | A2 {18}01-PA-CF-003 C          | For Item SL. No. 01.003   | 1 No     |                      |
| 19.00    |                                | Deleted   |          |                      |
| 20.00    |                                | Deleted   |          |                      |
| 21.00    |                                | Deleted   |          |                      |
| 22.00    |                                | Deleted   |          |                      |
| 23.00    |                                | Deleted   |          |                      |
| 24.00    |                                | Deleted   |          |                      |
| 25.00    |                                | Deleted   |          |                      |
| 31.00    |                                | Deleted   |          |                      |
| 32.00    |                                | Deleted   |          |                      |

- ▶ Bidder shall quote prices in EIL Price Schedule except for Sr.No.09.00. Price for documentation is implied to be included in the prices quoted against Sr.No. 01.00 to Sr.No. 32.00

Vendor to note that the numbers given in square '[' and curly '{}'' brackets are not for their use and meant for store purpose only. Items shall be tagged as per main equipment Tag No. only.

Note:

Bidder to note that one fixed price is to be quoted for grouped items. The groups of items are identified by A1, A2, where A1 indicates one group and so on.

Grouped items shall not be split ordered.

**Other Remarks**

**General Remarks**

1. Bidder's scope of supply shall include all commissioning spares (mechanical, Electrical and instrumentation) for each pump package as deemed necessary by the vendor/as listed in MR. The same shall be included in the base price of each pump package. Any spares consumed over and above the spares supplied along with each pump package, shall be furnished by the pump vendor at the time of commissioning without any time/cost implication to the purchaser. Any leftover (unused) spares after commissioning, out of those included by vendor in his offer, shall be handed over to the owner.
2. Bidders are required to submit a list of special tools and tackles (as recommended by them / as listed in MR) along with the offer which shall be supplied along with each pump package. Minimum special tools as specified in scope of work/supply of job specifications shall be supplied. If no special tools/tackles are required for normal operation and maintenance of pump package, the same shall be categorically indicated in the bid. The prices of the same shall be included in base price of each pump package. In addition, manufacturer shall include tools which are specific to manufacturer's design of the machine for each pump package.
3. The Bidder shall supply the mandatory spares as specified in Document no. C213-001-80-42-SL-5010 enclosed with the requisition. The cost of these spares shall be quoted separately and shall not be included in the base price of the pump package. For commercial evaluation purposes, the prices of the mandatory spares shall be considered. The bidder shall quote one(1) lot for each grouped item as detailed in the referenced document.
4. Bidder shall provide a separate quotation for their recommended two years' normal operation and maintenance spares for each pump package. This quotation shall include part numbers, part descriptions, recommended quantities (based on the installed quantity per pump item), and corresponding costs. The same shall not be considered for price evaluation.
5. The vendor shall provide his services for supervision during erection & commissioning of each pump package. Electrical & Instrumentation sub-vendor's engineers shall also be present along with vendor's erection & commissioning engineers, as required. For each pump package, the supervisory cost of 05 man-days shall be considered for the purpose of commercial comparison (i.e. a total of 10 man-days for Group A1 and 10 man-days for Group A2). The vendor shall indicate the cost of providing the above services on per diem basis. Per-diem rates, as quoted by the vendor, shall be the basis of payment, however the actual payment for supervision services shall be based on actual man-days consumed at site.
6. Refer Doc No.- C213-001-80-42-LP-5010 for technical loading and penalty details.
7. The initial fill of lubricants, sealing fluid & other consumables shall not be included in the scope of supply of pump vendor. However, vendor shall furnish list of recommended Indian make oils for bearing lubrication, etc. Type of oil to be mineral hydrocarbon type. Use of any synthetic oil is not preferred. In case recommended by vendor, same shall be highlighted during pre- bid/ in- bid stage and same shall be included in bidder's scope of supply (part of base price).

## SPECIAL INSTRUCTION TO BIDDERS

**PROJECT** : REVAMP OF DESALTER SYSTEM OF CDU/VDU  
AT NRL

**UNIT** : 001

**CLIENT** : M/s NRL

**EPCM** : M/s ENGINEERS INDIA LTD.

**JOB NO.** : C213

---

---

| Rev. No. | Date       | Purpose                 | Prepared by | Reviewed by | Approved by |
|----------|------------|-------------------------|-------------|-------------|-------------|
| A        | 02-04-2026 | Issued with Requisition | VRS         | ME          | TK          |

1.0 For bid evaluation philosophy, refer commercial section (RFQ) of inquiry.

2.0 Pre-Bid stage requirement:

- i) Following shall be discussed / finalized during the pre-bid meeting (if applicable as per RFQ):
  - Bidder's deviations to data sheets/specifications/referred codes and standards.
  - Bidder's deviations/clarifications (if any) w.r.t. scope of supply as specified.
- ii) Bidders shall submit their technical deviations / exceptions / clarifications with respect to MR/RFQ requirements within the cut-off date as specified in the enquiry document, in the enclosed format (**Doc no. C213-001-80-42-DF-5010**), after which Purchaser reserves the right not to entertain any clarifications/deviations. Only technical deviations /exceptions/clarifications mentioned in the format enclosed (**Doc no. C213-001-80-42-DF-5010**) in the material requisition shall be considered for review/approval. Deviations/exceptions/clarifications specified or referred elsewhere shall not be considered and shall be deemed to be withdrawn by the bidder.
- iii) Bidder to note that only technically infeasible deviations shall be discussed during **PRE-BID meeting** provided a suitable justification for the same is furnished. Purchaser's decision on such deviations shall be treated as **FINAL**. Deviations, which can be complied either with extra cost and/or with time implications, shall not be permitted. It is in Bidder's interest to ensure that all technical deviations are sorted out in the pre-bid meeting stage only.
- iv) In case, any of the bidder is not attending the PRE- BID meeting, it shall be understood that the bidder does not have any comments / deviations to MR/RFQ requirements. In case any deviations/ clarifications are furnished in his bid, those deviations shall be deemed to have been withdrawn by the bidder.
- v) Conflicts/ambiguity, if any, between various documents attached in the material requisition/inquiry document shall be highlighted by the bidder during pre-bid meeting. In case of any conflict among the documents attached in the inquiry document, the following preferential order shall govern, except as specifically indicated otherwise (in any document forming part of MR). However, Purchaser's decision/clarification shall be **FINAL** and **BINDING** in this regard.
  - a) Process Datasheets/P&IDs.
  - b) Mechanical Datasheets.
  - c) Job Specifications (if any).
  - d) EIL Standard Specifications
  - e) Other Specifications.
  - f) International Standards/Codes/recommended practices as applicable.In case of any other conflict /ambiguity is brought to purchaser's notice in the Bidder's bid/proposal & during post bid submission stage, the same shall also be subject to purchaser's review/approval and purchaser's decision shall be **FINAL** and **BINDING** in this regard. Purchaser's decision shall be complied by the bidder without any cost/ time implications.

3.0 In-Bid stage requirement:

- i) Bidder shall necessarily furnish the following along with the bid without which the bid/offer shall be considered incomplete and is likely to be rejected.
  - a) Duly Filled- in & signed / stamped Technical Compliance Statement (**Doc No. C213-001-80-42-TCL-5010**)
  - b) Duly signed, stamped & complied Scope of Work / Supply Document enclosed with the requisition.

- c) Duly signed & stamped Mandatory spare Parts List Document enclosed with requisition.
- d) Completely filled-in Pump Datasheets.
- e) Performance curves for Pumps.
- f) Filled in Past Supply Reference Proforma.
- g) General Reference List and latest Equipment Catalogue for offered equipment model.
- h) Preliminary GAD/Foundation details for the Pumps.
- i) Preliminary utility requirements for the Pump packages.
- j) Filled in Un-Priced EIL priced schedule format without any alteration / comments / clarifications.
- k) Un-Priced list of Mandatory Spares, Erection & Commissioning spares and Special Tools & Tackles.
- l) Un-priced list of bidder recommended two-year spares with quotations.
- m) Vendor shall furnish duly filled in, signed & stamped "Technical Details Proforma (doc.# C213-001-80-42-TD-5010)" along with the bid. The bid would be treated as incomplete without the same.
- n) Any other document/drawing required with bid as per Vendor Data Requirement.
- o) Clarifications/deviations finalised during Pre bid meeting. No new technical deviations other than what has been discussed and agreed upon in pre bid stage shall be considered or taken cognizance of. However, manufacturer deviations to API/other international codes due to inherent equipment design which are infeasible to be met will only be permitted in bid. Rest all manufacturer's deviations which can be complied at extra cost/time shall not be permitted.

**TECHNICAL COMPLIANCE STATEMENT**

(TO BE SIGNED BY VENDOR'S PRINCIPAL CORPORATE LEVEL SIGNATORY ON  
COMPANY LETTERHEAD)

I, ON BEHALF OF M/s \_\_\_\_\_ CONFIRM THAT THE PROPOSAL OF -----  
-----QUOTED BY M/s \_\_\_\_\_ FOR **REVAMP  
OF DESALTER SYSTEM OF CDU/VDU OF M/S NRL** AGAINST MATERIAL  
REQUISITION / TENDER/PACKAGE No. - \_\_\_\_\_ -  
\_\_\_\_\_ IS IN TOTAL COMPLIANCE TO THE FOLLOWING

- A. SCOPE OF SUPPLY AND WORK
- B. PROCESS DATASHEETS AND P&ID
- C. EQUIPMENT DATASHEETS
- D. BATTERY LIMIT/ INTERFACE REQUIREMENTS
- E. TECHNICAL AMENDMENT, IF APPLICABLE
- F. ANY OTHER DOCUMENT, ATTACHED AS PART OF MR

**AS WELL AS ALL THE TECHNICAL SPECIFICATION AND NO DEVIATION,  
VARIATION OR RESERVATION, WHATSOEVER HAS BEEN MENTIONED IN THE  
TECHNICAL OFFER.** IT IS FURTHER AGREED THAT THE TECHNICAL DETAILS  
FURNISHED IN OUR OFFER WILL BE REVIEWED BY EIL/ M/s NRL DURING  
DETAILED ENGINEERING STAGE AFTER ORDER AND ANY CHANGE REQUIRED  
TO MEET THE REQUIREMENTS OF ENQUIRY SCOPE AND SPECIFICATION  
INCLUDING AMENDMENT(S) (IF ANY) WILL BE INCORPORATED BY US WITHOUT  
ANY PRICE AND TIME IMPLICATION.

(SIGNATURE WITH SEAL)

## SCOPE OF WORK/ SUPPLY CENTRIFUGAL HORIZONTAL PUMP PACKAGES

**PROJECT** : Revamp of Desalter System of CDU/VDU at NRL  
**UNIT** : 001  
**CLIENT** : M/s NRL  
**EPCM** : M/s ENGINEERS INDIA LTD.  
**JOB NO.** : C213

---

---

---

| A    | 08-04-2026 | ISSUED WITH REQUISITION | VRS         | ME         | TK          |
|------|------------|-------------------------|-------------|------------|-------------|
| Rev. | Date       | Purpose                 | Prepared by | Checked by | Approved by |

## PART- A: MECHANICAL

Bidder shall furnish all equipment, drivers, auxiliary systems, instruments and controls and safety devices as per the enquiry document. Anything required, over and above that is specified, for safe and satisfactory operation of the pump package shall be included by the bidder in his scope and mentioned in additional sheets attached to this list in the vendor's proposal.

**Bidder to sign and stamp this scope of work / supply** and specifically mention for the items quoted by them. However, if the vendor is unable to provide any specific item, the same shall be highlighted by the vendor in this scope of work / supply with proper justification.

Bidder is requested not to furnish his scope of supply separately.

**Bidder (Pump vendor) shall be Single Point Responsibility Bidder (SPRV) for the Centrifugal Pump packages and scope of supply shall include, but not be limited to, the following for each pump package and each tag no. for each train. For complete scope of supply, refer complete enquiry document containing data sheets, P&ID's, equipment layouts, specifications, standards, ITPs, etc.**

### A. For Horizontal Centrifugal Pumps:

| Sr.no | Item no                   | Service             | Pump type | Remark |
|-------|---------------------------|---------------------|-----------|--------|
| 1.    | 01-PA-CF-003 A/B<br>(New) | WASH WATER PUMP     | OH2/BB2   |        |
| 2.    | 01-PA-CF-003 C/D          | RECYCLE WATER PUMPS | OH2       |        |

#### Notes:

1. *New Pump shall be mounted on existing foundation. No modification of existing foundation is envisaged. (Refer existing Pump GAD attached elsewhere in the MR)*

| S. No.     | Description  | Required by Purchaser | Remarks  |
|------------|--|-----------------------|--|
| <b>1.0</b> | <b>Pump (Refer Process datasheet, equipment data sheets and other specs. for full details)</b>                           |                       |  |
| 1.1        | Horizontal Centrifugal Pump with electric motor driver complete with the following:                                      | <b>Yes</b>            | <i>Centrifugal Pump as per API- 610 12<sup>th</sup> Ed.</i>                  |
| 1.2        | Electric Motor with canopy for each Pump   | <b>Yes</b>            |  |
| 1.3        | Common skid for pump, driver, seal system and other auxiliaries  | <b>Yes</b>            |  |
| 1.4        | Mechanical seals, Mechanical Seal flushing/quenching system  | <b>Yes</b>            | <i>Refer API, 682, 4<sup>th</sup> Ed. &amp; Job Specification-Mechanical</i> |
| <b>2.0</b> | <b>Coupling</b>  |                       |  |
| 2.1        | Dry Metallic Flexible (Non-lubricated disc or diaphragm type) type coupling with Spacer and Non-sparking Coupling Guard. | <b>Yes</b>            |  |
| <b>3.0</b> | <b>Baseplate</b>   |                       |  |
| 3.1        | Fabricated Steel Base Plate: Common for casing(s) of Pump & electric motor, seal system and other auxiliaries            | <b>Yes</b>            | <i>Refer Job Spec.</i>   |
| <b>4.0</b> | <b>Piping</b>  |                       |  |

| S. No.     | Description  | Required by Purchaser       | Remarks         |
|------------|--|-----------------------------|-----------------|
| 4.1        | All associated auxiliary piping etc., prefabricated and duly mounted on the equipment/base-plate   | Yes                         |                 |
| 4.2        | All Utility Piping (Cooling Water, External Flush etc., as applicable) within the Package B/L  | Yes                         |                 |
| 4.3        | Matching companion flanges, gaskets, bolts & nuts etc. at all terminating points requiring purchaser's interface   | Yes                         |                 |
| <b>5.0</b> | <b>Electrical Equipment</b><br>(Refer Electrical datasheet & Specifications for full details)  |                             |                 |
| 5.1        | Refer Electrical Scope of supply (PART- B)   | Yes                         |                 |
| 5.2        | All other items as per Electrical Datasheet & specifications.  | Yes                         |                 |
| <b>6.0</b> | <b>Instrumentation Equipment</b><br>(Also Refer P&IDs, Instrumentation Job Specification, Process/ Mechanical Datasheet, Instrumentation & Annunciation Datasheet, Instrumentation Datasheets & related specifications for full details) |                             |                 |
| 6.1        | Refer Instrumentation Scope of Supply (PART- C)  | Yes                         |                 |
| 6.2        | Instruments for Seal System & Seal Flushing Plan, required in line with API- 682, 4 <sup>th</sup> Edition, Standard Specification No. 6-41-0009 and Job Specification No. C213-001-80-42-SP-5050   | Yes                         |                 |
| 6.3        | Instruments for Cooling Water System, required in line with API-610, 12 <sup>th</sup> Edition, Standard Specification No. 6-41-0008 and Job Specification No. C213-001-80-42-SP-5010   | Yes                         |                 |
| 6.4        | All other items as per Instrumentation Datasheet & specifications.   | Yes                         |                 |
| <b>7.0</b> | <b>Spares and Special Tools &amp; Tackles</b><br>(Spares for the Pump Package including Mechanical, Electrical, Instrumentation, Piping etc.)  |                             |                 |
| 7.1        | Mandatory spares, as specified in the Doc. No. C213-001-80-42-SL-5010.   | Yes                         | Note-1          |
| 7.2        | Erection & Commissioning spares, as recommended by the Equipment manufacturer  | Yes                         | Note-2          |
| 7.3        | Special tools and tackles required, if any, for erection, site assembly and maintenance of the Pump Package as recommended by the Equipment Manufacturer.  | Yes                         | Note-3          |
| 7.4        | Quotation for 2 years' Normal Operation & Maintenance spares, as recommended by vendor, for Mechanical (i.e. Equipment, Piping, Vessels, Filters, etc.), Electrical & Instrumentation items.   | Yes<br>(Quotation Required) | Note-4          |
| <b>8.0</b> | <b>Inspection and Testing for each Pump</b>  |                             |                 |
| 8.1        | Witness Performance / Sound level test followed by Mechanical Run Test   | Yes                         |                 |
| 8.2        | Witness NPSH/Submergence test (as applicable) as per spec.   | Yes                         |                 |
| 8.3        | Witness Dismantle inspection and reassembly after test   | Yes                         |                 |
| 8.4        | Complete Unit Test with Job Motor  | Yes                         |                 |
| 8.5        | Witness Visual, Package Unitization/ Dimensional check & skid completeness check   | Yes                         |                 |
| 8.6        | Field trial run test at site for complete package  | Yes                         | Refer Job Spec. |
| 8.7        | Mechanical Seal Acceptance test  | Yes                         |                 |
| 8.8        | Other Shop Inspection and Testing for all items under Bidder's scope of supply, as specified in the inquiry document   | Yes                         |                 |

| S. No.      | Description   | Required by Purchaser | Remarks                      |
|-------------|---|-----------------------|------------------------------|
| <b>9.0</b>  | <b>Supervision of Erection &amp; Commissioning</b>  |                       |                              |
| 9.1         | Supervision of Erection, Site testing & Commissioning for Centrifugal Vertical Pump package (per diem rate basis)   | <b>Yes</b>            | <i>Note-5</i>                |
| <b>10.0</b> | <b>Vendor Data &amp; Drawings</b>   |                       |                              |
| 10.1        | All data & drawings as required per Vendor data requirements, data sheets, specifications and referenced codes and standards.   | <b>Yes</b>            |                              |
| <b>11.0</b> | <b>Miscellaneous</b>  |                       |                              |
| 11.1        | All items marked as "VF" (Vendor Furnished) in the P&IDs  | <b>Yes</b>            | <i>PG-1109 &amp; PG-1110</i> |
| 11.2        | First fill of consumables / lubricants  | <b>No</b>             | <i>Note-6</i>                |
| 11.3        | Annual Maintenance Contract Services for pump and its auxiliaries   | <b>Yes</b>            | <i>Note-7</i>                |
| 11.4        | Foundation bolts/Mounting Bolts/Anti-vibration pads   | <b>Yes</b>            |                              |
| 11.5        | Tapered wedge packer sets and SS Shims for alignment  | <b>Yes</b>            |                              |
| 11.6        | Certified lifting beams, slings and shackles suitable for lifting each baseplate with a single point lift for each location   | <b>Yes</b>            | <i>If required</i>           |
| 11.7        | Any other item/scope as mentioned elsewhere in the MR/inquiry document/datasheets.  | <b>Yes</b>            |                              |
| 11.8        | Additional items (including mechanical, electrical and instrumentation and controls) not specified by Purchaser but recommended by bidder for safe, smooth and efficient operation of individual Pump packages. | <b>Yes</b>            |                              |

#### MECHANICAL NOTES:

- 1) Bidder shall supply mandatory spare for centrifugal vertical pump package (as per document No. C213-001-80-42-SL-5010) attached with MR. Price of these mandatory spares shall be quoted separately. The same shall be considered for commercial evaluation.
- 2) Bidders are required to submit a list of commissioning spares (as specified/ recommended by them) along with the offer. Commissioning spares, as recommended by the Bidder, shall be included in the base offer and shall be supplied along with the pump package. Any spare, consumed over and above the spares supplied along with the pump package, shall be furnished by the Pump Vendors at the time of commissioning without any time/ cost implication to the Purchaser. However, any un-used spare(s) shall be retained at Purchaser's end without any cost implication. Refer Job Specification (C213-001-80-42-SP-5010) for details.
- 3) Bidder shall supply Special Tools & Tackles required, for erection, site assembly and maintenance of each equipment of pump package as recommended by the equipment manufacturer. Consolidated list of Special Tools & Tackles shall be furnished by the bidder along with the offer. Price of Special Tools & Tackles shall be included in the base price. Special tools provided by bidder shall include, as a minimum, all the tools required for complete overhauling of the pump at site.
- 4) Bidder shall include in his proposal, his recommended spares for 2 years' normal operation & maintenance over and above the mandatory spares, for Pump package (Quote only) including pump, driver, lube oil, piping, electrical, instrumentation, etc. together with part no., name of the parts, cost and recommended quantity of spare against the installed quantity per pump skid. Cost of these 2 years' spares shall not be added to the total cost for evaluation purposes.
- 5) Bidder shall provide his services for supervision during erection, testing and commissioning of each pump package. Electrical & Instrumentation sub-vendor's engineers shall also be

present along with bidder's erection and commissioning engineers, as required. Cost of supervision considering 05 mandays for each installed unit of Electric Motor driven pump packages shall be considered for the purpose of commercial comparison. The vendor shall indicate the cost of providing the above services on per-diem rate basis. Per-diem rates, as quoted by the vendor shall be the basis of payment. However, the actual payment for supervision services shall be based on actual man-days consumed at site.

- 6) The initial fill of lubricants, sealing fluid & other consumables shall not be included in the scope of supply of pump vendor. However, vendor shall furnish list of recommended make oils for bearing lubrication & seal pot buffer liquid (as applicable). Type of oil shall be mineral type. Use of any synthetic oil is not preferred. In case recommended by vendor, same shall be highlighted during pre-bid / in-bid stage.

#### **PART- B: ELECTRICAL**

- REFER DOC. NO. C213-001-16-50-SP-5010

#### **PART- C: INSTRUMENTATION**

- REFER DOC. NO. C213-001-16-51-SP-5010: JOB SPECIFICATION AND SCOPE OF WORK

# MANDATORY SPARE PARTS CENTRIFUGAL PUMP PACKAGES

**PROJECT** : Revamp of Desalter System of CDU/VDU at NRL  
**UNIT** : 001  
**CLIENT** : M/s NRL  
**EPCM** : M/s ENGINEERS INDIA LTD.  
**JOB NO.** : C213

---

---

---

---

| A    | 08-04-2026 | ISSUED WITH REQUISITION | VRS         | ME         | TK          |
|------|------------|-------------------------|-------------|------------|-------------|
| Rev. | Date       | Purpose                 | Prepared by | Checked by | Approved by |

The bidder shall supply specified mandatory spare parts (Mechanical, Electrical & Instrumentation). The mandatory spares shall be as defined below:

Section A: Machinery

Section B: Electrical

Section C: Instrumentation

### SECTION A: MACHINERY

#### 1. Equipment Item Number: 01-PA-CF-003 A/B (*Horizontal Centrifugal Pump*)

| Sr. No. | Part Description   | Quantity per Item Tag No.<br>(i.e. Total quantity for working & standby) |          | Remarks |
|---------|--|--|----------|---------|
|         |  | Unit   | Quantity |         |
| 1.      | Centrifugal Pumps Single/Two stage (Special Purpose Process Service) |  |          |         |
| 1.1.    | Set of Shaft & Impellers (full diameter)                             | Set  | 1        |         |
| 1.2.    | Mechanical seals (complete cartridge Assembly)                       | Set  | 1        |         |

#### 2. Equipment Item Number: 01-PA-CF-003 C/D (*Horizontal Centrifugal Pump*)

| Sr. No. | Part Description   | Quantity per Item Tag No.<br>(i.e. Total quantity for working & standby) |          | Remarks |
|---------|--|--|----------|---------|
|         |  | Unit   | Quantity |         |
| 1.      | Centrifugal Pumps Single/Two stage (Special Purpose Process Service) |  |          |         |
| 1.1.    | Set of Shaft & Impellers (full diameter)                             | Set  | 1        |         |
| 1.2.    | Mechanical seals (complete cartridge Assembly)                       | Set  | 1        |         |

#### Notes:

1. The word 'Set' means the quantity required for full replacement of that part (including both DE side and NDE side, as applicable) in one machine.
2. For full replacement of "shaft & impellers", key, impeller nut, sleeves, etc. as applicable shall be considered.
3. A full set of mechanical seals shall include complete cartridge including shaft sleeves, gland plates, and all internal components like stationary and rotary faces, elastomers, throttle bush, and compression units.

4. The bidder shall supply all the mandatory spares as defined above & as applicable to the proposed design of the equipment. In case, any spare which is listed in the checklist but not applicable due to specific construction/design of the equipment, the same shall be highlighted as 'Not Applicable' against that spare supported with proper technical explanation.'
5. Spare part shall be identical in all respects to the parts fitted on the main equipment, including dimensions, material of construction, and heat treatment.
6. For each different type/size/rating of coupling (e.g. High Speed, Low Speed, etc.), separate spares shall be considered.
7. Bidder has to submit the signed and stamped document along with his offer as a confirmation of inclusion of above mandatory spare parts.
8. Bidder shall note that, only the mandatory spares (Mechanical, Electrical, Instrumentation...etc.), as specified above, shall be included. No other spares of any type shall be included in this list of mandatory spares.

If any additional spare is included, the same will not be taken cognizance of.

If vendor wishes to quote for any spare, over and above, those specified above, the same shall be quoted as part of the Two years' Normal Operation and Maintenance spares.

9. The spare impeller- shaft assembly for Centrifugal Pumps shall be boxed and preserved in wooden/ metal containers for horizontal/ vertical storage as per Manufacturer's standard. Storage container shall be property of the Owner.
10. Mandatory spare shall be for 1 lot for each grouped item.

## SECTION B: ELECTRICAL

- REFER DOC. NO. C213-001-16-50-SL-5010 ATTACHED ELSEWHERE IN THE MR.

## SECTION C: INSTRUMENTATION

- REFER DOC. NO. C213-001-16-51-SP-5010: JOB SPECIFICATION AND SCOPE OF WORK ATTACHED ELSEWHERE IN THE MR.

# JOB SPECIFICATION FOR PUMP CENTRIFUGAL HORIZONTAL (SPP)

**PROJECT** : REVAMP OF DESALTER SYSTEM OF CDU/VDU  
AT NRL  
**UNIT** : 001  
**CLIENT** : M/s NRL  
**EPCM** : M/s ENGINEERS INDIA LTD (EIL)  
**MR NO.** : C213-001-PA-MR-5010  
**JOB NO.** : C213

---

---

---

---

---

| Rev. No. | Date       | Purpose        | Prepared by | Checked by | Approved by |
|----------|------------|----------------|-------------|------------|-------------|
| A        | 08.04.2026 | Issued with MR | VRS         | ME         | TK          |

---

---

## 1.0 **GENERAL**

- 1.1 This specification together with attached pump process data sheets, equipment specifications, drawings, schemes, other specifications, codes and standards etc. describes the minimum requirements for design, engineering, manufacture, procurement of materials and bought out components, assembly at shop, inspection, testing at manufacturer's works, packing, delivery, supply of all mandatory spares, commissioning spares & special tools and tackles, supervision of erection, commissioning & site testing and documentation of Centrifugal Pumps (Special Purpose Process) – Overhung Type(OH2), Between Bearing Type(BB2) as described hereunder and in various attachments listed in the “Table of Contents” of this material requisition for Revamp of Desalter System of CDU/VDU Project at NRL.

| S. No. | Tag No.                | Service             | Pump Type | Quantity (W/S) | Driver | Mode of Operation |
|--------|------------------------|---------------------|-----------|----------------|--------|-------------------|
| 1.     | 01-PA-CF-003 A/B (New) | WASH WATER PUMP     | OH2/BB2*  | 2nos. (1W+1S)  | EM     | Continuous        |
| 2.     | 01-PA-CF-003 C/D       | RECYCLE WATER PUMPS | OH2       | 2nos. (1W+1S)  | EM     | Continuous        |

\*- Wash Water Pumps shall be mounted on existing foundation with same footprints and anchor bolt locations. Refer existing pump foundation drawing attached elsewhere in the MR.

- 1.2 The intent of these requirements is to supplement, highlight and modify the requirements as given in data sheets, specifications as listed under list of attachments and enclosed with the MR and other applicable standards referred to in data sheets and specifications
- 1.3 Bidder to refer the “Special Instruction to Bidders (C213-001-80-42-SI-5010)”, attached elsewhere in the MR for special requirements during Pre- bid and In- bid stages.
- 1.4 In case of any conflict between this Job Specification and other enquiry documents, the following preferential order shall govern:
- Statutory requirements
  - Process Package (PDS, P&IDs, licensors specifications (if applicable), etc.)
  - Mechanical Datasheets
  - Job Specification
  - Other Datasheets/Drawings attached
  - EIL Standard Specifications
  - Other Specifications
  - International Standards/Codes/recommended practices as applicable

In case of any ambiguity in the above documents, the vendor/ supplier shall ask for clarifications in consolidated form during pre- bid meeting. After which any ambiguity brought out, the stringent of the same shall be applicable and the decision of the EIL/ Client shall be final. Suitable addendum/amendment/ revised MR shall be issued prior to the submission of the bids.

- 1.5 Vendor shall make all possible efforts to comply strictly to the requirements. Deviations, if any, required by vendor shall be separately consolidated under “List of Deviations” (format attached in MR) with specific references to Document no., Page no., Clause no./ Para no., Line no. etc. of the applicable document to which deviation applies, along with adequate reasons for each deviation during pre- bid stage. Further, **vendor shall furnish “Technical Compliance Statement”, duly filled, signed/ stamped**, stating that his offer is in total conformity with all the datasheets and document Listed under “Table of Contents” and the referenced codes, standards and recommended practices. No deviation shall be considered after award of the order. Any comment, deletion, correction on the body of the datasheets/ specifications will not be taken cognisance of and all such deviations shall be deemed to have been withdrawn.
- 1.6 Compliance with this specification shall not relieve the vendor of the responsibility of furnishing equipment and auxiliaries of proper design, material and workmanship to meet specified operation conditions.

## 1.7 Other General Requirements

The design, construction, manufacture, supply & testing and other general requirements of the pump package shall be strictly in accordance with the Process data sheets, P&ID's, equipment datasheets, job specifications, drawings, standard specifications, other referred or attached codes, standards and recommended practices which form part of this Material requisition.

Compliance with this material requisition shall not relieve the VENDOR of the responsibility of furnishing equipment and auxiliaries of proper design, materials and workmanship to meet specified start-up, operating & shut down conditions.

All equipment, accessories, heaters, motors; instruments etc. incorporated in complete pump package shall be suitable for the specified area classification. For area classification, refer Electrical Specifications.

## 2.0 APPLICABLE CODES & STANDARDS

The pump packages shall be designed, manufactured, tested and supplied in accordance to API 610 12<sup>th</sup> Edition. The other requirements of the pump package shall be strictly in accordance with the data sheets, this job specification, P&IDs (as attached), standard specifications and other standards as listed under Table of Contents as well as other referenced codes, standards and recommended practices.

| Sl. No. | Equipment Description                                      | API Std. No. & Ed.*  |
|---------|--|--|
| 1.      | Centrifugal Pumps (Special Purpose Process)                | API Std. 610, 12 <sup>th</sup> Ed. & EIL Std. Spec. 6-41-0008 Rev. 0 |
| 2.      | Pumps- Shaft Sealing System for Centrifugal & Rotary Pumps | API Std. 682, 4 <sup>th</sup> Ed. & EIL Std. Spec. 6-41-0009 Rev. 0  |

## 3.0 SAFETY

- 3.1 Equipment design and engineering shall incorporate adequate safety features [as per applicable specifications of respective equipment as well as environment codes (if any) & standards applicable] to provide protection to equipment and environment.
- 3.2 All controls shall operate in a fail-safe mode.
- 3.3 All Electrical Devices, Components & Installations and instrumentation shall be suitable for the specified electrical area classification and grouping in which they are installed. The same shall be as per Electrical Specification, attached elsewhere in the MR.
- 3.4 All couplings and similar rotating/moving parts shall be provided with non-sparking guards, as required.
- 3.5 Piping shall be arranged in such a manner so as to avoid tripping of personnel or fouling with overhead piping/ structure related problems. Piping or tubing of insufficient mechanical strength, which is standing or hanging, shall be protected from personnel traffic.
- 3.6 Permanent warning tags shall be provided, wherever electrical hazard exists, when the unit is running and/or when the unit is in standby condition.
- 3.7 Sight flow glass shall be provided at each isolatable cooling water return line. Thermal relief valves (TRV)/ Thermal Safety Valves (TSV) shall be provided for components that may be blocked in by isolation valves (including any cooling water return circuit piping of a cooler or a jacket (i.e., for each CW isolatable circuit upstream of globe valve on the CW outlet line. Set pressure for Thermal Relief Valve shall be less than or equal to the design pressure of cooling water return header as indicated in site & utility data.

## 4.0 NOISE LEVEL

Equipment noise level (Driver + Driven equipment train + auxiliaries) shall not exceed 85 dBA when measured at One-meter distance from the equipment skid in any direction (for all

operating conditions). This shall be demonstrated at site & if the noise limit exceeds the specified value, the necessary arrangement to meet the noise criteria, shall be provided by VENDOR without any cost implication. Jackets for Noise attenuation around the pump suction and Discharge nozzles for each stages shall be supplied by the VENDOR if found necessary to limit noise level within specified limits.

## 5.0 SITE & UTILITY DATA

Refer "Site and Utility Data (C213-001-80-42-SU-5010)", attached elsewhere in the MR.

## 6.0 LOADING CRITERIA

Refer "Loading & Penalty Criteria (C213-001-80-42-LP-5010)", attached elsewhere in the MR.

## 7.0 EXPERIENCE CRITERIA (EC) FOR PUMP

7.1 The offered equipment shall not be prototype design and shall be field proven for similar operating conditions and meet the technical requirements laid out in MR. Equipment Experience Criteria in EIL std. spec. 6-41-0008 Rev. 0 is not applicable.

7.2 Vendor shall complete the past supply reference proforma enclosed with the inquiry document (C213-001-80-42-PSR-5010).

7.3 In addition, manufacturer's catalogue and general reference list for all the above equipment shall also be furnished along with the proposal.

7.4 Alternatively, bidder may be an Indian manufacturer who is a subsidiary of Foreign Principal and the Experience criteria, as specified above, is met by the Foreign Principal or another subsidiary of the Foreign Principal or the holding company of the Foreign Principal, provided the requirement specified in **Annexure-A (Policy on Make in India)** are met.

\*Alternatively Indian Subsidiary of Foreign Principal can be qualified based on prevalent 'Make in India' Policy of EIL.

## 8.0 SCOPE OF SUPPLY/ WORK & EXCLUSION

8.1 All packages, components and auxiliary equipment as detailed in the "Scope of Work/ Supply" requiring only location in- place and hooking- up of wiring and piping for operation and maintenance aspects are included in vendor's scope. Vendor's scope of work/ supply for the pump packages shall include, as a minimum but not limited to, the items enlisted in the "Scope of Work/ Supply (C213-001-80-42-SS-5010)", attached elsewhere in the MR.

8.2 Unit Responsibility of the Centrifugal Pump (Electric Motor driven) Package(s) shall lie with the Bidder (i.e., Pump Manufacturer), who shall be the Single Point Responsibility Vendor (SPRV) for the complete Centrifugal Pump (Electric Motor driven) Package(s) including Centrifugal Pumps, Electric Motors and all other associated auxiliary systems, instrumentation & Controls etc. Single Point Responsibility Vendor's detailed scope of work/ supply is described in datasheets (Process/ Mechanical), specifications, Process P&ID's, equipment layout and Scope of Work/ Supply forming part of the inquiry document. However, It shall be the responsibility of the SPRV to furnish a safe operating unit. For this purpose, in case SPRV envisages additional equipment/ instruments/ control and safety devices, the same shall be offered by the SPRV and included in his scope of supply. Such additional items shall be separately listed with reasons for their inclusion.

## 8.3 Exclusions

Following are excluded from VENDOR's scope of supply:

- Foundation & civil works (including grouting material). However, vendor to specify the type (Cementous/ epoxy), grade & estimated quantity of the grouting material to be used and give grouting plan and grouting criteria.

- Civil & structural work.
- Erection, Site Testing & Commissioning (Except supervision on per diem rates)
- Initial fill of lubricants, sealing fluid & other consumables (except for synthetic oil, if recommended by the bidder)

8.4 Vendor's scope, as a minimum, shall include all components and auxiliary equipments as detailed in the "checklist for scope of supply/work" as required to make a complete and safe operating package.

#### 9.0 UNITIZATION OF PUMP & DRIVER

Unitization of Pump & Driver shall be done in pump manufacturer's shop. All pumps and their Drivers shall be supplied as skid mounted units with all accessories, auxiliaries along with auxiliary piping duly mounted on a single skid.

#### 10.0 INSTALLATION CRITERIA

All Pump packages shall be suitable for Outdoor Installation and shall be installed on Grade/ Ground Floor (i.e., on finished floor level). No equipment shelter is envisaged for the Pump Packages.

#### 11.0 ERECTION OF EQUIPMENT

Erection of all Centrifugal Pump (Electric Motor driven) Packages shall be carried out at Site by the Mechanical Works Contractor under the supervision of Centrifugal Pump Vendor.

#### 12.0 BASIC DESIGN

12.1 The pump package and associated equipment shall conform to API 610 12th edition together with Process Data Sheet, P&IDs, this specification, EIL Standard specification 6-41-0008 and other specifications as listed in the table of contents forming part of the MR.

12.2 Pump details (API Type & MOC class) have been specified in the respective Process/ Mechanical Datasheets. Vendor to strictly follow the same. No deviation to the same is acceptable.

MOC of pump- wetted parts shall also be suitable for MDMT, as specified in the respective Process/ Mechanical Datasheets.

12.3 For pump type, seal type and seal flushing plan, refer Table 1 of this document.

12.4 The pump package shall comply with requirement specified and specifications referred in process datasheets.

12.5 Selection of Pump shall be based upon the following considerations:

- Suitability for the specified duty conditions
- Standard Models under vendor's regular range of manufacture
- Proven Track Record

It's vendor responsibility to offer size and design which has a successful record of proven field service at operating conditions, similar to those specified.

Electric Motor driver shall be sized for full/ rated load of the pump for the maximum specific gravity, specified in the PDS/ MDS.

Electrical Motor driver shall also be suitable for pump operation at End of Curve (EOC) for all the centrifugal pumps running in parallel/ suitable for pump auto- start against open discharge

- valve condition/ where driver re- acceleration is required, as the case may be, as specified per respective Process/ Mechanical Datasheets.
- 12.6 Pumps shall be selected to have their Rated operating point falling in 70% to 110% of BEP flow of the Rated Impeller except for low flow pumps ( $\leq 20$  m<sup>3</sup>/hr) or pump rated BkW upto 15 kW. The bid/proposal shall include the power consumption curve and NPSHR curves from MCF to End-of-Curve flow.
- 12.7 Pumps shall have stable head/flow-rate curves (continuous head rise from rated to shutoff).
- 12.8 Preferred Operating Region and Allowable Operating Region to be marked on the characteristic curve for each pump item. The rated and the normal operating points shall be marked on the characteristic curve. The rated flow shall not exceed 110% of pump capacity at best efficiency point.
- 12.9 Bidder shall indicate the values of thermal minimum continuous flow (MCF) & stable MCF on the pump data sheet, in the offer. Vendor to specify minimum design flow requirement and associated modifications to controls, piping, instrumentation etc.
- 12.10 **NPSH margin of NPSHa over NPSHr shall be at least 0.6 m.** Vendor to offer their suitable model considering the same, as the same is a rejection criteria.
- 12.11 Suction flange rating shall be same as that of discharge flange for all pumps.
- 12.12 Maximum allowable working pressure & temperature of the equipment shall not be less than the design pressure & temperature as specified in the data sheet nor less than those specified in specifications, codes & standards. Pump MAWP shall also be suitable for testing with water (Sp. Gravity=1.0).
- 12.13 Pumps shall be suitable for instantaneous startup from ambient to full operating temperature.
- 12.14 All pump packages shall be directly driven by Electric Motor. No gear box is envisaged. The rated speed of the Pump shall not exceed 3000 rpm.
- 12.15 No cast iron pressure containing parts (like casing) shall be used for the pump intended for hydrocarbon service.
- 12.16 Single and two-stage pumps operating at temperatures less than 150°C and multi- stage pumps operating at temperatures less than 120°C shall be suitable for instantaneous startup from ambient to full operating temperature without any warm-up. For higher operating temperatures the vendor shall provide suitable hardware (i.e. piping, valves & fittings) & as part of the operating manual a suitable startup procedure shall be provided. Any required monitoring equipment (i.e., skin thermo couples) to ensure that the pump, including seal(s), does not incur damage due to rapid heat up shall be supplied by pump vendor.
- 12.17 All high temperature pumps with hot circulation provision shall have provision of hot liquid circulation from pump bottom to suction line. This will ensure uniform heating of complete pump.
- 12.18 The maximum impeller diameter for a single stage overhung pump design operating with 2-pole (50Hz motor), shall not exceed 17 inches (430 mm). Further I(SF) [as per equation K.2 of Annexure K of API 610 12th Edn]  $\leq 1.2$  times the value from equation K.4 of Annexure K (Refer API 610 12th Ed. for Annexure – K & L3/D4 calculations) shall be followed for all pumps operating with 2-pole (50Hz) motor.
- 12.19 Double suction single stage, two-stage & multi-stage pumps shall be of in-between bearing types.

- 12.20 Inducer shall not be used for any of the pumps. Inducers shall not be used except for integrally geared type of pumps.
- 12.21 Pumps shall be directly driven by Electric motor. Pumps driven through gearbox are not acceptable.
- 12.22 All rotating equipment base plates shall have jacking provision for aligning the prime movers.
- 12.23 The maximum permissible running clearances shall not be less than twice the running clearances as specified in API 610.
- 12.24 Vendor shall provide sufficient drain & vent connection in the pump casing to allow the draining & venting of the pumping liquid completely. A proper draining provision for suction barrel shall be provided.
- 12.25 As a minimum piping material shall be stainless steel for seal flushing plans and shall be carbon steel for cooling water plans.
- 12.26 All pumps shall be provided with Constant level oiler and bearing isolators. Bearing housings shall be provided with a gate valve and magnetic drain plug for inspecting the oil while it is running. Bearing isolators shall be of non contact type and shall meet the requirements of API 610.
- 12.27 Vendor shall fill Utility Data sheet forming part of the Enquiry Document and submit his recommendation along with his proposal. Vendor, in his offer, shall list all the utilities required for the following (Vendor to furnish item wise breakup for the utilities required):
- Sealing fluid requirement
  - Cooling water requirement for bearing cooling
  - Cooling water required for seal coolers
  - Other utility requirements (if any)
- 12.28 Maximum Allowable Working Pressure (MAWP) & Maximum Allowable Working Temperature (MAWT) of Pumps shall neither be less than the Design Pressure (estimated shut-off pressure for Pumps) & Design Temperature, as specified in the respective Process/ Mechanical Datasheets of Pumps nor less than those specified in specifications, codes & standards.
- The Pump casing shall also be suitable for operation at maximum discharge pressure (developed at Pump minimum flow with Specific Gravity= 1.0(i.e. water), this is required during Shop Performance test with water at Rated Speed.
- 12.29 The maximum shut-off pressure of pumps shall be the maximum suction pressure plus the maximum differential pressure/ head including all test tolerances, the pump is able to develop, when operating with the furnished impeller (with rated impeller diameter) at the rated speed and specified maximum specific gravity at any specified operating condition (including start-up/ commissioning with water at normal suction pressure, if specified). The same shall not exceed downstream design pressure/ estimated shut-off pressure (as mentioned in respective Process/ Mechanical datasheet of the pumps).
- 12.30 Suction specific speed limitation specified in pump datasheets are to be complied. In case of deviation, the bid shall be liable for rejection.

### 13.0 **Bearing Design & Lube Oil System**

- 13.1 Type of bearings for pumps shall, as a minimum, meet the requirements specified in Cl. 6.10

of API 610 and shall be as per vendor's standard proven design.

- 13.2 Vendor shall provide details in the Past Supply Reference Proforma (attached elsewhere in the MR) for selected radial and thrust bearings to justify the provenness of the offered design.
- 13.3 Vendor shall also provide calculations as per API 610 to justify that the offered type of bearings meets the minimum requirements specified therein.
- 13.4 Pump Lubrication system shall be as per manufacturer standard. Vendor shall furnish necessary and adequate references in the Experience Record Proformas to establish the provenness of the offered pumps for offered type of lubrication.

#### 14.0 **BASEPLATES**

- 13.1 Base- plates shall also have jacking provision for aligning the prime movers. Baseplates shall have 8 nos. jack bolts for ease of alignment (4 nos. in Radial & 4 Nos. in Axial directions). For heavy motors, jack bolts shall also be provided for jacking the motors at bolting locations for inserting shims.
- 13.2 Base plate drain shall be provided with 2" 150# flanged connection.
- 13.3 Non- skid decking covering all walk and work areas shall be provided on top of the base plate for ease of inspection, operation & maintenance of the pump package parts

#### 15.0 **Couplings**

- a) Couplings shall be all metallic, non-lubricated flexible element type (i.e. either diaphragm coupling or disc coupling) with spacer for all equipment. All coupling models shall be selected for a minimum service factor of 1.5 over driver rating.
- b) The coupling shall have spacer of adequate length to enable maintenance/replacement of seal/bearings without dismantling any equipment i.e. Pump & Driver. Length of coupling spacer to be necessarily longer than single coupling hub length. The DBSE shall be more than the seal cartridge length and shall facilitate replacement of Seal/bearings without disturbing the Pumps and Drivers.
- c) Removable non sparking coupling guard shall be provided over all exposed Rotating parts. Coupling guard shall be fabricated from a non-sparking material and shall be open at the bottom to permit manual shaft rotation and shall be sufficiently rigid to resist a deflection as a result of bodily contact of nominally 100 kgs.
- d) Coupling guard shall have a hinge to open and Inspection window to see the healthiness of the coupling shims.

#### 16.0 **Auxiliary Piping**

- ❖ All auxiliary piping interface connections shall be flanged terminated with a gate valve at the equipment battery limit (i.e. at the edge of the base plate).
- ❖ Purchaser shall provide/receive Water at Single Point Inlet/Outlet at the edge of Baseplate of each Pump for Seal Cooler/Lube-Oil Cooler & Bearing Housing (if applicable). The terminating flanges shall be of 3/4" (minimum) size. Vendor shall provide Sight Flow Glass/TRV at each Cooling Water Outlet.
- ❖ All Customer Piping Interfacing will be done towards any one edge of the Base Plate (Pump, Seal Plan and all auxiliaries mounted on the same baseplate). EIL std. 7-44-0321 attached in the MR shall also be referred.

- ❖ Vendor's scope shall also include Matching companion flanges, gaskets, bolts & nuts etc. at all terminating points requiring purchaser's interface having non-standard sizes/Ratings, including reducer from non-standard size to nearest standard size, as loose supply.
- ❖ As a minimum Piping material shall be Stainless Steel (SS304/ SS316/ SS321) for Seal Flushing Plans/ Lube Oil system and shall be Carbon Steel (A106 Gr. B) for Cooling Water Plans. Auxiliary process fluid piping material shall be SS316, as a minimum.
- ❖ Purchaser shall provide/ receive cooling water at single point inlet/ outlet at the edge of baseplate of each Pump package for seal cooler & bearing housing (if applicable). The terminating flanges shall be of ¾" (minimum) size. Vendor shall provide sight flow glass at each cooling water outlet.
- ❖ All Purchaser's piping interfacing will be done towards the base plate edge of non- drive end (NDE) of pump. As such all terminations including seal system drain shall be terminated at the base plate edge of non drive end (NDE) of pump.
- ❖ Pump nozzles especially at Purchaser's interface shall be as per Piping Material Specifications, attached elsewhere with the MR. In case, non-standard sizes or different from line rating nozzles are unavoidable, companion flanges along with bolts, nuts, gaskets and fasteners shall be included in the scope of the pump vendor.
- ❖ Vendor shall fill in "Template for vendor interface data" (doc.# C213-001-80-42-BF-5010), during detail engineering stage.

## 17.0 Mechanical Seals

- 14.1 Mechanical seals shall conform to API Standard 682, 4th edition and EIL Standard Spec 6-41-009 for centrifugal pumps.
- 14.2 The type of mechanical seal & seal plans shall be as defined in Table 1 of this document. The pump manufacturer shall also obtain seal manufacturer recommendations regarding the above & furnish the same along with his proposal. Any change required by seal vendor to be highlighted & purchaser's decision shall be obtained during pre-bid stage.
- 14.3 Mechanical seals to be suitable for maximum shut-off pressure under static conditions for pusher type seals. For Bellows seal, mechanical seal shall be suitable upto bellows design pressure, as a minimum.
- 14.4 Seals as offered shall be suitable for stuffing box pressure during operation considering maximum suction pressure case during start-up and shall also be suitable for Maximum shut off/ Maximum Allowable Working Pressure of the pump in static condition. Mechanical seals shall be suitable for Pump Casing design pressure under dynamic condition.
- 14.5 Stuffing Box Dimensions shall be as per API Standard 610 (ISO:13709).
- 14.6 For standard mechanical seals, Seal Qualification tests (SQT) shall have been conducted on the proposed mechanical seal model(s). Related certificates shall be provided during detailed engineering stage.
- 14.7 Mechanical Seals (as per API- 682, 4th Ed.) shall be from any of the EIL approved sub-vendors, as per sub-vendor List (Doc. No. C213-001-80-42-VL-5010), attached elsewhere in the MR.
- 14.8 In case, the offered mechanical seal is intended to be supplied by any of the subsidiaries of the principals of seal manufacturer, following requirements shall be met:

- ❖ For standard mechanical seals, for which SQT has been conducted by the principals, critical components such as Bellows, Springs and seal faces shall be sourced from their principals.
- ❖ For Engineered seals, the complete mechanical seal along with sleeve and gland plate shall be sourced from their principals. Seal drawings shall be from the principals or duly vetted by principals.

14.9 Any seal offered under "Engineered Seal" category or when seal area/stuffing box is subjected to operating pressure  $\geq 20\text{Kg/cm}^2$  (i.e. seals having MDSP  $\geq 20\text{Kg/cm}^2$ ) shall undergo the following Seal Acceptance Test (SAT):

- ❖ All seals installed in one pump per item / tag shall undergo SAT as per the following: "Four hour static test, four hour dynamic test and one hour cyclic test with test fluid selection as per API 682 and test conditions commensurate with either API 682 test conditions or the conditions expected during operation in normal as well as start-up / shut-down conditions, whichever is more stringent. However for temperature, API limit of 260 degree C may be followed for testing in case of high temperature applications."
- ❖ Propane testing, as per API 682 4th edition conditions, shall be carried out only for liquids with S.G < 0.6 & pumping temperature of -5 degC to 176 degC or for all flashing hydrocarbons with pumping temperature < -5 degC.
- ❖ Additionally, for propane testing, in case operating pressures are higher than API 682 4th Edition test conditions, additional seal acceptance testing with Diesel/Mineral oil (as applicable) shall be carried out at actual operating pressures.(as per above) SAT certificates shall also be furnished as part of final documentation.
- ❖ The complete sealing system along with instruments and all accessories shall be mounted/installed on the pump base plate. Aux. Seals/Flushing Systems & Plans/Cooling Systems & Plans shall be as per API 682 requirements & also as per the attached specification requirements.

14.10 Sealing Plan 11/23/52/53A/53B/62:

- ❖ The complete sealing system along with instruments and all accessories shall be mounted/ installed on the pump base plate. Aux. Seals/Flushing Systems & Plans/Cooling Systems & Plans shall be as per API 682 requirements & also as per the attached specification requirements.
- ❖ Vendor shall furnish recommended Buffer/Barrier Fluids for various pump items in their offer. Fluid shall be suitable for the seal operating environment and approved by the mechanical seal supplier. Process compatibility of the recommended fluids shall be checked at purchaser's end and final Buffer/Barrier fluids shall be firmed up during detailed engineering stage. Consideration shall be given to minimize the number of fluids the refiner/client has to stock. Annexure-B shall be referred for special requirements for Seal plan 52/53A/53B.

14.11 Seal and Seal systems (i.e. Mechanical Seals & Seal Flushing Plans, as the case may be, shall be designed & supplied by Seal OEM).

14.12 Orientation of seal pot and auxiliary connections :

- The interface points for auxiliary connections (ie. cooling water supply/return, other connections etc.) as well as the seal reservoir (i.e. for seal plan 23/52/53A/53B/62) shall be located on the Left Hand Side, when viewed from non-drive end of pump, of the pump skid. Also refer "Standard for orientation of seal pot and connections of centrifugal pumps", Doc# 7-44-0321, attached elsewhere in the MR.

- Orientation of seal pots/coolers for pumps with seal plans 23/52/53A/53B shall be mirror images of each other for pumps placed below the piperack. List of such pumps will be identified during detailed engineering stage. Mirror images of seal pots shall have clear passage in between the pumps, when two pumps are placed in one bay.

14.13 In case of Horizontal Overhung Pumps with Seal Flushing Plan 53B, NRV shall be provided on vent line to flare for each pump.

14.14 The pressure alarm for re- filling Piping Plan 53B shall be on the basis of a fixed alarm set point (a pressure alarm without a temperature bias). Figure F.17 of API 682 4th Ed. illustrates a fixed alarm strategy. Accordingly, temperature transmitter (refer Figure G.19 of API 682 4th Ed.) for measuring gas temperature in the bladder of auxiliary seal system is not applicable.

14.15 Instrumentation associated with Mechanical Seal Flushing Plans 11, 23, 32, 53B, 61 & 62 shall be as per API- 682, 4th Edition requirements, Annexure- B of this Job Specification, Instrumentation Specifications, Data sheets etc.

14.16 The Vendor's Scope of Supply and the scheme for Mechanical Seal Flushing Plan 53B & plan 32 shall be as per sketch indicated in Annexure- 2(A) of this Job Specification. For Plan 11, 23, 61 & 62, refer API- 682, 4th Edition.

## **15 ELECTRICAL**

15.1 All electrical equipment shall be as per electrical datasheet/specification attached elsewhere.

## **16 INSTRUMENTATION**

16.1 All Instrumentation and controls shall be minimum as per the Instrumentation data sheets, EIL job specifications, EIL standard specifications, P&ID's and any other document attached/specified in the inquiry document.

16.2 For all Single Stage pumps covered in the inquiry, pump vendor to provide provision for mounting 2 Nos. accelerometer probes (X & Y) (supplied separately by purchaser) on each bearing housing for monitoring vibration values in horizontal and vertical directions. The tapping size in the bearing housing shall be 6mm NPT with a depth of 6mm and shall be provided with a cap.

16.3 Also refer Electrical Specifications for Instrumentation requirements w.r.t. motors.

## **17 INSPECTION AND TESTS**

17.1 The scope of Inspection and tests shall be as per the data sheets and other referred /specified standards and specifications forming a part of this inquiry document. Vendor shall take into consideration the complete testing requirements while committing equipment delivery schedules

17.2 All pumps shall be mechanical run tested and performance tested at shop.

17.3 NPSHR test shall be performed when the difference between NPSHA and NPSHR is less or equal to one (1) meter.

17.4 Owner and/or his Consultant may participate along with the Contractor's inspectors in any inspection and tests. The vendor shall notify to owner of all inspection and tests at least four weeks before the scheduled date of inspection and test and reconfirm the same at least one week before the date of inspection and testing.

- 17.5 Vendor shall submit the test procedure for approval of the purchaser at least one month in advance of the actual date of conducting each test.
- 17.6 The scope of Inspection and tests shall be as per the Mechanical Data sheets, Inspection & Test Plans and other referred/specified Codes, Standards and Specifications forming part of this Enquiry Document.

All tests which are marked as "Witness" tests may be witnessed by Purchaser's/ Consultant's Inspector. Vendor shall submit details of all test procedures for approval by Purchaser at least 6 weeks prior to scheduled test date. Also, vendor shall notify to owner of all such inspection and tests at least four weeks before the scheduled date of inspection & test and re- confirm the same at least one week before the date of inspection and testing.

Rejections made by Purchaser's Inspector, based on Inspection & Testing, shall be final. Acceptance by the inspector in no way release the vendor from guarantees as to materials, workmanship and performance of the equipment inspected.

17.7 Performance Test:

17.7.1 Test Facilities, Arrangements & Procedures:

Vendor shall furnish the details of the proposed test arrangements and testing procedures to be followed on conducting the Performance Tests & Mechanical Run Tests of Pump, during detailed engineering stage. However, detailed test procedures for testing of Pump shall be subject to Purchaser's review/ approval.

17.7.2 Performance Test of Centrifugal Pumps:

Performance test of Centrifugal Pump at rated load & rated speed with Job Mechanical Seals shall be carried out at pump vendor's shop. The Performance Test shall cover the complete range of operation at Rated Flow, Normal Flow, Midway between Normal & Minimum Stable Continuous Flow, Minimum Stable Continuous Flow, shut off (refer & consider API- 610 requirements for high energy pumps) & at 110% of rated flow.

Dismantling inspection of all close clearance parts, bearings & seals, shall follow the performance test. This shall be applicable only in case of abnormality in mechanical behavior (such as excessive noise & vibration, bearing temperature rise, etc.) during performance test.

Performance Test shall be followed by mechanical run test for four (4) hours.

17.7.3 Test Tolerance for Centrifugal Pumps:

Test Tolerances for Centrifugal Pumps shall be as per modifications made in EIL Standard Specification No. 6-41-0008, Rev 0 against Table- 16 of API- 610, 12th Ed.

17.7.4 **Field Trial Run Test:**

17.7.4.1 Field trial run test at site of the complete package shall be done under the supervision of the vendor at per diem rates provided in offer. This test shall be done with available media and load to ensure satisfactory performance, safe, smooth, reliable operation, mechanical integrity and sound level of the complete package. Dismantling inspection by vendor's representative will follow this test.

17.7.4.2 Modifications / additions / changes as required to resolve/correct any fault in the package, detected during field trial run test shall be in vendor's scope without any time / cost

implications to the employer. No per diem rates shall be payable for such modifications/additions/changes.

17.7.4.3 Duration of field trial test for package shall be 72 hours. The duration of 72 hours shall be on sustained basis i.e. process interruptions shall be allowed to cumulate, however machine related interruptions shall not be counted.

17.7.4.4 If any additional equipments/instruments are necessary in addition to those in vendor's scope of supply for the purpose of testing & measurement, vendor shall bring them to site duly calibrated and shall take them back after successful completion. All utility and safety systems shall be operating during the test.

## 18 SPARE PARTS

### 18.1 Mandatory Spares

Bidders shall quote mandatory spares as listed in "Mandatory spare parts (Doc. No. C213-001-80-42-SL-5010)" forming part of inquiry document. The cost of the same shall be added to the total cost of the pump package for the purpose of commercial evaluation.

### 18.2 Spares For 2 Years Normal Operation

Bidder shall furnish an itemized list with quotation of recommended spare parts/as listed in MR with unit prices for two year normal operation & maintenance of each complete pump package, over & above the mandatory spares (including mechanical, electrical, instrumentation spares). Quotation of these spares shall not be considered for commercial evaluation.

### 18.3 Erection And Commissioning Spares

Bidder's scope of supply shall include all erection & commissioning spares (as specified elsewhere in inquiry / as recommended by them) (mechanical, electrical and instrumentation) for each pump package as deemed necessary by the vendor. The same shall be included in the base price of the pump package. Any spares consumed over and above the spares supplied along with pump package, shall be furnished by the pump vendor at the time of commissioning without any time/cost implication to the purchaser. Any un-used spare(s) shall be retained at purchaser's end without any cost implication.

### 18.4 Special Tools And Tackles

Bidders are required to submit a list of special tools and tackles (as recommended by them / as listed in MR) along with the offer which shall be supplied along with the pump package. Minimum special tools as specified in scope of work/supply of job specifications shall be supplied. If no special tools/tackles are required for normal operation and maintenance of pump package, the same shall be categorically indicated in the bid. The prices of the same shall be included in base price of pump package. In addition, manufacturer shall include tools which are specific to Manufacturer's design of the machine for pump package.

## 19 VENDOR DATA AND DRAWING

19.1 The data and drawing required are detailed out under "Vendor Data Requirement (Doc. C213-001-80-42-VDR-5010)" and Vendor Data Required as per Electrical and Instrumentation Sections. Vendor shall ensure that complete data is furnished as required.

19.2 The vendor document submission schedule shall be discussed post- order, which shall meet project schedule requirements.

- 19.3 Any other information/ data as required by the purchaser to carryout engineering for construction, installation and commissioning of the package shall be provided by the vendor during detailed engineering stage.
- 19.4 Vendor to indicate the recommended **type, make and estimated quantity (litres or m3) of grout** in their proposal for the erection and installation of the equipment package. Also, the same shall be indicated by the vendor in the foundation drawing.

## 20 EQUIPMENT STORAGE

All pumps shall be packed (export boxing) for an outside storage period of at least 12 months. The following shall be ensured before dispatch of rotating equipments:

- All the openings shall be plugged and sealed conditions during dispatch.
- Instruments like gauges, speed indicators, probes, oiler etc. shall be removed from the main equipment and dispatched separately to avoid damage to these components while transportation handling and erection.
- In addition to normal packing the pump and motor skids shall be separately covered with transparent polythene cover with opening of piping.

## 21 INITIAL FILL

The initial fill of lubricants, sealing fluid & other consumables shall not be included in the scope of supply of centrifugal pump- electric motor package vendor. However, vendor, in his proposal, shall furnish list of recommended Make (NRL/IOCL Equivalent) and Grade of oils for bearing lubrication & seal pot barrier Liquid (as applicable) and the quantities required for each Pump. Type of oil shall be hydrocarbon type and use of any synthetic oil is not preferred.

**In case recommended by vendor, the same shall be highlighted during pre- bid/ in- bid stage and same shall be included in Bidder's scope of supply (as part of Base Price).**

## 22 SUPERVISION OF ERECTION, TESTING & COMMISSIONING

The vendor shall provide his services for supervision during erection, commissioning & field trail testing of the each pump package (for example 10 man-days for Tag \_\_\_A/B). No. of man-days as defined below shall be considered for purpose of commercial comparison (which the vendor may decide between days for discipline wise).

| S. No. | Pump Package   | No. of Man-days |
|--------|--|-----------------|
| 1.     | Centrifugal Pumps (Single/Two Stages) -<br>Electric Motor Driven Package | 5               |

Per diem rates, as quoted by the bidder, shall be the basis of payment, however the actual payment for supervision services shall be based on actual man-days consumed at site

## 23 PARTICIPATION OF PURCHASER'S ENGINEERS DURING ASSEMBLY AND OTHER IMPORTANT ACTIVITIES:

Purchaser may depute his Engineers at the vendor's shop during the time of Impeller- shaft Assembly, Balancing of Impeller & shaft, Performance Test, and such other important activities which may be required to be performed during maintenance of machines and the associated system. The Purchaser's engineers deputed in the Vendor's shop shall participate in the assembly operation and other activities and shall maintain records of all the data like tolerances, clearances etc. Vendor shall have to provide all such data and records to the Purchaser's Engineers. **Vendor shall submit a list of activities post- order in which such participation shall be useful for future maintenance work, along with the time period of each activity and the schedule when these activities are likely to be performed.**

## 24 PAINTING

- 24.1 Painting for Centrifugal Pump shall be as per Manufacturer's Standard meeting the requirements, as applicable, specified in the 'Specification for Surface Preparation & Protective Coating', attached elsewhere in the MR.
- 24.2 Refer Electrical & Instrumentation requirements for Painting as per the respective inputs, attached elsewhere in the MR.

## 25 WEATHER PROTECTION, EQUIPMENT STORAGE & PREPARATION FOR SHIPMENT

- 25.1 All vents shall be protected against rain etc. and shall be fitted with a screen or filter.
- Special corrosion protection shall be provided for Electric Motors in view of tropical, high humidity, corrosive atmosphere. Tropical insulation shall be provided for Electric Motors.
- 25.2 All equipment covered in the Pump Package shall be packed for an outside storage period of twelve (12) months.
- Packaging shall be of export quality (either for domestic or export shipment) and sea-worthy (as required) to avoid damages during transportation via rail/ road/ sea.
- Vendor's recommended extended storage and preservation procedure shall be furnished to Purchaser/Owner before dispatch.
- 25.3 Equipment vendor to ensure the following before dispatch:
- All the openings shall be plugged & sealed condition during dispatch.
  - Instruments like gauges, speed indicators, probes, oiler etc. shall be removed from the main equipment and dispatched separately to avoid the damage of these components during transportation, handling and erection.
  - In addition to normal packing, the pump, electric motor skids shall be separately covered with transparent polythene cover with opening for piping.
  - Vents shall be protected against rain etc. and shall be fitted with a screen or filter.
- 25.4 Special corrosion protection shall be provided for Electric Motors in view of tropical, high humidity, corrosive atmosphere. Tropical insulation shall be provided for Electric Motors, as required.
- 25.5 The Centrifugal Pump with mechanical run/ performance- tested impeller- shaft assembly shall be shipped as complete equipment with suitable protection and preservative measures, as per Manufacturer's Standard.
- 25.6 The spare impeller- shaft assembly(ies) for Centrifugal Pumps shall be boxed and preserved in wooden/ metal containers for horizontal/ vertical storage as per Manufacturer's standard. Storage container shall be property of the Owner.

## 26 UTILITY DATA REQUIREMENTS & LUBRICATION SCHEDULE

Vendor shall furnish filled- in Utility Data Requirements and Lubrication Schedule for all items in the Bid, as per the formats attached elsewhere in the MR.

## 27 VENDOR LIST

- 27.1 Refer Sub- vendor list (C213-001-80-42-VL-5010), attached elsewhere in the MR, for Mechanical items of the Pump-Electric Motor Package(s).
- 27.2 For Electrical & Instrumentation items, refer respective sub- vendor list, attached elsewhere in the MR

**28 OFFLINE / ONLINE MEETINGS:**

Bidder to note that all meetings during pre- bid stage, technical offer review/ In- bid stage and subsequent detailed engineering/ post- bid stage (in case of an order) may be held in Offline/Virtual. As such, bidder shall ensure availability (at a short notice) of his/ his sub- vendor's representative (as the case maybe) for all such meetings.

**29 List of Annexures:**

1. Annexure-A: Make In India Policy
2. Annexure-B: TYPICAL SKETCH FOR SEAL PLAN 53B

**TABLE 1**

| S. NO. | PUMP ITEM NO.    | SERVICE             | PUMP TYPE | SEAL FLUSHING PLAN | SEAL TYPE                          |
|--------|------------------|---------------------|-----------|--------------------|------------------------------------|
| 1.     | 01-PA-CF-003 A/B | WASH WATER PUMPS    | OH2/BB2   | 53B                | PRESSURIZED DOUBLE MECHANICAL SEAL |
| 2.     | 01-PA-CF-003 C/D | RECYCLE WATER PUMPS | OH2       | 53B                | PRESSURIZED DOUBLE MECHANICAL SEAL |

**ANNEXURE-A (POLICY ON MAKE IN INDIA)**

The bidder in order to qualify has to offer equipment meeting the Experience criteria and the technical specifications laid out in the Material Requisition.

In order to encourage indigenous vendors to enhance their portfolio and manufacturing capabilities in engagement with their principals and in line with Government of India's policy on "Make in India", EIL offers the following qualification criteria for such subsidiaries which are not meeting the Experience criteria for the offered equipment, but can get qualified based on either their Foreign Principal or another subsidiary of the Foreign Principal or the holding company of the Foreign Principal, meeting the Experience criteria requirement:

In case, the bidder is an Indian manufacturer who is a subsidiary (Principal holding at least 51% shares) of a Foreign Principal and the qualification criteria is met by the Foreign Principal or another subsidiary of the Foreign Principal or of the Foreign Principal's holding company:

***(a) Qualification Criteria for Foreign Principal or another subsidiary of Foreign Principal (Principal holding at least 51% shares) hereinafter called "Group Company" of the Foreign Principal or for the Foreign Principal's Holding Company:***

1. The Principal or the Group Company shall be in the business of manufacturing of the offered product line (for at least last five years, reckoned from the bid due date) for which the Indian Manufacturer is seeking to bid.
2. The Principal or the Group Company, whose PTR is being considered, shall already be enlisted either with EIL OR is in Licensor's vendor list, for the same product line.
3. The Principal or the Group Company shall have executed at least TWO orders for the same product line<sup>1</sup>, within the last five years, reckoned from the bid due date.

*Note: All the above criteria shall be met by the same company (either the Principal or the Group Company).*

***(b) Qualification Criteria for Indian Manufacturer (hereinafter called the bidder):***

1. The Bidder must be a subsidiary of the Foreign Principal (Principal holding at least 51% shares) for at least last one year, reckoned from the bid due date.
2. Scope/activity matrix between the Bidder and Principal or the Bidder and the Group Company, shall be submitted to EIL along with the bid. However, the bidder must also note that EIL shall reserve the right to mandate certain activity(ies) or sourcing to be from identified sources only, (#) depending upon the product line under consideration and its criticality. The bidder shall not claim any extra payment on account of any change in sourcing inline with EIL's requirement.
3. The bidder shall source critical components OR the bare tested machine from the Principal or the Group Company or directly from the manufacturers supplying the same to the Principal or the Group Company (a certificate to this effect shall be provided by the Principal or the Group Company) and source non-critical components / auxiliary components supplies himself (subject to # above).
4. The bidder shall have the necessary engineering, manufacturing capability and adequate infrastructure comprising of space, manpower, equipment corresponding to matrix cited above,

***1 Same Product Line for Principal or Group Company: Same type of Equipment being sought in the inquiry [e.g. Centrifugal Horizontal Pump (API 610, OH2/BB2) (Special purpose process) compliant to API610 having equal or higher driver power vis a vis offered driver power].***

duly approved by the Principal or the Group Company, as the case may be, for the product line under consideration.

5. As a minimum, the Principal or the Group Company as the case may be, shall carry out the following activities:
  - Design / Application engineering
  - Approval of sourcing of components
  - Approval of Quality Assurance Plans (QAP) identifying Hold, Check & Witness stages (by Principal)
  - Responsibility Matrix
6. The bidder shall have Manufacturing, Assembly and Testing facility for the proposed scope. However, in the remote case of the Manufacturer not having testing facility at all or not having appropriate testing facility, the Manufacturer shall outsource testing to another independent testing facility subject to acceptance by EIL.
7. The Bidder shall have an established service facility in India (either his own or an approved service provider) which must be approved by Principal or the Group Company, as the case may be.
8. The Bidder shall have executed and supplied minimum two orders in the same product line<sup>2</sup>.
9. The Bidder shall be enlisted with EIL for the same product line<sup>2</sup>.

**Documentation required (along with the bid and in single lot)**

1. General reference list of Principal or the Group Company for the same product line, for the last five years as well as General reference list of the bidder for the same product line.
2. Scope / Activity Matrix
3. Certificate of Incorporation of the Bidder
4. Documents for establishing the bidder as a subsidiary of the Foreign Principal (Principal holding at least 51% shares)
5. Documents for establishing the relationship of the group company, if applicable.
6. Letter from the Principal or the Group Company (as the case may be) confirming that the bidder's engineering facility, manufacturing, testing & assembly facility and service facility in India is duly approved by them.
7. Certificate for sourcing of critical components (as applicable).
8. Corporate Guarantee of the Principal or the Group Company (in the format provided by EIL)

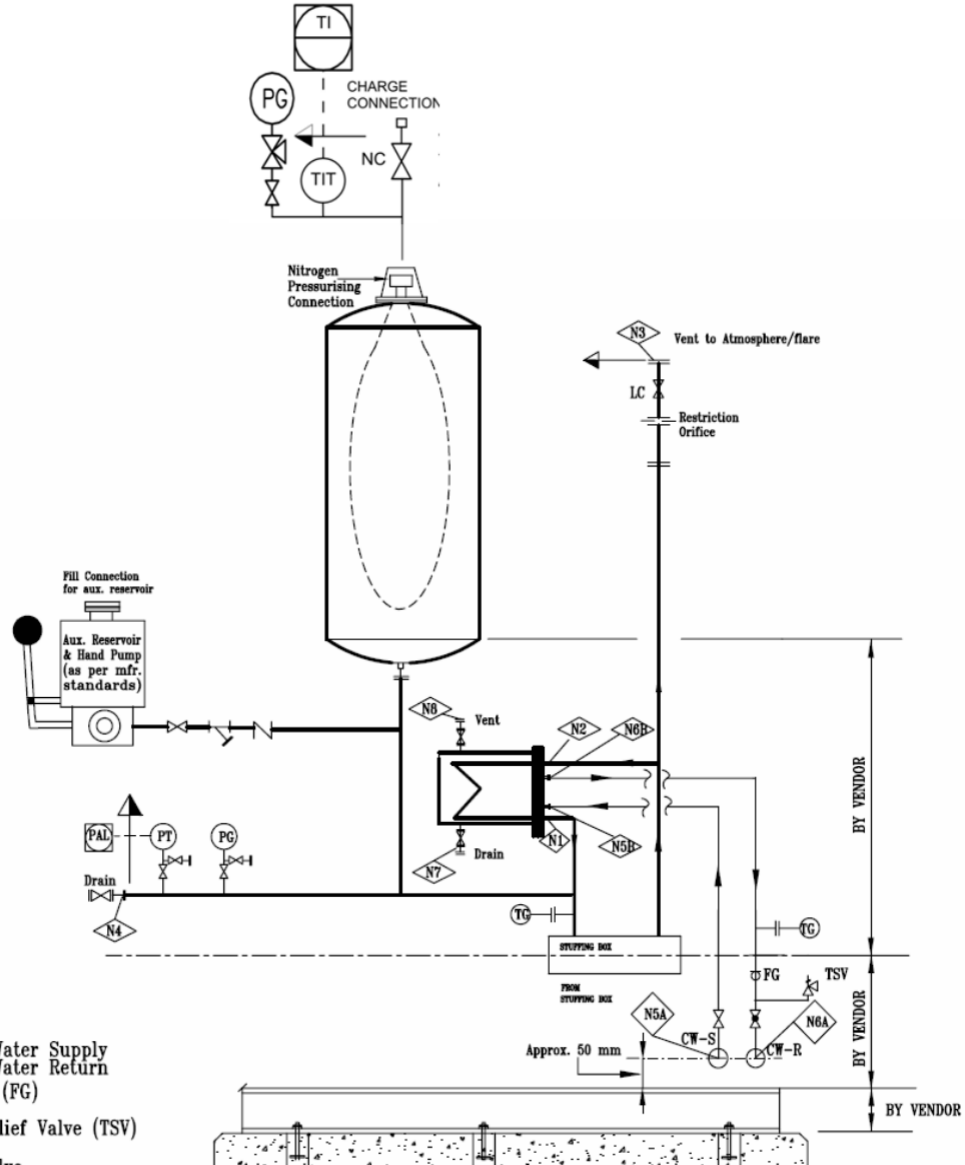
*[Note: The bidder may carry these documents during pre-bid meeting, in case they desire to seek some clarification from EIL. However, formal submission of documents shall only be with bid submission.]*

---

**2 Same Product Line for Indian manufacturer: Same type of Equipment being sought in the inquiry [e.g. Centrifugal Horizontal Pump (API 610, OH2/BB2) (Special purpose process) compliant to API610 having at-least 50% of the offered driver power].**

**ANNEXURE-B**

**TYPICAL SKETCH FOR SEAL PLAN 53B**



**LEGEND**

- CW-S: Cooling Water Supply
- CW-R: Cooling Water Return
- Flow Glass (FG)
- ⊥ Thermal Relief Valve (TSV)
- ⊗ Isolation Valve
- ⊗ Globe valve
- LC LOCK CLOSE
- PG Pressure gauge
- PT Pressure Transmitter
- PAL Pressure Alarm Low
- TG Temperature gauge
- N NRV
- ⊥ Strainer
- ← Purchaser
- ← Vendor

**NOTES**

- 1 : Pipe projection for filling connection shall be minimum and shall be rigidly supported.
- 2 : Aux. resevoir shall be hinged & bolted.
- 3 : All dimesions are in mm.
- 4 : Accumulator volume : 25 liters or Min. 25 days working voulme without refilling, whichever is greater, with 30% (min.) emergency volume.
- 5 : Coolers shall be vendor's std. water (shell & tube) cooler type.
- 6 : Bladder shall be of BUNA-N.
- 7 : Complete cooling water supply/ return piping upto baseplate edge including gate valve, globe valve, TSV, TG and flow glass will be in Vendor's scope of supply
- 8 : Vendor shall supply charging kit for Nitrogen pressurisation, Nitrogen cylinder and regulator are in purchaser's scope.

| DESIGN PARAMETERS (for Plan 53B)  |                                      |              |                    |                     |
|---|--------------------------------------|--------------|--------------------|---------------------|
| Optg. Pressure (kg/cm <sup>2</sup> ) / Optg. Temp (°C)  | : As per respective pump data sheets |              |                    |                     |
| Design Pressure (kg/cm <sup>2</sup> ) / Design Temp (°C)  | : 40.0 (min.) / Ambient (min.) §     |              |                    |                     |
| Hydro test pressure (kg/cm <sup>2</sup> ):  | : 1.5 times Design Pressure          |              |                    |                     |
| MOC of Reservoir  | : SS 316L                            |              |                    |                     |
| MOC of Bladder  | : BUNA-N                             |              |                    |                     |
| § Sealing system shall be designed for shutoff pressure/casing design pressure at design temperature. |                                      |              |                    |                     |
| NOZZLE SCHEDULE   |                                      |              |                    |                     |
| Nozzle  | Service                              | Size, mm (") | Min. ANSI Rating § | Flange type (Rem 6) |
| N1  | To:seal                              | 20 (3/4")    | 300#               | SWRF                |
| N2  | From Seal                            | 20 (3/4")    | 300#               | SWRF                |
| N3  | Vent                                 | 15 (1/2")    | 3000#              | SWRF                |
| N4  | Drain                                | 20 (3/4")    | 300#               | SWRF                |
| N5A   | Cooling water Supply @ grade         | 20 (3/4")    | 150#               | SWRF                |
| N5 B  | Cooling Water Inlet                  | 15 (1/2")    | 300#               | SWRF                |
| N6 A  | Cooling Water Return @ grade         | 20 (3/4")    | 150#               | SWRF                |
| N6 B  | Cooling Water Outlet                 | 15 (1/2")    | 300#               | SWRF                |
| N7  | HE Drain                             | 15 (1/2")    | 300#               | NPT (F)             |
| N8  | HE Vent                              | 15 (1/2")    | 300#               | NPT (F)             |
|   |                                      |              |                    |                     |
| INSTRUMENTS   |                                      |              |                    |                     |
| Description   | Function                             | Required     | Remark             |                     |
| Temperature Gauge (TG)(Barrier Fluid)   | Temperature Indication Local         | YES          |                    |                     |
| Pressure Gauge (PG) (Barrier Fluid)   | Press. Indication Local              | YES          |                    |                     |
| Pressure Transmitter (PT)   | Press. Alarm Low (PAL)               | YES          |                    |                     |
| Temp. Safety Valve (TSV)  | --                                   | YES          |                    |                     |
| Restr. Orifice (RO)   | --                                   | YES          |                    |                     |
| Flow Glass (FG)   | --                                   | YES          |                    |                     |
| Temperature Gauge (TG) (CW-R)   | Temperature Indication Local         | YES          |                    |                     |
|   |                                      |              |                    |                     |
|   |                                      |              |                    |                     |

**REMARKS**

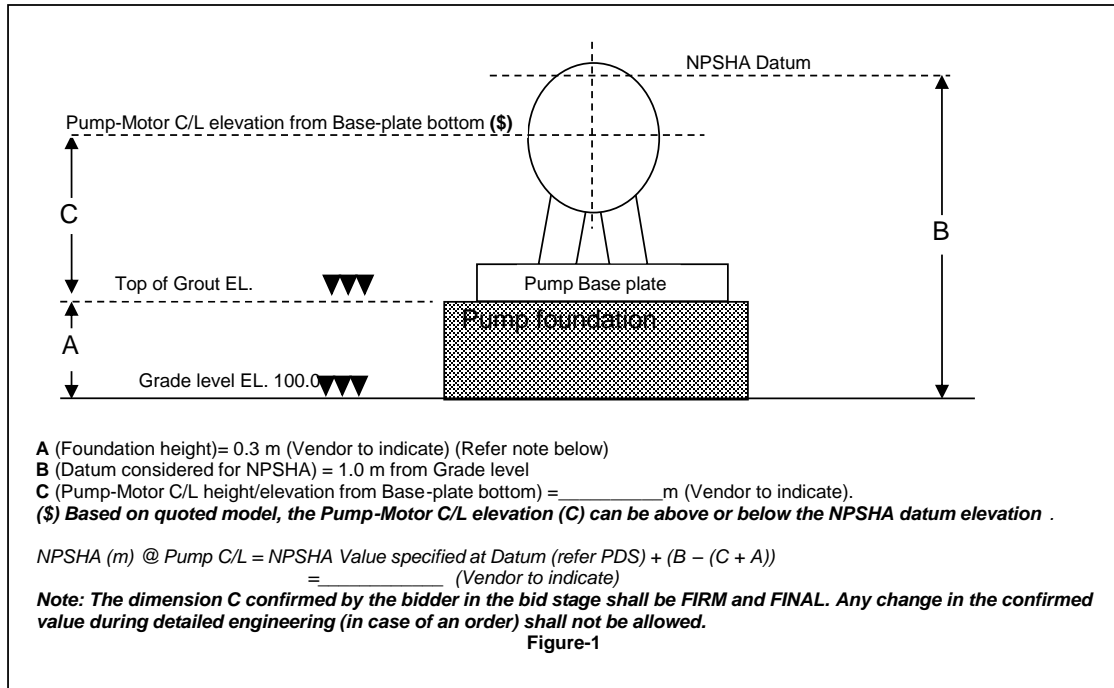
- The Barrier fluid reservoir shall be arranged in accordance with the schematic shown in the drawing.
- The reservoir and piping shall be designed, fabricated & tested in accordance with
  - ISO 15649/ASME B 31.3 using Piping component
  - ASME Sec VIII Div 1
- The complete seal system for each stuffing box including the reservoir shall be arranged as one skid and supported/bolted to the base plate in a manner that the projection of any equipment/instruments falls within the confines of base plate. The reservoir and the accessories to be mounted on a structural support furnished by the manufacturer and should not be affected by the pump vibration. In case of between bearing pumps there shall be two such units, one each for each stuffing box mounted on opposite ends of the pump.
- The mechanical design of auxiliary piping shall achieve the following:
  - Proper support and protection to prevent damage from vibration or from shipment, operation & maintenance.
  - Proper flexibility and normal accessibility for operation, maintenance and thorough cleaning.
  - Installation in a neat and orderly arrangement adapted to the contour of the

- machine without obstructing access openings.
- d) Elimination of air pockets by the use of valved vents or non-accumulating piping arrangements.
  - e) Complete drainage through low points without dis-assembly of piping, seal or gland components.
  - f) Reduce the number of potential emission sources and pressure drops by minimising the use of threaded connections, flanges, fittings and valves.
5. Refer Instrumentation specification for details of instruments.
6. Flange type specified in the table above is for sealing system design of 300# rating. Wherever the sealing system design exceeds 300# rating the flange type for complete sealing system (including coolers etc.) shall be as per standard ASME B 16.5

| GENERAL |   |  |   |                                     |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
|---------|---|--|---|-------------------------------------|-------------------------------------|-------------------------------------|--|--|---|-------------------------------------|--------------------------|-------------------------------------|---|----------------------|----|
| 1       | GENERAL   |  |   |                                     |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
| 2       | Project:  | REVAMP OF DESALTER SYSTEM OF CDU/VDU AT                            |   |                                     |                                     |                                     | Job. No.:  | C213   |   |                                     |                          |                                     |   |                      |    |
| 3       | Client:   | M/s NUMALIGARH REFINERY LIMITED (NRL)                              |   |                                     |                                     |                                     | Site:  | NRL  |   |                                     |                          |                                     |   |                      |    |
| 4       | Consultant:   | M/s EIL  |   |                                     |                                     |                                     | Unit:  | CDU/VDU  |   | Unit No.:                           |                          | 001                                 |   |                      |    |
| 5       | Item No.:   | 01-PA-CF-003 A/B   |   |                                     |                                     |                                     | Service:   | WASH WATER PUMP  |   |                                     |                          |                                     |   |                      |    |
| 6       | No. Required  | 2  | Working:  | 1                                   | Standby:                            | 1                                   | Parallel Operation Required:                                 | <input type="checkbox"/>                                 | Yes   | <input checked="" type="checkbox"/> | No                       |                                     |   |                      |    |
| 7       | Applicable to   | <input checked="" type="checkbox"/>                                | Proposals   | <input type="checkbox"/>            | Purchase                            | <input type="checkbox"/>            | As Built   |  |   |                                     |                          |                                     |   |                      |    |
| 8       | <input checked="" type="checkbox"/>   | Scope,option & Information Specified By Purchaser                  |   |                                     |                                     |                                     | <input type="checkbox"/>                                     | Information reqd. from and options left to vendor        |   |                                     |                          |                                     | Vendor to cross <input checked="" type="checkbox"/> the selected option |                      |    |
| 9       | Driver:   | 2  | Working   | 1                                   | Standby                             | 1                                   | Driver Supplied & Mounted By:                                | <input checked="" type="checkbox"/>                      | Pump Mfr.   | <input type="checkbox"/>            | Other                    |                                     |   |                      |    |
| 10      | OPERATING CONDITIONS (Refer Pump Process Datasheet)   |  |   |                                     |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
| 11      | Liquid Handled  | DESALTER WATER   |   |                                     |                                     |                                     | Capacity (Min/Nor/Rated):Note                                | m <sup>3</sup> /hr                                       | 16.1  | 32.2                                | 36.8                     |                                     |   |                      |    |
| 12      | Pumping Temp. (°C):   | Normal   | 30  | Max.                                | 45                                  |                                     | Discharge Pressure (kg/cm <sup>2</sup> ,A):                  | 25   |   |                                     |                          |                                     |   |                      |    |
| 13      | Specific Gravity at P.T./15°C:  | 0.9998   |   |                                     |                                     |                                     | Suction Pressure: Nor./ Max. (kg/cm <sup>2</sup> ,A):        | 1.5  | 5.18  |                                     |                          |                                     |   |                      |    |
| 14      | Vapour Pressure (kg/cm <sup>2</sup> ,A):  | 0.1  |   |                                     |                                     |                                     | Diff. Pressure (kg/cm <sup>2</sup> ) @ Rated Capacity:       | 23.5   |   |                                     |                          |                                     |   |                      |    |
| 15      | Viscosity at P.T. cP  | 0.6  |   |                                     |                                     |                                     | Diff. Head (m) @ Rated Capacity:                             | 235  |   |                                     |                          |                                     |   |                      |    |
| 16      | Solids in suspension  | <input type="checkbox"/>   | Yes   | <input checked="" type="checkbox"/> | No                                  |                                     | NPSH Available (m):Note-6                                    | 4.0  |   |                                     |                          |                                     |   |                      |    |
| 17      | <input type="checkbox"/>  | Flammable  | <input type="checkbox"/>                                      | Toxic:H/C                           | <input checked="" type="checkbox"/> | H2S(H2S > 500 PPM)                  | <input type="checkbox"/>                                     | CHLORIDE   | <input type="checkbox"/>                                      | Others                              |                          |                                     |   |                      |    |
| 18      | MANUFACTURER'S SPECIFICATIONS   |  |   |                                     |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
| 19      | Pump Manufacturer:  |  |   |                                     |                                     |                                     | Model No.:   |  |   |                                     |                          |                                     |   |                      |    |
| 20      | CONSTRUCTION  |  |   |                                     |                                     |                                     | PERFORMANCE  |  |   |                                     |                          |                                     |   |                      |    |
| 21      | Type:   | <input checked="" type="checkbox"/>                                | OH2 OR  | <input checked="" type="checkbox"/> | BB2                                 | Suction Specific Speed              |  |  |   |                                     |                          |                                     |   |                      |    |
| 22      | Casing Mounting:  | <input checked="" type="checkbox"/>                                | Centerline  | <input type="checkbox"/>            | Foot                                | <input type="checkbox"/>            | Inline   | Proposal Curve No.                                       |   |                                     |                          | L <sup>3</sup> /D <sup>4</sup> :    |   |                      |    |
| 23      | Casing Split:   | <input type="checkbox"/>   | Axial   | <input checked="" type="checkbox"/> | Radial                              |                                     | Visc. Corr. Factor: C <sub>n</sub>                           | C <sub>o</sub>   | C <sub>H</sub>  |                                     |                          |                                     |   |                      |    |
| 24      | Type:   | <input type="checkbox"/>   | Single Volute   | <input type="checkbox"/>            | Double Volute                       | <input type="checkbox"/>            | Diffuser   | NPSH Reqd. (Water) (m):                                  | FL Speed (rpm):   |                                     |                          |                                     |   |                      |    |
| 25      | Casing Connection:  | <input checked="" type="checkbox"/>                                | Vent  | <input checked="" type="checkbox"/> | Drain                               | <input type="checkbox"/>            | Gauge  | No. of stages:   | Efficiency (%):   |                                     |                          |                                     |   |                      |    |
| 26      | Nozzles   | Size   |   | ANSI Rating                         | Facing                              | Position                            |  | Rated BKW(0% Tol.):                                      | Max. BKW rtd. Imp.:   |                                     |                          |                                     |   |                      |    |
| 27      | Suction   | 300#   |   | RF                                  |                                     |                                     |  | BKW @ MCF(p=1.0):  | Driver Rating: (kW)   |                                     |                          |                                     |   |                      |    |
| 28      | Discharge   | 300#   |   | RF                                  | TOP                                 |                                     |  | Max.head rtd imp.(m):                                    | Cap@ BEP(m <sup>3</sup> /hr):                                 |                                     |                          |                                     |   |                      |    |
| 29      | Imp. Φ (mm)   | Max:   | Rated:  |                                     | Min:                                | Type:                               | Closed   | MCF (m <sup>3</sup> /hr):Stable                          | Suc. Specific Speed   |                                     |                          |                                     |   |                      |    |
| 30      | Brg.Type/No.  | Radial:  | Thrust:   |                                     | Lub:                                | Oil                                 |  | M.A.W.P @ 15°C/P.T./Design Temp.(kg/cm <sup>2</sup> ,G): |   |                                     |                          |                                     |   |                      |    |
| 31      | Cplg.:Make/Type   | Fleximetl with spacer  |   | Nonspark Guard                      | <input checked="" type="checkbox"/> | Yes                                 | <input type="checkbox"/>                                     | No   | Hydrostatic Test pressure (kg/cm <sup>2</sup> ,G): 1.5 x MAWP |                                     |                          |                                     |   |                      |    |
| 32      | Driver Half cplg. mounted by:   | <input checked="" type="checkbox"/>                                | Pump Mfr.   | <input type="checkbox"/>            |                                     |                                     | Others   | Rotation facing coupling end:                            | <input type="checkbox"/>                                      | CW                                  | <input type="checkbox"/> | CCW                                 |   |                      |    |
| 33      | Packing Type:   | NA   | Size:   | No. of rings:                       |                                     | Seal flush/ Quench plan:            |  | 53B  | Material:   |                                     |                          |                                     |   |                      |    |
| 34      | Mech. Seal: Make  | Model  | API Code:   | Ext. seal flush fluid:              |                                     | LPM:                                | Kg/cm <sup>2</sup> G   | °C   |   |                                     |                          |                                     |   |                      |    |
| 35      | Base Plate Drain Rim Type :   | <input checked="" type="checkbox"/>                                | Yes   | <input type="checkbox"/>            | No                                  | Fdn. Bolts:                         | <input checked="" type="checkbox"/>                          | Yes  | <input type="checkbox"/>                                      | No                                  | Seal Barrier fluid:      | LPM:                                | Kg/cm <sup>2</sup> G  | °C                   |    |
| 36      | Throat Bush:  | <input checked="" type="checkbox"/>                                | Yes   | <input type="checkbox"/>            | No                                  | Matl.:                              | Bal. Device:   | <input checked="" type="checkbox"/>                      | Yes   | <input type="checkbox"/>            | No                       | Ext. quench fluid:                  | LPM:  | Kg/cm <sup>2</sup> G | °C |
| 37      | Materials (API-610 Matl. Class):Refer PDS   | S-6  | MOC   | ASTM Grades                         |                                     | C.W. Plan :                         |  | LPM:   | Kg/cm <sup>2</sup> G  | °C                                  |                          |                                     |   |                      |    |
| 38      | I - Cast Iron (Ductile)   | Casing   | C   | CA6NM + PWHT (NOTE-4)               |                                     | Weight(kg): Pump+Base+Coupling:     |  | Driver:  |   |                                     |                          |                                     |   |                      |    |
| 39      | B - Bronze  | X-AISI 410   | Impeller  | C                                   | CA6NM                               |                                     | Auxiliary Piping Interfacing Plan                            |  |   |                                     |                          |                                     |   |                      |    |
| 40      | S - Carbon Steel (KCS)  | Inner Case parts   | All interface conn.shall be termtd.with a flng. block valves) |                                     |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
| 41      | Z-LTCS  | C - 11-13% Chr. S  | Sleeve-Packed   | Size                                |                                     | Rating(ANSI)                        | Facing   |  |   |                                     |                          |                                     |   |                      |    |
| 42      | C(S) - 11-13% Chr.Stl.(LC)  | Sleeve Seal  | Lantern Ring Inlet/Outlet                                     |                                     |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
| 43      | K -SS 304   | K(S)-SS304L (LC)   | Casing ring   | ΔH-BHN                              | C                                   | Ext. Seal flush fluid Inlet/Outlet  |  |  |   |                                     |                          |                                     |   |                      |    |
| 44      | L -SS 316   | L(S)-SS316L (LC)   | Impeller ring   | 50(min)                             | C                                   | Seal Quench fluid Inlet             |  |  |   |                                     |                          |                                     |   |                      |    |
| 45      | D-Duplex SS   | h - Hardened   | Shaft   | Y                                   | Seal pot vent/ drain                |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
| 46      | SD-Super Duplex   | f - Faced  | Throttle Bush   | Casing vent/ drain                  |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
| 47      | LC - Low Carbon   | Throat Bush  | C.W Inlet/ Outlet   |                                     |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
| 48      | Y-AISI 4140   | Balance Drum   | Base plate drain (only flanged)                               |                                     | 2"                                  | 150#                                |  |  |   |                                     |                          |                                     |   |                      |    |
| 49      | <input type="checkbox"/>  | Driver suitable for Pump starting with open Disc. Valve condition. | Casing steam jacket   |                                     |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
| 50      | INSPECTION & TESTS (EACH PUMP) (Also Refer ITP Attached)  |  |   |                                     |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
| 51      | Witness   |  |   |                                     |                                     | Observe                             |  |  |   |                                     | Witness                  |                                     | Observe   |                      |    |
| 52      | <input checked="" type="checkbox"/>   | Shop Test / Inspection   | <input checked="" type="checkbox"/>                           | <input type="checkbox"/>            |                                     | <input checked="" type="checkbox"/> | NPSH As Reqd.  | <input checked="" type="checkbox"/>                      | Per Spec  | <input type="checkbox"/>            | Mandatory                | <input checked="" type="checkbox"/> | <input type="checkbox"/>  |                      |    |
| 53      | <input checked="" type="checkbox"/>   | Material Certificates  | <input type="checkbox"/>                                      | <input checked="" type="checkbox"/> |                                     | <input checked="" type="checkbox"/> | Dismantle Insp. & Re-assembly after Test (Note)              |  |   |                                     |                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>  |                      |    |
| 54      | <input checked="" type="checkbox"/>   | Hydrostatic  | <input type="checkbox"/>                                      | <input checked="" type="checkbox"/> |                                     | <input checked="" type="checkbox"/> | Unitisation/Check for direction of rotation of pump & driver |  |   |                                     |                          | <input type="checkbox"/>            | <input checked="" type="checkbox"/>                                     |                      |    |
| 55      | <input checked="" type="checkbox"/>   | Performance/Sound Level  | <input checked="" type="checkbox"/>                           | <input type="checkbox"/>            |                                     | <input checked="" type="checkbox"/> | Visual, Dimension & skid completeness check                  |  |   |                                     |                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>  |                      |    |
| 56      | Applicable Specification: API Std. 610,12th Ed.,EIL Std. Spec. 6-41-0008 Rev. 0 & Job Spec. No. C213-001-80-42-SP-5010.   |  |   |                                     |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
| 57      | <input type="checkbox"/>  | Coke Cutting/Crusher Impeller;                                     | <input type="checkbox"/>                                      | Wear ring Flushing;                 | <input type="checkbox"/>            | Pump Jacketing;                     | <input type="checkbox"/>                                     | Stuffing box Jacketing                                   |   |                                     |                          |                                     |   |                      |    |
| 58      | REMARKS:- 1) Max. allowable casing working pressure shall not be less than 34 kg/cm <sup>2</sup> g @ 75 °C  |  |   |                                     |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
| 59      | 2) Down Stream Design Pressure is 34 kg/cm <sup>2</sup> g @75 °C. Maximum shut-off, considering max suction pressure, including all tolerances shall not exceed this value.   |  |   |                                     |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
| 60      | 3) For Pump Type, MOC class and Seal Plan, refer Annexure-A of Job specification # C213-001-80-42-SP-5010 for details.  |  |   |                                     |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
| 61      | 4) ALL WELDS TO BE PWHT, STRESS RELIEVED AND HARDNESS NOT TO BE EXCEEDED 200 BHN (MAX)  |  |   |                                     |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
| 62      | 5) Dismantle Inspection of Pump after performance test shall be applicable only in case of abnormality in mechanical behavior (such as excessive noise & vibration, bearing temperature rise etc.) during performance test. |  |   |                                     |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
| 63      | 6) Vendor shall arrive at exact NPSHA at Pump centerline and provide details / calculation for NPSHA as per Fig. 1 of datasheet.  |  |   |                                     |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
| 64      | 7) Rated flow of pump shall be specified flow (in PDS) plus warm up flow & balancing line flow(as applicable). Vendor to indicate rated flow with breakup(rated flow and warmup flow) seperately in datasheet accordingly.  |  |   |                                     |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |
| 65      | 8) Guarantee point for the purpose of loading & penalty shall be rated flow (maximum flow as specified in PDS + warm up &   |  |   |                                     |                                     |                                     |  |  |   |                                     |                          |                                     |   |                      |    |

|    |   |      |             |             |             |
|----|---|------|-------------|-------------|-------------|
| 68 | balancing flow, as applicable), rated differential head (as specified in PDS), pumping fluid maximum density (as specified in PDS) & maximum density (as specified in PDS).                 |      |             |             |             |
| 69 | 9) No. of skin thermocouples = _____  |      |             |             |             |
| 70 | 10) Vendor to indicate NPSHR at Rated Point, MCF and 120% of BEP<br>NPSHR (Water) (m) at Rated Point = _____<br>NPSHR (Water) (m) at MCF= _____<br>NPSHR (Water) (m) at 120% BEP= _____     |      |             |             |             |
| 71 | 11) C.S MATERIALS SHALL BE COMPLIED WITH NACE MR0103  |      |             |             |             |
| 72 | 12) These pumps shall be mounted on existing foundation. No modification of existing foundation is envisaged. Refer existing pump foundation and GAD attached elsewhere in the requisition. |      |             |             |             |
|    |   | A    | VRS         | ME          | TK          |
|    |   | REV. | PREPARED BY | REVIEWED BY | APPROVED BY |

Fig.1 NPSHA at pump centerline calculation



| GENERAL |   |  |                                     |   |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
|---------|---|--|-------------------------------------|---|---|--|---------------------------------|--|--|---|-------------------------------------|--------------------------|-----------|-------------------------------------|--------------------------|
| 1       | GENERAL   |  |                                     |   |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 2       | Project:  | REVAMP OF DESALTER SYSTEM OF CDU/VDU AT                            |                                     |   |   |  |                                 | Job. No.:  | C213   |   |                                     |                          |           |                                     |                          |
| 3       | Client:   | M/s NUMALIGARH REFINERY LIMITED (NRL)                              |                                     |   |   |  |                                 | Site:  | NRL  |   |                                     |                          |           |                                     |                          |
| 4       | Consultant:   | M/s EIL  |                                     |   |   |  |                                 | Unit:  | CDU/VDU  |   | Unit No.:                           |                          | 001       |                                     |                          |
| 5       | Item No.:   | 01-PA-CF-003 C/D   |                                     |   |   |  |                                 | Service:   | RECYCLE WATER PUMPS  |   |                                     |                          |           |                                     |                          |
| 6       | No. Required  | 2  | Working:                            | 1   | Standby:  | 1  | Parallel Operation Required:    | <input type="checkbox"/>                                 | Yes  | <input checked="" type="checkbox"/>                           | No                                  | <input type="checkbox"/> |           |                                     |                          |
| 7       | Applicable to   | <input checked="" type="checkbox"/>                                | Proposals                           | <input type="checkbox"/>                                      | Purchase  | <input type="checkbox"/>   | As Built                        |  |  |   |                                     |                          |           |                                     |                          |
| 8       | <input checked="" type="checkbox"/>   | Scope,option & Information Specified By Purchaser                  | <input type="checkbox"/>            | Information reqd. from and options left to vendor             | Vendor to cross <input checked="" type="checkbox"/> the selected option |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 9       | Driver:   | 2  | Working                             | 1   | Standby   | 1  | Driver Supplied & Mounted By:   | <input checked="" type="checkbox"/>                      | Pump Mfr.  | <input type="checkbox"/>                                      | Other                               | <input type="checkbox"/> |           |                                     |                          |
| 10      | OPERATING CONDITIONS (Refer Pump Process Datasheet)   |  |                                     |   |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 11      | Liquid Handled  | DESALTER WATER   |                                     |   |   |  |                                 | Capacity (Min/Nor/Rated):Note                            | m <sup>3</sup> /hr   | 16.1  | 32.2                                | 36.8                     |           |                                     |                          |
| 12      | Pumping Temp. (°C):   | Normal   | 120                                 | Max.  | 135   |  |                                 | Discharge Pressure (kg/cm <sup>2</sup> ,A):              | 23.03  |   |                                     |                          |           |                                     |                          |
| 13      | Specific Gravity at P.T./15°C:  | 0.93   |                                     |   |   |  |                                 | Suction Pressure: Nor./ Max. (kg/cm <sup>2</sup> ,A):    | 14.33  | 17.33   |                                     |                          |           |                                     |                          |
| 14      | Vapour Pressure (kg/cm <sup>2</sup> ,A):  | 3.5  |                                     |   |   |  |                                 | Diff. Pressure (kg/cm <sup>2</sup> ) @ Rated Capacity:   | 8.7  |   |                                     |                          |           |                                     |                          |
| 15      | Viscosity at P.T. cP  | 0.227  |                                     |   |   |  |                                 | Diff. Head (m) @ Rated Capacity:                         | 93.5   |   |                                     |                          |           |                                     |                          |
| 16      | Solids in suspension  | <input type="checkbox"/>   | Yes                                 | <input checked="" type="checkbox"/>                           | No  | NPSH Available (m):Note-6  |                                 |  |  |   |                                     | >8                       |           |                                     |                          |
| 17      | <input type="checkbox"/>  | Flammable  | <input type="checkbox"/>            | Toxic:H/C   | <input checked="" type="checkbox"/>                                     | H2S(H2S > 500 PPM)   |                                 | <input type="checkbox"/>                                 | CHLORIDE   | <input type="checkbox"/>                                      | Others                              |                          |           |                                     |                          |
| 18      | MANUFACTURER'S SPECIFICATIONS   |  |                                     |   |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 19      | Pump Manufacturer:  |  |                                     |   |   |  |                                 | Model No.:   |  |   |                                     |                          |           |                                     |                          |
| 20      | CONSTRUCTION  |  |                                     |   |   |  | PERFORMANCE                     |  |  |   |                                     |                          |           |                                     |                          |
| 21      | Type:   | <input checked="" type="checkbox"/>                                | OH2                                 | <input type="checkbox"/>                                      | BB2   | Suction Specific Speed   |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 22      | Casing Mounting:  | <input checked="" type="checkbox"/>                                | Centerline                          | <input type="checkbox"/>                                      | Foot  | <input type="checkbox"/>   | Inline                          | Proposal Curve No.                                       | L <sup>3</sup> /D <sup>4</sup> :                             |   |                                     |                          |           |                                     |                          |
| 23      | Casing Split:   | <input type="checkbox"/>   | Axial                               | <input checked="" type="checkbox"/>                           | Radial  |  |                                 | Visc. Corr. Factor: C <sub>n</sub>                       | C <sub>o</sub>   | C <sub>H</sub>  |                                     |                          |           |                                     |                          |
| 24      | Type:   | <input type="checkbox"/>   | Single Volute                       | <input type="checkbox"/>                                      | Double Volute   | <input type="checkbox"/>   | Diffuser                        | NPSH Reqd. (Water) (m):                                  | FL Speed (rpm):  |   |                                     |                          |           |                                     |                          |
| 25      | Casing Connection:  | <input checked="" type="checkbox"/>                                | Vent                                | <input checked="" type="checkbox"/>                           | Drain   | <input type="checkbox"/>   | Gauge                           | No. of stages:   | Efficiency (%):  |   |                                     |                          |           |                                     |                          |
| 26      | Nozzles   | Size   | ANSI Rating                         | Facing  | Position  |  |                                 | Rated BKW(0% Tol.):                                      | Max. BKW rtd. Imp.:  |   |                                     |                          |           |                                     |                          |
| 27      | Suction   | 300#   |                                     |   | RF  | END  |                                 | BKW @ MCF(p=1.0):  | Driver Rating: (kW)  |   |                                     |                          |           |                                     |                          |
| 28      | Discharge   | 300#   |                                     |   | RF  | TOP  |                                 | Max.head rtd imp.(m):                                    | Cap@ BEP(m <sup>3</sup> /hr):                                |   |                                     |                          |           |                                     |                          |
| 29      | Imp. Φ (mm)   | Max:   | Rated:                              | Min:  | Type:   | Closed   |                                 |  | MCF (m <sup>3</sup> /hr):Stable                              | Suc. Specific Speed   |                                     |                          |           |                                     |                          |
| 30      | Brg.Type/No.  | Radial:  | Thrust:                             | Lub:  | Oil   |  |                                 | M.A.W.P @ 15°C/P.T./Design Temp.(kg/cm <sup>2</sup> ,G): |  |   |                                     |                          |           |                                     |                          |
| 31      | Cplg.:Make/Type   | Fleximetl with spacer  |                                     |   | Nonspark Guard  | <input checked="" type="checkbox"/>  | Yes                             | <input type="checkbox"/>                                 | No   | Hydrostatic Test pressure (kg/cm <sup>2</sup> ,G): 1.5 x MAWP |                                     |                          |           |                                     |                          |
| 32      | Driver Half cplg. mounted by:   | <input checked="" type="checkbox"/>                                | Pump Mfr.                           | <input type="checkbox"/>                                      | Others  | Rotation facing coupling end: <input type="checkbox"/> CW <input type="checkbox"/> CCW |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 33      | Packing Type:   | NA   | Size:                               | No. of rings:   | Seal flush/ Quench plan:  |  |                                 | 53B  | Material:  |   |                                     |                          |           |                                     |                          |
| 34      | Mech. Seal: Make  | Model  | API Code:                           | Ext. seal flush fluid:  |   |  | LPM:                            | kg/cm <sup>2</sup> G                                     | °C   |   |                                     |                          |           |                                     |                          |
| 35      | Base Plate Drain Rim Type :   | <input checked="" type="checkbox"/>                                | Yes                                 | <input type="checkbox"/>                                      | No  | Fdn. Bolts: <input checked="" type="checkbox"/>  | Yes                             | <input type="checkbox"/>                                 | No   | Seal Barrier fluid:   | LPM:                                | kg/cm <sup>2</sup> G     | °C        |                                     |                          |
| 36      | Throat Bush:  | <input checked="" type="checkbox"/>                                | Yes                                 | <input type="checkbox"/>                                      | No  | Matl.: Bal. Device: <input checked="" type="checkbox"/>                                | Yes                             | <input type="checkbox"/>                                 | No   | Ext. quench fluid:  | LPM:                                | kg/cm <sup>2</sup> G     | °C        |                                     |                          |
| 37      | Materials (API-610 Matl. Class):Refer PDS   | S-6  | MOC                                 | ASTM Grades   |   |  | C.W. Plan :                     | LPM:   | kg/cm <sup>2</sup> G   | °C  |                                     |                          |           |                                     |                          |
| 38      | I - Cast Iron (Ductile)   | Casing   | C                                   | CA6NM + PWHT (NOTE-4)   |   |  | Weight(kg): Pump+Base+Coupling: | Driver:  |  |   |                                     |                          |           |                                     |                          |
| 39      | B - Bronze  | X-AISI 410   | Impeller                            | C   | CA6NM   |  |                                 | Auxiliary Piping Interfacing Plan                        |  |   |                                     |                          |           |                                     |                          |
| 40      | S - Carbon Steel (KCS)  | Inner Case parts   |                                     | All interface conn.shall be termtd.with a flng. block valves) |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 41      | Z-LTCS C - 11-13% Chr. S  | Sleeve-Packed  |                                     | Size  | Rating(ANSI)  | Facing   |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 42      | C(S)- 11-13% Chr.Stl.(LC)   | Sleeve Seal  |                                     | Lantern Ring Inlet/Outlet                                     |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 43      | K -SS 304 K(S)-SS304L (LC)  | Casing ring  | ΔH-BHN                              | C   | Ext. Seal flush fluid Inlet/Outlet                                      |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 44      | L -SS 316 L(S)-SS316L (LC)  | Impeller ring  | 50(min)                             | C   | Seal Quench fluid Inlet   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 45      | D-Duplex SS h - Hardened  | Shaft  |                                     | Y   | Seal pot vent/ drain  |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 46      | SD-Super Duplex f - Faced   | Throttle Bush  |                                     | Casing vent/ drain  |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 47      | LC - Low Carbon   | Throat Bush  |                                     | C.W Inlet/ Outlet   |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 48      | Y-AISI 4140   | Balance Drum   |                                     | Base plate drain (only flanged)                               |   |  | 2"                              | 150#   |  |   |                                     |                          |           |                                     |                          |
| 49      | <input type="checkbox"/>  | Driver suitable for Pump starting with open Disc. Valve condition. | Casing steam jacket                 |   |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 50      | INSPECTION & TESTS (EACH PUMP) (Also Refer ITP Attached)  |  |                                     |   |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 51      | Witness   |  |                                     |   |   |  | Observe                         |  |  |   |                                     |                          |           |                                     |                          |
| 52      | <input checked="" type="checkbox"/>   | Shop Test / Inspection   | <input checked="" type="checkbox"/> | Witness   |   | <input type="checkbox"/>   | Observe                         | <input checked="" type="checkbox"/>                      | NPSH As Reqd.  | <input checked="" type="checkbox"/>                           | Per Spec                            | <input type="checkbox"/> | Mandatory | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 53      | <input checked="" type="checkbox"/>   | Material Certificates  | <input type="checkbox"/>            | Witness   |   | <input checked="" type="checkbox"/>  | Observe                         | <input checked="" type="checkbox"/>                      | Dismantle Insp. & Re-assembly after Test (Note               | <input checked="" type="checkbox"/>                           | <input type="checkbox"/>            |                          |           |                                     |                          |
| 54      | <input checked="" type="checkbox"/>   | Hydrostatic  | <input type="checkbox"/>            | Witness   |   | <input checked="" type="checkbox"/>  | Observe                         | <input checked="" type="checkbox"/>                      | Unitisation/Check for direction of rotation of pump & driver | <input type="checkbox"/>                                      | <input checked="" type="checkbox"/> |                          |           |                                     |                          |
| 55      | <input checked="" type="checkbox"/>   | Performance/Sound Level  | <input checked="" type="checkbox"/> | Witness   |   | <input type="checkbox"/>   | Observe                         | <input checked="" type="checkbox"/>                      | Visual, Dimension & skid completeness check                  | <input checked="" type="checkbox"/>                           | <input type="checkbox"/>            |                          |           |                                     |                          |
| 56      | Applicable Specification: API Std. 610,12th Ed.,EIL Std. Spec. 6-41-0008 Rev. 0 & Job Spec. No. C213-001-80-42-SP-5010.   |  |                                     |   |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 57      | <input type="checkbox"/>  | Coke Cutting/Crusher Impeller;                                     | <input type="checkbox"/>            | Wear ring Flushing;   | <input type="checkbox"/>  | Pump Jacketing;  | <input type="checkbox"/>        | Stuffing box Jacketing                                   |  |   |                                     |                          |           |                                     |                          |
| 58      | <b>REMARKS:-</b> 1) Max. allowable casing working pressure shall not be less than 28 kg/cm <sup>2</sup> g @ 150 °C  |  |                                     |   |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 59      | 2) Down Stream Design Pressure is 28 kg/cm <sup>2</sup> g @150°C. Maximum shut-off, considering max suction pressure, including all tolerances shall not exceed this value.   |  |                                     |   |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 60      | 3) For Pump Type, MOC class and Seal Plan, refer Annexure-A of Job specification # C213-001-80-42-SP-5010 for details.  |  |                                     |   |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 61      | 4) ALL WELDS TO BE PWHT, STRESS RELIEVED AND HARDNESS NOT TO BE EXCEEDED 200 BHN (MAX)  |  |                                     |   |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 62      | 5) Dismantle Inspection of Pump after performance test shall be applicable only in case of abnormality in mechanical behavior (such as excessive noise & vibration, bearing temperature rise etc.) during performance test. |  |                                     |   |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 63      | 6) Vendor shall arrive at exact NPSHA at Pump centerline and provide details / calculation for NPSHA as per Fig. 1 of datasheet.  |  |                                     |   |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 64      | 7) Rated flow of pump shall be specified flow (in PDS) plus warm up flow & balancing line flow(as applicable). Vendor to indicate rated flow with breakup(rated flow and warmup flow) seperately in datasheet accordingly.  |  |                                     |   |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |
| 65      | 8) Guarantee point for the purpose of loading & penalty shall be rated flow (maximum flow as specified in PDS + warm up &   |  |                                     |   |   |  |                                 |  |  |   |                                     |                          |           |                                     |                          |



**DEVIATIONS TO TECHNICAL SPECIFICATIONS**

**PROJECT** : **REVAMP OF DESALTER SYSTEM OF CDU/VDU  
AT NRL**

**UNIT** : **001**

**CLIENT** : **M/s NRL**

**CONSULTANT** : **M/s ENGINEERS INDIA LTD.**

**JOB NO.** : **C213**

**RFQ NO.** :

**NAME OF THE VENDOR** :

**VENDOR'S REF. NO.** :

**NOTES:**

1. Bidder shall note that only those deviations to specified standards & codes (if any), shall be permitted which are technically infeasible to be met, provided suitable justification for the same is furnished. Deviations, which can be complied with extra cost and / or time implication, shall not be permitted.
2. Any deviations/deletions/corrections made elsewhere in the body of the bidder's proposal will not be taken cognisance of and all such deviations shall be deemed to have been withdrawn by the bidder.







# **LOADING & PENALTY CRITERIA** **CENTRIFUGAL PUMPS** **(Special Purpose Process)**

**PROJECT** : REVAMP OF DESALTER SYSTEM OF CDU/VDU A  
NUMALIGARH REFINERY

**OWNER** : NUMALIGARH REFINERY LIMITED(NRL)

**EPCM** : ENGINEERS INDIA LTD. (EIL)

**JOB NO.** : C213

---

---

---

| A        | 02.04.2026 | Issued with MR | VRS         | ME         | TK          |
|----------|------------|----------------|-------------|------------|-------------|
| Rev. No. | Date       | Purpose        | Prepared by | Checked by | Approved by |

## 1.0 SCOPE

This specification describes the loading & penalty criteria applicable to all Centrifugal Pumps (Special Purpose Process) included in the inquiry document C213-001-PA-MR-5010.

## 2.0 PERFORMANCE GUARANTEES

- 2.1 Loading and penalty criteria shall be based on the guaranteed performance of the Pump. The parameter for loading shall be the BKW of the Pump at the guaranteed (rated) operating point specified in the data sheets.
- 2.2 Bidder shall furnish the guaranteed values for BKW of Pump including all losses with zero per cent positive tolerance including errors in instruments and measurement, at the rated operating (i.e. guarantee) point specified in the data sheets.
- 2.3 Bidder must submit the guaranteed BKW in Annexure-1 format (attached with this specification) along with the bid.

## 3.0 LOADING CRITERIA

Loading shall be applied on operating units only and not on standby units. Moreover, Loading shall not be done on equipment which are for intermittent operation.

### 3.1 TOTAL COST

The total cost of Pump grouped item (including all working & standby units, as applicable), for evaluation purposes, shall be computed as under:

Total Cost of Pump grouped item for evaluation purposes = A + B + C + D

Where:

- A = Capital Cost of complete Pump Package including cost of Erection & Commissioning Spares, Special Tools & Tackles of the grouped item number
- B = Differential Operating Cost as defined hereunder
- C = Cost incurred on Supervision of Erection, Field Trial Run Testing & Commissioning of complete Pump Package at site. Per diem rate for **5 man-days** for each installed pump package shall be considered.
- D = Cost of Mandatory Spares

### 3.2 DIFFERENTIAL OPERATING COST

3.2.1 Differential Operating Cost (B) is defined as under:

$B \text{ (in Rupees)} = N_{OPP} \times (BKW_{GP} - BKW_{RP}) \times C_F \times 8000 \times D_F$

$N_{OPP}$  = Number of Operating Units for Pump (**Refer PDS**)

$BKW_{GP}$  = Guaranteed Shaft Power (BKW) as defined in Cl. 2.1, for the Pump quoted by the Bidder under evaluation

$BKW_{RP}$  = Lowest quoted (Guaranteed) Pump BKW (amongst the Technically Acceptable Bidders)

$C_F$  = Cost of Electrical Power **INR 6.50 per KW-hr**

8000 = Number of Operating Hours per year

$D_F$  = Discounting factor to arrive at Net Present Value (NPV) based on number of operating years as defined under clause 3.2.2

3.2.2 Discounting factor ( $D_F$ ) is defined as under:

$$D_F = \sum_{n=2}^{n=k+1} [1 / \{1 + (X/100)\}^n]$$

Where:

- k = Number of operating years for which loading is to be done as specified i.e. **5 years**  
(Starting from 1 year after delivery of equipment)  
X = Percentage Rate of interest (**12.00 % per year**)  
 $D_F = \underline{3.21855}$

- The above formula considers one (1) year time for start-up of operation.

3.3 The maximum loading to be applied, however, shall not exceed **10 %** of the Total Capital Cost of the complete Pump Package grouped item as defined in Cl. 3.1.

#### 4.0 PENALTY CRITERIA

During the Performance Test at the Vendor's Works, in case the offered Pump fails to meet the Guaranteed Values, the following procedure shall be followed: -

##### 4.1 *Penalty Criteria during Shop Performance Testing of Pump*

In case, during Shop Performance Test, the power ( $BKW_{TP}$ ) consumed by the Pump exceeds the stipulated Bidder's/ Supplier's quoted Guaranteed  $BKW_{GP}$  value (as defined under Cl. 2.1) by more than **4%**, the subject Pump gets rejected.

However, for excess power (kW) consumed over and above the Bidder's/ Supplier's Guaranteed Shaft Power ( $BKW_{GP}$ ) upto a **maximum of four percent (4%)**, the Bidder/ Supplier shall be penalized for extra energy consumption for **each Pump** having tested  $BKW_{TP}$  greater than the guaranteed  $BKW_{GP}$  value, as defined hereunder:

The Penalty for the Pump shall be worked out on the basis of Differential operating cost ( $P_{CP}$ ) as under:

$$P_{CP} \text{ (in INR)} = M_F \times (BKW_{TP} - BKW_{GP}) \times C_F \times 8000 \times D_F$$

where:

- $BKW_{TP}$  = Pump BKW as obtained from shop test results  
 $BKW_{GP}$  = Guaranteed Pump BKW as defined in Cl. 2.1.

$$M_F \text{ (Multiplying Factor)} = \frac{\text{Number of Operating Units for Pumps (N}_{OPP})}{\text{Total No. of Pumps (Working + Stand-by)}}$$

**(For no. of operating units Pumps & total no. Pumps in a grouped item, refer PDS)**

4.2 The maximum penalty to be charged, for non-conformance to guaranteed values during the shop performance test of all Pump(s) put together (including all working & standby units), however, shall not exceed **10 %** of the Total Capital Cost, as defined in Cl. 3.1. This Penalty shall be independent of any other penalties, specified elsewhere in the Bid/ Inquiry Documents.

**ANNEXURE-1**  
**FORMAT FOR GUARANTEED POWER CONSUMPTION**

MR NO. : C213-001-PA-MR-5010  
BIDDING DOCUMENT NO. :  
NAME OF THE BIDDER :

**GUARANTEED POWER CONSUMPTION**

| SI. NO. | ITEM / TAG NOS.  | DESCRIPTION /SERVICE | GUARANTEED POWER CONSUMPTION<br>(Compressor Shaft BKW, Per Compressor package)<br>(0% +ve Tol.) |
|---------|------------------|----------------------|---|
| 1       | 01-PA-CF-003 A/B | WASH WATER PUMP      |   |
| 2       | 01-PA-CF-003 C/D | RECYCLE WATER PUMPS  |   |

**NOTES:**

In-case of suo-moto change in guaranteed parameters (used for techno-commercial evaluation of the offer) by the bidder after submission of their offer; the changed guaranteed parameters are to be considered for techno-commercial evaluation for Loading & Penalty purposes as per the methodology mentioned below:

- (1) In-case the changed guaranteed values are higher than the originally quoted guaranteed values, bidder's bid / offer shall be rejected.
- (2) In-case the changed guaranteed values are lower than the originally quoted guaranteed values, the guaranteed parameters contained in original proposal are to be considered for the purpose of loading for commercial evaluation.
- (3) In-case, after commercial loading as per above, the bidder (who had lowered the guaranteed values as compared to the originally quoted guaranteed values) turns out to be L1, the changed guaranteed values (which are lower than the originally quoted guaranteed values) are to be considered for ordering and applicable performance penalties during Performance Test.
- (4) Bidder to submit the guaranteed power in the format attached in commercial section as specified in RFQ.

***Remark: Bidder shall note that the Guaranteed power consumption indicated by bidder in priced part of price schedule format in NO case shall be less than the Rated BKW indicated in the Pump Mechanical Data Sheet submitted in un-priced technical bid.***

**NOTES TO BIDDERS:**

1. Prototype pump model/model series shall not be considered.

| SL. NO. | PARAMETER   | INFORMATION ON PROPOSED MODEL | INFORMATION ON REFERRED EXISTING INSTALLATIONS |        |        | REMARKS |
|---------|---|-------------------------------|--|--------|--------|---------|
|         |   |                               | Ref.-1   | Ref.-2 | Ref.-3 |         |
| 1       | <b>GENERAL</b>  |                               |  |        |        |         |
| 2       | Whether the Bidder's pump offer is under Make in India (MII)?<br><b>Yes / No</b><br>If yes, Whether all required supporting documents have been submitted by Bidder?<br><b>Yes / No</b> |                               |  |        |        |         |
| 2.1     | Model Series  |                               |  |        |        |         |
| 2.2     | Model Number  |                               |  |        |        |         |
| 2.3     | Type of Driver  |                               |  |        |        |         |
| 2.4     | Driver Rating (kW)  |                               |  |        |        |         |
| 2.5     | Driver Rated Speed (rpm)  |                               |  |        |        |         |
| 2.6     | No. of unit(s)  |                               |  |        |        |         |
| 2.7     | Shop from where pump is designed, manufactured, packaged, tested & supplied   |                               |  |        |        |         |
| 2.8     | In case pump testing is outsourced, Mention place of testing.   |                               |  |        |        |         |
| 3       | <b>OPERATING CONDITIONS</b>   |                               |  |        |        |         |
| 3.1     | Service   |                               |  |        |        |         |
| 3.2     | Pumping Liquid  |                               |  |        |        |         |
| 3.3     | Specific Gravity  |                               |  |        |        |         |
| 3.4     | Viscosity (cp)  |                               |  |        |        |         |
| 3.5     | Pumping temperature (deg C)   |                               |  |        |        |         |
| 3.6     | Rated Capacity (m <sup>3</sup> /hr)   |                               |  |        |        |         |
| 3.7     | Rated Diff. Head (m)  |                               |  |        |        |         |
| 3.8     | Pressure (Suction/Discharge/Design) (kg/cm <sup>2</sup> g)  |                               |  |        |        |         |
| 3.9     | Design temperature (deg C)  |                               |  |        |        |         |

Place:  
Date:

[Signature of Authorized Signatory]  
Name:  
Designation:  
Seal:

| SL. NO. | PARAMETER  | INFORMATION ON PROPOSED MODEL | INFORMATION ON REFERRED EXISTING INSTALLATIONS |        |        | REMARKS |
|---------|--|-------------------------------|--|--------|--------|---------|
|         |  |                               | Ref.-1   | Ref.-2 | Ref.-3 |         |
| 3.10    | NPSHR (m)  |                               |  |        |        |         |
| 3.11    | Efficiency (%)   |                               |  |        |        |         |
| 3.12    | No. of stages  |                               |  |        |        |         |
| 3.13    | Minimum Continuous Stable Flow, (m3/hr)  |                               |  |        |        |         |
| 3.14    | Rated Speed  |                               |  |        |        |         |
| 3.15    | Whether the proposed model and reference models have identical hydraulic and design (for impeller / diffuser / volute) |                               |  |        |        |         |
| 3.16    | Impeller Dia. (Max/Rated/min.) (mm)  |                               |  |        |        |         |
| 3.17    | Impeller Arrangement / No. of Impellers  |                               |  |        |        |         |
| 3.18    | Minimum continuous flow (m3/hr)  |                               |  |        |        |         |
| 3.19    | Type of lubrication system   |                               |  |        |        |         |
| 3.20    | Pump Speed RPM   |                               |  |        |        |         |
| 3.21    | Type of Bearings   |                               |  |        |        |         |
| 3.22    | Type of Mechanical Seal  |                               |  |        |        |         |
| 3.23    | Shaft Diameter under Bearing (mm)  |                               |  |        |        |         |
| 3.24    | Casing MAWP (15°C / PT / Design Temperature)   |                               |  |        |        |         |
| 3.25    | Bearing Span (m)   |                               |  |        |        |         |
| 4       | <b>MATERIAL OF CONSTRUCTION</b>  |                               |  |        |        |         |
| 4.1     | Casing   |                               |  |        |        |         |
| 4.2     | Impeller   |                               |  |        |        |         |
| 4.3     | Shaft  |                               |  |        |        |         |
| 5       | <b>OTHER INFORMATION ON INSTALLATIONS</b>  |                               |  |        |        |         |
| 5.1     | Date of supply   |                               |  |        |        |         |
| 5.2     | Date of commissioning  |                               |  |        |        |         |
| 5.3     | Has the reference pump completed one year of operation at site   |                               |  |        |        |         |

Place:  
Date:

[Signature of Authorized Signatory]  
Name:  
Designation:  
Seal:

| SL. NO. | PARAMETER   | INFORMATION ON PROPOSED MODEL | INFORMATION ON REFERRED EXISTING INSTALLATIONS |        |        | REMARKS |
|---------|---|-------------------------------|--|--------|--------|---------|
|         |   |                               | Ref.-1   | Ref.-2 | Ref.-3 |         |
| 5.4     | Purchaser's Name, Address, Contact No. & email ID |                               |  |        |        |         |

Place:  
Date:

[Signature of Authorized Signatory]  
Name:  
Designation:  
Seal:

## SITE & UTILITY DATA

**PROJECT** : REVAMP OF DESALTER SYSTEM OF CDU/VDU  
AT NRL  
**UNIT** : 001  
**CLIENT** : M/s NRL  
  
**EPCM** : M/s ENGINEERS INDIA LTD (EIL)  
**MR NO.** : C213-001-PA-MR-5010  
**JOB NO.** : C213

---

---

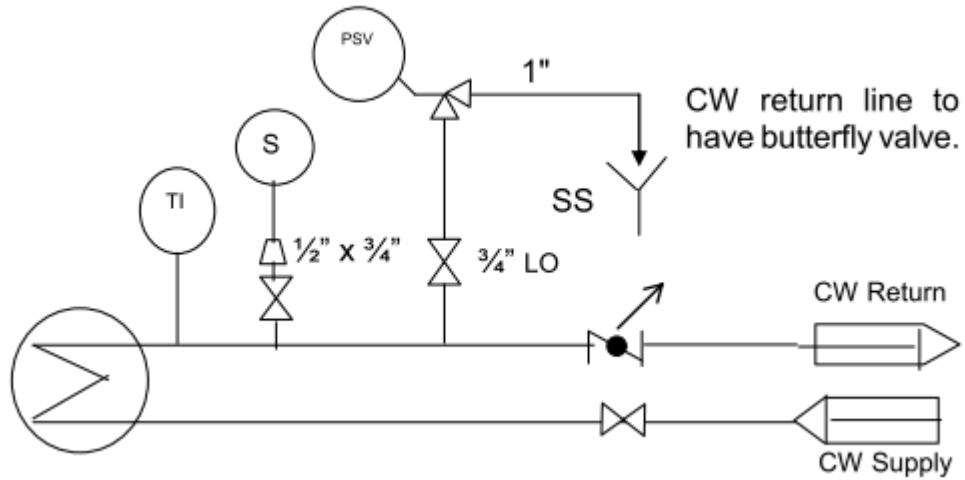
---

---

---

| A       | 02.04.2026 | Issued with MR | VRS         | ME/TK                 |
|---------|------------|----------------|-------------|-----------------------|
| Rev. No | Date       | Purpose        | Prepared by | Checked & Approved by |

### 1. Typical cooling water piping and instrumentation at heat exchangers



Notes:

1. Back flush lines to be provided when main cooling water line size is >10"NB.
2. All pump bridle cooling water lines (for bearing cooling, gland cooling and seal cooling) shall be minimum 1.5"NB.



**1.4.3 PRESENT PRODUCT CHARACTERISTICS AFTER DQUP**

| Samples                | SN     | HN     | KERO   | LGO    | HGO    | VD     | VGO    | VR   |
|------------------------|--------|--------|--------|--------|--------|--------|--------|------|
| Density @ 15 °C        | 0.7379 | 0.7852 | 0.8289 | 0.8765 | 0.8951 | 0.9176 | 0.9195 | 1.01 |
| Pour pt °C             |        |        |        | <0     |        |        | +42    |      |
| Flash pt °C            |        |        | 45     | >100   |        |        |        |      |
| Smoke pt, mm           |        |        | 18     |        |        |        |        |      |
| Colour                 |        |        |        | <0.5   |        |        | 3.5    |      |
| RVP kg/cm <sup>2</sup> | 0.38   |        |        |        |        |        |        |      |
| ASTM Distillation      |        |        |        |        |        |        |        |      |
| IBP                    | 49     | 113    | 154    | 228    | 155    | 279    |        |      |
| 5%                     | 70     | 131    | 168    | 243    | 279    |        |        |      |
| 10%                    | 75     | 135    | 173    | 249    | 298    | 300    |        |      |
| 30%                    | 88     | 142    | 183    | 259    | 330    |        |        |      |
| 50%                    | 99     | 147    | 193    | 267    | 351    | 323    |        |      |
| Samples                | SN     | HN     | KERO   | LGO    | HGO    | VD     | VGO    | VR   |
| 70%                    | 112    | 151    | 208    | 277    | 367    |        |        |      |
| 90%                    | 128    | 157    | 228    | 294    | 392    | 339    |        |      |
| 95%                    | 135    | 160    | 238    | 302    | 400    | 347    |        |      |
| FBP                    | 142    | 179    | 260    | 316    | 408    | 353    |        |      |
| Recovery @200 °C       |        |        | 59%    |        |        |        |        |      |
| Sulphur,ppm            |        |        |        | 945    |        |        |        |      |

**1.5 FEED AND PRODUCT BATTERY LIMIT CONDITIONS**

| Particulars         | PRESSURE | TEMP | SOURCE   |
|---------------------|----------|------|----------|
| <b>FEED STOCKS</b>  |          |      |          |
| Assam Mix crude oil | -        | 30°C | ONGC/OIL |

|                     |                        |       |                |
|---------------------|------------------------|-------|----------------|
| Miri Crude          | -                      | 30°C  | Imported Crude |
| <b>PRODUCTS</b>     |                        |       |                |
| LPG                 | 16Kg/Cm <sup>2</sup> a | 40°C  | To storage     |
| SR Naphtha          | 5 Kg/Cm <sup>2</sup> a | 40°C  | To storage     |
| SR Kerosene         | 5 Kg/Cm <sup>2</sup> a | 45°C  | To storage     |
| SR Gas Oil          | 5 Kg/Cm <sup>2</sup> a | 45°C  | To storage     |
| Cold VGO            | 5 Kg/Cm <sup>2</sup> a | 80°C  | To storage     |
| Hot VGO             | 5 Kg/Cm <sup>2</sup> a | 170°C | To HCU         |
| Cold Vacuum Residue | 5 Kg/Cm <sup>2</sup> a | 95°C  | To storage     |
| Hot Vacuum Residue  | 5 Kg/Cm <sup>2</sup> a | 170°C | To DCU         |

## 1.6 UTILITIES AND THEIR SPECIFICATIONS

| Particulars                             |  | Normal Design | Mechanical Design |
|---|--|---------------|-------------------|
| HP steam                                | Pressure kg./ Cm <sup>2</sup> a                    | 32.5          | 36                |
|   | Temperature °C                                     | 260           | 285               |
| MP steam                                | Pressure kg./ Cm <sup>2</sup> a                    | 15.5          | 17.5              |
|   | Temperature °C                                     | 220           | 240               |
| LP steam                                | Pressure kg./ Cm <sup>2</sup> a                    | 5.5           | 7.5               |
|   | Temperature °C                                     | 170           | 200               |
| Instrument air                          | Pressure kg./ Cm <sup>2</sup> a                    | 6.5           | 11.5              |
|   | Dew point °C                                       | -15           |                   |
| Plant air                               | Pressure kg./ Cm <sup>2</sup> a                    | 6.5           | 11.5              |
| Cooling Water<br>Type-<br>Recirculation | Pressure kg./ Cm <sup>2</sup> a(<br>Supply/return) | 6.0/4.5       | 9                 |
|   | Temperature °C                                     | 33/45         | 70                |
| BFW                                     | Pressure kg./ Cm <sup>2</sup> a                    | 39.5          |                   |
|   | Temperature °C                                     | 105           |                   |
| DM water                                | Pressure kg./ Cm <sup>2</sup> a                    | 5             |                   |
|   | Temperature °C                                     | Ambient       |                   |
| Fuel Oil                                | Pressure kg./ Cm <sup>2</sup> a                    | 9             | 21.5              |
|   | Net Calorific value<br>Kcal/kg                     |               | 9720              |
|   | Sp. gravity @ 15°C                                 |               | 0.969             |

|          |                                 |     |               |
|----------|---------------------------------|-----|---------------|
| Fuel Gas | Pressure kg./ Cm <sup>2</sup> a | 4.5 | 8             |
|          | Net heating value kcal/kg       |     | 9300 to 10000 |

## 1.7 CHEMICAL AND UTILITIES CONSUMPTION

### 1.7.1 CHEMICAL CONSUMPTION

TABLE 1.2

| Sl.no | Chemicals  | Consumption<br>Tons/Annum (Avg.) |
|-------|--|----------------------------------|
| 1     | Neutralizing Amine (SR-1259 of Dorf Ketal) or equivalent)  | 20                               |
| 2     | Corrosion Inhibitor (SR-1271 of Dorf Ketal) or equivalent) | 15                               |
| 3     | De-emulsifier (SR-1198 of Dorf Ketal)                      | 16                               |
| 4     | 10% Strength Caustic                                       | --                               |

### 1.7.2 UTILITIES CONSUMPTION

TABLE 1.3

| SL. NO | Utilities                 | Units  | Consumption  |
|--------|---------------------------|--------|--------------|
| 1      | Cooling water circulation | m3/hr  | 3105         |
| 2      | Boiler Feed water         | m3/hr  | 8.8          |
| 3      | DM water                  | m3/hr  | 15.0         |
| 4      | Service Water             | m3/hr  | Intermittent |
| 5      | MP Steam Import           | T/hr   | 10.5         |
| 6      | LP Steam Import           | T/hr   | 25.5         |
| 7      | LP Steam Generation       | T/hr   | 8.3          |
| 8      | Power                     | KWH/hr | 3000         |
| 9      | Instrument Air            | Nm3/hr | 300          |
| 10     | Plant Air                 | Nm3/hr | Intermittent |
| 11     | LP Fuel Gas               | T/hr   | 6.5          |
| 12     | Fuel oil                  | T/hr   | 5.3          |
| 13     | Inert Gas                 | Nm3/hr | 50           |

Bidder shall furnish in his bid, the following tables (Table 1 & Table 2) completely filled-in:

**Table 1 (Offered Pump Model Technical Details)**

| Sr. No. | Pump tag No.     | Offered Pump detail<br>{Vendor to Fill-in} |                        |        |                      |   |                         |                     |                      |                     |   |                               |                                    |                                     |                   |   |  |   |  |                         |                          |                              |                            |                                |                           |  |
|---------|------------------|--|------------------------|--------|----------------------|---|-------------------------|---------------------|----------------------|---------------------|---|-------------------------------|------------------------------------|-------------------------------------|-------------------|---|--|---|--|-------------------------|--------------------------|------------------------------|----------------------------|--------------------------------|---------------------------|--|
|         |                  | Pump Model No.                             | Nozzle Size and Rating |        | NPSHA @ Pump C/L (m) | NPSHR @ Rated point / MCF (whichever is higher) (m) | NPSHR @ 120% of BEP (m) | Max. Imp. Dia. (mm) | Rated Imp. Dia. (mm) | Min. Imp. Dia. (mm) | Head rise available at rated conditions by replacing rated dia impeller by max dia impeller (%) | Pump MCF (m <sup>3</sup> /hr) | Pump BEP flow (m <sup>3</sup> /hr) | Ratio of Rated Flow to BEP Flow (%) | Shut-off head (m) | Head rise from Rated Head to Shutoff head (%) | Shutoff pressure considering maximum suction pressure & maximum density (kg/cm <sup>2</sup> g) | Downstream Design Pressure kg/cm <sup>2</sup> g | MAWP @ Design Temperature kg/cm <sup>2</sup> g | BKW at Rated point (kw) | BKW at End of curve (kw) | BKW at MCF (with water) (kw) | Offered Driver Rating (kw) | Offered API 610 Material Class | Offered API 682 Seal Plan |  |
|         |                  |  | Suct.                  | Disch. |                      |   |                         |                     |                      |                     |   |                               |                                    |                                     |                   |   |  |   |  |                         |                          |                              |                            |                                |                           |  |
| 1       | 01-PA-CF-003 A/B |  |                        |        |                      |   |                         |                     |                      |                     |   |                               |                                    |                                     |                   |   |  |   |  |                         |                          |                              |                            |                                |                           |  |
| 2       | 01-PA-CF-003 C/D |  |                        |        |                      |   |                         |                     |                      |                     |   |                               |                                    |                                     |                   |   |  |   |  |                         |                          |                              |                            |                                |                           |  |

**Table 2 (Pump Vendor Confirmations)**

| Sr. No. | Pump tag No.     | Vendor's Confirmations<br>(Yes/ No)  |   |  |  |  |                                      |  |  |  |   |   |   |  |                                 |                                      |  |   |   |
|---------|------------------|--------------------------------------|---|--|--|--|--------------------------------------|--|--|--|---|---|---|--|---------------------------------|--------------------------------------|--|---|---|
|         |                  | Is NPSHA-NPSHR at rated point ≥ 0.6? | Is NPSHA ≥ NPSHR at 120% of BEP? (applicable for parallel operation, auto start against open discharge valve) | Is 5% Head rise available at rated conditions by increase in impeller dia? | Is flow vs head performance curve of pump continuously rising from rated to shut off ? | Is 10% head rise available from rated head to shut off head? (applicable for parallel operation) | Is MCF less than Normal/ Rated flow? | Is Rated flow within 70% to 110% of BEP? | Is Driver rating meets margin requirement at rated point as specified in Standard Specification 6-41-0008? | Is driver suitable for auto start/ parallel operation? (as required) | Is driver suitable for operation with water at MCF? | Offered pump meets experience criteria? | Is offered pump based on experience of any other company and the offered pump is as per MII | Is offered MOC Material class is as specified in MR? | Is offered seal plan as per MR? | Is [ISF (SI Unit)] / (L3 / D4)" ≤1.2 | Is Pump shut off pressure (considering max suction pressure & max density) less than downstream design pressure? | Is Pump MAWP greater than or equal to downstream design Pressure @ Design Temp? | Is pump being suitable for existing foundation without any modification to existing foundation? |
| 1       | 01-PA-CF-003 A/B |                                      |   |  |  |  |                                      |  |  |  |   |   |   |  |                                 |                                      |  |   |   |
| 2       | 01-PA-CF-003 C/D |                                      |   |  |  |  |                                      |  |  |  |   |   |   |  |                                 |                                      |  |   | NA  |

Bidder's Seal & Signature

**Note 1:** Bidder shall refer to process datasheets and also other specifications attached in the MR and shall quote accordingly.







---

# VENDOR DATA REQUIREMENTS FOR STATIC & MACHINERY EQUIPMENT

|             |             |                 |             |            |             |
|-------------|-------------|-----------------|-------------|------------|-------------|
| A           | 11-MAR-2026 | ISSUED FOR BIDS | VRS         | ME         | TK          |
| Rev.<br>No. | Date        | Purpose         | Prepared by | Checked by | Approved by |

## VENDOR DATA REQUIREMENTS

The following drawings/documents marked "✓" shall be furnished by the bidder.

| S. N. O. | DESCRIPTION   | WITH BID | POST ORDER |            |                        | REMARKS   |
|----------|---|----------|------------|------------|------------------------|---|
|          |   |          | FOR REVIEW | FOR RECORD | WITH DATA BOOK (FINAL) |   |
| 1.       | List of mandatory spares, commissioning spares and special tools & tackles for complete pump package  | ✓        | ✓          |            | ✓                      |   |
| 2.       | Precommissioning & commissioning procedures for the complete pump package   |          |            |            | ✓                      |   |
| 3.       | Duly filled-in & signed / stamped Technical Compliance Statement  | ✓        |            |            |                        |   |
| 4.       | Cross Sectional Drawings (with Bill of Materials & Part Nos.) - Pump  |          |            | ✓          | ✓                      |   |
| 5.       | Signed / stamped checklist - scope of supply / works  | ✓        |            |            |                        |   |
| 6.       | Piping & Instrumentation diagrams (P&IDs) for sealing system, cooling / heating system of pump package  | ✓        | ✓          |            | ✓                      | <i>Typical P&amp;ID required with bid.</i>  |
| 7.       | GAD - Couplings   |          |            | ✓          | ✓                      |   |
| 8.       | GAD - Sealing system - Seal plan  |          |            | ✓          | ✓                      |   |
| 9.       | Cross Sectional Drawings (with Bill of Materials & Part Nos.) - Couplings   |          |            | ✓          | ✓                      |   |
| 10.      | Cross Sectional Drawings (with Bill of Materials & Part Nos.) - Mechanical seal   |          |            | ✓          | ✓                      |   |
| 11.      | Test Procedure(s) : MRT, Performance test, NPSH test  |          |            | ✓          | ✓                      | @   |
| 12.      | General Arrangement & Foundation drawing showing main as well as all associated equipment (driven equipment, driver, lube oil system (if applicable)) with interface connection, straight line distance, maintenance space, cable trays, table of termination points and details of foundation bolts, their location, foundation bolt pocket dimensions, foundation load data (static & dynamic), estimated quantity & details of recommended grout material (material, grout thickness), allowable forces and moments and thermal movements at pump suction and discharge nozzles etc., $Wk_{\xi}$ / $GD_{\xi}$ value of equipment rotor system referred to driver shaft etc. Refer special instructions to bidders. | ✓        | ✓          |            | ✓                      | <i>Vendor shall furnish General Arrangement Drawing (GAD)/ Equipment Layout of the proposed pump package along with the proposal. Vendor shall ensure that the dimensions furnished in the General Arrangement Drawing (GAD) / Equipment Layout shall be accurate (i.e. within max. variation of ? 5%) as the same shall be used by the purchaser for further Downstream engineering.</i> |
| 13.      | Quotation for recommended spare parts for two years of normal operation (indicating exact name of the part, part no. and material of construction)  | ✓        |            | ✓          | ✓                      |   |
| 14.      | List of recommended commissioning spares (indicating exact name of the part, part no. and material of construction)   | ✓        |            | ✓          | ✓                      |   |

| S.<br>N.<br>O. | DESCRIPTION   | WITH<br>BID | POST ORDER    |               |                                 | REMARKS   |
|----------------|---|-------------|---------------|---------------|---------------------------------|---|
|                |   |             | FOR<br>REVIEW | FOR<br>RECORD | WITH<br>DATA<br>BOOK<br>(FINAL) |   |
| 15.            | List of recommended Special Tools & Tackles (indicating exact name of the part and part no.)  | ✓           |               | ✓             | ✓                               |   |
| 16.            | List of clarifications / recommendations finalised during Pre-Bid Meeting   | ✓           |               |               |                                 |   |
| 17.            | Filled in experience record proforma for pump   | ✓           | ✓             |               |                                 |   |
| 18.            | Allowable thermal movements pump and discharge nozzles  |             |               | ✓             | ✓                               |   |
| 19.            | Tabulation of Utility consumption data including electric load data, schedule of lubricants, chemicals & consumables with specifications    | ✓           |               | ✓             | ✓                               |   |
| 20.            | List of loose supply items in vendor's scope, to be installed in purchaser's piping   | ✓           |               | ✓             | ✓                               |   |
| 21.            | Test Procedure(s) : Witness tests as specified in data sheets / other specs enclosed in the inquiry / MR or as required by approved ITP/QAP |             |               | ✓             | ✓                               | @   |
| 22.            | Document Control Index  |             | ✓             |               |                                 | <i>This shall be first document to be submitted post order.</i> |
| 23.            | Installation, Operation & Maintenance Manuals   |             |               |               | ✓                               |   |
| 24.            | Data Sheets along with performance curves - Pump  | ✓           | ✓             |               | ✓                               |   |
| 25.            | Duly signed & stamped copy of Technical Amendment(as applicable) & Pre-Bid Replies  | ✓           |               |               |                                 |   |
| 26.            | Duly signed, stamped & complied Licensor's / EIL Process Datasheets and P&IDs   | ✓           |               |               |                                 |   |
| 27.            | Un-Priced EIL Price Schedule Format without any alteration / comments / clarifications  | ✓           |               |               |                                 |   |
| 28.            | Duly Filled-in Technical Details Proforma   | ✓           |               |               |                                 |   |

**Notes :**

- "TICK" denotes applicability.
- Post order, drawing / document review shall commence only after approval of Document Control Index (DCI).
- All post order documents shall be submitted / approved through EIL eDMS portal.
- Final documentation shall be submitted in hard copy (Six prints) and soft ( two CDs/DVDs ) in addition to submission through EIL eDMS.
- Refer - 6-78-0001: Specification for quality management system from Bidders.
- Refer - 6-78-0003: Specification for documentation requirement from Suppliers.
- All drawings & documents shall be submitted in A4 or A3 paper sizes. Documents in higher paper size shall be submitted in exceptional circumstances or as indicated in the MR/Tender.
- Post order- The schedule of drawing / data submission shall be mutually agreed between EIL & the bidder / contractor / supplier during finalization of Document Control Index (DCI).
- Bill of Material shall form part of the respective drawing.
- Also refer other department's VDR :-
- Electrical
- Instrumentation

## SUB VENDOR LIST CENTRIFUGAL PUMP PACKAGES

**PROJECT** : Revamp of Desalter System of CDU/VDU at NRL  
**UNIT** : 001  
**CLIENT** : M/s NRL  
**EPCM** : M/s ENGINEERS INDIA LTD.  
**JOB NO.** : C213

| A    | 08-04-2026 | ISSUED WITH REQUISITION | VRS         | ME         | TK          |
|------|------------|-------------------------|-------------|------------|-------------|
| Rev. | Date       | Purpose                 | Prepared by | Checked by | Approved by |

**SUB- VENDOR LIST  
CENTRIFUGAL PUMP PACKAGES  
(Horizontal)**

| S. No.    | Item Description   | Vendor's Name   |
|-----------|--|---|
| <b>A.</b> | <b>ROTATING EQUIPMENT</b>  |   |
| 1)        | Mechanical Seal for Pumps/ Agitators   | As per annexure- I to Sub-Vendor List<br>(Document No "Annexure-I_ C213-001-80-42-VL-5010") |
| <b>B.</b> | <b>ELECTRICAL</b>  |   |
|           | Refer "VENDOR LIST" (Doc. No. C213-001-16-50-VL-5010)" attached elsewhere in MR, for Electrical items.           |   |
| <b>C.</b> | <b>INSTRUMENTATION</b>   |   |
|           | Refer " <b>VENDOR LIST</b> " (Doc. No. C213-16-51-VL-5010)" attached elsewhere in MR, for Instrumentation items. |   |

**GENERAL NOTES:**

- 1) VENDOR shall necessarily procure all the material / equipment forming permanent part of the package from OWNER/ CONSULTANT approved vendors only. This shall include sub-ordered items / components also. The "Approved Vendors" shall be item specific.
- 2) OWNER/ CONSULTANT approved vendor list for the various items is enclosed in this section.
- 3) VENDOR may procure material from any of OWNER/ CONSULTANT approved vendors. However, current validity, holiday status and range of approval as per enlistment letter, work load, stability and solvency need to be verified by the vendor before placement of order.  
  
VENDOR is also required to ensure that equipment qualification criteria, specified elsewhere in the bid document, are also simultaneously met.
- 4) Vendors on OWNER/ CONSULTANT holiday list shall not be considered for ordering. VENDOR shall comply with this requirement without any time or cost implication to the OWNER. If a vendor is put on OWNER/ CONSULTANT holiday list subsequent to VENDOR placing an order, it shall be VENDOR's responsibility to ensure quality work and timely supply from the vendor.
- 5) VENDOR may consider additional/ alternate vendors not included in "OWNER/ CONSULTANT approved Vendors" list with prior approval of OWNER/ CONSULTANT. "Approval status" documents/ credentials to be furnished by the vendors in such cases shall solely be the responsibility of the VENDOR. OWNER/ CONSULTANT decision on approval shall be final and non- negotiable. Non-acceptance of a particular proposed vendor due to any reasons whatsoever shall not be a cause of schedule and cost implication.
- 6) For items not covered in the above list, the vendors list shall be approved by OWNER/ CONSULTANT prior to placement of order by VENDOR. VENDOR shall list down the proposed suppliers/ vendors for such items and submit the same for OWNER/ CONSULTANT review/ approval along with necessary documents/

Format Rev.1 Issue Date-01/07/2009

- credentials. "Approval status" documents/ credentials to be furnished by the vendors in such cases shall solely be the responsibility of the VENDOR. OWNER/ CONSULTANT decision on approval shall be final and non- negotiable. Non acceptance of a particular proposed vendor due to any reasons whatsoever shall not be a cause of schedule and cost implication.
- 7) VENDOR shall make an independent assessment of capability of all the vendors for timely deliveries of material/ equipment. Any delays in deliveries by vendor(s) shall not be a cause of schedule and cost implication.
  - 8) At any stage of the project, if it comes to the notice of OWNER/ CONSULTANT that VENDOR has procured material/ equipment, intentionally or unintentionally whatsoever, from an unapproved vendor and/ or items not falling in approved range of vendor(s), the same shall be rejected forthwith and VENDOR shall be liable to replace such material/ plant/ machinery without any schedule and cost implication to the OWNER.
  - 9) List of vendors appearing anywhere else in the contract document in case of duplication of the items at two or more places shall not be considered by VENDOR and shall be superseded by the vendor list enclosed herewith.
  - 10) It is understood that in case the name of Vendor be changed due to change in their Company or Corporate shareholding, OWNER may accept such Vendors under its new name with prior approval. Any such approval shall however, not absolve the VENDOR from any of his obligations under the contract; neither shall any such approval signify nominations or instruction to use such a vendor. All approved vendors are deemed to have been freely chosen by the VENDOR at his own risk.
  - 11) Any Vendor on HPCL / EIL Holiday List shall not be considered.

| Sr No                     | Supplier Code | Supplier Name                                      | Country        | Holiday Description |
|---------------------------|---------------|--|----------------|---------------------|
| <b>Item Code : 04MH</b>   |               | <b>Description : MECH.SEAL FOR PUMPS/AGITATORS</b> |                |                     |
| <b>Approved Suppliers</b> |               |  |                |                     |
| 1                         | 3754          | EAGLEBURGMANN INDIA PRIVATE LIMITED                | INDIA          |                     |
| 2                         | 4150          | HI-FAB ENGINEERS PRIVATE LIMITED                   | INDIA          |                     |
| 3                         | A750          | AESSEAL PLC  | UNITED KINGDOM |                     |
| 4                         | J078          | JOHN CRANE SEALING SYSTEMS INDIA PVT. LTD.         | INDIA          |                     |
| 5                         | 3858          | SEALMATIC INDIA LIMITED                            | INDIA          |                     |
| 6                         | F149          | FLOWSERVE SANMAR PRIVATE LIMITED                   | INDIA          |                     |
| 7                         | L060          | LEAK PROOF ENGG (I) PVT. LTD                       | INDIA          |                     |
| 8                         | E153          | EAGLEBURGMANN INDIA PRIVATE LIMITED                | INDIA          |                     |
| 9                         | C753          | CHETRA DICHTUNGSTECHNIK AG                         | GERMANY        |                     |

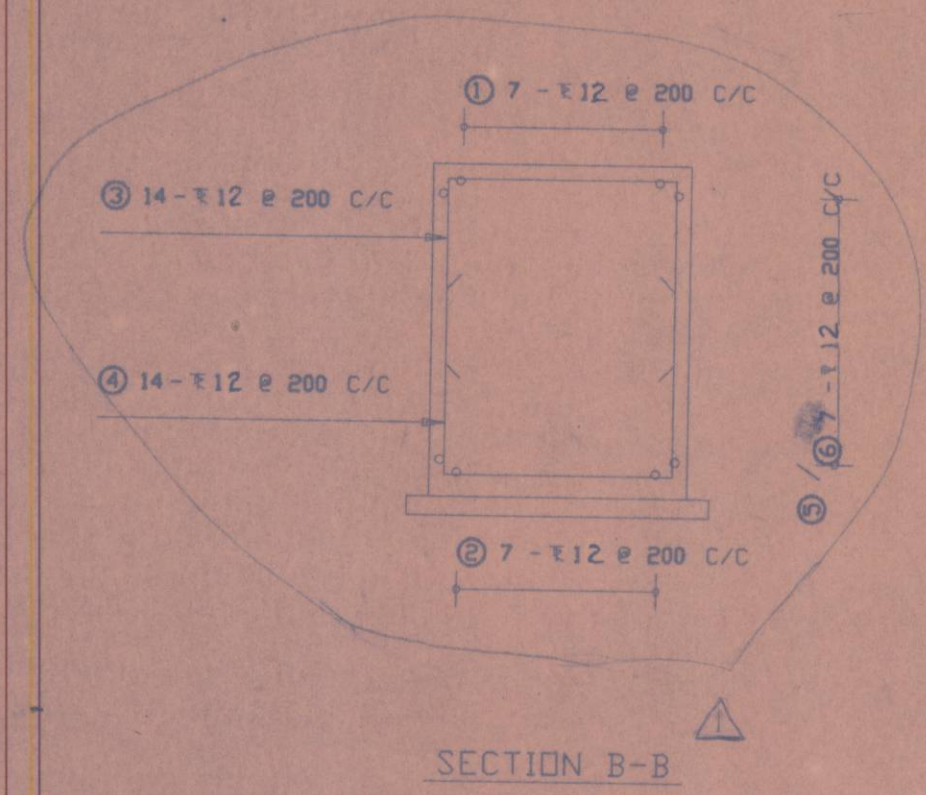
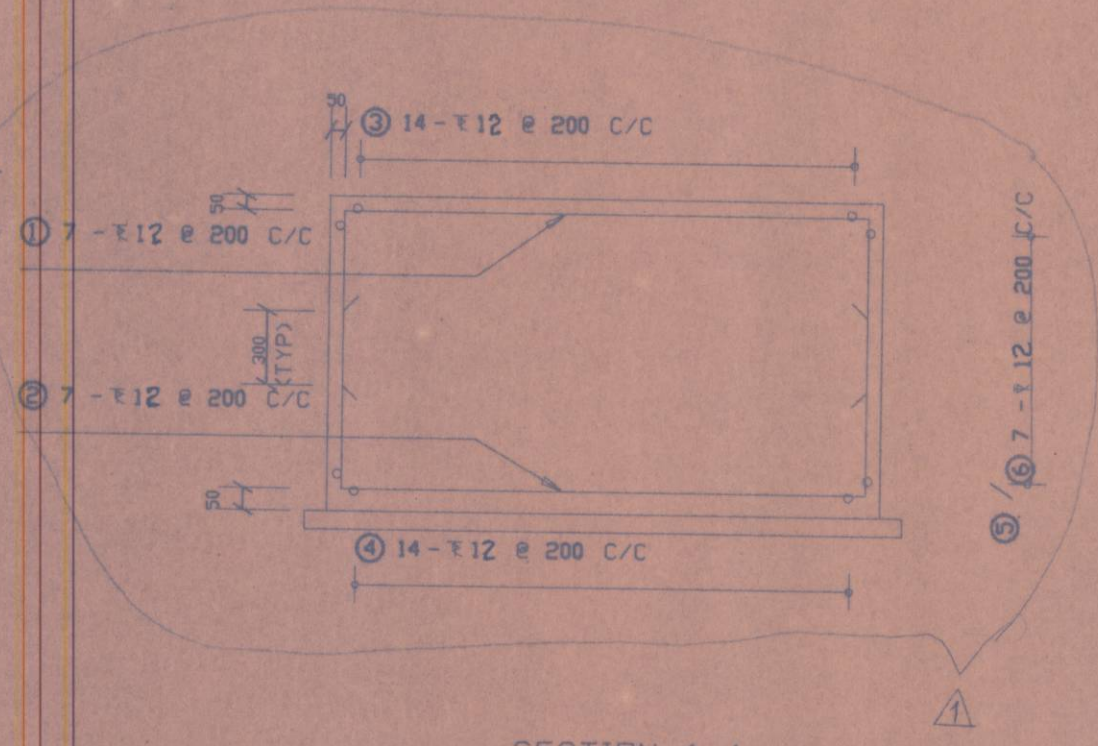
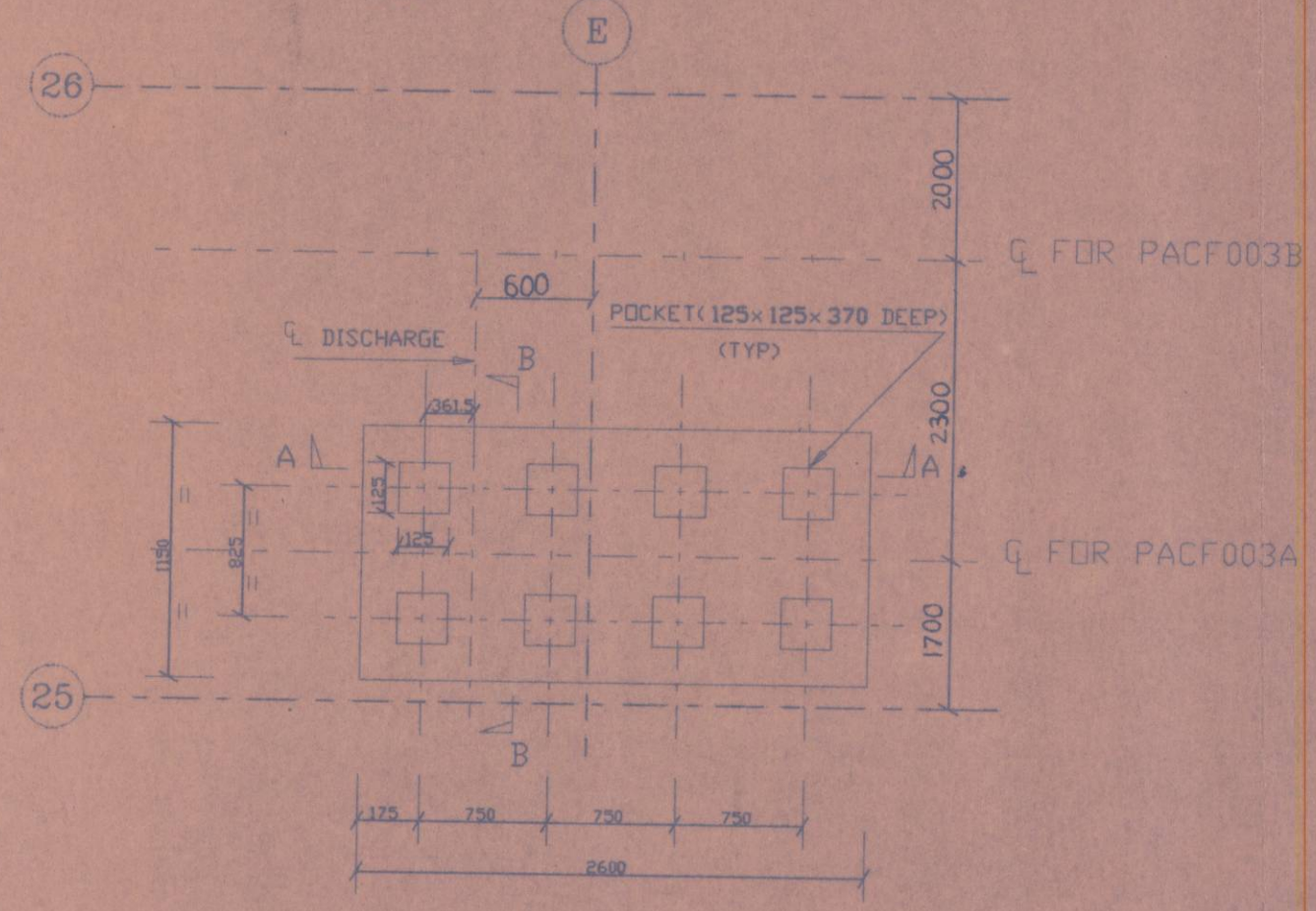
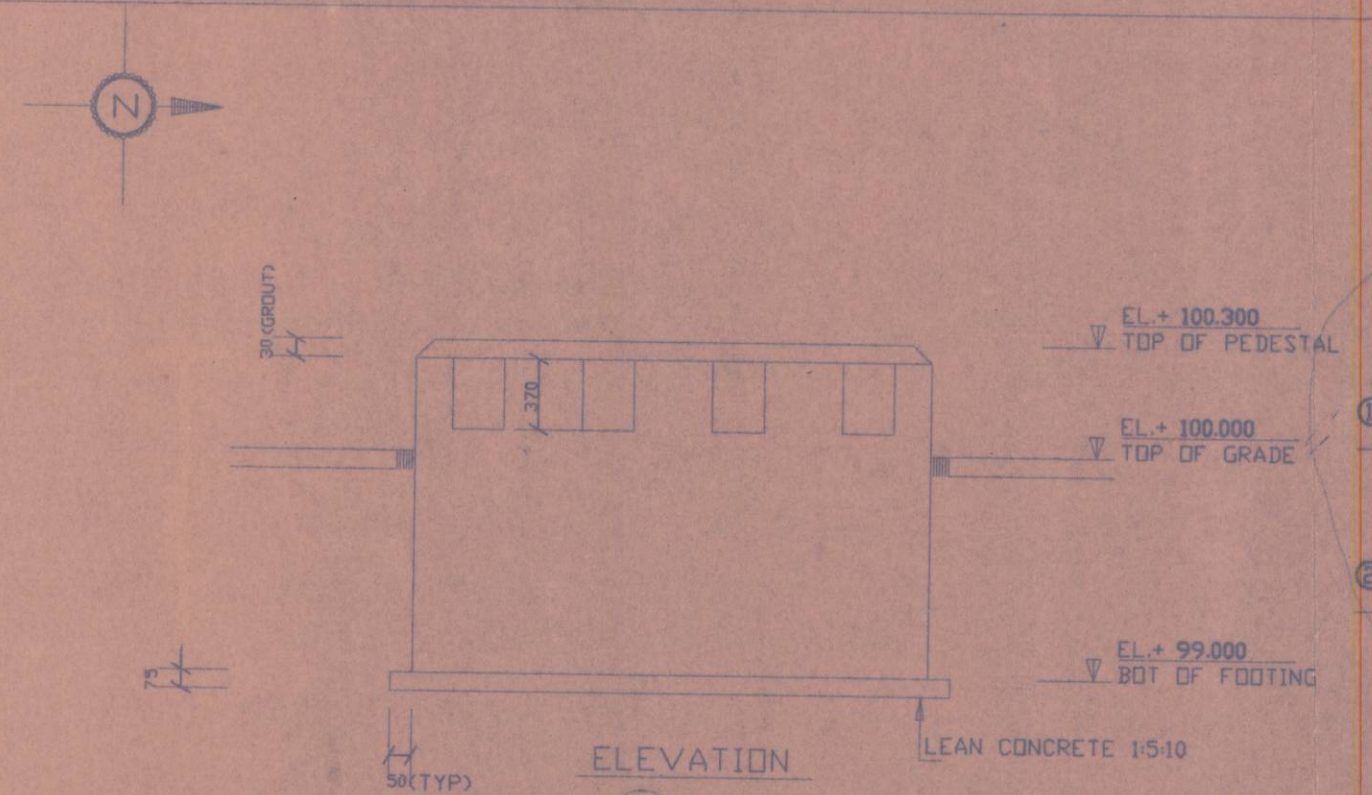


068052048056

Master File Copy

THIS DRAWING AND THE DESIGN IT COVERS ARE PROPERTY OF ENGINEERS INDIA LIMITED. THEY ARE MERELY LOANED ON THE BORROWERS EXPRESS AGREEMENT THAT THEY WILL NOT BE REPRODUCED, COPIED, OR EXHIBITED OR USED EXCEPT IN THE LIMITED WAY AND PRIVATE USE PERMITTED BY ANY WRITTEN CONSENT GIVEN BY THE LENDER TO THE BORROWER. EIL-627 A3-279432

PACF003



CONCRETE: M 15

- NOTES:-
- FOR GENERAL NOTES REFER STAND. NO. 7-68-004
  - B.B.S. SHALL BE PREPARED AT SITE
  - EL. 100.000 REFERS TO H.P.P.
  - THIS FDNS. SHALL BE CAST ONLY AFTER THE ADJACENT DEEPER FDNS. ARE CAST.
  - FOR LOCATION REFER DRG. NO. 3244-01-16-48-0-104

M.T.O. (FOR TWO PUMP FDNS.)

| P.C.C. (CUM.) | CONCRETE : M 15 (CUM.) | HYD BARS (kg) |
|---------------|------------------------|---------------|
| 0.3x2 = 0.6   | 3.8x2 = 7.6            | AS PER BBS    |

**EIL** ENGINEERS INDIA LIMITED  
NEW DELHI

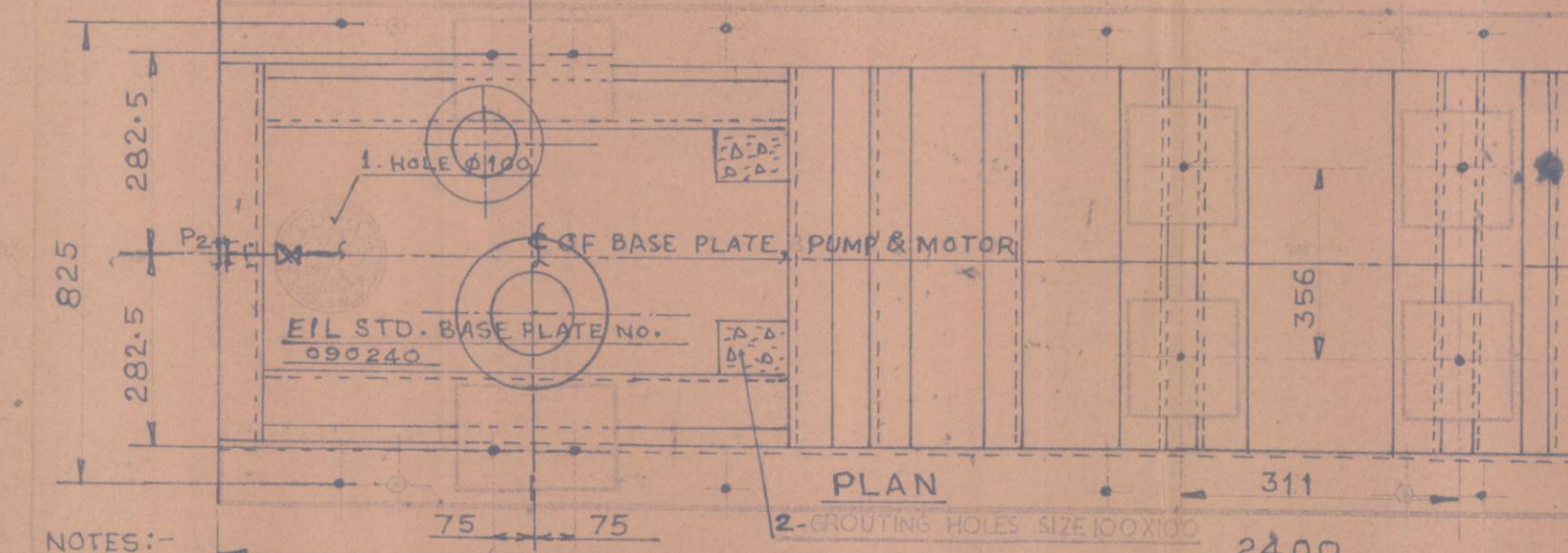
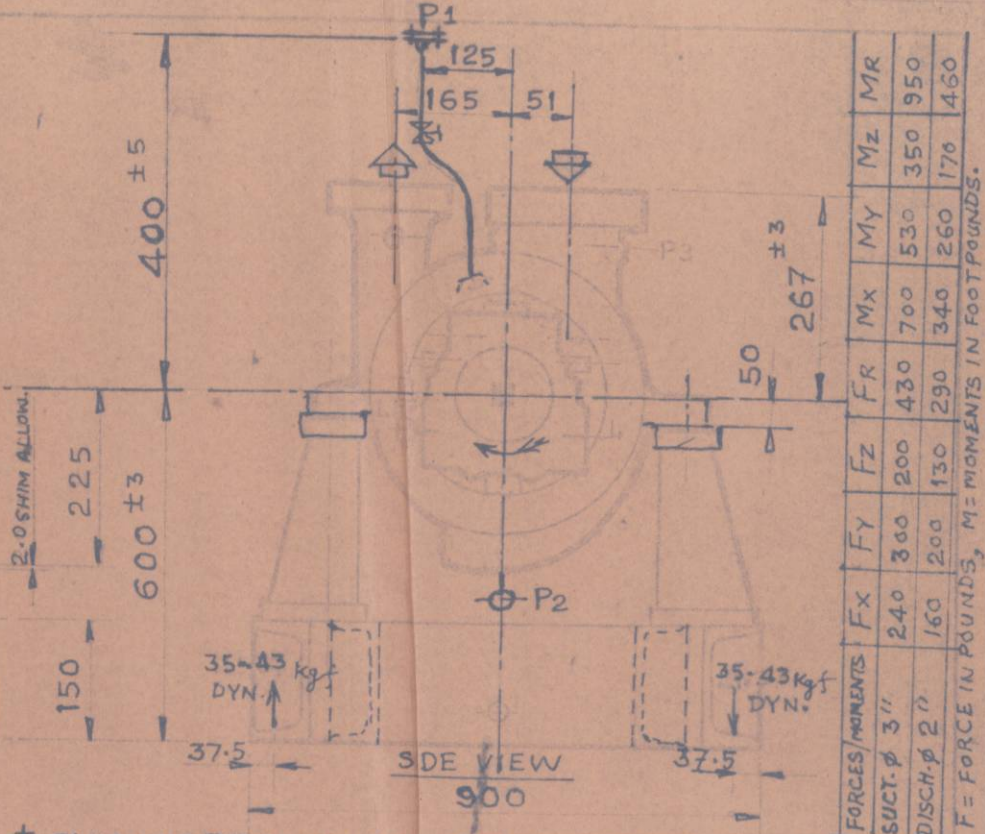
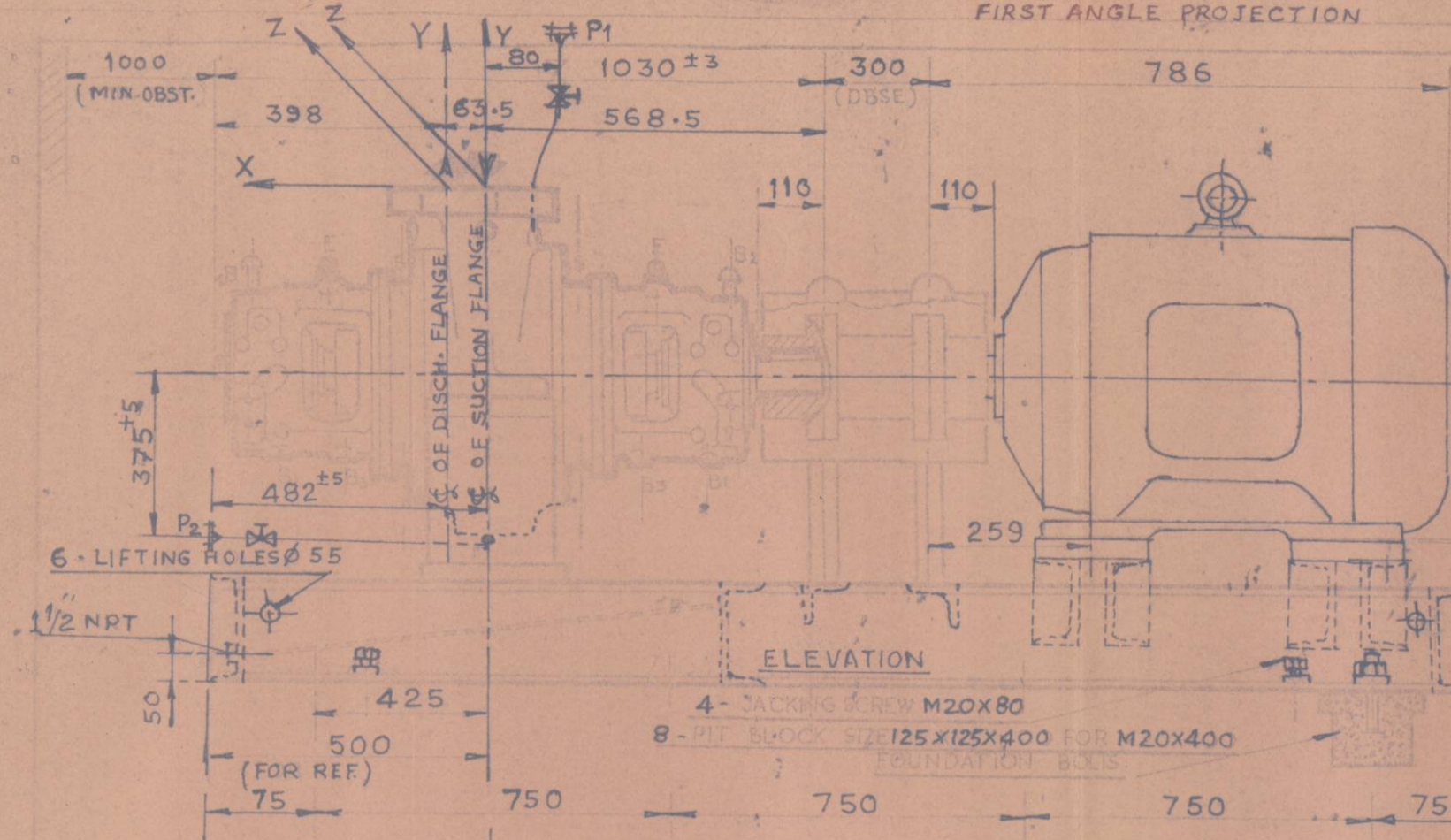
DL. 22-11-94  
3CP12710 Rev f  
DWG. NO.  
GENERAL ARRANGEMENT DRG.  
(BHARAT PUMPS & COMPRESSORS LTD.)  
REF. DRAWING

N. R. L.  
NUMALIGARH  
REFINERY PROJECT

| NO | DATE     | REVISION            | BY | CH | APPD |
|----|----------|---------------------|----|----|------|
| 1  | 20-9-95  | REVISED AS MKD      |    |    |      |
| 0  | 6-01-95  | ISSUED FOR CONST.   |    |    |      |
| A  | 26-12-94 | ISSUED FOR COMMENTS |    |    |      |

| FDN. DET. FOR 01PACF003A/B | JOB NO. | DRAWING NO.         | REV |
|----------------------------|---------|---------------------|-----|
| C.D.U/V.D.U                | 3244    | 3244-01-16-48-3-167 | 1   |

FIRST ANGLE PROJECTION



NOTES:-  
 1- BPC SCOPE OF SUPPLY INCLUDES ALL ITEMS SHOWN INCLUDING MOTOR.  
 2- CASING VENT & DRAIN SHALL BE 1/2" TERMINATED WITH WN FLANGE 1/2" ANSI 300# RF SMOOTH, ALONG WITH BLIND FLANGE.  
 3- Δ COUPLING SHALL BE LAMINATED DISC TYPE, UNIQUE TRANS. MAKE SERIES 80 SPL, SIZE 150, - IN A 105/106 / C.S.  
 4- FLANGE LOAD BEARING CAPACITY IS DOUBLE THAN LOADINGS, INDICATED IN DRAWING.

|  |                                      |
|--|--------------------------------------|
| E : EYE BOLTS : M16                        | L : CONSTANT LEVEL OILER : 1/4" NPT. |
| P1 : CASING VENT : 1/2" } SEE NOTE         | B2 : BRG HOUSING VENT : 1/2" NPT.    |
| P2 : CASING DRAIN : 1/2" } NO. 2           | B3 : LEAKAGE DRAIN : 3/4" NPT PLUGD. |
| P3 : CASING GAUGE : N/A                    | F : FLUSHING QUENCHING : 1/2" PIPING |
| S : STE BOX COOLING : 3/4" NPT PLUGD.      | CI : COOLING INLET : N/A             |
| B1 : BRG HOUSING COOLING : 3/4" NPT PLUGD. | C2 : COOLING OUT LET : N/A           |

† FLUSHING PIPING DRG. WILL BE SUBMITTED SEPERATELY.  
 B.P.C 3/0 NO: 2094011-02  
 CLIENT:- NUMALIGARH REFINERY LTD. GUWAHATI, CONSULTANT:  
 EIL  
 CLIENT REQUI NO/ITEM NO-3244-00-PA-PR-5024/01-PA-CF-003A/B  
 WEIGHT OF PUMP- 400 Kg. WEIGHT OF BASE PLATE- 355 Kg.  
 FLANGE SUCTION SIDE: Ø 80 ANSI 300# RF DISCHARGE: Ø 50 ANSI 300# RF (SMOOTH)  
 SHAFT DIA: 40 Ø 6 MOTOR SHAFT DIA: 55 m6  
 SPACER COUPLING: Δ COUPLING GAURD (NON SPARKING ALUM)  
 ROTATION OF PUMP (FACILE COUPLING END): CCW  
 COOLING LIQUID:- QTY:- PRESSURE:-  
 EXTERNAL FLUSHING LIQUID:- QTY:- PRESSURE:-  
 COOLING API PLAN:- MATERIAL:-  
 FLUSHING API PLAN:- 13,61 MATERIAL: S.S. DRG. No. 3CP12731R.†  
 GD VALUE (PUMP + COUPLING): 1.06 Kg-m<sup>2</sup>  
 EXTERNAL (FORCE & MOMENT): AS PER API 610-1981

MAKE: NGEF  
 FRAME: AMW 225 M2 A1  
 KW: 45 RPM: 2932 (FULL LOAD)  
 DRG. NO: 34 9910 1464 WEIGHT: 355 Kg.  
 DRN: Haldy  
 CRD: 1/5/2  
 DATE: 7-8-94  
 BHARAT PUMPS & COMPRESSORS LTD  
 GENERAL ARRANGEMENT

| REV. | DESCRIPTION                         | CHD.  | DRG. NO. | REV. |
|------|-------------------------------------|-------|----------|------|
| 1    | INCORPORATED THE CLIENT'S COMMENTS. | Haldy | 3CP12710 | 1    |
|      |                                     |       | 3CP12710 |      |

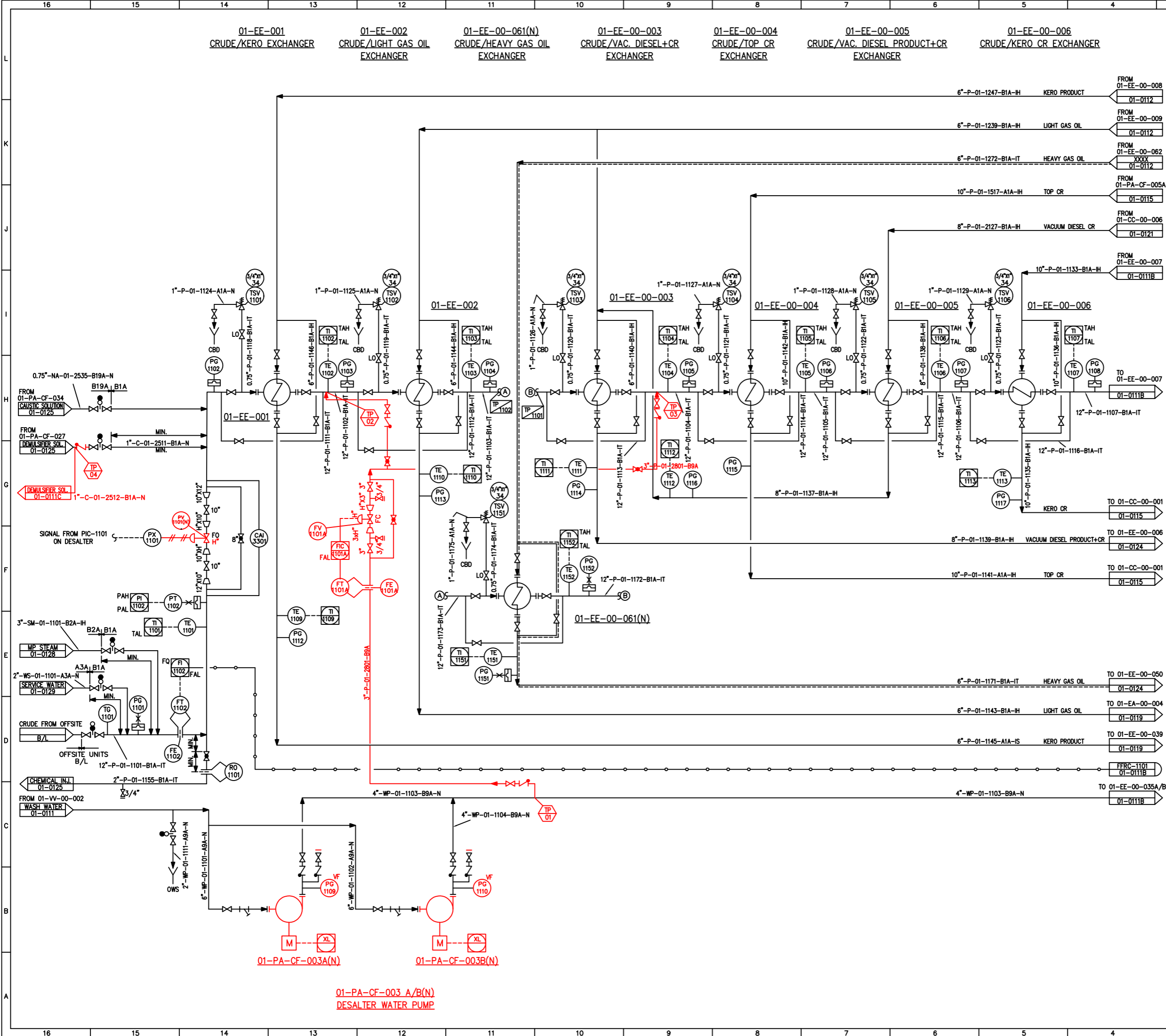
|  |                               |                                     |          |                 |                         |
|--|-------------------------------|-------------------------------------|----------|-----------------|-------------------------|
| PROJECT UNIT   | REVAMPING OF CDU/VDU DESALTER |                                     | CLIENT   | NRL             |                         |
| UNIT   | CDU/VDU                       |                                     | JOB NO.  | C213            | UNIT NO. 1              |
| ITEM NO.   | 01-PA-CF-003 A/B (New)        |                                     | SERVICE  | WASH WATER PUMP |                         |
| OPERATING  | 1                             | STANDBY                             | 1        | TYPE OF PUMP    | CENTRIFUGAL             |
| PROPERTIES OF LIQUID   |                               |                                     |          |                 |                         |
| LIQUID HANDLED   | DESALTER WATER                |                                     |          |                 |                         |
| PUMPING TEMPERATURE  |                               |                                     | DEG C    | 30-45           |                         |
| VISCOSITY AT PUMPING TEMPERATURE   |                               |                                     | cSt      | 0.600           |                         |
| VAPOUR PRESSURE AT PUMPING TEMPERATURE   |                               |                                     | KG/CM2 A | 0.10            |                         |
| LIQUID DENSITY AT PUMPING TEMPERATURE  |                               |                                     | KG/M3    | 999.8           |                         |
| PRESENCE OF CORROSIVE / TOXIC COMPONENTS   | YES (H2S > 500 PPM)           |                                     |          |                 |                         |
| SOLIDS IN SUSPENSION   | NO                            |                                     |          |                 |                         |
| POUR POINT (FOR CONGEALING SERVICE)  |                               |                                     | DEG C    |                 |                         |
| OPERATING CONDITIONS FOR ONE PUMP  |                               |                                     |          |                 |                         |
| FLOW RATE  | NORMAL                        | M3/HR                               | 32.2     |                 |                         |
|  | MAXIMUM                       | M3/HR                               | 36.8     |                 |                         |
|  | MINIMUM                       | M3/HR                               | 16.1     |                 |                         |
| SUCTION PRESSURE   |                               |                                     | KG/CM2 A | 1.5             |                         |
| DISCHARGE PRESSURE   |                               |                                     | KG/CM2 A | 25              |                         |
| DIFFERENTIAL PRESSURE  |                               |                                     | KG/CM2   | 23.5            |                         |
| DIFFERENTIAL HEAD  |                               |                                     | METERS   | 235.0           |                         |
| NPSH AVAILABLE   |                               |                                     | METERS   | 4.00            |                         |
| CAPACITY CONTROL FOR VOLUMETRIC PUMPS  |                               |                                     |          |                 |                         |
| METHOD OF CONTROL  |                               |                                     |          |                 |                         |
| TYPE OF CONTROL  |                               |                                     |          |                 |                         |
| CONTROL RANGE  |                               |                                     |          |                 |                         |
| PRECISION AT MINIMUM RATE  |                               |                                     |          |                 |                         |
| MECHANICAL DATA  |                               |                                     |          |                 |                         |
| DESIGN PRESSURE  |                               |                                     | KG/CM2 G | 34              |                         |
| MAXIMUM SUCTION PRESSURE   |                               |                                     | KG/CM2 G | 4.15            |                         |
| DESIGN TEMPERATURE   |                               |                                     | DEG C    | 75              |                         |
| MATERIAL OF CONSTRUCTION   |                               |                                     |          |                 |                         |
| CASING   | CA6NM + PWHT (NOTE-2)         |                                     |          |                 |                         |
| IMPELLER/ PISTON/ PLUNGER  | CA6NM                         |                                     |          |                 |                         |
| SEAL TYPE  | DUAL PRESSURISED (NOTE-4)     |                                     |          |                 |                         |
| LINE RATING  |                               |                                     |          |                 |                         |
| SUCTION  | 300#                          |                                     |          |                 |                         |
| DISCHARGE  | 300#                          |                                     |          |                 |                         |
| DRIVER TYPE  |                               |                                     |          |                 |                         |
| ELECTRIC MOTOR   |                               |                                     |          |                 |                         |
| STEAM TURBINE DATA   |                               |                                     |          |                 |                         |
| INLET PRESSURE   | (MIN./NOR./MAX.)              | KG/CM2 G                            |          |                 |                         |
| INLET TEMPERATURE  | (MIN./NOR./MAX.)              | DEG C                               |          |                 |                         |
| DESIGN PRESSURE  |                               |                                     | KG/CM2 G |                 |                         |
| DESIGN TEMPERATURE   |                               |                                     | DEG C    |                 |                         |
| EXHAUST PRESSURE   | (MIN./NOR./MAX.)              | KG/CM2 G                            |          |                 |                         |
| LINE RATING  |                               |                                     |          |                 |                         |
| INLET  |                               |                                     |          |                 |                         |
| OUTLET   |                               |                                     |          |                 |                         |
| NOTES:   |                               |                                     |          |                 |                         |
| 1. PUMP SHUT-OFF PRESSURE SHOULD NOT EXCEED 34 KG/CM2G                                 |                               |                                     |          |                 |                         |
| 2. ALL WELDS TO BE PWHT, STRESS RELIEVED AND HARDNESS NOT TO BE EXCEEDED 200 BHN (MAX) |                               |                                     |          |                 |                         |
| 3. C.S MATERIALS SHALL BE COMPLIED WITH NACE MR0103                                    |                               |                                     |          |                 |                         |
| 4. TYPE OF SEAL FLUSHING PLAN: 11, 53B IS AS PER RED INPUT                             |                               |                                     |          |                 |                         |
|  |                               |                                     |          |                 |                         |
|  |                               |                                     |          |                 |                         |
| 2  | 06.03.2026                    | UPDATED & RE-ISSUED FOR ENGINEERING |          | SB              | MR VY                   |
| 1  | 24.02.2026                    | UPDATED & RE-ISSUED FOR ENGINEERING |          | SB              | MR VY                   |
| 0  | 29.12.2025                    | ISSUED FOR ENGINEERING              |          | SB              | MR VY                   |
| Rev. No.   | Date                          | Purpose                             |          | Prepared By     | Reviewed By Approved By |



**PUMP**  
**PROCESS DATA SHEET**

|  |                               |                                     |                           |                     |                         |
|--|-------------------------------|-------------------------------------|---------------------------|---------------------|-------------------------|
| PROJECT  | REVAMPING OF CDU/VDU DESALTER |                                     | CLIENT                    | NRL                 |                         |
| UNIT   | CDU/VDU                       |                                     | JOB NO.                   | C213                | UNIT NO. 1              |
| ITEM NO.   | 01-PA-CF-003 C/D              |                                     | SERVICE                   | RECYCLE WATER PUMPS |                         |
| OPERATING  | 1                             | STANDBY                             | 1                         | TYPE OF PUMP        | CENTRIFUGAL             |
| PROPERTIES OF LIQUID   |                               |                                     |                           |                     |                         |
| LIQUID HANDLED   |                               |                                     | DESALTER WATER            |                     |                         |
| PUMPING TEMPERATURE  |                               |                                     | DEG C                     | 120-135             |                         |
| VISCOSITY AT PUMPING TEMPERATURE   |                               |                                     | CP                        | 0.227               |                         |
| VAPOUR PRESSURE AT PUMPING TEMPERATURE   |                               |                                     | KG/CM2 A                  | 3.50                |                         |
| LIQUID DENSITY AT PUMPING TEMPERATURE  |                               |                                     | KG/M3                     | 930                 |                         |
| PRESENCE OF CORROSIVE / TOXIC COMPONENTS   |                               |                                     | YES (H2S > 500 PPM)       |                     |                         |
| SOLIDS IN SUSPENSION   |                               |                                     | NO                        |                     |                         |
| POUR POINT (FOR CONGEALING SERVICE)  |                               |                                     | DEG C                     |                     |                         |
| OPERATING CONDITIONS FOR ONE PUMP  |                               |                                     |                           |                     |                         |
| FLOW RATE  |                               | NORMAL                              | M3/HR                     | 32.2                |                         |
|  |                               | MAXIMUM                             | M3/HR                     | 36.8                |                         |
|  |                               | MINIMUM                             | M3/HR                     | 16.1                |                         |
| SUCTION PRESSURE   |                               |                                     | KG/CM2 G                  | 13.3                |                         |
| DISCHARGE PRESSURE   |                               |                                     | KG/CM2 G                  | 22                  |                         |
| DIFFERENTIAL PRESSURE  |                               |                                     | KG/CM2                    | 8.7                 |                         |
| DIFFERENTIAL HEAD  |                               |                                     | METERS                    | 93.5                |                         |
| NPSH AVAILABLE   |                               |                                     | METERS                    | >8                  |                         |
| CAPACITY CONTROL FOR VOLUMETRIC PUMPS  |                               |                                     |                           |                     |                         |
| METHOD OF CONTROL  |                               |                                     |                           |                     |                         |
| TYPE OF CONTROL  |                               |                                     |                           |                     |                         |
| CONTROL RANGE  |                               |                                     |                           |                     |                         |
| PRECISION AT MINIMUM RATE  |                               |                                     |                           |                     |                         |
| MECHANICAL DATA  |                               |                                     |                           |                     |                         |
| DESIGN PRESSURE  |                               |                                     | KG/CM2 G                  | 28                  |                         |
| MAXIMUM SUCTION PRESSURE   |                               |                                     | KG/CM2 G                  | 16.30               |                         |
| DESIGN TEMPERATURE   |                               |                                     | DEG C                     | 150                 |                         |
| MATERIAL OF CONSTRUCTION   |                               |                                     |                           |                     |                         |
| CASING   |                               |                                     | CA6NM + PWHT (NOTE-2)     |                     |                         |
| IMPELLER/ PISTON/ PLUNGER  |                               |                                     | CA6NM                     |                     |                         |
| SEAL TYPE  |                               |                                     | DUAL PRESSURISED (NOTE-4) |                     |                         |
| LINE RATING  |                               |                                     |                           |                     |                         |
| SUCTION  |                               |                                     | 300#                      |                     |                         |
| DISCHARGE  |                               |                                     | 300#                      |                     |                         |
| DRIVER TYPE  |                               |                                     | ELECTRIC MOTOR            |                     |                         |
| STEAM TURBINE DATA   |                               |                                     |                           |                     |                         |
| INLET PRESSURE   |                               | (MIN./NOR./MAX.)                    | KG/CM2 G                  |                     |                         |
| INLET TEMPERATURE  |                               | (MIN./NOR./MAX.)                    | DEG C                     |                     |                         |
| DESIGN PRESSURE  |                               |                                     | KG/CM2 G                  |                     |                         |
| DESIGN TEMPERATURE   |                               |                                     | DEG C                     |                     |                         |
| EXHAUST PRESSURE   |                               | (MIN./NOR./MAX.)                    | KG/CM2 G                  |                     |                         |
| LINE RATING  |                               |                                     |                           |                     |                         |
| INLET  |                               |                                     |                           |                     |                         |
| OUTLET   |                               |                                     |                           |                     |                         |
| NOTES:   |                               |                                     |                           |                     |                         |
| 1. PUMP SHUT-OFF PRESSURE SHOULD NOT EXCEED 34 KG/CM2G                                 |                               |                                     |                           |                     |                         |
| 2. ALL WELDS TO BE PWHT, STRESS RELIEVED AND HARDNESS NOT TO BE EXCEEDED 200 BHN (MAX) |                               |                                     |                           |                     |                         |
| 3. C.S MATERIALS SHALL BE COMPLIED WITH NACE MR0103                                    |                               |                                     |                           |                     |                         |
| 4. TYPE OF SEAL FLUSHING PLAN: 11, 53B IS AS PER RED INPUT                             |                               |                                     |                           |                     |                         |
|  |                               |                                     |                           |                     |                         |
|  |                               |                                     |                           |                     |                         |
|  |                               |                                     |                           |                     |                         |
| 1  | 06.03.2026                    | UPDATED & RE-ISSUED FOR ENGINEERING |                           | SB                  | MR VY                   |
| 0  | 02.02.2026                    | ISSUED FOR ENGINEERING              |                           | SB/MR               | VY RKG                  |
| Rev. No.   | Date                          | Purpose                             |                           | Prepared By         | Reviewed By Approved By |

This drawing and the design it covers are the property of ENGINEERS INDIA LIMITED. They are hereby loaned and on the borrower's express agreement that they will not be reproduced, copied, loaned, exhibited, nor used except in the limited way and private use permitted by any written consent given by lender to the borrower.



- NOTES: -**
- PSV-1101/1102 DISCHARGE SHOULD BE FREE DRAINING TO COLUMN.
  - TYPICAL TYPE OF EXCHANGER DRAIN AND FLUSHING CONNECTIONS ARE AS INDICATED IN P&ID NO. 01-02-41-0130.
  - VALVES SHOULD BE LOCATED AT MINIMUM DISTANCE FROM THE CRUDE LINE 12"-P-01-1101-B1A
  - ALL PRESSURE GAUGES AND FLOW TRANSMITTERS IN CRUDE, RCO, VR, SLOP DISTILLATE, HVGO, MVGO, ETC. SHOULD BE SUITABLE FOR CONGEALING TYPE FLUID, i.e. PREFERABLY DIAPHRAGM TYPE
  - TO BE LOCATED AT B/L
  - FOR DETAILS OF A) FLOW CONNECTIONS SHOWN AS [FLO] AND PUMP DRAIN VENT CONNECTIONS, REFER P&ID NO.- 01-02-41-0130
  - ALL TVS DOWNSTREAM PIPING SHOULD BE FREE DRAINING
  - ISOLATION VALVE ON STEAM LINES SHOULD BE 'MINIMUM' DISTANCE FROM CRUDE TRY LINES
  - FLO CONNECTIONS NOT TO BE PROVIDED ON SHELL SIDE OF 01-EE-00-037 AS IT IS WATER
  - A LOW POINT DRAIN SHOULD BE PROVIDED ON TRY LINE COOLER.
  - ALL INSTRUMENT NUMBERS TO BE PREFIXED BY TAG NO. '01'.
  - DPT-1101/DPI-1101 ARE IN THE DESALTER VENDOR'S SCOPE.
  - DELETED
  - ALL PG'S ON STEAM TRACED LINES ARE DIAPHRAGM TYPE WITH SEAL ARRANGEMENT
  - DELETED.
  - PROVISION/LOCATION FOR INJECTION OF OIL SOLUBLE DEMULSIFIER IN ADDITION TO THE PROVISION SHOWN.
  - DETAILS OF DESALTER INTERNALS AS PER DESALTER VENDOR. PLEASE REFER TO VENDOR DRAWING (FINAL) FOR DETAILS REGARDING DRAINS CONNECTIONS
  - DIVERSION OF SRB STRIPPED WATER TO DESALTER
  - INSTALLATION OF CRUDE OIL DENSITY METER
  - LOW LOW LEVEL LEVEL OF 01-LT-1101, 01-LT-1101A & 01-LT-1101B ACTUATES LSSL 1103 SWITCH WITH VOTING LOGIC 2oo3.
  - DESALTER 3 NOS. OF TRANSFORMER VOLTAGE & CURRENT INDICATION PROVIDED IN DCS.
  - HIGH HIGH LEVEL OF 01-LT-1101, 01-LT-1101A & 01-LT-1101B ACTUATES TRIPPING OF DESALTER POWER UNIT WITH VOTING LOGIC 2oo3.
  - PARTIAL WASH WATER ADDITION FACILITIES PROVIDED AT DOWNSTREAM OF 01-PV-1101 AND UPSTREAM OF EXCHANGER 01-EE-002.
  - ALL EXCHANGERS TSV OUTLET ROUTED TO CBD IN RTA'23 AS PER ISA-2021-22 RECOMMENDATION
- REVAMP NOTES:**
- EXISTING FRESH WATER PUMP IS GOING TO BE REPLACED WITH NEW FRESH WATER PUMP
  - EXISTING 1.5" LINE TO BE BLOCKED/REMOVED AND NEW 3" LINE TO BE PROVIDED AS INDICATED ALONG WITH NEW CONTROL VALVE AND FLOW ELEMENT
  - THIS P&ID TO BE READ IN-CONJUNCTION WITH EXISTING ORIGINAL P&ID 6850-02-41-01-0111 REV.9

| Sl. No. | Date     | Revisions                           | Drawn | Checked | By | CHKD/APPD. |
|---------|----------|-------------------------------------|-------|---------|----|------------|
| 5A      | 03.03.28 | HAZOP RECOMMENDATIONS INCORPORATED  | NR    | SB      | MR | VY         |
| 5       | 24.02.28 | ISSUED FOR HAZOP                    | NR    | SB      | MR | VY         |
| 4       | 17.02.28 | NRL'S COMMENTS INCORPORATED         | NR    | SB      | MR | VY         |
| 3       | 07.02.28 | UPDATED & RE-ISSUED FOR ENGINEERING | NR    | SB      | MR | VY         |
| 2       | 02.01.28 | UPDATED & RE-ISSUED FOR ENGINEERING | NR    | SB      | MR | VY         |
| 1       | 11.12.25 | UPDATED & RE-ISSUED FOR ENGINEERING | NR    | SB      | MR | VY         |
| 0       | 03.12.25 | ISSUED FOR ENGINEERING              | NR    | SB      | MR | VY         |

**ENGINEERS INDIA LIMITED**  
 (A Govt. of India Undertaking)

**NUMALIGARH REFINERY LIMITED**  
**REVAMP OF CDU/VDU**  
**DESALTER**

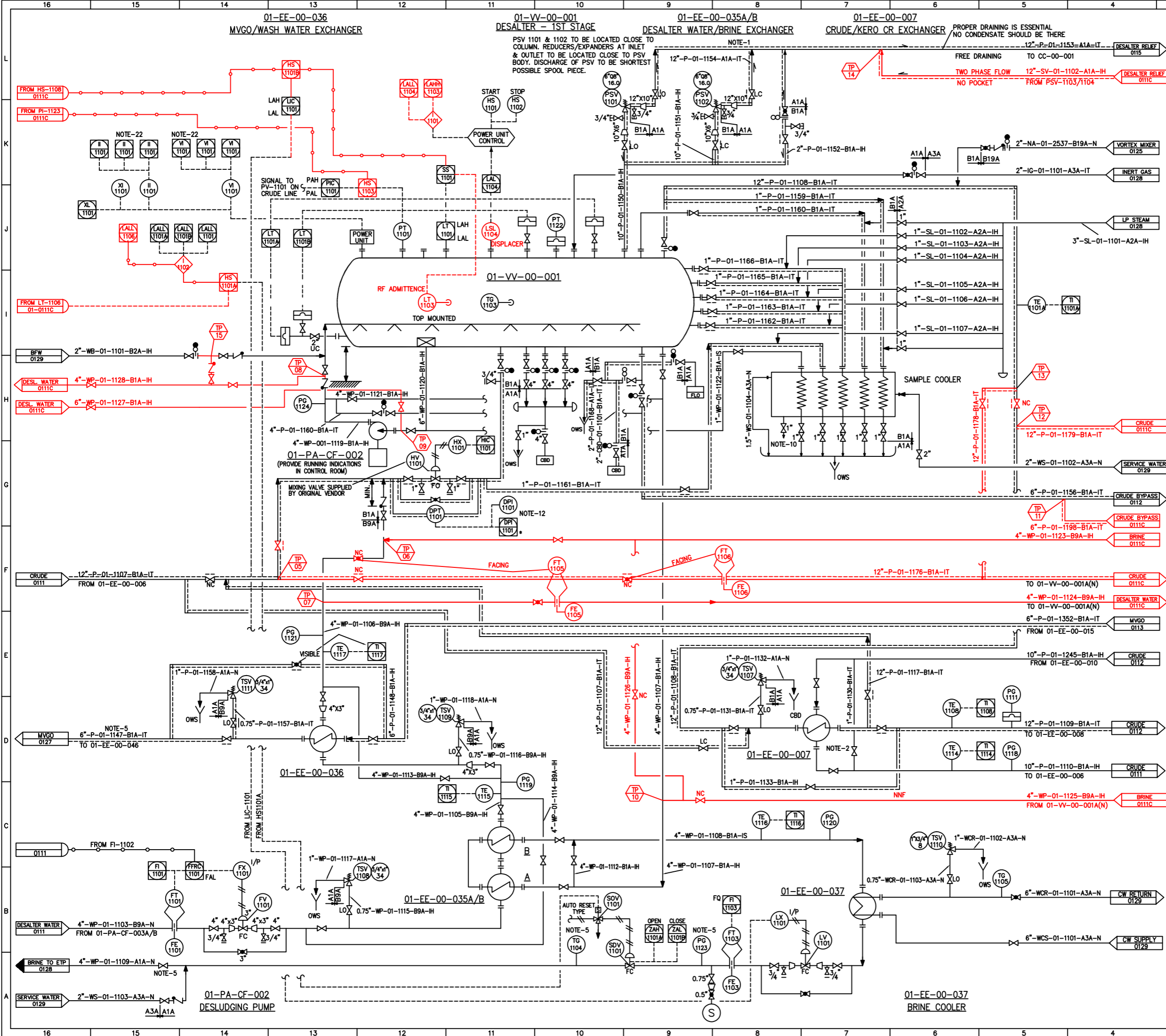
पाइपिंग रण्ड इंस्ट्रुमेंटेशन डायग्राम  
**PIPING AND INSTRUMENTATION DIAGRAM**  
**CRUDE/VACUUM DISTILLATION UNIT**  
**PREHEAT TRAIN-1**

| अनुमान SCALE | कार्य संख्या JOB NO. | विभाग DEPT. | अनुभाग SECTN. | इकाई UNIT | आरेख संख्या DWG. No. | रंजी. REV. |
|--------------|----------------------|-------------|---------------|-----------|----------------------|------------|
| 1:1          | C213                 | 03          | 41            | 01        | 0111A                | 5          |

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

Page 487 of 747 - C213-001-PA-MR-5010-03-REQ - Rev A

This drawing and the design it covers are the property of ENGINEERS INDIA LIMITED. They are merely loaned and on the borrower's express agreement that they will not be reproduced, copied, loaned, exhibited, nor used except in the limited way and private use permitted by any written consent given by lender to the borrower.



- NOTES: -**
- PSV-1101/1102 DISCHARGE SHOULD BE FREE DRAINING TO COLUMN.
  - TYPICAL TYPE OF EXCHANGER DRAIN AND FLUSHING CONNECTIONS ARE AS INDICATED IN P&ID NO. 01-02-41-0130.
  - VALVES SHOULD BE LOCATED AT MINIMUM DISTANCE FROM THE CRUDE LINE 12"-P-01-1101-B1A
  - ALL PRESSURE GAUGES AND FLOW TRANSMITTERS IN CRUDE, RCO, VR, SLOP DISTILLATE, HVGO, MVGO, ETC. SHOULD BE SUITABLE FOR CONGEALING TYPE FLUID, I.E. PREFERABLY DIAPHRAGM TYPE
  - TO BE LOCATED AT B/L
  - FOR DETAILS OF A) FLOW CONNECTIONS SHOWN AS FLO AND PUMP DRAIN VENT CONNECTIONS, REFER P&ID NO.- 01-02-41-0130
  - ALL TSV DOWNSTREAM PIPING SHOULD BE FREE DRAINING
  - ISOLATION VALVE ON STEAM LINES SHOULD BE 'MINIMUM' DISTANCE FROM CRUDE TRY LINES
  - FLO CONNECTIONS NOT TO BE PROVIDED ON SHELL SIDE OF 01-EE-00-037 AS IT IS WATER
  - A LOW POINT DRAIN SHOULD BE PROVIDED ON TRY LINE COOLER.
  - ALL INSTRUMENT NUMBERS TO BE PREFIXED BY TAG NO. '01'.
  - DPT-1101/DPI-1101 ARE IN THE DESALTER VENDOR'S SCOPE.
  - DELETED
  - ALL PG'S ON STEAM TRACED LINES ARE DIAPHRAGM TYPE WITH SEAL ARRANGEMENT
  - DELETED.
  - DELETED.
  - PROVISION/LOCATION FOR INJECTION OF OIL SOLUBLE DEMULSIFIER IN ADDITION TO THE PROVISION SHOWN.
  - DETAILS OF DESALTER INTERNALS AS PER DESALTER VENDOR. PLEASE REFER TO VENDOR DRAWING (FINAL) FOR DETAILS REGARDING DRAINS CONNECTIONS
  - DIVERSION OF SRB STRIPPED WATER TO DESALTER
  - INSTALLATION OF CRUDE OIL DENSITY METER
  - LOW LOW LEVEL LEVEL OF 01-LT-1101, 01-LT-1101A & 01-LT-1101B ACTUATES LSSL-1103 SWITCH WITH VOTING LOGIC 2oo3.
  - DESALTER 3 NOS. OF TRANSFORMER VOLTAGE & CURRENT INDICATION PROVIDED IN DCS.
  - HIGH HIGH LEVEL OF 01-LT-1101, 01-LT-1101A & 01-LT-1101B ACTUATES TRIPING OF DESALTER POWER UNIT WITH VOTING LOGIC 2oo3.
  - PARTIAL WASH WATER ADDITION FACILITIES PROVIDED AT DOWNSTREAM OF 01-PV-1101 AND UPSTREAM OF EXCHANGER 01-EE-002.
  - ALL EXCHANGERS TSV OUTLET ROUTED TO CBD IN RTA'23 AS PER ISA-2021-22 RECOMMENDATION

- REVAMP NOTES: -**
- THIS P&ID SHALL BE READ IN CONJUNCTION WITH ORIGINAL P&ID 6850-02-41-01-0111 REV.9
  - NEW LINES HAVE BEEN ADDED AS PART OF REVAMP TO OPERATE THE DESALTER SYSTEM IN SERIES MODE WITH OPTIONS FOR PARALLEL AND STANDALONE SINGLE DESALTER OPERATION
  - LSSL-1103 & LSL-1104 SHALL BE REPLACED WITH NEW INSTRUMENTS
- 29. INTERLOCK LOGIC:**
- | INTERLOCK NO. | ACTUATED BY   | ACTION UPON   |
|---------------|---|---|
| I-1101        | 01-LT/LALL-1104 (AT LOW LOW LEVEL)<br>01-LT/LAHL-1103 (AT HIGH INTER- POWER UNITS (FACE LEVEL))                   | TRIP DESALTER POWER UNITS<br>TO CLOSE SDV-1101 (FROM 1ST STAGE) |
| I-1102        | 01-LT/LALL-1101<br>01-LT/LALL-1101A<br>01-LT/LALL-1101B (2oo3 FROM 1ST STAGE)<br>01-LT/LALL-1106 (FROM 2ND SATGE) | TO CLOSE SDV-1101   |

| Sl. No. | Date     | Revision                            | By | Check | Appd. |
|---------|----------|-------------------------------------|----|-------|-------|
| 5A      | 03.03.28 | HAZOP RECOMMENDATIONS INCORPORATED  | NR | SB    | MR    |
| 5       | 24.02.28 | ISSUED FOR HAZOP                    | NR | SB    | MR    |
| 4       | 17.02.28 | NR'S COMMENTS INCORPORATED          | NR | SB    | MR    |
| 3       | 07.02.28 | UPDATED & RE-ISSUED FOR ENGINEERING | NR | SB    | MR    |
| 2       | 02.01.26 | UPDATED & RE-ISSUED FOR ENGINEERING | NR | SB    | MR    |
| 1       | 11.12.25 | UPDATED & RE-ISSUED FOR ENGINEERING | NR | SB    | MR    |
| 0       | 03.12.25 | ISSUED FOR ENGINEERING              | NR | SB    | MR    |

**ENGINEERS INDIA LIMITED**  
(A Govt. of India Undertaking)

**NUMALIGARH REFINERY LIMITED**  
**REVAMP OF CDU/VDU**  
**DESALTER**

पाइपिंग रण्ड इंस्ट्रुमेंटेशन डायग्राम  
**CRUDE/VACUUM DISTILLATION UNIT**  
**CRUDE DESALTER - 1st STAGE**

|                 |                         |                |                  |              |                         |              |
|-----------------|-------------------------|----------------|------------------|--------------|-------------------------|--------------|
| अनुमान<br>SCALE | कार्य संख्या<br>JOB NO. | विभाग<br>DEPT. | अनुभाग<br>SECTN. | इकाई<br>UNIT | आरेख संख्या<br>DWG. No. | रजि.<br>REV. |
|                 | C213                    | 03             | 41               | 01           | 0111B                   | 5            |

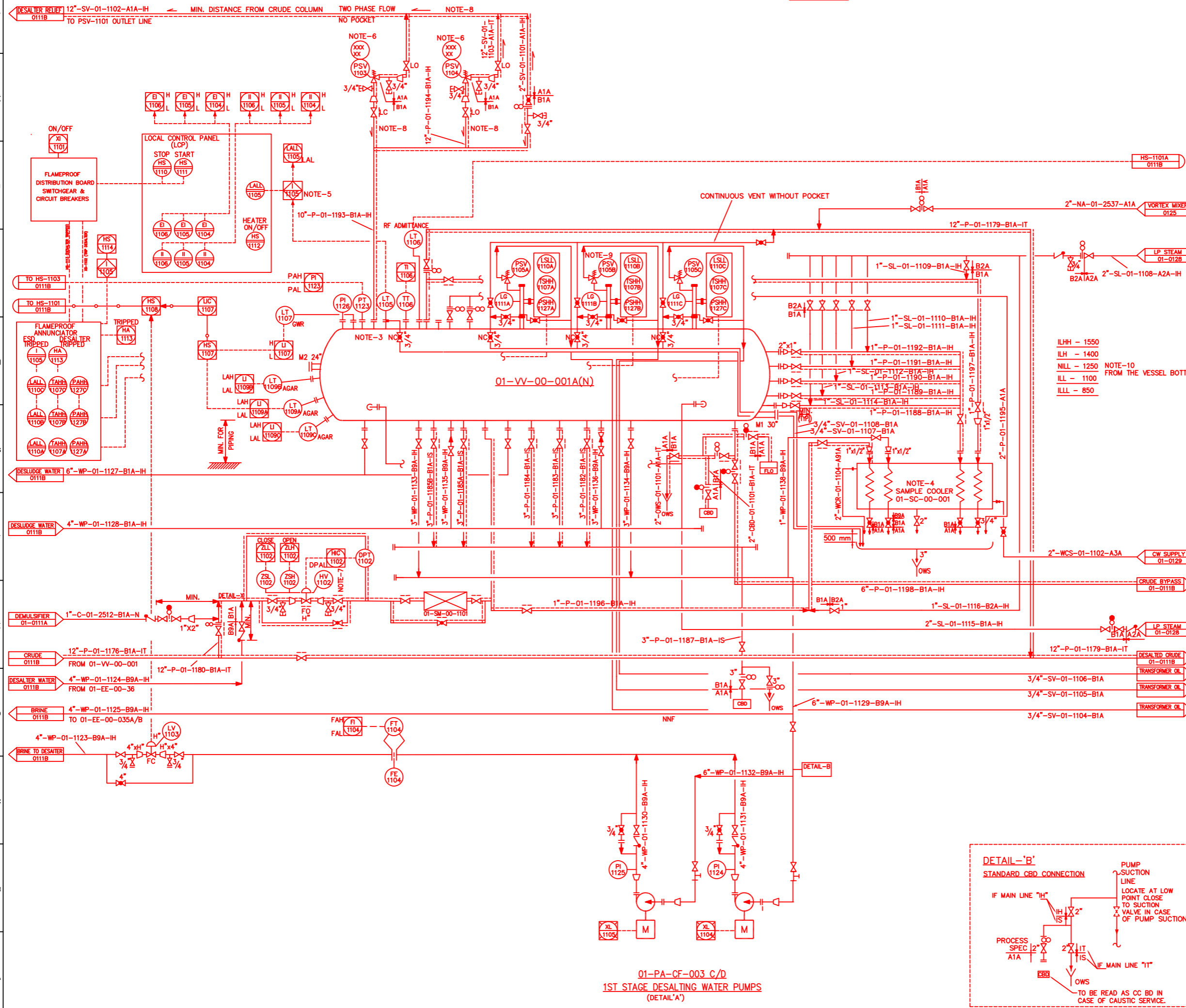
EIL-0241-502-REV-0-A      DISTRIBUTION CODE

This drawing and the design it covers are the property of ENGINEERS INDIA LIMITED. They are merely loaned and on the borrower's express agreement that they will not be reproduced, copied, loaned, exhibited, nor used except in the limited way and private use permitted by or on behalf of the borrower.

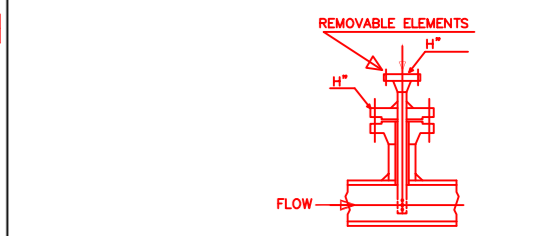
01-VV-00-001A(N) DESALTER-2ND STAGE  
 01-SM-00-1201 STATIC MIXER  
 01-PU-00-1102(N) A/B/C TRANSFORMER

- NOTES:**
- TYPE AND DETAIL DESIGNATION HAS BEEN ALLOTTED FOR A PARTICULAR DRAIN, VENT, FLUSHING ARRANGEMENT OF EXCHANGER, PUMPS AND LINES REFER DWG NO.
  - ALL DCS OPEN AND CLOSED LOOP INSTRUMENTS SHOWN IN P&ID ARE SMART TRANSMITTERS
  - FOR INTERPHASE LEVEL  
 LT-1109 TO BE AGAR CORPORATION MULTI-PROBE TYPE LEVEL INSTRUMENT.  
 LT-1107 TO BE EXTERNAL GWR TYPE & LT-1106 TO BE RF ADMITTANCE TYPE LEVEL INSTRUMENTS.  
 FOR OIL PHASE LEVEL  
 LT-1105 SHALL BE DISPLACER TYPE
  - SAMPLE COOLER: EIL STANDARD FOR NON-CONGEALING HC SERVICE ABOVE 55 DEG SHALL BE CONSIDERED
  - INTERLOCK LOGIC :
 

| INTERLOCK NO. | ACTUATED BY                        | ACTION UPON               |
|---------------|------------------------------------|---------------------------|
| I-1105        | 01-LT/LALL-1105 (AT LOW LOW LEVEL) | TRIP DESALTER POWER UNITS |
- (DESALTER TRIP ANNUNCIATION HS-XXXX TO BE PROVIDED IN DCS)
- PSV-1103/1104 TO BE LOCATED AT MIN. DISTANCE FROM 01-CC-00-01.
  - SOFT LIMIT STOP IN DCS SHALL BE PROVIDED FOR MINIMUM OPENING OF HV-1102.
  - LINE SIZE/NOZZLE SIZE ARE FINALIZED DURING DETAIL ENG.
  - PSV-1105A/B/C, PSHH-1127A/B/C, LG-1111A/B/C, LSL-1110A/B/C TSHH-1107A/B/C SHALL BE PART OF TRANSFORMER SUPPLIERS SCOPE
  - INTERFACE LEVELS SHALL BE FINALIZED DURING DETAIL ENGINEERING
  - IT IS A NEW DESALTER VESSEL WITH ASSOCIATED PIPING & INSTRUMENTATION AS PART OF REVAMP. TO INTEGRATED WITH EXISTING DESALTER & CDU/VDU UNIT.
  - THIS P&ID TO BE READ IN CONJUNCTION WITH EXISTING ORIGINAL P&ID 6850-02-41-01-0111 REV.9



**DETAIL X: WASH WATER INJECTION QUILL**



| Sl. No. | DATE     | REVISIONS                           | DRN | BY | CHKD | APPD. |
|---------|----------|-------------------------------------|-----|----|------|-------|
| 5A      | 24.02.26 | HAZOP RECOMMENDATIONS INCORPORATED  | NR  | SB | MR   | VY    |
| 5       | 24.02.26 | ISSUED FOR HAZOP                    | NR  | SB | MR   | VY    |
| 4       | 17.02.26 | NRL'S COMMENTS INCORPORATED         | NR  | SB | MR   | VY    |
| 3       | 07.02.26 | UPDATED & RE-ISSUED FOR ENGINEERING | NR  | SB | MR   | VY    |
| 2       | 02.01.26 | UPDATED & RE-ISSUED FOR ENGINEERING | NR  | SB | MR   | VY    |
| 1       | 11.12.25 | UPDATED & RE-ISSUED FOR ENGINEERING | NR  | SB | MR   | VY    |
| 0       | 03.12.25 | UPDATED & RE-ISSUED FOR ENGINEERING | NR  | SB | MR   | VY    |

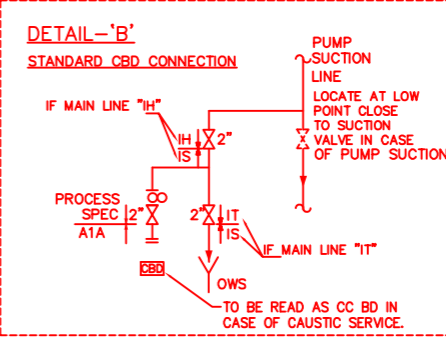
इंजिनियर्स  
**इंडिया लिमिटेड**  
 (भारत सरकार का उपकार)

**ENGINEERS INDIA LIMITED**  
 (A Govt. of India Undertaking)

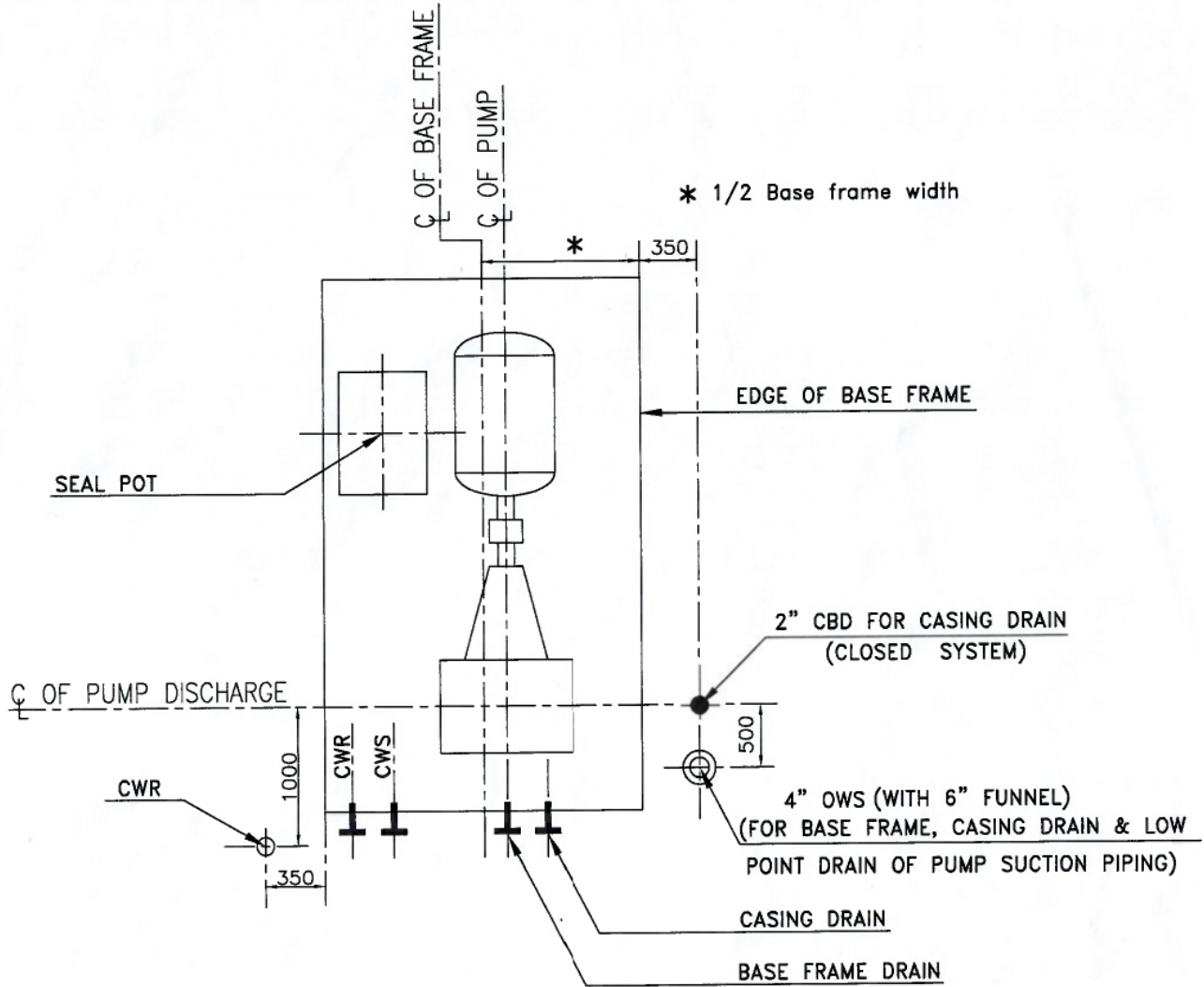
**NUMALIGARH REFINERY LIMITED**  
**REVAMP OF CDU/VDU DESALTER**

पाइपिंग एवं इंस्ट्रुमेंटेशन डायग्राम  
**PIPE AND INSTRUMENTATION DIAGRAM**  
**CRUDE/VACUUM DISTILLATION UNIT**  
**CRUDE DESALTER - 2nd STAGE**

|        |              |       |        |      |             |        |
|--------|--------------|-------|--------|------|-------------|--------|
| जुनमाप | कार्य संख्या | विभाग | अनुभाग | इकाई | जांच संख्या | संज्ञा |
| SCALE  | C213         | 03    | 41     | 01   | 0111C       | 5      |



01-PA-CF-003 C/D  
 1ST STAGE DESALTING WATER PUMPS  
 (DETAIL 'A')



APPLICABLE FOR PUMPS WITH

1. END SUCTION/TOP DISCHARGE
2. TOP SUCTION/TOP DISCHARGE
3. SIDE SUCTION/SIDE DISCHARGE

NOTES

1. Pump supplier to ensure that the locations / orientation of seal pot , Drain connections , CWS & CWR shall be as indicated in this drawing.
2. All dimensions are in mm, unless other wise specified.
3. Seal pot, CW supply/return, U/G points shall be mirror image for the pump tag nos identified during detail engineering, considering access/client requirements. Input shall be provided in MR.

LEGEND

- CBD : CLOSED BLOW DOWN
- ⊙ OWS : OILY WATER SEWER
- CWS : COOLING WATER SUPPLY
- CWR : COOLING WATER RETURN

|          |          |                                 |             |            |                          |                       |
|----------|----------|---------------------------------|-------------|------------|--------------------------|-----------------------|
| 3        | 09.10.25 | REAFFIRMED & ISSUED AS STANDARD | SRG         | PK         | SH                       | MN                    |
| 2        | 04.05.20 | REAFFIRMED & ISSUED AS STANDARD | SG          | SH         | GB                       | SKS                   |
| Rev. No. | Date     | Purpose                         | Prepared by | Checked by | Stds. Committee Convenor | Stds. Bureau Chairman |
|          |          |                                 |             |            |                          | Approved by           |

उपकेन्द्रीय पम्पों के लिए मानक विनिर्देश  
विशिष्ट प्रयोजन प्रक्रिया पम्प  
[एपीआई-६१०, १२वें संस्करण पर आधारित]

STANDARD SPECIFICATION FOR  
CENTRIFUGAL PUMPS  
(SPECIAL PURPOSE PROCESS SERVICE)  
[BASED ON API-610, 12<sup>TH</sup> EDITION]

| Rev. No | Date       | Purpose                          | Prepared by | Checked by | Standards Committee Convenor | Standards Bureau Chairman |
|---------|------------|----------------------------------|-------------|------------|------------------------------|---------------------------|
| 0       | 31.07.2023 | Issued as Standard Specification | HM          | MG/TR      | NK                           | शंजम SM                   |

**Abbreviations:**

|       |   |  |
|-------|---|--|
| API   | : | American Petroleum Institute                 |
| ARV   | : | Automatic Recirculation Valve                |
| ASME  | : | The American Society of Mechanical Engineers |
| BDD   | : | Bid due date/Tender due date                 |
| BEP   | : | Best Efficiency Point                        |
| BLO   | : | Balance Leak off                             |
| DCI   | : | Document Control Index                       |
| EC    | : | Experience Criteria                          |
| eDMS  | : | Electronic Document Management System        |
| FFT   | : | Fast Fourier Transform                       |
| HPRT  | : | Hydraulic Power Recovery Turbine             |
| ISA   | : | Instrumentation Society of America           |
| ISBL  | : | Inside Battery Limits                        |
| MAWP  | : | Maximum Allowable Working Pressure           |
| MCF   | : | Minimum Continuous Flow                      |
| MCR   | : | Maximum Continuous Rating                    |
| MCS   | : | Maximum Continuous Speed                     |
| MKS   | : | Meter, Kilogram, Seconds                     |
| MMS   | : | Machine Monitoring System                    |
| MOP   | : | Main Oil Pump                                |
| MRT   | : | Mechanical Run Test                          |
| NPSH  | : | Net Positive Suction Head                    |
| NPSHA | : | Net Positive Suction Head Available          |
| NPSHR | : | Net Positive Suction Head Required           |
| NPSH3 | : | Net Positive Suction Head 3%                 |
| OSBL  | : | Outside Battery Limits                       |
| P&ID  | : | Piping and Instrumentation Diagram           |
| PTC   | : | Power Test Codes                             |
| PTR   | : | Proven Track Record                          |
| VDM   | : | Vendor Document Management System            |
| VDR   | : | Vendor Data Requirements                     |
| VMS   | : | Vibration Monitoring System                  |

**Rotating Equipment Standards Committee**

Convener: Mr. Nalin Kumar

**Members:** Mr. Tarun Kumar  
Mr. J S Duggal  
Mr. Abhay Kumar  
Mr. Mahesh Easwaran  
Mr. Mahesh Gupta  
Mr. Pintu Lal  
Mr. Ayush Mathur (Projects)

CONTENTS

|          | Page No.  |
|----------|---|
| 1        | Scope..... 4  |
| 1A       | Amendments / Supplements to API Standard 610..... 4         |
| 1B       | Experience Criteria..... 4                                  |
| 3        | Terms and Definitions ..... 5                               |
| 3.1.21   | Maximum Allowable Working Pressure..... 5                   |
| 3.1.23   | Maximum Discharge Pressure..... 5                           |
| 3.1.64   | Supplier / Vendor..... 5                                    |
| 4        | General..... 5  |
| 4.1      | Unit Responsibility..... 5                                  |
| 5        | Requirements..... 6   |
| 5.1      | Units..... 6  |
| 5.3      | Hierarchy of Requirements..... 6                            |
| 6        | Basic Design..... 6   |
| 6.1      | General..... 6  |
| 6.2      | Pump types..... 8   |
| 6.3      | Pressure Casings ..... 8                                    |
| 6.4      | Nozzles and pressure casing connections ..... 9             |
| 6.5      | External Nozzle Forces and Moments..... 9                   |
| 6.7      | Wear Rings And Running Clearances ..... 9                   |
| 6.8      | Mechanical Shaft Seals ..... 10                             |
| 6.9      | Dynamics..... 10  |
| 6.10     | Bearings and Bearing Housings..... 10                       |
| 6.11     | Lubrication ..... 10  |
| 6.12     | Materials ..... 10  |
| 7        | Accessories ..... 11  |
| 7.1      | Drivers..... 11   |
| 7.2      | Couplings & Guards..... 11                                  |
| 7.3      | Guards..... 12  |
| 7.4      | Base Plates ..... 12  |
| 7.5      | Instrumentation..... 13                                     |
| 7.6      | Piping & Appurtenances ..... 13                             |
| 8        | Inspection Testing and Preparation for Shipment ..... 14    |
| 8.1      | General..... 14   |
| 8.2      | Inspection..... 14  |
| 8.3      | Testing..... 16   |
| 8.4      | Preparation For Shipment ..... 18                           |
| 9        | Specific Pump Types..... 18                                 |
| 9.1      | Single Stage Overhung Pump ..... 18                         |
| 9.2      | Between Bearing Pumps (Types BB1, BB2, BB3 and BB5)..... 18 |
| 9.3      | Vertically Suspended Pumps (types VS1 through VS7)..... 20  |
| 10       | Vendor's Data..... 21                                       |
| Annex-C: | Hydraulic power recovery turbines ..... 22                  |
| C.1      | General..... 22   |
| C.2      | Terminology..... 22   |
| C.3      | Design ..... 22   |
| C.4      | Testing..... 24   |
| Annex-L: | Contract Documents and Engineering Design Data..... 26      |
| L.2      | Proposals..... 26   |
| L.3      | Engineering Design Data..... 26                             |

## 1 Scope

- i. This specification together with the attendant Data Sheets and other specifications/attachments to inquiry / order defines the minimum requirements for vertical and horizontal centrifugal pumps including pumps running in reverse direction as hydraulic power recovery turbines and their accessories / auxiliaries for use in the petroleum, petrochemical and natural gas industries.
- ii. Vendor shall comply with the requirement of this specification and other specifications/attachments to inquiry/order. No deviation or exception shall be permitted without the written approval of the purchaser.
- iii. Compliance with this Specification shall not relieve the vendor of the responsibility of furnishing equipment and accessories /auxiliaries of proper design, materials and workmanship to meet the specified start up and operating conditions.

In case the vendor considers requirement of additional instrumentation, controls, safety devices and any other accessories/auxiliaries essential for safe and satisfactory operation of the equipment, they shall recommend the same along with reasons in a separate section along with his proposal and include the same in their scope of supply.

### 1A Amendments / Supplements to API Standard 610

- 1A.1 Except as modified herein, the centrifugal pumps shall be designed, manufactured, tested and supplied strictly in accordance with the **API Standard 610 - Centrifugal Pumps for Petroleum, Petrochemical and Natural gas industries, Twelfth Edition, January 2021.**
- 1A.2 Except for new paragraphs, the number and title of the paragraphs in this specification correspond to the respective sections and paragraphs of the above standard. Paragraphs not addressed in this specification shall be strictly in accordance to **API Standard 610, Twelfth Edition, January 2021** requirements.

The word in parenthesis following the number or title of a paragraph indicates the following:

- |                |   |   |
|----------------|---|---|
| (Addition)     | : | An addition to a part, section or paragraph referred to.  |
| (Modification) | : | An amplification or rewording has been made to a part of the corresponding section or paragraph but not a substitution replacing the entire section or paragraph. |
| (Substitution) | : | A substitution has been made for the corresponding section or paragraph of the standard in its totality.  |
| (New)          | : | A new section or paragraph having no corresponding section or paragraph in the Standard.  |
| (Delete)       | : | The paragraph is deleted.   |

### 1B Experience Criteria

- 1B.1 The pump model offered shall be from the existing pump model series and shall be from the regular manufacturing range of the vendor (Prototypes are not acceptable).

The mechanical design as well as the hydraulic performance (including NPSHR/NPSH3) for the complete range of operation of the offered model shall have been established in the shop test. (Details to be furnished, if required).

The offered pump model with identical hydraulics and design shall be field proven (at least ONE unit) with minimum operating experience of one year for similar operating/design conditions & driver rating (at rated pump speed), rotor dynamics, mechanical design, pumping liquid and material of construction, supplied in the last Ten (10) years, from the

proposed manufacturing plant, as on BDD.

(Note: Similar operating/design conditions & driver rating would mean approx. 80% or higher; Pumping liquid and material of construction would mean references in the same model series, are also acceptable.)

- 1B.2 The vendor shall complete the Experience Record Proforma enclosed with the inquiry document to amply prove that the offered pump model meets the above criteria by furnishing details of similar operating/design conditions {flow, head, operating/design pressures & temperatures, viscosity, speeds, efficiencies, driver rating, no. of stages, bearing span/column length etc.}, Rotor Dynamics {Impeller Arrangement, No. of Impellers, Bearing Span, Speeds etc.}, Mechanical Design {Bearing Type & Lubrication, MAWP etc.}, pumping liquid & material of construction etc. as applicable in the format.

Past Test Curves shall also be submitted (when requested) to justify the quoted efficiencies. Multiple references may be furnished to justify the above.

In addition, manufacturer's catalogue and general reference list for "Centrifugal Pumps-Special Purpose Process Service" shall also be furnished along with the proposal.

## 1 Scope

Paragraph 1 of API Standard 610 - Centrifugal Pumps for Petroleum, Petrochemical and Natural gas industries, Twelfth Edition, January 2021 stands modified as per para 1, para 1A and para 1B above.

## 3 Terms and Definitions

### 3.1.21 Maximum Allowable Working Pressure (Addition)

MAWP shall not be less than maximum discharge pressure calculated as per 3.1.23 below and must satisfy the pressure and temperature parameters consistent with the discharge flange rating upto 600#.

For higher pressure rating pumps (900# and above), MAWP shall not be less than downstream design conditions as a minimum.

### 3.1.23 Maximum Discharge Pressure (Modification)

- Replace 'relative density' by 'maximum specified relative density at any specified operating condition' (including start-up/commissioning with water, if specified).
- Highest Pressure shall include all test tolerances for shut off head.

### 3.1.64 Supplier / Vendor (Substitution)

Unless otherwise specified, **Supplier / Vendor** shall be the manufacturer of centrifugal pumps (special purpose), as per API 610, having adequate design, engineering, manufacturing, packaging and testing facilities and shall have supplied similar centrifugal pumps (special purpose) package as a single point responsibility vendor. The vendor shall also be the manufacturer of the proposed centrifugal pumps (special purpose).

## 4 General

### 4.1 Unit Responsibility (Substitution)

Vendor shall have UNIT RESPONSIBILITY of complete centrifugal pump package & shall be responsible for complete design, engineering, manufacturing, packaging, testing, supply & supervision of erection & commissioning of total package as per specification requirements. Vendor's scope shall include but not limited to the responsibility for execution, coordination of all technical aspects of equipment and its auxiliary systems, their selection & integration into a complete package constituting total order. All drawings/documents, including sub vendor's drawings, pertaining to the order shall be duly reviewed & approved by the vendor before onward submission.

4.2.2 Unless otherwise specified OH1, OH4, OH5, BB4, VS3, VS5 & VS7 type pumps are not acceptable.

## 5 Requirements

### 5.1 Units (Modification)

Unless otherwise specified, MKS system of units shall be used.

### 5.3 Hierarchy of Requirements (Substitution)

In case of conflict between this specification and the attendant data sheets, job specifications (if any) and other attached specification the following order of precedence shall govern:

1. Process Data Sheet / P&IDs / Process Package
2. Mechanical Data Sheets.
3. Job Specifications/scope of work (if any)
4. This specification
5. Other standards & specifications
6. Other referred codes and standards

The editions of referenced publication that are in effect at the time of inquiry or at a date specified in the inquiry documents shall be applicable.

In case of any ambiguity in the above documents, the vendor/supplier shall seek clarification from the owner/purchaser and the decision of the owner/purchaser shall be final and binding.

## 6 Basic Design

### 6.1 General

#### 6.1.4 (Addition)

Unless otherwise specified, pump minimum continuous flow (MCF) shall be less than or equal to process normal flow for cases wherein addition of MCF to process flow is not specified in process data sheet. Pumps having MCF greater than Process Normal Flow are not acceptable.

#### 6.1.5 (Modification)

The words "different hydraulic design, variable speed capability" stands deleted.

#### 6.1.9 (Addition)

Unless otherwise specified, pumps where difference between NPSHA and NPSHR/NPSH3 from quoted minimum flow to rated flow is less than 0.6 meter are not acceptable. The said NPSHR/NPSH3 value shall correspond to the maximum value of NPSHR/NPSH3 from rated flow down to the recommended minimum continuous stable flow specified by the vendor. Additionally, in case of parallel operation and/or auto start against open discharge valve condition, NPSHR/NPSH3 upto 120% of best efficiency point shall not exceed specified NPSHA.

Pumps (except for OH6 type pumps) fitted with inducers/coke crusher for reducing NPSHR/NPSH3 is not acceptable.

Note: Actual datum for NPSHA (i.e. grade level, top of foundation level or any other level as defined in enquiry) shall be referred from the data sheets forming part of enquiry document.

#### 6.1.14 (Substitution)

Unless otherwise specified, discharge orifice shall not be used to achieve required head rise to shut off, even in case of parallel operation.

For discharge nozzle size less than 2-inch, reduced bore design, if used, shall be clearly highlighted in the proposal (pump datasheet/performance curve) and may be considered with prior experience of hydraulics.

6.1.15 (Substitution)

Pumps shall have stable head/flow-rate curves (continuous head rise from rated to shutoff) for all applications (except for pumps permitted as per Cl. 8.3.3.4.2 of API 610 wherein continuous head rise from rated to MCF is required).

If parallel operation is specified, the head rise from rated point to shutoff shall be at least 10%.

For all other pumps, minimum 5% head rise from rated to shut-off shall be provided in order to ensure stable pump operation.

6.1.16 (Substitution)

Pumps shall have preferred operating region of 70% to 120% of best efficiency flow-rate of the pump as furnished. Rated flow shall be within 70% to 110% of best efficiency flow-rate of the rated impeller except for low flow pumps ( $\leq 20$  m<sup>3</sup>/hr) or pump rated BKW upto 15 kW. The "end of the curve flow" is defined as 120% of the BEP flow. Vendor shall indicate "Preferred Operating Range" and "Allowable Operating Range" on the characteristic curve.

6.1.19 (Substitution)

The NOTE at end of Cl. 6.1.19 is substituted with the following clause:

Unless otherwise specified, the maximum permissible sound pressure level of the complete equipment (pump + driver) train including all ancillaries & auxiliaries shall not exceed 85 dBA measured at 1 meter from equipment surface in any direction for the recommended range of operation at site.

6.1.22 (Modification)

Unless otherwise specified, vendor shall offer their standard cooling plan (as per API Annex B) guaranteeing safe and satisfactory operation of the pump package.

The need for cooling shall be determined by the vendor, and the method shall be agreed upon by the purchaser. However water cooling shall be provided to bearing housing for all pumps with fluid temperature greater than 250°C operating in ISBL areas.

6.1.27 (Modification)

Unless otherwise specified, water cooling systems (jackets, heat exchangers and so forth) shall be designed for the following conditions on the water side:

|  |   |                                 |
|--|---|---------------------------------|
| Velocity over heat exchanger surface           | : | 1.5 - 2.5 m/sec.                |
| Maximum Allowable Working Pressure (MAWP)      | : | $\geq 8.0$ kg/cm <sup>2</sup> g |
| Test Pressure                                  | : | = 1.5 x MAWP                    |
| Maximum Pressure Drop                          | : | 0.7 kg/cm <sup>2</sup>          |
| Maximum Inlet Temperature                      | : | 33°C                            |
| Maximum Outlet Temperature                     | : | 45°C                            |
| Maximum Temperature Rise                       | : | 12°C                            |
| Minimum Temperature Rise                       | : | 6°C                             |
| Fouling Factor on Water Side                   | : | 0.0004 m <sup>2</sup> hr°C/kcal |
| Shell Side Corrosion allowance (not for tubes) | : | 3.2 mm                          |

Note: TSV set pressure (in CW isolatable circuits) shall not exceed the design pressure of purchaser's CW header.

6.1.36 (Addition)

Unless otherwise specified, equipment shall be designed to be suitable for outdoor installation without a roof.

- 6.1.42 (New)  
For balancing axial thrust in multi-stage pumps, only the following arrangements shall be used:
- Opposed arrangements of impellers.
  - A balancing piston
- 6.1.43 (New)  
Unless otherwise specified, for rated flows exceeding 1000 m<sup>3</sup>/hr or with differential head above 200 m, only "Between Bearing Type" pump shall be supplied. For offsites/OSBL, pumps falling in this range shall be selected with Side Suction/Top Discharge or Side Suction/Side Discharge nozzle orientation.
- 6.1.44 (New)  
Unless otherwise specified, electric motor driven pumps shall be directly driven.
- 6.1.45 (New)  
Single and two-stage pumps operating at temperatures less than 150°C and multi-stage pumps operating at temperatures less than 120°C shall be suitable for instantaneous start-up from ambient to full operating temperature without any warm-up.  
For operating temperatures higher than the above, unless otherwise specified, the pump vendor shall provide casing warm-up arrangement with suitable hardware (i.e. flanged piping, valves, orifice & fittings as applicable) within pump skid battery limits.  
Warm up flow shall be added to the rated flow for pump/driver sizing and selection and the same shall be reflected on data sheet and performance curves. Flanged warm-up connection shall be provided at the skid edge for the further interfacing by purchaser.  
Casing warm up schematic shall be provided by pump vendor.  
As part of the operating manual, an appropriate start-up procedure shall be provided by pump vendor.  
Required sensing/monitoring equipment (i.e. skin thermo-couples, temperature transmitters etc.) to ensure that the pump, including seal(s), does not incur damage due to rapid heat up, shall be supplied by pump vendor.
- 6.2 **Pump Types (Modification)**  
Unless otherwise specified, pump types as listed in Table 3 shall not be offered.
- 6.3 **Pressure Casings**
- 6.3.1 (Substitution)  
The maximum discharge pressure shall be the maximum suction pressure plus the maximum differential pressure including all test tolerances, the pump is able to develop, when operating with the furnished impeller at the rated speed (MCS for pumps equipped with variable speed drivers) and specified maximum relative density at any specified operating condition' (including start-up/commissioning with water at normal suction pressure, if specified).
- 6.3.3 (Modification)  
The 'NOTE' stands modified as under:  
Vendor to note that the criteria specified in a) above shall also be used for design of purchaser's associated piping system.
- 6.3.6 (Modification)  
MAWP shall be calculated as per 3.1.21 defined in this specification.
- 6.3.8 (Modification)  
Unless otherwise specified, regions of VS6, OH6, BB3 & BB5 that are subjected only to suction pressure shall be designed for the same MAWP as that of discharge section.

- 6.3.13 (Modification)  
The second line "Gaskets other than spiral-wound may be proposed and furnished, if proven suitable for service and approved by the purchaser" stands deleted.
- 6.3.14 (Modification)  
The words "except as allowed in 9.2.1.2" stand deleted.
- 6.4 Nozzles and pressure casing connections**
- 6.4.3 **Auxiliary connections**
- 6.4.3.1 (Addition)  
All drain and vent connections shall be terminated at the skid edge along with instructions that the same are to be further connected to either an open drain or a closed drain.
- 6.4.3.11 (New)  
For horizontal multistage pumps, In case, Balance-leak-off (BLO) line is connected to suction source (piping / vessel) of the pump, the balance line shall be provided with pressure gauge, orifice & pressure relief valve upto vendors battery limit. Vendor shall ensure that BLO flow has already been considered in pump & driver sizing and the rated capacity is available from pump discharge. Screwed connections are not allowed. Balance leak off line shall be designed for the pump casing MAWP..
- 6.5 External Nozzle Forces and Moments**
- 6.5.1 (Modification):  
The pump's pressure casing and their base-plates shall be suitable to withstand twice the forces and moments in Table 5 applied simultaneously to the pump through each nozzle, plus internal pressure, without distortion that would impair operation of the pump or seal.  
Note:  
1. Vendor to note that the above criteria shall be used for design of purchaser's associated piping system.  
2. Annex F of API 610 may be utilised for pumps with Automatic Recirculation Valve (ARV) mounted on the pump discharge nozzle.
- 6.7 Wear Rings and Running Clearances**
- 6.7.3 (Modification)  
Tack welding shall not be employed for fitting of the metallic wear rings.
- 6.7.4 (Addition)  
In order to ensure close clearances between impeller wear ring and casing wear ring and to achieve improved efficiency, following Non-Metallic wear rings shall be used for all clean applications within the design temperature limitations as per Table H-3:  
a) Polyether Ether Ketone (PEEK) Continuous –Carbon-Fibre wound  
b) PFA/CF Carbon-fiber Filled 20% mass fraction random X-Y oriented carbon-fibre  
Offered Non-metallic wear ring material shall be field proven and certified compatible with the specified process liquid. A letter from the wear ring material manufacturer shall be furnished in the bid certifying compatibility of offered wear ring material with the process liquid and operating and design conditions.
- 6.7.5d) (New)  
The maximum permissible running clearances shall not be less than twice the new running clearances.  
Note: While selecting the running clearances, galling tendency of the offered wear rings shall be taken into consideration.

**6.8 Mechanical Shaft Seals**

6.8.1 (Addition)

For the applicable flushing plans, the vendor shall also include in his scope of supply, all items shown as optional items in Annex-G of API 682 4<sup>th</sup> edition (Standard Flush Plan and auxiliary Hardware) along with other additional specified/ required items, if any.

**6.9 Dynamics**

6.9.2 TORSIONAL ANALYSIS

6.9.2.9 (Modification)

Replace the words 'If specified' by 'If torsional analysis is performed'.

**6.10 Bearings and Bearing Housings**

6.10.2 BEARING HOUSINGS

6.10.2.9 (Modification)

Bearing housings shall be equipped with suitable replaceable noncontact type bearing isolators where shaft passes through the housing.

6.10.2.13 (Substitution)

All multistage pumps without forced feed lubrication system and driver rating  $\geq 160$  Kw shall be provided with accelerometer based transducers in X&Y directions.

6.10.2.14 (Substitution)

A flat surface at least 25 mm in diameter shall be supplied for the location of magnetic based vibration measuring equipment, whether or not vibration measuring equipment is included in the vendor's scope of supply. Pumps shall also have provision for mounting accelerometers (X & Y) on each bearing housing.

6.10.2.16 (New)

Bearing housing shall be equipped with magnetic drain plug except for multistage pumps where vendor's standard design may not permit this.

**6.11 Lubrication**

6.11.3 (Substitution)

Provision shall be made for pure/purge oil mist lubrication as specified.

**6.12 Materials.**

6.12.1.8 (Modification)

The words 'if specified' stand deleted.

6.12.1.13 (Modification)

Where even trace quantities of wet H<sub>2</sub>S are indicated to be present, reduced hardness materials in accordance with NACE MR0175/MR0103 shall be provided by the vendor.

6.12.2.5 (Modification)

The words 'if specified' stand deleted.  
The second sentence also stands deleted.

6.12.3.4.1 (Modification)

Requirements of additional examination shall be as specified vide clause 8.2.1.3 of this specification.

6.12.4.3 (Modification)  
ASME Sec VIII, Div 1 shall apply with regard to impact testing requirements.

## 7 Accessories

### 7.1 Drivers

#### 7.1.5 (Substitution)

Electric motor drivers shall have a maximum continuous rating (MCR) (i.e. service factor equal to 1) not lower than the following unless higher rating is dictated by the Note 1 and / or Note 2:

| <b>Pump Rated BKW*</b> | <b>Motor MCR (% of Pump Rated BKW)</b>   |
|------------------------|--|
| Up-to 22 kW            | To suit maximum BKW indicated on pump data sheet or 125% of rated pump BKW, whichever is higher. |
| 22 kW to 55 kW         | 115%   |
| Higher than 55 kW      | 110%   |

\* including all mechanical & transmission losses & with 0% +ve tolerance.

The electric motor shall be suitable for the electrical area classification specified on the data sheet.

Note:

1. The motor nameplate rating for pumps under parallel operation or for pumps with auto-start operation shall not be less than the max. BKW indicated on pump data sheet (maximum power at any point on the pump performance curve from shutoff to end of the curve for the rated impeller) or shall have the specified margin as per this clause whichever is greater. The pump motors shall also be suitable for start-up under open discharge valve condition.
2. The motor nameplate rating for applications where the specific gravity of pumped fluid is less than 1.0 shall either be 100% of the BKW of pump at minimum continuous stable flow with clean cold water of sp. gravity 1.0 or shall have the specified margin as per this clause, whichever is greater.

#### 7.1.10 (Modification)

Unless otherwise specified, steam turbine drivers shall be sized to deliver continuously 110% of pump rated power at minimum inlet and maximum exhaust steam conditions.

The steam turbine rating (with minimum inlet and maximum exhaust steam conditions) for pumps under parallel operation or for pumps with auto-start operation shall not be less than the max. BKW indicated on pump data sheet (maximum power at any point on the pump performance curve from shutoff to end of the curve for the rated impeller). The turbine shall also be suitable for start-up under open discharge valve condition.

In any case, Turbine Rating shall be at least equal to the Motor Rating of the standby pump.

## 7.2 Couplings and Guards

#### 7.2.2(g) (Substitution)

Couplings shall be balanced to ISO 21940-11, grade G2.5.

#### 7.2.3 (Addition)

The coupling service factor shall not be less than 1.5 over the driver rating. However, during selection of coupling, vendor to ensure that the maximum service factor (actual SF) for the coupling shall not exceed the allowable stresses of the drive train. Further, for the pumps equipped with gear box, max service factor for coupling shall not exceed the gear box service factor.

#### 7.2.4 (Substitution)

Unless otherwise specified, all couplings required for multistage pump package(s) (greater than two stages) shall conform to API standard 671 where either the driver rating is greater than 160 kW or the maximum continuous speed is greater than 3000 rpm.

However in case of gear box driven multistage pump units, both low speed and high speed couplings shall conform to API standard 671 if any of the above criteria of speed or power is satisfied.

### 7.3 Guards

#### 7.3.2a) (Addition)

Coupling guard shall be open at the bottom to permit manual shaft rotation.

#### 7.3.2d) (Modification)

Coupling guard shall be fabricated from non-sparking material.

### 7.4 Base Plates

#### 7.4.1 (Addition)

Pumps in corrosive service shall have provision to collect and drain the leakage from mechanical seal or packing, through a drip pan of metallurgy equivalent or superior to pump casing. Leakages from drip pan shall be piped to base-plate with a flanged connection for onward disposal by purchaser. Where the design of bearing prohibits provision of drip pan, the material of bearing bracket shall be suitable for the corrosive service. Base plates shall have jacking provision for aligning the prime movers & shall be provided with 2" 150# flanged connection.

#### 7.4.6 (Deletion)

This clause shall stand deleted.

#### 7.4.8 (Modification)

Replace "if specified" by "For all multistage pumps".

#### 7.4.22 (Modification)

The pump manufacturer shall furnish the anchor bolts.

#### 7.4.24 (Modification)

All pumps offered shall have been tested for nozzle load test (either by physical testing or by computer simulation study using finite element analysis) in the past for twice the API loads meeting shaft deflection criteria as per Table-13 for baseplate intended for grouting limits and shall be demonstrated through the past test reports for the offered model. Categorical compliance to the above is mandatory and report may be furnished on demand.

In case pipe load test has not been conducted in the past, the vendor shall demonstrate the pipe load test with the above defined loads & shaft deflection as per Table-13 (either by physical testing at their manufacturing shop or by computer simulation study using finite element analysis) for the proposed pump model(s). Unless otherwise specified, this is not a witness test and only report is required.

#### 7.4.25 (New)

Skid layout of pump trains along-with their auxiliary systems (i.e. seal flushing plans) shall be designed in a manner so as to ensure that there is enough space within the skid for maintenance and operation. Special care shall be taken for pumps provided with seal flushing plans 23, 52, 53, 75, etc., so that couplings and seals can be attended for maintenance without disturbing any seal piping/cables/other items located on the skid. As far as possible, area on motor terminal box and coupling side shall be left clear of all piping and accessories for ease of maintenance.

## 7.5 Instrumentation

### 7.5.2.2 (Modification)

The words 'if specified' stand deleted. The vendor shall supply the detectors.

### 7.5.2.5 (Modification)

The words 'if specified' stand deleted.

### 7.5.2.6 (Modification)

The words 'if specified' stand deleted.

### 7.5.2.8 (New)

Horizontal multistage pumps intended for pumping temperature above 120°C shall be provided with pump casing skin temperature monitoring system consisting of the following:

- Four thermocouples for number of stages  $\geq 4$  & minimum two thermocouples for number of stages  $< 4$ , along-with yoke mounted temperature transmitters with integral indicator for each thermocouple.
- One Junction Box (JB) to be mounted on the pump base-plate.
- Cables between the thermocouples and transmitters.
- Cables between transmitters and junction box.

For multistage pumps in pipeline applications, where MCF recirculation line is generally not provided, casing skin temperature monitoring as defined above shall be provided irrespective of the pumping temperature.

## 7.6 Piping and Appurtenances

### 7.6.1 General

#### 7.6.1.6 (Modification)

The words 'if specified' stand deleted.

#### 7.6.1.7 (Modification)

Flange fasteners on stainless steel piping systems shall be of stainless steel.

### 7.6.2 Auxiliary Process Fluid Piping

#### 7.6.2.3 (Modification)

Auxiliary process fluid piping material shall be SS-316 as a minimum.

#### 7.6.2.6 (Substitution)

Casing shall be provided with drain connection with nipple, threaded and seal welded or manufacturer's standard and provided with a socket welded gate valve terminated at edge of the base plate. Gate valve shall be of minimum 800# rating with material of construction (MOC) equal or superior to the pump casing. For multistage pumps with more than one drain point, block valves at each drain point shall be provided and the piping shall be terminated at edge of the base plate with a flange. Unless made self-venting design, vent connections shall also be provided with a nipple, threaded and seal welded and terminated with a gate valve. Pressure gauge connection shall not be provided unless specifically required in the inquiry. Nipples shall meet the requirements of 6.4.3.4.

#### 7.6.2.8 (Modification)

Flanges are required instead of socket welded unions for all auxiliary process fluid piping.

- 7.6.2.11 (New)  
Unless otherwise specified, material for seal flushing liquid cooler shall be as under:  
Tube or Coil : Type 316 stainless steel or Monel.  
Casing (or Shell) : Carbon Steel.  
Cooling water shall be on the casing (Shell) side.

### 7.6.3 Cooling Water Piping

- 7.6.3.4 (New)  
Sight flow indicator shall have ball or flag for easy verification of water flowing through pipes.

- 7.6.3.5 (New)  
Thermal relief valve (in each isolatable cooling water circuit) shall be provided upstream of globe valve on the cooling water outlet line. Set pressure of thermal relief valve shall be equal to the design pressure of cooling water piping system.

## 8 Inspection, Testing and Preparation for Shipment

### 8.1 General

- 8.1.7 (New)  
Prior to start of test, manufacturer shall furnish the certificate of latest calibration / re-calibration of driver and measuring instruments for review by purchaser's inspection agency. Unless electrical or mechanical failure occurs, driver used for shop testing need not be recalibrated and original calibration certificate shall remain valid.  
Duration of recalibration for all measuring instruments shall be as per the recommendations of HI Standards.

### 8.2 Inspection

#### 8.2.1 GENERAL

- 8.2.1.3 (Substitution)  
The minimum inspection requirements for pressure containing casing shall be as per the following:

| Inspection category | Inspection requirement  | Remarks   |
|---------------------|---|---|
| CATEGORY A          | Visual inspection and Magnetic Particle or Liquid Penetrant inspection of following components as a minimum:<br>- Nozzle weld<br>- Butt welds on pressure containing components<br>- Fillet welds on pressure containing components.<br>- Shaft<br>Radiographic or ultrasonic inspection of the following as a minimum:<br>- Nozzle weld<br>- Butt welds on pressure containing components. | C1. Liquid penetrant inspection shall be performed only when specified magnetic particle inspection is not feasible.<br>C2. Magnetic particle or liquid Penetrant inspection shall be carried out in accordance with Table 14.<br>C3. Ultrasonic inspection shall be carried out when radiography is not feasible. Radiography or ultrasonic inspection shall be carried out in accordance with Table 14. |
| CATEGORY B          | Visual inspection and Magnetic Particle or Liquid Penetrant   | B1. Liquid penetrant inspection shall be performed only when  |

| Inspection category  | Inspection requirement  | Remarks   |
|--|---|---|
|  | inspection of following components as a minimum:<br>- Nozzle weld<br>- Butt welds on pressure containing components<br>- Fillet welds on pressure containing components.<br>- Shaft | specified magnetic particle inspection is not feasible.<br><br>B2. Magnetic particle or liquid penetrant inspection shall be carried out in accordance with Table 14. |
| <b>CATEGORY C</b>  | As per vendor's standard Quality Assurance Plan   |   |
| <p><b>Note:</b></p> <p><b>Category A:</b><br/>This category is applicable for services with process design pressure above 70 kg/cm<sup>2</sup>g or process design temperature below -29°C or above 300°C.</p> <p><b>Category B:</b><br/>This category is applicable for services within the design pressure and temperature range other than covered under category A above and category C below.</p> <p><b>Category C:</b><br/>This category is applicable for carbon steel and cast iron for services with process design pressure up to 40 kg/cm<sup>2</sup>g and design temperature from 0 to 150°C.</p> |   |   |

8.2.1.5 (New)

Inspection shall also include dimensional check of pump, driver and auxiliaries (if any) duly mounted on the base plate, in accordance with certified general assembly drawing. This will include all main pump dimensions, base plate dimensions, location of foundation bolt holes, size/position/rating of flanges, coupling guard arrangement, verification of the required material certificates and their trace-ability to the respective components. In addition, following checks shall also be carried out:

- A measurement of the actual running clearances throughout the pump.
- A check for the hardness of wear rings.
- A check of discharge nozzle bore size
- A check for good workmanship and finish throughout.

8.2.1.6 **Inspection & Testing requirements: (New)**

A. Pump-Centrifugal Horizontal (SPP) / Pump-Centrifugal Vertical (SPP) / Pump-Centrifugal Canned Motor / Pump-Centrifugal Submerged Motor (Cryogenic) / High Speed Integrally Geared Centrifugal Pumps:

| Sno. | Inspection & Tests   | Scope of Inspection (Note-1)   |
|------|--|--|
| 1    | Shop Test / Inspection   | R  |
| 2    | Material Certificates  | R  |
| 3    | Hydrostatic test   | R  |
| 4    | Performance Test / Sound level Test  | W  |
| 5    | NPSH Test as required (as per specification) / Minimum Submergence Test (for Vertical pumps) | W  |
| 6    | Dismantle Inspection & Re-assembly after test  | W (Note-2)   |
| 7    | Unitization / Check of direction of rotation of pump   | O (but not required for PMC jobs; to be governed by contractor's quality plan) |
| 8    | Visual, dimension and skid completeness check  | W (Conventional jobs)<br>R (PMC jobs)  |

**B. Pump-Centrifugal Horizontal Multistage (SPP) / Pump-Centrifugal (BFW)**

| Sno. | Inspection & Tests                                   | Scope of Inspection (Note-1)   |
|------|--|--|
| 1    | Shop Test / Inspection                               | R  |
| 2    | Material Certificates                                | R  |
| 3    | Hydrostatic test                                     | W  |
| 4    | Rotor Dynamic Balancing (Both Main & Spare Rotor)    | O  |
| 5    | Performance Test / Sound level Test                  | W  |
| 6    | NPSH Test as required (as per specification)         | W  |
| 7    | Dismantle Inspection & Re-assembly after test        | W  |
| 8    | Unitization / Check of direction of rotation of pump | O (but not required for PMC jobs; to be governed by contractor's quality plan) |
| 9    | Visual, dimension and skid completeness check        | W (Conventional jobs)<br>R (PMC jobs)  |
| 10   | Complete Unit Test                                   | W (Note-3)   |

**Legends:**

- R: Required: Reviewing of manufacturer's shop test reports shall be considered as adequate.  
O: Observed: Purchaser shall be notified but work may proceed after scheduled date.  
W: Witnessed: A HOLD shall be applied and work shall not proceed without approval.

**Notes:**

- The inspection & test requirements specified are applicable for each pump unless otherwise specified.
- Dismantle Inspection of pump after performance test shall be applicable only in case of abnormality in mechanical behavior (such as excessive noise & vibration, bearing temperature rise etc.) during performance test.
- All the pumps (except for steam turbine drive pump) with forced feed lubrication system shall undergo complete unit test at rated speed. Job drive, job mechanical seal & job coupling shall be used (with motor getting loaded only upto its full load current value). Shop LO system, Shop machine monitoring instrumentation & controls & shop sealing system can be utilized for this test.

**8.2.2 Pressure Casing and Process Piping Materials Inspection**

**8.2.2.6 (Modification)**

The words "if specified" stand deleted.

**8.2.2.7 (Modification)**

The words "if specified" stand deleted.

**8.3 Testing**

**8.3.1 GENERAL**

**8.3.1.1 (Modification)**

The words 'if specified' stand substituted with 'Unless otherwise specified'

**8.3.1.2 (Modification)**

Table 16 stands modified as under:

Rated Head : Zero negative tolerance @ rated flow rate & rated speed

Shut-off Head : Following criteria shall apply:

- Positive tolerance permitted as long as maximum shutoff pressure corresponding to shut-off head (as observed during the shop performance test) and the maximum suction pressure (as specified on

pump data sheet). does not exceed the downstream design pressure (as specified on pump data sheet).

b) Negative tolerance (as per Table-16) may be permitted only if test curve still shows continuously rising characteristics & shutoff head is minimum 110% of rated head for pumps in parallel operation and minimum 105% of rated head for pumps not in parallel operation.

[Note: Generally, shutoff head should be limited within 120% of rated head.]

NPSHR : Zero positive tolerance.  
Rated BKW : Zero positive tolerance. (However, pumps may be accepted upto 104% of guaranteed BKW subject to Penalties as defined elsewhere.

#### 8.3.1.4 (New)

Unless otherwise specified the following tests shall be witnessed by the Purchaser or by their authorised representative or by both together.

1. Hydrostatic test as per 8.3.2 for Multistage Pumps.
2. Performance test as per 8.3.3.
3. NPSHR test as per 8.3.4.3 when specified in the material requisition or when the difference between NPSHA and NPSH3/NPSHR is less or equal to one (1) meter.
4. Unitization of Pump with Job Driver at shop.
5. Dismantling inspection and reassembly, after the running test
6. Dynamic balancing of Complete Rotor in case of Multistage Pumps
7. Sound level test.

Test Certificates for Hydrostatic Test & Dynamic Balancing of Impeller(s) will suffice for single & two stage pumps. These test certificates shall be furnished to purchaser's inspector for review prior to performance testing.

### 8.3.3 Performance Test

#### 8.3.3.6.3 (Modification)

During the performance test, rise in temperature of bearing oil shall be measured and results recorded on the test log. If specified, pumps provided with oil mist lubrication (Purge/Pure) shall be tested with shop oil mist system & suitable performance at vendor's shop shall be demonstrated.

#### 8.3.3.8.2 (Modification)

The words 'if specified' stand deleted.

#### 8.3.3.10 (New)

Shop driver shall be used for testing and the rating of the driver shall not exceed 150% of power that may be consumed while running at duty point with water; or power at full valve open condition, whichever is higher. The limitation of 150% is applicable only for medium voltage motors.

### 8.3.4 Optional Tests

#### 8.3.4.2 Mechanical Run Test

##### 8.3.4.2.2 (Modification)

The words 'if specified' stand deleted.

#### 8.3.4.3 NPSH Required Test

##### 8.3.4.3.1 (Addition)

If NPSH Required test is specified or if it is required to be done as per para 8.3.1.4, NPSHR shall be determined at each test point defined in 8.3.3.4 except shut-off and in-case of parallel operation additionally at 120% of BEP.



**8.3.4.5 Sound Level Test (Modification)**  
The words "if specified" stand deleted.

During the performance test, the equipment shall be checked for its sound level at minimum flow, at rated flow, at flow at best efficiency point and at 120% BEP flow.

The maximum allowable value shall not exceed the value specified under clause 6.1.14 or as specified in the datasheet, whichever is lower, when measured at one (1) meter from pump surface.

Where complete unit test is specified, vendor is required to demonstrate the noise levels within the maximum permissible sound level for the complete unit.

Recorded sound levels during shop test shall be taken for reference only & not for final acceptance or rejection. However sound level as specified in the inquiry document shall be guaranteed at site.

**8.3.4.6 Auxiliary Equipment Test (Modification)**  
The words "if specified" stand deleted.

## **8.4 Preparation for Shipment**

**8.4.2 (Modification)**  
Unless otherwise specified, the equipment shall be protected for an outdoor storage of 12 months at site. If any extra precaution is to be taken by the Purchaser for storage beyond 12 months the same shall be explicitly indicated in the operation and maintenance manuals.

**8.4.7 (Substitution)**  
Two copies of the manufacturer's job specific installation manual shall be packed and shipped with the equipment.

## **9 Specific Pump Types**

### **9.1 Single Stage Overhung Pump**

**9.1.1 (Addition)**  
Unless otherwise specified, overhung pumps for rated flow exceeding 1000 m<sup>3</sup>/hr or differential head above 200 m are not acceptable.

**9.1.1.3 (Substitution)**  
The shaft flexibility index shall be calculated in accordance with K.2 and shall be indicated by the pump vendor in his proposal / technical data sheet. The value of shaft flexibility index for overhung pumps,  $I_{SF}$ , for the given pump size factor,  $K_1$  shall not exceed 1.2 times the equation K.4 (SI units) or K.5 (US units).

### **9.1.3 Integral Gear Driven (Type OH6) Pumps**

**9.1.3.5 (Modification)**  
Diameter of gauges shall be 100mm (4 in.) as a minimum.

### **9.2 Between Bearing Pumps (Types BB1, BB2, BB3 and BB5)**

**9.2.1.2 (Substitution)**  
Pumps for all services shall be centreline mounted irrespective of pumping temperature.

**9.2.2.3 (Modification)**  
The words 'if specified' stand deleted.

9.2.2.5 (New)

Unless otherwise specified, Maximum number of stages shall not exceed 12 for horizontal pumps subject to meeting PTR with respect to Bearing Span & Speed and similar service. Unless otherwise specified, Maximum number of stages shall not exceed 15 for vertical pumps subject to meeting PTR with respect to Bearing Span & Speed and similar service.

**9.2.4 Dynamics**

9.2.4.1.1 Table 18-Decision logic for rotor lateral analysis (Modification)

The words 'similar or' stand deleted from step-2.

**9.2.6 Lubrication**

9.2.6.5 (New)

In case a pressure lubrication system is required and is supplied with shaft-driven main oil pumps (MOP), the MOP shall be suitable for safe coast down of the complete equipment train without necessitating the requirement of overhead rundown tank.

In case MOP is not suitable for safe shutdown of the complete equipment train, the vendor in his offer may propose for purchaser's consideration any special arrangement/provision provided for equipment safety and protection when the equipment decelerates. Provision shall be adequate for coast down time and cool-off time as applicable.

Due to space constraints, mechanical seals for lube oil pump can be as per API 610 / API 676.

9.2.6.6 (New)

External pressure-lubrication systems shall comply with the following additional requirements:

- Pumps, filters, strainers, coolers, traps, valves and all other components that retain oil under pressure and are external to the reservoir shall be made of steel.
- Except in case of shaft driven pumps, if a positive displacement type of oil pump is supplied, a separate relief valve (not integral with the pump) shall be provided. The relief valve shall not be used for pressure regulation. Horizontal oil pumps shall not be installed on top of the oil reservoir.
- A removable tube bundle design is required for shell and tube coolers with more than 0.5 m<sup>2</sup>.
- The oil side operating pressure of the oil cooler shall be higher than the water-side operating pressure to prevent contamination of oil in case of cooler failure.
- Filters shall be equipped with a continuous flow transfer valves and an equalising line.
- Oil system shall have drain rim or pan to catch oil spills.
- Unless otherwise specified, heating element shall not be provided. However, if in the opinion of vendor such an arrangement is required (especially in view of the lowest ambient temperature prevailing at job site), the same shall be supplied by the pump manufacturer with specific approval of the purchaser.

**9.2.7 Testing**

9.2.7.4 (Modification)

The words 'if specified' stand deleted.

**9.2.8 Preparation for Shipment**

9.2.8.2 (Modification)

The words 'if specified' stand deleted.

- 9.2.8.3 (Modification)  
The words 'if specified' stand deleted.
- 9.2.8.4 (Modification)  
The words 'if specified' stand deleted.
- 9.3 Vertically Suspended Pumps (types VS1 through VS7)**
- 9.3.1 General**
- 9.3.1.1 (Modification)  
Hydraulic performance shall also be corrected for friction head losses in the inlet strainer.
- 9.3.1.5 (New)  
Unless otherwise specified, in case of tank-mounted pumps, the setting depth shall be so arrived that the pump minimum submergence is ensured within the boot of the vessel, i.e. minimum liquid level shall be considered to correspond to bottom of the tank level for ensuring complete evacuation of the tank.
- 9.3.1.6 (New)  
All vertically suspended pumps shall be with shaft segment length not exceeding 750mm.
- 9.3.2 Pressure Casings**
- 9.3.2.11 (New)  
Bowls and columns shall be flanged and bolted.
- 9.3.3 Rotors**
- 9.3.3.2 (Addition)  
Multi-piece vertical pump line shaft shall not be joined by threaded couplings.
- 9.3.6 Bushings and Bearings**
- 9.3.6.1 (Addition)  
Unless otherwise specified, for vertical pumps, material of guide bushing shall be suitable for dry running during start-up / transient conditions as well as running on lubrication by pumping fluid/external source.  
These bushing shall be non-metallic [material as per table H.3 (only PEEK continuous-carbon-fiber wound or PFA/CF carbon-fiber filled) suitably selected for service. These bearings after start up shall be lubricated by the pumped fluid or external fluid. A letter from the bush bearing material manufacturer shall be furnished with the bid certifying compatibility of offered line shaft bearing material with the process liquid and operating and design conditions.
- 9.3.6.2 (Modification)  
Pump thrust shall not be transferred to driver motor. Vertical pumps shall be provided with their own thrust bearing to carry rotor weight and pump generated axial forces.  
Thrust bearing shall be positively locked on the pump shaft (shouldered shaft) and the bearing housing.
- 9.3.8 Accessories**
- 9.3.8.1.1 Drivers (Modification)  
For vertical pumps, not provided with non-reverse ratchet, vendor shall describe the precaution taken, to prevent damage due to reverse rotation.

9.3.8.3 **Mounting Plates**

9.3.8.3.1 (Modification)

The words 'if specified' stand deleted.

9.3.8.3.2 (Modification)

The words 'if specified' stand substituted with 'unless otherwise specified'.

9.3.10 **Single Case Diffuser (VS1) And Volute (VS2) Pumps**

9.3.10.4 (Modification)

The words 'if specified' stand deleted.

9.3.13 **Double Casing Diffuser (VS6) And Volute (VS7) Pumps**

9.3.13.1 (Modification)

The words 'if specified' stand deleted.

9.3.13.4 (Modification)

The words 'if specified' stand deleted.

10 **Vendor's Data**

Refer Annexure-L

**Annex-C: Hydraulic power recovery turbines**

**C.1 General**

**C.1.1 EXPERIENCE CRITERIA**

- C.1.1.1 The HPRT model offered shall be from the existing HPRT model series and shall be from the regular manufacturing range of the vendor (Prototypes are not acceptable).

The mechanical design as well as the hydraulic performance for the complete range of operation of the offered model shall have been established in the shop test. (Details to be furnished, if required).

The offered HPRT model shall be field proven (at least ONE unit) with minimum operating experience of one year for similar operating/design conditions & power generated, rotor dynamics, mechanical design, pumping liquid and material of construction, supplied in the last Ten (10) years, from the proposed manufacturing plant, as on BDD.

(Note: Similar operating/design conditions & power generated would mean approx. 80% or higher. For pumping liquid and material of construction references in the same model series are also acceptable.)

- C.1.1.2 The vendor shall complete the Experience Record Proforma enclosed with the inquiry document to amply prove that the offered HPRT model meets the above criteria by furnishing details of similar operating/design conditions {flow, head, operating/design pressures & temperatures, % vapour handled at discharge, speeds, efficiencies, power generated, no. of stages, bearing span etc.}, Rotor Dynamics {Impeller Arrangement, No. of Impellers, Bearing Span, Speeds etc.}, Mechanical Design {Bearing Type & Lubrication, MAWP etc}, pumping liquid & material of construction etc. as applicable in the format.

Past Test Curves of HPRT tested as HPRT shall also be submitted (when requested) to justify the quoted efficiencies.

Multiple references may be furnished to justify the above. Only pumps working as HPRT will be construed as valid reference.

In addition, manufacturer's catalogue and general reference list for "Centrifugal Pumps-Special Purpose Process Service working as HPRT" shall also be furnished along with the proposal.

**C.2 Terminology (Addition)**

Unless otherwise specified, all the requirements for centrifugal pumps, specified herein this Standard Specification, shall be applicable for HPRT, as applicable. However, the word 'Centrifugal Pump' shall be read as 'HPRT'.

**C.3 Design**

**C.3.1 Liquid Characteristics**

**C.3.1.2 (Addition)**

Vendor shall estimate the vapour volumes expected at each stage of the HPRT and furnish a stage-wise profile of the vapour evolution. Vendor shall justify that the HPRT is capable of handling the expected vapour volumes with suitable references and supporting design documents.

### C.3.3 Overspeed Trip

#### C.3.3.1 (Addition)

The Hydraulic Power Recovery Turbine (HPRT) shall be provided with a speed detector and a non-latching over-speed trip contact (Mechanical/ Electronic through Speed Transmitters (2003 voting logic)) and an additional contact for pre-alarm. The over-speed trip contact will be incorporated into shutdown system by the Purchaser to close the inlet valve of the HPRT. Pump operation shall, however, be allowed without interruption.

The over speed trip setting for HPRT shall be verified at Manufacturer's test bed during Performance Testing. In case of any limitation at Vendor's Works, the same shall be demonstrated during Field Trial Run Test.

### C.3.4 Dual Drivers

#### C.3.4.2 (Substitution)

Power availability from HPRT shall not be considered for the purpose of motor sizing as pumps are supposed to run even without HPRT and motor shall be sized for full load.

#### C.3.4.3 (Substitution)

The HPRT shall be equipped with an overrunning (one way i.e., a clutch that transmits torque in one direction and freewheels in the other) clutch-coupling for connection with the Electric Motor driving the Pump. The clutch coupling shall be designed for 1.7 times the maximum recoverable kW of the HPRT. Vendor shall propose clutch Manufacturer having suitable past supply references for similar power ratings and speed and same shall be subject to Purchaser's review and approval during Detailed Engineering Stage.

#### C.3.4.5 (Substitution)

Unless otherwise specified, the HPRT cum Electric Motor driven Pump trains shall consist of a double ended motor with pump on one side and an overrunning clutch with HPRT on the other side.

Train configuration with HPRT + PUMP + Single Ended Motor may be permitted only in case of axially split pump design.

Pump operation shall, however, be allowed without interruption, in case of HPRT outage.

### C.3.6 Throttle Valves (Addition)

All the trips connected to the HPRT will only be configured to shutdown the inlet valve of the HPRT, thereby allowing the pump operation without interruption.

### C.3.9 Miscellaneous Technical Requirements (New)

C.3.9.1 The rated speed of the Pump- HPRT Train shall not exceed 3000 rpm (synchronous). No gear box is normally envisaged.

C.3.9.2 Dual Pressure Rating (Suction/ Discharge) for HPRT is not acceptable

C.3.9.3 Impeller of HPRT shall also be positively locked against axial movement in the direction opposite to normal hydraulic thrust.

C.3.9.4 Maximum Allowable Working Pressure (MAWP) & Maximum Allowable Working Temperature (MAWT) of HPRT shall neither be less than the Upstream Design Pressure/ Maximum Suction Pressure (as the case may be) & Design Temperature, as specified in the respective Process Datasheets nor less than those specified in specifications, codes & standards.

The HPRT casing shall also be suitable for operation at maximum pressure available at HPRT minimum flow with Specific Gravity= 1.0 (i.e. water). This is required during Shop Performance test with water at Rated Speed.

**C.3.10 Base plate (New)**

The Pump, Electric Motor and HPRT with Clutch assembly shall be mounted on a common base plate, to be erected at site at Grade. However, if found infeasible due to transportation constraints, the Pump and Electric Motor shall be mounted on one base plate and the HPRT with clutch assembly may be mounted on one separate base plate for ease of assembly at site. Vendor shall provide both the base plate sections with machined mating surfaces and all provisions for integrating (dowelling/ bolting etc.) and matching for accurate field reassembly and unitizing the two base plate sections to make one single common base plate under pump train at site. For this, horizontal and vertical jack screws shall be provided for ease in alignment. LO Console & SO Console may be mounted on separate base plates subject to Purchaser's approval.

**C.4 Testing**

**C.4.1 Performance Test (Substitution)**

**a) Test Facilities, Arrangements & Procedures:**

The vendor shall have the testing facility for testing HPRT as HPRT and not as a Centrifugal Pump to establish Guaranteed Power recovered from HPRT. A high pressure source (or another pump) shall be used to run the HPRT for Performance Test and power output from HPRT shall be measured at various points as per details below.

Vendor shall furnish the details of the proposed test arrangements and testing procedures to be followed on conducting the Performance Tests of HPRT and the Complete Unit Test (Mechanical Run), during detailed engineering stage. However, detailed test procedures for testing of HPRT shall be subject to Purchaser's review/ approval.

Note: Sample test procedures of test conducted in the past by the vendor should be furnished in proposal. Past supply references of jobs wherein proposed testing of HPRT is carried out as HPRT should also be furnished by the vendor, in the proposal.

**b) Performance Test of Hydraulic Power Recovery Turbines (HPRTs):**

Performance test of the HPRT at its full load and full speed with Job / Contract Mechanical Seals, shall be carried out at Manufacturer's shop either as separate performance test as HPRT or during complete pump-HPRT train complete unit test. HPRT shall be performance tested as HPRT and not as a pump.

The performance Test shall establish the guarantee power output and shall also fully establish the performance curves covering at least four (4) points. Dismantling inspection of all close clearance parts, bearings & seals, shall follow the performance test in case abnormality in mechanical behavior such as excessive noise, bearing temperature rise, etc. is encountered.

Note: Vendor shall provide brief technical proposal for the HPRT performance test along with the Bid.

Performance Test shall be followed by Mechanical Run Test for four (4) hours and Over-speed trip demonstration test.

**C.4.2 Performance Tolerances (Addition)**

No negative tolerance on power for the specified operating conditions, as per Process/ Mechanical Datasheet is permitted.

**C.4.5 Complete Unit Test (New)**

Unless Otherwise specified/ agreed, Complete Unit Test (applicable for all the Pump- HPRT Trains) of the Pump, along with Job Coupling, Job Mechanical Seal, Job Electric Motor driver, Job HPRT and Job Probes (except Job Lube Oil System & Job Seal System), shall be performed for at least four (4) hours at Pump Manufacturer's Shop. Use of Shop Panel/ Monitoring System & Shop Strainers, is acceptable.

**Annex-L : Contract Documents and Engineering Design Data (Informative)**

L1.1a) (Substitution)

The purchaser's/owner's/consultant's corporate name

**L.2 Proposals**

L.2.1 **General** (Substitution)

The vendor's proposal shall as a minimum include the following:

- All data sheets, drawings and documents specified under "WITH BID" Section in the Vendor Data Requirement Form.

Note: Clearance less than those required by 6.6.4 and Table 6, shall be stated as an exception to API 610.

L.2.4 **Curves**

a) (Modification)

This clause stands deleted.

**L.3 Engineering Design Data**

L.3.1 **General** (Substitution)

L.3.1.1 Engineering Design Drawings and data as required after purchase order has been specified in Vendor Data Requirement. Vendor to note that the drawing/document descriptions/titles as given in the Vendor Data Requirement are generic in nature. It is possible that against one drawing / document specified there are several drawings to be furnished by the vendor or vice versa.

L.3.1.2 All vendor data/drawings/documents shall be in English Language and in Metric Systems. All post order documents shall be submitted / approved through EIL VDM portal.

L.3.1.3 Final documentation shall be submitted in hard copy and soft (CDs/ DVDs) in addition to submission through EIL VDM portal. The number of prints and/or reproducible required to be submitted by vendor are specified in Purchaser's inquiry/order.

उपकेन्द्रीय एवं घूर्णी पम्पों के शाफ्ट सीलिंग  
लिए मानक विनिर्देश

STANDARD SPECIFICATION  
FOR  
SHAFT SEALING SYSTEM FOR  
CENTRIFUGAL & ROTARY PUMPS

| Rev. No | Date       | Purpose                          | Prepared by | Checked by | Standards Committee Convenor | Standards Bureau Chairman |
|---------|------------|----------------------------------|-------------|------------|------------------------------|---------------------------|
| 0       | 20.08.2025 | Issued as Standard Specification | MG          | TK         | NK                           | MN                        |

Approved by

### Abbreviations:

|      |   |  |
|------|---|--|
| API  | : | American Petroleum Institute             |
| ASME | : | American Society of Mechanical Engineers |
| EC   | : | Experience Criteria                      |
| ES   | : | Engineered Seal                          |
| GA   | : | General Arrangement                      |
| ISO  | : | International Standards Organization     |
| MAWP | : | Maximum Allowable Working Pressure       |
| MSSP | : | Maximum Static Sealing Pressure          |
| MDSP | : | Maximum Dynamic Sealing Pressure         |
| NRV  | : | Non Return Valve                         |
| OD   | : | Outside Diameter                         |
| PEEK | : | Poly Ether Ether Ketone                  |
| P&ID | : | Piping & Instrumentation Diagram         |
| PSV  | : | Pressure Safety Valve                    |
| PTR  | : | Proven Track Record                      |
| SWG  | : | Standard Wire Gauge                      |
| TFE  | : | Tetrafluoroethylene                      |
| TPI  | : | Third Party Inspection                   |
| TI   | : | Temperature Indicator                    |
| QAP  | : | Quality Approval Plan                    |
| VDM  | : | Vendor Data Management                   |

### Rotating Equipment Standards Committee

**Convenor:** Mr. Nalin Kumar

**Members:** Mr. Tarun Kumar  
Mr. J S Duggal  
Mr. Abhay Kumar  
Mr. Mahesh Gupta  
Mr. Mahesh Easwaran  
Mr. Rituraj Thakur  
Mr. Pintu Lal  
Mr. Aasheesh K Handa (Projects)

## CONTENTS

|      |   |    |
|------|---|----|
| 1.   | SCOPE (Substitution).....   | 4  |
| 2.   | NORMATIVE REFERENCES (Addition).....                                  | 5  |
| 3.   | TERMS, DEFINITIONS, AND SYMBOLS (Addition) .....                      | 5  |
| 4.   | SEALING SYSTEMS .....   | 5  |
| 4.1  | Seal categories, types, and arrangements .....                        | 5  |
| 5.   | GENERAL .....   | 5  |
| 5.1  | Unit Responsibility (Modification) .....                              | 5  |
| 6.   | DESIGN REQUIREMENTS.....  | 5  |
| 6.1  | Common Design Requirements (All Categories).....                      | 5  |
| 7.   | SPECIFIC SEAL CONFIGURATIONS.....                                     | 8  |
| 7.1  | Arrangement 1 Seals .....   | 8  |
| 8.   | ACCESSORIES .....   | 8  |
| 8.1  | General.....  | 8  |
| 8.3  | Components of Seal Auxiliary Systems (if specified in Annex II) ..... | 10 |
| 9.   | INSTRUMENTATION (Substitution) .....                                  | 11 |
| 10.  | INSPECTION, TESTING AND PREPARATION FOR SHIPMENT.....                 | 11 |
| 10.3 | Testing.....  | 11 |
| 11.  | DATA TRANSFER.....  | 12 |
| 11.2 | Data Requirement Forms (Substitution) .....                           | 12 |
| 12.  | ANNEXURES.....  | 12 |

## 1. SCOPE (Substitution)

- (i) This specification together with the inquiry document covers the minimum requirements & give recommendations for shaft seals and related sealing auxiliary systems for centrifugal and rotary pumps used in the petroleum, natural gas and chemical industries. It is applicable for all services. It is required for the improvement of equipment availability and the reduction of emissions to the atmosphere and of life-cycle sealing costs.

The applications addressed in this specification covers sealing duties for pumps with a working temperature range of -40 °C to +400 °C (-40 °F to 750 °F) and a maximum allowable working pressure of 4 MPa (40 bar) (600 psig). It covers seals for pump shaft diameters from 20 mm (0.75 in) to 110 mm (4.3 in). Seal applications outside these boundaries are specified as Engineered seals and specific requirements for the same are included in this specification.

Seals and auxiliary systems for ISO 13709/API 610 Type OH6 high speed integrally gear driven pumps shall comply with this specification as far as practical, with allowance being made for the relatively inflexible constraints of the seal hardware arrangement.

Seals and auxiliary systems for hydraulic power recovery turbines shall conform to the requirements in this specification as much as practical, but these are engineered systems and require consultant's /owner's approval.

The pump vendor shall review all seal and auxiliary system applications and shall notify the consultant/owner if, according to their best practice and experience with seals or auxiliary systems in similar applications, a deviation from the requirements in the data sheets or this specification would result in equal or improved sealing. Pump vendor's recommendation shall be necessarily corroborated by seal vendor's recommendation/past supply reference list.

Seals and Seal systems shall necessarily be procured from seal manufacturer.

- (ii) Vendor shall comply with the requirement of this specification and other specifications/attachments to inquiry/order. No deviation or exception shall be permitted without the written approval of the purchaser.
- (iii) Compliance with this Specification shall not relieve the vendor of the responsibility of furnishing equipment and accessories /auxiliaries of proper design, materials and workmanship to meet the specified start up and operating conditions.

In case the vendor considers requirement of additional instrumentation, controls, safety devices and any other accessories/auxiliaries essential for safe and satisfactory operation of the equipment, they shall recommend the same along with reasons in a separate section along with his proposal and include the same in their scope of supply.

- (iv) Except as modified herein, the main equipment and their auxiliaries shall be designed, manufactured, tested and supplied strictly in accordance with the **API Standard 682, Fourth Edition, May 2014, "PUMP SHAFT SEALING SYSTEMS FOR CENTRIFUGAL AND ROTARY PUMPS"**
- (v) Except for new paragraphs, the number and title of the paragraphs in the following Modifications to API Standard – 682 correspond to the respective sections and paragraphs of the above standard. Paragraphs not addressed in this specification shall be strictly in accordance to API Standard 682, Fourth **Edition, May 2014** requirements.

The word in parenthesis following the number or title of a paragraph indicates the following:

|                |   |   |
|----------------|---|---|
| (Addition)     | : | An addition to a part, section or paragraph referred to.  |
| (Modification) | : | An amplification or rewording has been made to a part of the corresponding section or paragraph but not a substitution replacing the entire section or paragraph. |
| (Substitution) | : | A substitution has been made for the corresponding section or paragraph of the standard in its totality.  |

- (New) : A new section or paragraph having no corresponding section or paragraph in the Standard.
- (Delete) : This paragraph is deleted.

## 2. NORMATIVE REFERENCES (Addition)

ISO 5199 Technical Specification for Centrifugal Pumps – Class II

NFPA 20 Standard for the Installation of Stationary Pumps for Fire Protection Applicable for Jockey Pumps Only

## 3. TERMS, DEFINITIONS, AND SYMBOLS (Addition)

### 3.1.96 Auto-ignition product

Hydrocarbon liquid that may spontaneously ignite upon exposure to atmosphere

### 3.1.97 Plan 54 (plant wide)

Is a Plan 54 where the external seal flush is supplied from a plant-wide system engineered and supplied by the Buyer.

### 3.1.98 Plan 54 (stand-alone)

Is a Plan 54 where the external seal flush is supplied from a stand-alone seal support console engineered and supplied by the Seal Supplier. There will be one such console per pump.

## 4. SEALING SYSTEMS

### 4.1 Seal categories, types, and arrangements

#### 4.1.4.1 (Addition)

Note 3 When a nitrogen supply is required, for example as a buffer gas or to pressurize a system, equipment shall be sized considering the plant nitrogen system minimum and maximum supply pressures

## 5. GENERAL

### 5.1 Unit Responsibility (Modification)

The pump vendor having the UNIT RESPONSIBILITY shall be responsible for complete design, engineering, packaging, testing, supply & supervision of erection & commissioning of the seal system as per specification requirements. Vendor's scope shall include but not limited to the responsibility for execution, coordination of all technical aspects of equipment and its auxiliary systems, their selection & integration into a complete package constituting total order. All drawings/documents, including sub vendor's drawings, pertaining to the order shall be duly reviewed & approved by the pump vendor before onward submission.

## 6. DESIGN REQUIREMENTS

### 6.1 Common Design Requirements (All Categories)

#### 6.1.1 General information

##### 6.1.1.1 (Addition)

The requirement for seal removal is not applicable to vertical close-coupled pumps (i.e. ISO 13709, designation OH5).

**6.1.1.2 (Modification)**

If recommended by seal manufacturer, a stationary flexible element can be supplied for Type A and Type B seals based on technical justifications and field proven past references.

**6.1.1.3 (Modification)**

If recommended by seal manufacturer, a rotating flexible element can be supplied for Type C seals based on technical justifications and field proven past references.

**6.1.1.4 (Addition)**

The assembly bolting of seal cartridges shall have sufficient strength to withstand the force needed to remove the cartridge from the pump, taking into account the high friction which may be present due to deposits between the shaft and the shaft sleeve.

**6.1.1.6 (Modification)**

The static sealing pressure rating (SSPR) of mechanical seals shall be greater than or equal to the maximum static sealing pressure (MSSP), which shall be calculated as indicated below.

For Arrangement 1 seals, the MSSP of each seal shall be equal to the maximum static seal chamber pressure that can occur in the pump. Unless otherwise specified, this shall be the shut-off pressure of the pump at maximum suction pressure or pump MAWP whichever is higher.

For Arrangement 2 seals, the MSSP of both the inner and outer seal shall be equal to the maximum static seal chamber pressure that can occur in the pump. Unless otherwise specified, this shall be the shut-off pressure of the pump at maximum suction pressure or pump MAWP whichever is higher.

For Arrangement 3 seals, the MSSP of the outer seal shall be equal to the maximum static seal chamber pressure that can occur in the pump. Unless otherwise specified, this shall be the greater of 1) shut-off pressure of the pump at maximum suction pressure or 2) the maximum barrier fluid pressure or 3) pump MAWP. The MSSP of the inner seal shall be the greater of 1) differential between the maximum barrier fluid pressure and the minimum seal chamber pressure or 2) the maximum differential between maximum seal barrier fluid pressure and atmospheric pressure or 3) pump MAWP.

Non pressure containing parts of Mechanical seals (such as seal ring, mating ring, sleeves, miscellaneous internal seal parts etc.) shall be suitable for maximum shut-off pressure under static conditions.

However, for Bellows seals, bellows shall be suitable upto bellows design pressure, as a minimum.

Note: Shut-off head to be considered for calculating maximum shut off pressure shall be either the value specified in the approved pump mechanical datasheet or the approved value recorded during pump performance testing, which ever is higher.

**6.1.1.11(Addition)**

Unless otherwise specified by the Purchaser, if a single mechanical seal is considered suitable it shall be of the metal bellows type and shall be suitable for the highest and lowest specified static or dynamic seal chamber pressure except for water applications wherein pusher type seals may be accepted.

**6.1.2 Seal Chamber and Gland Plate**

**6.1.2.3 (Addition)**

Internally mounted seal chambers are not acceptable.

**6.1.2.6 (Addition)**

The use of lower clearances only for retrofit applications with purchaser's approval is acceptable.

**6.1.2.8b (Addition)**

Default seal cartridge centering shall be with inside diameter fit.  
For Category 1 seals, shaft centering is acceptable.

**6.1.2.15(Addition)**

Lip seal type throat bushings shall not be supplied unless otherwise approved by the purchaser.

**6.1.2.16(Modification)**

Replace "purchaser" with "consultant's/owner's". 'If specified, or' stands deleted.

**6.1.2.17(Addition)**

Add to Table 2: Process vent (V) connection for seal configurations 3NC FF, 3NC BB, and 3NC FB shall only be used on vertical pumps with Plan 02.

Note (d) shall also apply to Plan 23 FI/FO connections for Category 2 and 3 seals.  
Gland plate connection locations listed in the Table refer to the port entry to the ID of the gland plate. The external port locations on the OD of the gland may be altered to allow for tangential port connections or to avoid pump bracket obstructions.

**6.1.2.18.2(Addition)**

When seals are supplied installed in a pump, metal plugs shall be installed in all unused gland plate connections, before delivery.

**6.1.2.20(Addition)**

For vertical in-line pump the seal chamber shall be vented. A self-venting design (Plan 13) with seal flush piped to the pump suction line above the seal chamber to be provided. Use of a manual vent shall be avoided.

**6.1.2.24(Modification)**

'If specified' shall be read as "if specified or recommended by the seal Manufacturer".

**6.1.2.24.1(New)**

If heating jackets are provided, they shall have connections arranged so that the entire passageway can be mechanically cleaned, flushed and drained.

**6.1.2.24.2(New)**

If heating jackets are provided, heating jacket systems shall be designed to positively prevent the process stream from leaking into the heat transfer medium. Heating passages shall not open into casing joints.

**6.1.2.24.3(New)**

In case of steam jacketing, same shall be supplied complete with dedicated temperature control valve (TCV), pressure indicator, temperature indicator and a steam trap for each pump.

**6.1.6 Materials**

**6.1.6.1.4(Addition)**

If specified on the datasheet or materials are exposed to wet H<sub>2</sub>S, materials shall conform to requirements of NACE MR0175 or MR0103 (as applicable), applied based on the assessed severity or material limits.

Copper or bronze filled carbon or other copper bearing materials shall not be used for services involving contact with carbonates, high concentrations of H<sub>2</sub>S, ammonia, ammonium chloride, and acetylene.

#### 6.1.6.2.2(Modification)

Except as required by 6.1.6.2.4, one of the rings shall be premium grade, blister-resistant carbon graphite, with manufacturing treatment to reduce wear, provide chemical resistance and minimize porosity consistent with the intended service.

Carbon Ring material for seal faces shall be suitable to operate continuously at the maximum operating temperature and able to withstand the Design Temperature for the pump in which the seal is incorporated.

#### 6.1.6.5.1(Substitution)

Unless otherwise specified, O-rings shall be fluor elastomer (FKM). Temperature limitations for elastomers are listed in B.4

#### 6.1.6.5.2(Substitution)

Unless otherwise specified, if operating temperatures or chemical compatibility preclude the use of fluor elastomers (FKM), O-rings shall be perfluoro elastomers (FFKM). See B.4 for additional details.

#### 6.1.6.10.5a(Modification)

'If specified' stands replaced with 'Wherever applicable'.

## 7. SPECIFIC SEAL CONFIGURATIONS

### 7.1 Arrangement 1 Seals

#### 7.1.2.2 (Modification)

"if specified" stands replaced by "if pump design permits".

#### 7.1.2.5 (Modification)

b) Seals equipped with a water/nitrogen quench shall be designed as per Fig G.24

#### 7.1.2.5 (Addition)

e) Seal quench piping shall include a fixed metering orifice/ valve for the required quenching capacity for each mechanical seal. An appropriate steam trap and condensate drain shall be installed as close as practical to the pump in order to ensure a dry steam supply to the gland plate in the steam piping to the seal.

f) The quench drain shall be piped to the baseplate drain.

## 8. ACCESSORIES

### 8.1 General

#### 8.1.2 (Modification)

The seal flushing plans shall be as specified in the Process datasheets/ Pump datasheets / Purchase requisition/ tender document. The pump vendor shall review all seal and auxiliary system applications and shall notify the consultant/owner if, according to their best practice and experience with seals or auxiliary systems in similar applications, a deviation from the requirements in the data sheets or this specification would result in equal or improved sealing. Pump vendor's recommendation shall be necessarily corroborated by seal vendor's recommendation/past supply reference list.

**8.1.3 (Modification)**

The arrangement of the equipment including piping and auxiliaries shall be as specified in Purchase requisition/ tender document. The arrangement shall provide adequate clearance areas and safe access for operation and maintenance.

**8.1.14 (Addition)**

Electric motors, for example forced draft air cooler fan motors, shall be suitable for the hazardous area classification indicated on the datasheet/Purchase requisition/tender document.

**8.1.15 (Addition)**

Separate independent seal auxiliary systems (with exception of external source systems) shall be provided for each seal chamber.

**8.2 Piping for Seal Auxiliary Systems**

**8.2.2 (Modified)**

- a) The complete sealing system along with instruments and all accessories shall be mounted/ installed on the Pump base plate by the pump OEM. In case of between bearing Pumps, there shall be two such independent units, one each for each stuffing box and both the system shall be mounted on the same side to allow for maintenance of the Pumps. Auxiliary Seals/ Seal Flushing Systems & Plans/ Cooling Systems & Plans shall be as per this specification.
- b) All auxiliary piping interface connections shall be flanged terminated with a gate valve at the equipment battery limit (i.e. at the edge of the base plate) by the pump OEM.
- c) As a minimum Piping material shall be Stainless Steel (300 series) for Seal Flushing Plans/ Lube Oil system and shall be Carbon Steel (A106 Gr. B) for Cooling Water Plans (unless otherwise specified).
- d) Purchaser shall provide/ receive cooling water at single point inlet/ outlet at the edge of base plate of each Pump package for seal cooler & bearing housing (if applicable). The terminating flanges shall be of ¾" (minimum) size. Vendor shall provide sight flow glass at each cooling water outlet.
- e) Between Bearing Pumps with two Seal Pots configuration shall have the drains of both the Seal Pots combined downstream of the individual drain isolation valves and shall be terminated at the edge of the base plate.
- f) All Purchaser's piping interfacing will be done towards the base plate edge of non- drive end (NDE) of pump. As such all terminations including seal system drain shall be terminated at the base plate edge of non-drive end (NDE) of pump.
- g) Pump nozzles especially at Purchaser's interface shall be as per Piping Material Specifications, attached elsewhere with the MR. In case, non- standard sizes or different from line rating nozzles are unavoidable, companion flanges along with bolts, nuts, gaskets and fasteners shall be included in the scope of the pump vendor.

**8.2.13 (Modified)**

Slip on Flanges shall not be used.

**8.2.16 (Addition)**

If chloride concentration exceeds this value, the piping or tubing material shall be upgraded to a material resistant to chloride cracking on all auxiliary systems except Plans 51, 53, 54, 72 and 74. Temperature exceeds 60 °C (140 °F) and atmospheric chlorides are present in sufficient quantity to cause chloride cracking of Type 316 SS pipe or tubing (e.g., caused by overspray

from cooling water tower) then piping or tubing material shall be upgraded to a material resistant to chloride cracking.

**8.2.21 (Modified)**

Stainless Steel (300 series) / Duplex stainless steel shall be used for cooling water lines as per the water quality specified in enquiry document.

**8.2.22 (Modified)**

'If Specified' stands deleted.

**8.2.24 (Modified)**

'If specified' stands deleted.

**8.2.25 (Addition)**

Insulation or guarding shall be provided as an integral part of the auxiliary piping system to provide personnel protection when the non-insulated metal temperature exceeds 70°C (160°F) and the auxiliary piping system is in an area where it can be touched during normal operation and maintenance activities.

**8.2.26 (Addition)**

The need for steam or electric heat tracing in conjunction with insulation to prevent freezing (solidification) or viscosity related flow problems shall be discussed and agreed with the Seal Vendor and Pump vendor. Consideration should be given to normal conditions as well as start-up conditions.

**8.3 Components of Seal Auxiliary Systems (if specified in Annex II)**

**8.3.2 Coolers**

**8.3.2.1.1 (Modification)**

All coolers shall be of horizontal configuration and external. Coolers integral to the barrier / buffer fluid reservoirs are preferred. However cooling coil provision in plan 52 may be permitted based on heat soak calculations.

The seal Vendor shall remain responsible for the combined performance of the seal and seal system in accordance with this specification.

The type(s) of seal flush system(s) shall be specified on the bidding document.

**8.3.2.1.13 (Addition)**

The seal manufacturer shall include a provision enabling back-flushing of the cooling water side of the exchanger.

**8.3.2.3 Air Coolers**

**8.3.2.3.5 (Addition)**

Air Cooled Type Seal Cooler shall be designed for limiting temperature rise of buffer/barrier fluid within 10 C above maximum ambient temperature (including the surrounding temperature due to Main/Auxiliary Motors). In case the desired temperature is not achievable with one cooler, coolers in series shall be provided. Cooler fans shall be directly driven by Electric Motor (V-belt drives are not acceptable). Refer seal plan sketch attached in Annexure II.

**8.3.2.3.6 (Addition)**

Forced draft seal-flush coolers shall be equipped with either a device to alarm on high fluid temperature or loss of fan draft, if this event would lead to rapid seal failure.

#### 8.3.2.3.7 (Addition)

Motors for forced-draft fans shall meet the electrical classification of the area.

#### 8.3.2.3.8 (Addition)

Fins shall be aluminium with an anticorrosion coating (unless otherwise agreed by the purchaser) to prevent atmospheric corrosion

#### 8.3.5 Flow Control Orifice

##### 8.3.5.2 (Modification)

Orifice shall be mounted in the auxiliary piping between a pair of flanges. Tubing is not recommended.

#### 8.3.6 Barrier/Buffer Fluid Reservoirs and Accumulators

##### 8.3.6.1 General

##### 8.3.6.2.1 (Modification)

Unless otherwise specified, the barrier/buffer fluid reservoir shall be arranged as shown in Annexure II.

##### 8.3.6.1.1 (Modification)

Sizing, instrumentation requirement and general arrangement of the barrier/buffer fluid reservoir or accumulator shall be as per the sketch of the respective seal plans attached with this specification. Fluid selection shall be compatible with the process fluid. For any clarification of fluid selection, seal vendor shall approach the Purchaser.

##### 8.3.6.2 Barrier / Buffer Fluid Reservoirs

##### 8.3.6.2.4 (Modification)

Instrumentation requirement in the reservoir shall be as per the sketches attached to this specification.

#### 8.3.9 Collection reservoir for Liquid Leakage

##### 8.3.9.3 Reservoir for Containment Seal Chamber Leakage (Piping Plan 75)

##### 8.3.9.3.3 (Modification)

'if specified' stands deleted.

##### 8.3.9.3.4 (Modification)

'if specified' stands deleted.

#### 9 INSTRUMENTATION (Substitution)

Refer Instrumentation Specification for Pump Seal Flushing Plans attached as Annexure-I.

#### 10 INSPECTION, TESTING AND PREPARATION FOR SHIPMENT

##### 10.3 Testing

##### 10.3.3 (Addition)

##### Seal Acceptance Test

Any seal offered under "Engineered Seal" category or when seal area/stuffing box is subjected to operating pressure  $\geq 20 \text{Kg/cm}^2 \text{g}$  (i.e. seals having MDSP  $\geq 20 \text{Kg/cm}^2 \text{G}$ ) shall undergo the Seal Acceptance Test (SAT):

SAT shall be carried out on all seals installed in one pump per item / tag comprising of Four-

hour static test, four-hour dynamic test and one-hour cyclic test with test fluid selection (refer Note-1 below) as per API 682 and test conditions commensurate with either API 682 test conditions or the conditions expected during operation in normal as well as start-up / shut-down conditions, whichever is more stringent. However, for temperature, API limit of 260° C may be followed for testing, in case of high temperature applications.

Propane testing, as per API 682 4th Edn. test conditions, shall be carried out only for liquids with S.G  $\leq$  0.6 & pumping temperature of -5°C to 176°C or for all flashing hydrocarbons with pumping temperature  $\leq$  -5°C. Additionally, for propane testing, in case operating pressures are higher than API 682 4<sup>th</sup> edn. test conditions, additional seal acceptance testing with Diesel/Mineral oil (as applicable) shall be carried out at actual operating pressures. (as per above).

## 11 DATA TRANSFER

### 11.2 Data Requirement Forms (Substitution)

**11.2.1** Engineering Design Drawings and data as required after purchase order has been specified in Vendor Data Requirement. Vendor to note that the drawing/document descriptions/titles as given in the Vendor Data Requirement are generic in nature. It is possible that against one drawing / document specified there are several drawings to be furnished by the vendor or vice versa.

**11.2.2** All vendor data/drawings/documents shall be in English Language and in Metric Systems. All post order documents shall be submitted / approved through EIL VDM portal.

**11.2.3** Final documentation shall be submitted in hard copy and soft (CDs/ DVDs) in addition to submission through EIL VDM portal. The number of prints and/or reproducible required to be submitted by vendor are specified in Purchaser's inquiry/order.

## 12 ANNEXURES

| SNO. | Deptt.          | Document No. | Revision No. |
|------|-----------------|--------------|--------------|
| 1.   | Instrumentation | 6-41-0009-A1 | 0            |
| 2.   | SMED            | 6-41-0009-A2 | 0            |

# ANNEXURE-I INSTRUMENTATION SPECIFICATIONS

| Rev. No     | Date       | Purpose  | Prepared by | Checked by | Standards Committee Convenor | Standards Bureau Chairman |
|-------------|------------|--|-------------|------------|------------------------------|---------------------------|
| 0           | 20.08.2025 | Issued as Annexure-I to Standard Specification 6-41-0009 | JT          | AR         | MN                           | MN                        |
| Approved by |            |  |             |            |                              |                           |

## GENERAL

- 1.1 The purpose of this specification is to define general requirements and philosophy of Pump Seal instrumentation as per API Seal Plans.
- 1.2 This specification along with attached data sheets / standards and relevant part of this requisition covers the design, engineering, supply and testing of Instrumentation with all accessories and materials.
- 1.3 If there is any conflict between this specification, data sheets, related standard, codes etc, vendor shall refer the matter to Purchaser for clarification and only after obtaining the same, shall proceed further.

## 2.0 SCOPE OF SUPPLY AND WORK

- 2.1 Vendor's scope of instrumentation supply and work shall include the following as a minimum:
  - a) Design, Engineering, testing, inspection and supply of all instruments as per Pump Seal Plan typical schematic specified in the requisition.
  - b) Impulse piping and all other erection materials including fittings, isolation and drain/vent valve etc. required for erection of instruments alongwith mounting accessories, instrument supports (2" yoke type), canopy.
  - c) Cable glands/plugs supplied duly installed with the instruments.
  - e) Submission of filled in data sheets for all instruments along with sizing calculations for safety valve, self-actuated pressure control valve and restriction orifice where applicable. Vendor shall also indicate make and model numbers of the offered instruments. Data sheets shall be submitted for review/approval with one set of technical catalogues of offered instruments with model decoding details.
- 2.2 Instrumentation cabling and junction box required for interconnection between vendor's supplied field instruments like Pressure, level etc. and Owner's Control System shall be done by Others and it is excluded from vendor's scope of supply and work.

## 3.0 DESIGN PHILOSOPHY AND TECHNICAL REQUIREMENTS

- 3.1 All electronic field transmitters shall be intrinsically safe certified by statutory body for electrical hazardous area as specified elsewhere in the requisition.

A copy of approval for intrinsically safe instrument shall be provided as per following:

- i) For all electrical items manufactured in India, the testing shall be carried out & test report issued by Indian test laboratory recognized by the Chief Controller of Explosives and valid copy of BIS license (only for Ex Electric Apparatus having flameproof type protection) or IECEx Certificate of Conformity, valid copy of IECEx Quality Assessment Report (summary) and IECEx Test Report.
- ii) For all electrical items manufactured outside India, Test report issued by Indian test laboratory recognized by the Chief Controller of Explosives and valid copy of BIS license or IECEx Certificate of Conformity, valid copy of IECEx Quality Assessment Report (summary) and IECEx Test Report. OR EU Type Examination Certificate (Applicable for manufacturers having manufacturing locations in countries covered under the European Union), valid copy of Production Quality Assessment / Assurance Notification

iii) For installations in India, additionally a copy of approval for intrinsically safe/flameproof enclosure from local statutory authority i.e 'Petroleum and Explosives Safety Organization (PESO), Nagpur in India' shall also be provided based on above.

- 3.2 All instruments shall also be weatherproof to IP65 as per IS/IEC-60529.
- 3.3 Vendor shall provide the instrument range and alarm set values for all transmitters during detail engineering as part of "INSTRUMENT RANGE AND ALARM SET POINT DOCUMENT".
- 3.4 No process switches shall be acceptable; even if it is shown in seal plan drawing. In place of process switches (pressure, temperature, level etc.), 4-20 mA DC SMART transmitters with HART Protocol shall be provided for Seal Plan.
- 3.5 All field instruments/transmitters shall be with dual cable entries. Unused entry shall be plugged using suitable metallic plug. All cable entries shall be 1/2" NPT (F) size and shall be fitted with double compression type SS cable glands with Slipper type PVC sleeves (cable shrouds) and suitable for hazardous area classification as indicated elsewhere. However, for duplex temperature elements and its cable connectivity with temperature transmitter, cable entry size shall be 3/4" NPTF.
- 3.6 Housing case material for Pressure Transmitters, Differential Pressure Transmitter and Temperature Transmitter shall be as per manufacturer standard. However, body and element material shall be SS 316 as a minimum and suitable for the fluid being handled.
- 3.7 All instruments shall be supplied as per the vendor list provided in the requisition.
- 3.8 Pressure rating of thermowell flanges for temperature element/ temperature gauge shall be minimum 300# rating or as per respective piping specification whichever is higher.
- 3.9 Instrument Installations Connections

Instrument installation connections shall be as follows on vessels/pipes:

- The minimum rating of all instrument nozzles on the vessels shall be 300#.
- Temperature Instrument nozzle connection on vessel shall be 1.5" flanged as a minimum.
- Pressure Instrument impulse line connection on line shall be 3/4" welded (SW/BW) and on vessel shall be 3/4" Flanged, however the instrument connection shall be 1/2" NPT(F).
- Temperature instrument connection on line shall be 1.5" Flanged upto 600# and 2" flanged for 900# and above pressure rating.
- For side mounted level instrument, connection on vessel shall be 3/4" Flanged.
- For top mounted level Transmitter connection shall be 2" Flanged.

For mounting of the pressure instruments, root isolation valves and integral 2-Valve manifold arrangement for the instrument shall be applicable. However, for ratings 900# and above site fabricated external manifold with gate isolation valve and drain/vent valve arrangement shall be provided.

Impulse line shall be Piping with Tubing at instrument end for instrument installation. For pressure ratings 900# and above, impulse line shall be only piping upto the instrument end. The material of construction & specification for instrument installation impulse piping and fittings shall be as per pump seal vessel/pipe where the same are being installed. However, tubing material for instrument installation where provided shall be SS316L and Tube fittings shall be SS316.

- 3.10 All electronic instruments as applicable shall have internal terminal block, anti-vibration type for cable termination. Flying leads are not acceptable.

- 3.11 S.S. tag plates shall be provided for all the instruments.
- 3.12 Prefabricated FRP canopy shall be used for field electronic instruments. Canopy for transmitters shall cover TOP and all 3 SIDES (back and 2 sides). SS canopy instead of FRP shall also be acceptable. Tag number shall be printed on the canopy.

Typical characteristics of FRP canopy shall be following:

- i) High mechanical strength
  - ii) Weather resistant (Resistant to most of the acids, alkalies, vapours & fumes)
  - iii) UV resistant
  - iv) Anti-Static
  - v) Special rubber grommets for Cable/ Tube entry.
- 3.13 Data sheet for each instrument shall be provided by the vendor during detail engineering in ISA format. Vendor shall furnish filled in data sheet for each tag after sizing, range selection, material selection etc. These data sheets shall be reviewed by EIL / Purchaser after placement of order. Proper selection of instruments, materials etc. shall be vendor's responsibility. Any necessary change required later for meeting the specification shall be done by the vendor without any price or delivery implications. While filling the instruments data sheets, the following shall be taken care:
- a) All the relevant data shall be filled in. If any point is not applicable then N/A shall be indicated.
  - b) Make and model number of the offered instruments shall be indicated with model decoding details for offered instrument, without model no, data sheet shall not be reviewed.
  - c) Vendor seal with signature shall be provided and vendor shall ensure the correctness of the process data.
  - d) Instruments tag numbers /data sheet numbers shall be indicated.

### 3.14 Pressure Gauge

- a) Pressure gauge dial shall be 150mm white of non-rusting material with black figures. Pressure gauge shall have solid front for gauges having range of 0 to 100 kg/cm<sup>2</sup>g.
- b) Pressure gauge shall have ½" NPT (M) bottom connection.
- c) Pressure gauge shall be provided with features like bayonet bezel, externally adjustable zero, over range protection and blow out disc.
- d) Sensing element (bourdon tube) shall be of SS 316 and movement of SS 304, as a minimum. Case material for pressure gauges shall be SS 304.
- e) Pressure gauge shall have accuracy within 1% of URV (Upper Range Value) and range shall be so selected that gauge normally operates in middle third of the range.
- f) Pressure gauge shall be suitable for maximum pressure or 130% of the range whichever is higher, without any calibration drift.

### 3.15 Pressure Transmitter

- a) All transmitters used in the pump seal plan shall be SMART type having 4-20mA DC output with superimposed HART protocol and shall be suitable for the specified area class.
- b) Integral LED/LCD output meter shall be provided for all transmitters.
- c) Smart transmitters shall be used in analog mode with an accuracy of ± 0.065% of span with a rangeability of 10:1 and with stability of ± 0.2% of URL for a minimum period of 10 years. All smart transmitters shall be suitable to be configured using Purchaser's Universal type Hand held communicator.
- d) Transmitters shall have static pressure rating of 160 kg/cm<sup>2</sup>g except for low-range (0-25 kg/cm<sup>2</sup>g or less) for which the static pressure shall be 52 kg/cm<sup>2</sup>g.
- e) Threaded end connections shall be to NPT as per ANSI B 1.20.1. Flanged end connections shall be as per ANSI B 16.5.

### 3.16 Level Gauge

- Only Magnetic Type Level Gauges with 3/4" flanged connection shall be used. All level gauges shall be provided with vent/ drain valves with plug. Body/ chamber and cover material shall be SS as a minimum for all type of level gauges and Body rating of gauge shall be considered suitably to meet the process design condition.

### 3.17 Level Transmitter

- Level Transmitter shall be Time Domain Reflectometry type Guided Wave Radar level instrument. Transmitters shall be SMART type having 4-20mA DC output with superimposed HART protocol and shall be suitable for the specified area class.
- 2" flanged connection size as a minimum shall be applicable for top mounted GWR Level transmitter.
- Sensor shall be Wave Guided type with process wetted parts material suitable for process fluid (SS316 / 316L as minimum).
- Accuracy of Guided wave radar shall be within  $\pm 3.0$  mm. Co-axial type GWR shall be provided.
- Level transmitter Chamber and other accessories materials like mounting Flanges; Stud bolts material shall be suitable for the process fluid.

### 3.18 Temperature Gauges

- The temperature gauges shall be bimetallic type and shall be provided with 1 1/2" flanged (min. 300# rating) thermowell with 1/2" NPT (F) connection for temperature gauges.
- Thermowell shall be fabricated out of bar stock as per 7-52-0035/7-52-0036. For thermowell with RTJ Flange, flange bore diameter shall be as per ASME B16.5 and thermowell bar stock OD shall be considered accordingly for fitting with these flanges.
- Temperature gauges shall have accuracy as per EN 13190 Class I.
- Thermowell and flanges of Thermowell shall be minimum of SS-316 or better to suit the service conditions.
- Case material for temperature gauges shall be SS 304.
- The gauge movement material shall be of stainless steel, as a minimum
- The case of bimetallic type of gauges shall be all angles rotatable type

### 3.19 Temperature Transmitter

- All transmitters used in the pump seal plan shall be SMART type having 4-20mA DC output with superimposed HART protocol and shall be suitable for the specified area class
- Duplex RTD element shall be provided.
- Thermowell shall be fabricated out of bar stock as per 7-52-0035/7-52-0036. For thermowell with RTJ Flange, flange bore diameter shall be as per ASME B16.5 and thermowell bar stock OD shall be considered accordingly for fitting with these flanges.
- Temperature transmitter shall be universal type, able to accept input from resistance temperature detector (RTD) or thermocouple (T/C) of any type and range.
- Temperature transmitters shall be provided with dual compartment having metallic separation.
- Temperature transmitter shall be remote mounted type with at least 10m armoured triad cable between Temperature element and temperature transmitter.
- The accuracy of the temperature transmitter with RTD element shall be as follows:

| <u>Temperature Range</u> | <u>Accuracy</u> |
|--------------------------|-----------------|
| Above 350°C              | $\pm 0.075\%$   |
| Between 350°C to 150° C  | $\pm 0.15\%$    |

|              |        |
|--------------|--------|
| Below 150° C | ±0.25% |
|--------------|--------|

- h) Dual input capability with automatic transfer to back-up sensor shall be considered for all temperature transmitters. Accordingly, both the elements shall be wired to transmitters. Burnout protection (selectable Up Scale /Down Scale) must be provided for temperature transmitters.
- i) Integral LED/LCD output meter shall be provided for all transmitters.

### 3.20 Variable Area Flowmeter (with Flow Transmitter)

- a) Variable Area Flowmeter shall be of metal tube type. Transmitter shall be SMART type having 4-20mA DC output with superimposed HART protocol and shall be suitable for the specified area class.
- b) The material for tube & float shall be SS 316 as a minimum.
- c) The packing material shall be PTFE if the liquid temperature is below 200° C. For temperatures above 200° C, packing shall be of GRAFOIL.
- d) Variable Area Flowmeter shall have an accuracy Class 1.6 or better as per VDE/VDI directive 3513/2

### 3.21 Restriction Orifice Plate

- a) Restriction Orifice Plate shall be concentric square edged type.
- b) Each Restriction Orifice Plate shall have an integral handle, which shall, upon assembly with flanges, extend to a distance of 50 mm. with following information punched on it:
  - Tag Number.
  - Nominal pipe size in inches and rating in psi.
  - Material of plate.
- c) Restriction Orifice Plate material shall be SS 316 as a minimum or better.

### 3.22 Pressure Relief Valve / Thermal Relief Valve

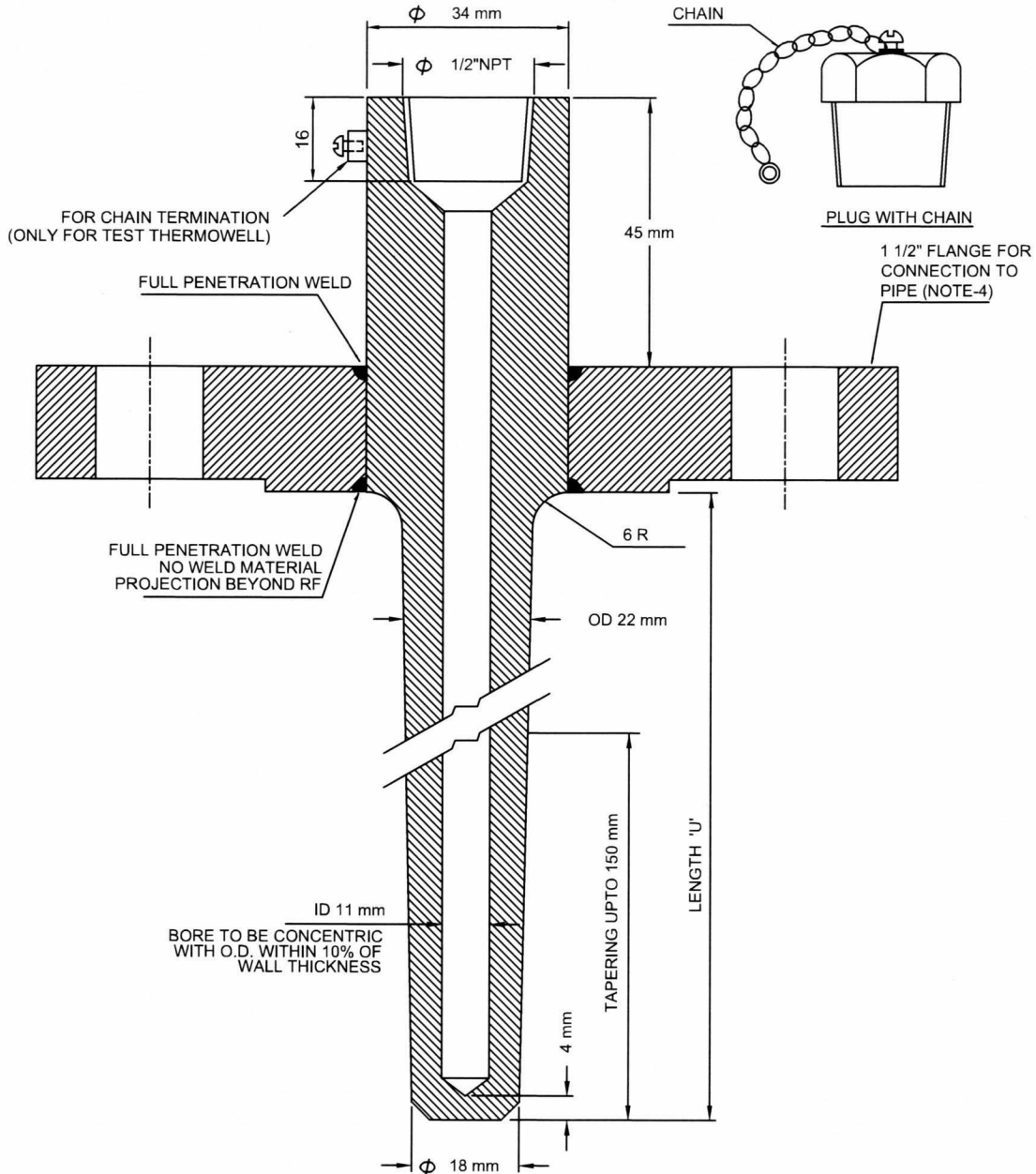
- a) Pressure Relief Valve shall meet the limiting relief valve requirements as defined in API RP-520 (Part-I & II) and in API-526.
- b) Pressure Relief Valve shall be full nozzle full lift type and Thermal Relief Valve shall be modified nozzle type.
- c) Percentage Accumulation shall be 10% for Pressure Relief Valve and 25% for Thermal Relief Valve.
- d) Body material shall be Carbon Steel as a minimum. Nozzle and disc material shall be SS 316 as a minimum with machined SS guide and spindle. Spring material shall be selected as per operating conditions as follows:  
Between (-29°C to 230°C) : Plated Carbon steel as a minimum  
More than 230°C : Tungsten alloy steel  
Less than (-29°C) : Stainless Steel
- e) Pressure Relief Valve shall have flanged connections for sizes 1" and above and shall have screwed connection for sizes 3/4" and below.
- f) Thermal Relief Valve shall have screwed connection with 0.38 cm<sup>2</sup> orifice size and inlet outlet shall be of 3/4" NPT (M) X 1" NPT (F) sizes. For high pressure rating 900# and above, Thermal Relief Valve with flanged end connections shall be considered.
- g) Selection of proper type of pressure relief valve type shall be vendor's responsibility suitable for the system.
- h) Pilot operated relief valves shall be selected for special services and where set pressure is closer to the operating pressure by less than 10% or back pressure is above 50% of set pressure.

#### 4.0 TAG NUMBERING

- 5.1 Instrumentation symbol shall follow latest edition of ISA standard S 5.1.
- 5.2 All vendor-supplied instruments shall have Tag No. as assigned and provided by purchaser with the requisition or during detailed engineering.

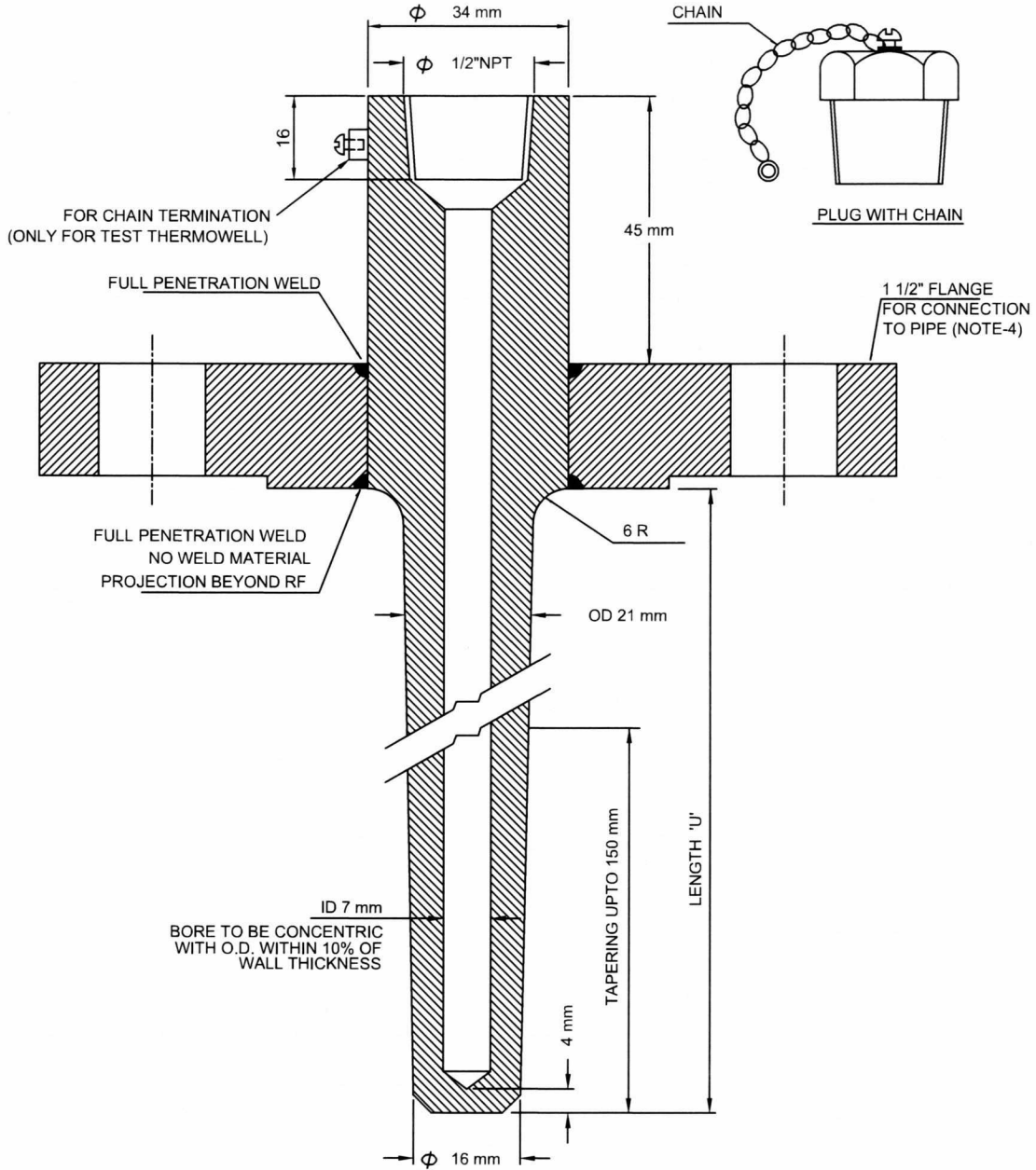
#### ATTACHMENTS:

| S. No. | Description                                  | Document no. |
|--------|--|--------------|
| 1.     | Thermowell                                   | 7-52-0035    |
| 2.     | Thermowell/RTD assembly with thermowell      | 7-52-0036    |
| 3.     | Instrument Range and Alarm Setpoint Document |              |



- NOTES -**
1. THIS STANDARD IS APPLICABLE FOR ;
    - a) TEMPERATURE GAUGES, BEADED TEMPERATURE ELEMENTS AND DUPLEX TEMPERATURE ELEMENTS.
    - b) THERMOWELL UPTO 1500 CLASS AS PER ASME OR EQUIVALENT WITH RF AS PER SPECIFICATIONS/PMS.
  2. DP TEST SHALL BE CARRIED OUT FOR ALL WELD JOINTS. OTHER TESTING REQUIREMENT AS PER PMS.
  3. CHAIN AND PLUG SHALL BE APPLICABLE ONLY FOR TEST THERMOWELLS.
  4. FLANGE SIZE SHALL BE 2" FOR RATING (AS PER ASME CLASS) >600 OR THERMOWELL CONNECTION ON UNCLADDED EQUIPMENT. FOR CLADDED EQUIPMENT FLANGE SIZE SHALL BE 3"

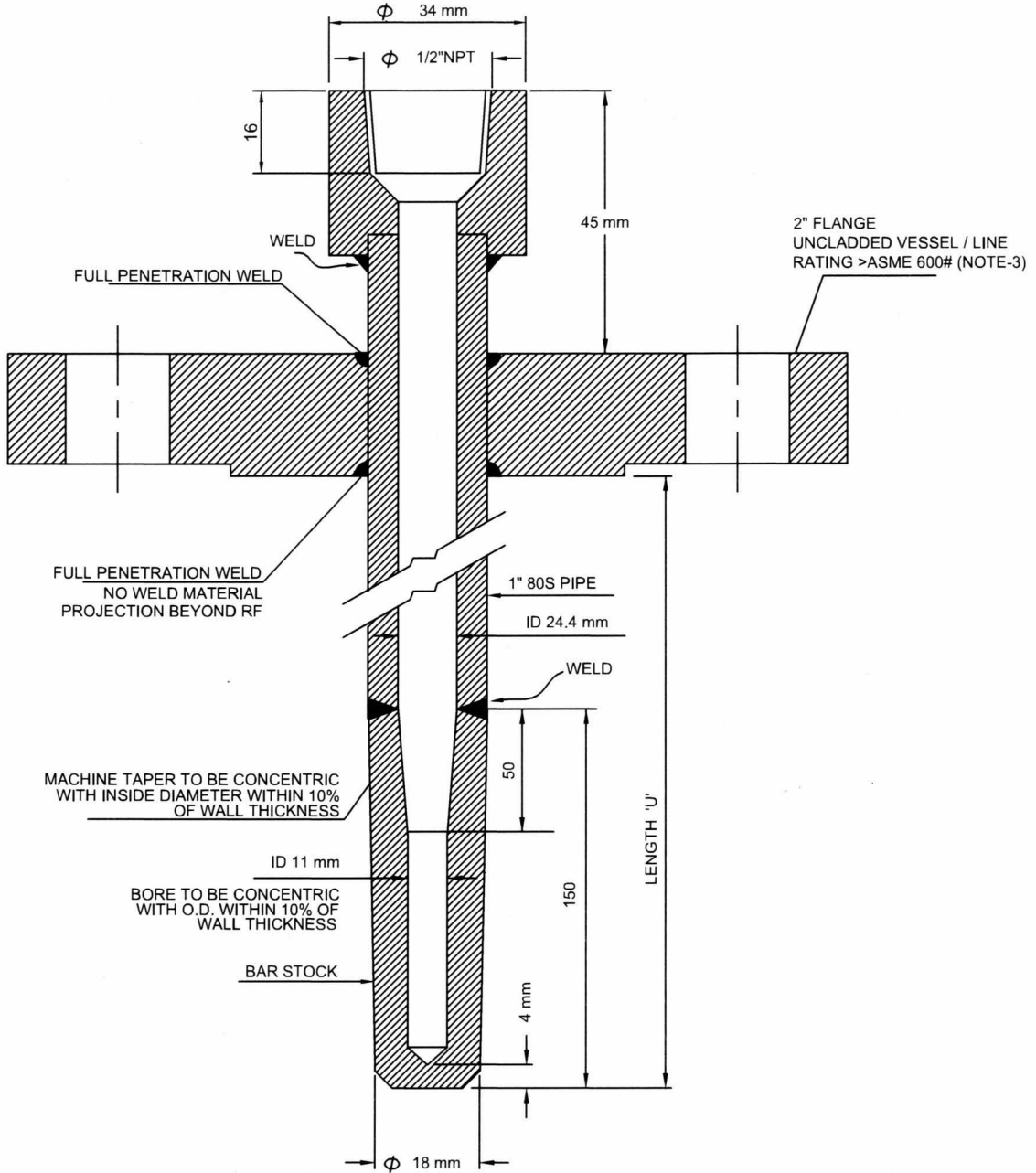
|          |          |                       |             |            |                          |                       |
|----------|----------|-----------------------|-------------|------------|--------------------------|-----------------------|
| 5        | 14-11-23 | REVISED & REISSUED    | Kushal/RSC  | AJS        | MN                       | MN                    |
| 4        | 25-04-18 | REAFFIRMED & REISSUED | Manoj       | MN         | RG                       | RN                    |
| Rev. No. | Date     | Purpose               | Prepared by | Checked by | Stds. Committee Convener | Stds. Bureau Chairman |
|          |          |                       |             |            |                          | Approved by           |



- NOTES -**
1. THIS STANDARD IS APPLICABLE FOR ;
    - a) SINGLE TEMPERATURE ELEMENT.
    - b) THERMOWELL UPTO 1500 CLASS AS PER ASME OR EQUIVALENT WITH RF AS PER SPECIFICATIONS/PMS.
  2. DP TEST SHALL BE CARRIED OUT FOR ALL WELD JOINTS. OTHER TESTING REQUIREMENT AS PER PMS.
  3. CHAIN AND PLUG SHALL BE APPLICABLE ONLY FOR TEST THERMOWELLS.
  4. FLANGE SIZE SHALL BE 2" FOR RATING (AS PER ASME CLASS) >600 OR THERMOWELL CONNECTION ON UNCLADDED EQUIPMENT. FOR CLADDED EQUIPMENT FLANGE SIZE SHALL BE 3"

|          |          |                       |             |            |                          |                       |
|----------|----------|-----------------------|-------------|------------|--------------------------|-----------------------|
| 5        | 14-11-23 | REVISED & REISSUED    | Kushal/RSC  | AJS        | MN                       | MN                    |
| 4        | 25-04-18 | REAFFIRMED & REISSUED | Manoj       | MN         | RG                       | RN                    |
| Rev. No. | Date     | Purpose               | Prepared by | Checked by | Stds. Committee Convenor | Stds. Bureau Chairman |
|          |          |                       |             |            | Approved by              |                       |

**BUILT-UP THERMOWELL**

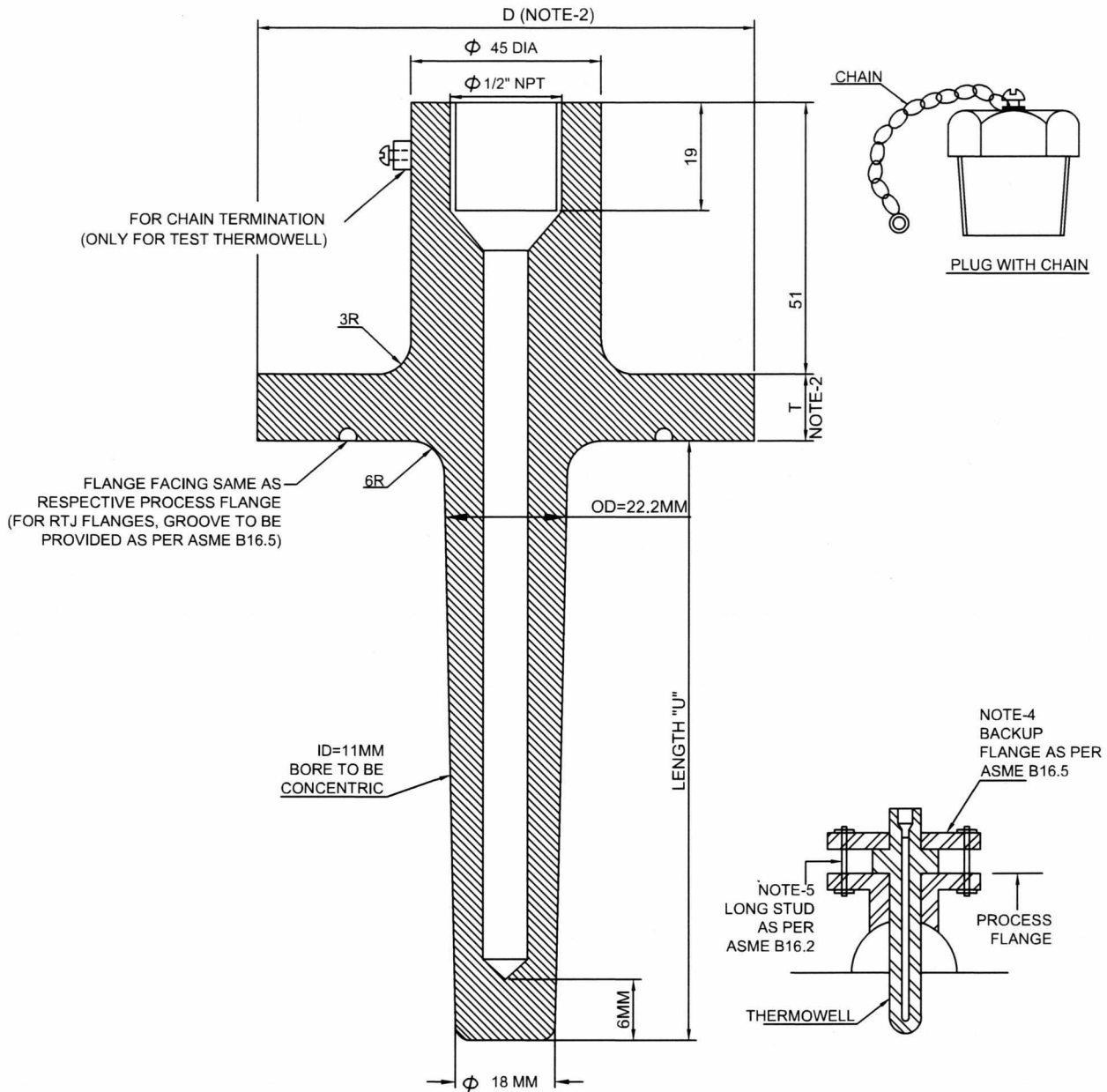


**NOTES:-**

1. THIS STANDARD IS APPLICABLE FOR ;
  - a) TEMPERATURE GAUGES, BEADED TEMPERATURE ELEMENTS AND DUPLEX TEMPERATURE ELEMENTS.
  - b) THERMOWELL UP TO 1500 CLASS AS PER ASME OR EQUIVALENT WITH RF AS PER SPECIFICATIONS/PMS.
2. DP TEST SHALL BE CARRIED OUT FOR ALL WELD JOINTS. OTHER TESTING REQUIREMENT AS PER PMS.
3. FLANGE SIZE SHALL BE 3" FOR CLADDDED EQUIPMENT, FLANGE SIZE SHALL BE 1.5" FOR LINE UP TO ASME CLASS 600#.

|          |          |                       |             |            |                          |                       |
|----------|----------|-----------------------|-------------|------------|--------------------------|-----------------------|
| 5        | 14-11-23 | REVISED & REISSUED    | Kushal/RSC  | AJS        | MN                       | MN                    |
| 4        | 25-04-18 | REAFFIRMED & REISSUED | Manoj       | MN         | RG                       | RN                    |
| Rev. No. | Date     | Purpose               | Prepared by | Checked by | Stds. Committee Convenor | Stds. Bureau Chairman |
|          |          |                       |             |            | Approved by              |                       |

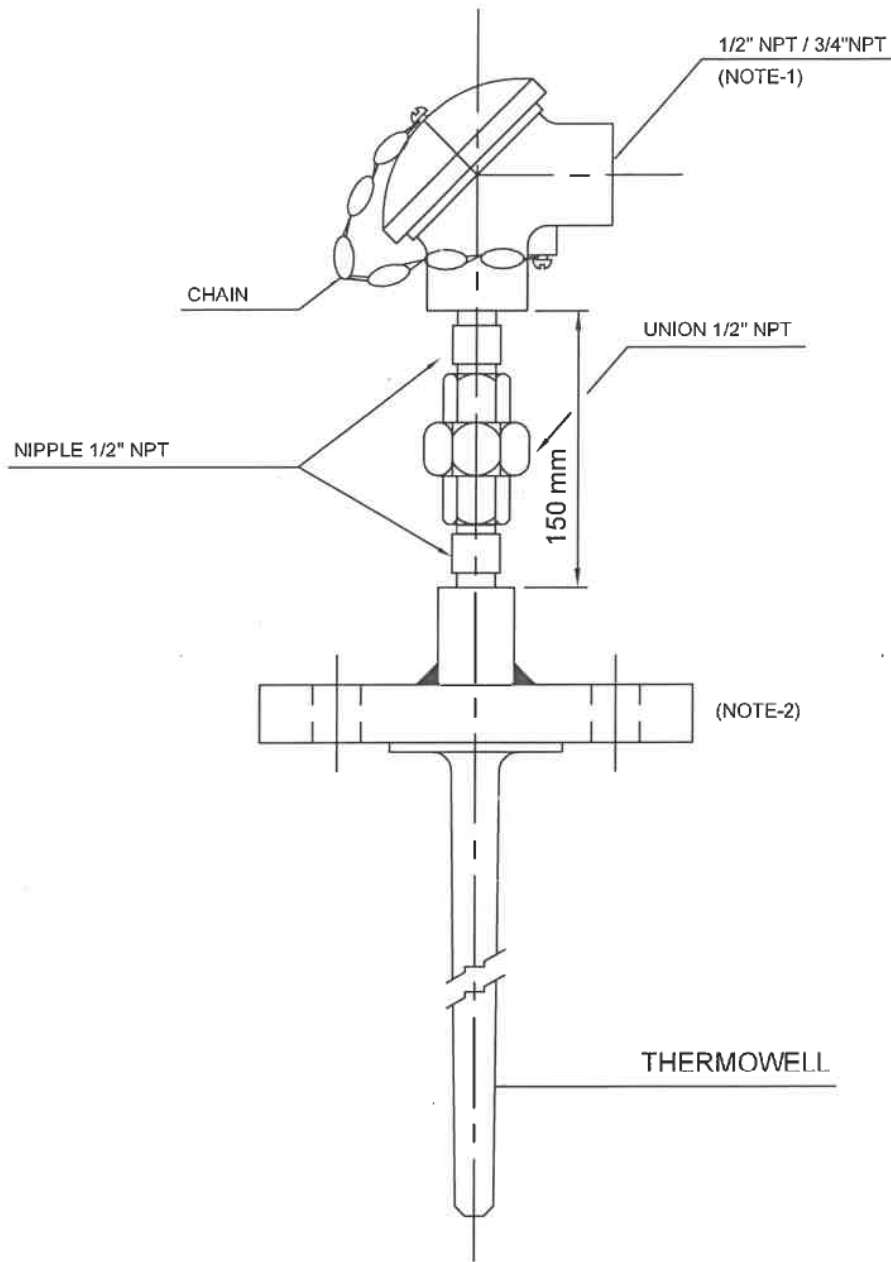
**VANSTONE THERMOWELL BARSTOCK TAPERED**



**NOTES -**

1. ALL DIMENSIONS ARE IN "MM". FIGURES IN BRACKETS ARE IN INCHES.
2. THE COLLAR SHOULD BE EQUAL TO RF DIA "R" FOR RF FACING WELD AND COLLAR DIA SHOULD BE DIA "K" AS PER ASME B16.5. THE COLLAR THICKNESS SHOULD BE 15MM FOR RF FACING UP TO 1500# AND 20MM FOR RF UPTO 2500# FLANGE END FOR ALL RATING OF RTJ FLANGE
3. THERMOWELLS SHALL BE HYDROSTATICALLY TESTED INTERNALLY FOR RESPECTIVE PRESSURE RATING.
4. VENDOR SHALL SUPPLY ASME BACK-UP FLANGE WITH A HOLE OF I.D. TO SUIT 45MM O.D. OF THERMOWELL WITH EACH THERMOWELL. THIS BACK UP FLANGE IS TO BE MOUNTED ON THE THERMOWELL ON THE OTHER SIDE OF PROCESS FLANGE. THE BACKUP FLANGE MATERIAL SHALL BE AS PER DATA SHEET.
5. SPECIAL LONG STUDS WITH NUTS TO FIX THE THERMOWELL WITH PROCESS FLANGE AND BACK-UP FLANGES SHALL BE SUPPLIED ALONG WITH EACH TAG.
6. FLANGE SIZE & RATING AS PER DATA SHEET.

|             |          |                    |                   |            |                          |                       |
|-------------|----------|--------------------|-------------------|------------|--------------------------|-----------------------|
| 5           | 14-11-23 | ISSUED AS STANDARD | <i>Kushal/RSC</i> | <i>AJS</i> | MN <i>Shawdi</i>         | MN <i>Shawdi</i>      |
| Rev. No.    | Date     | Purpose            | Prepared by       | Checked by | Stds. Committee Convener | Stds. Bureau Chairman |
| Approved by |          |                    |                   |            |                          |                       |

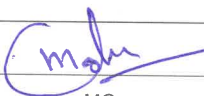


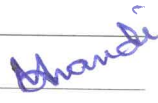


- NOTE -
1. IN THE CASE OF DUPLEX THERMOCOUPLE/RTD, TWO INDEPENDENT 3/4"(NPT) CABLE ENTRIES SHALL BE PROVIDED.
  2. FLANGE TYPE, SIZE AND RATING SHALL BE AS PER DATA SHEET.

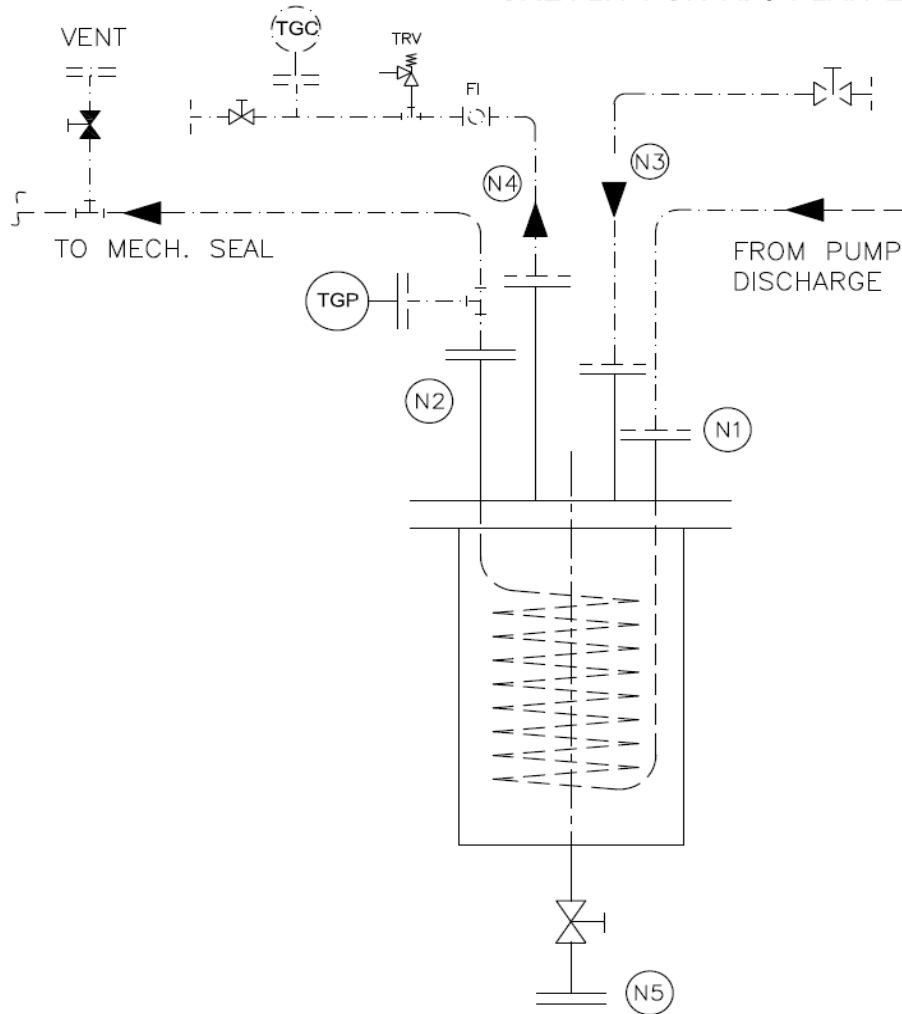
|          |          |                                   |             |            |                          |                       |
|----------|----------|-----------------------------------|-------------|------------|--------------------------|-----------------------|
| 6        | 21.10.24 | Reaffirmed & Reissued As Standard | Sonu        | AJS        | MN                       | MN                    |
| 5        | 10.10.19 | Reaffirmed & Reissued As Standard | Manoj       | MN         | RG                       | RN                    |
| Rev. No. | Date     | Purpose                           | Prepared by | Checked by | Stds. Committee Convenor | Stds. Bureau Chairman |
|          |          |                                   |             |            | Approved by              |                       |

# ANNEXURE-II


## STANDARD FLUSH PLANS AND AUXILIARY HARDWARE

| Rev. No.    | Date     | Purpose   | Prepared by   | Checked by  | Standards Committee Convenor  | Standards Bureau Chairman   |
|-------------|----------|---|---|---|---|---|
| 0           | 20.08.25 | Issued as Annexure-II to Standard Specification 6-41-0009 | <br>MG | <br>TK | <br>NK | <br>MN |
| Approved by |          |   |   |   |   |   |

SKETCH FOR API PLAN 21

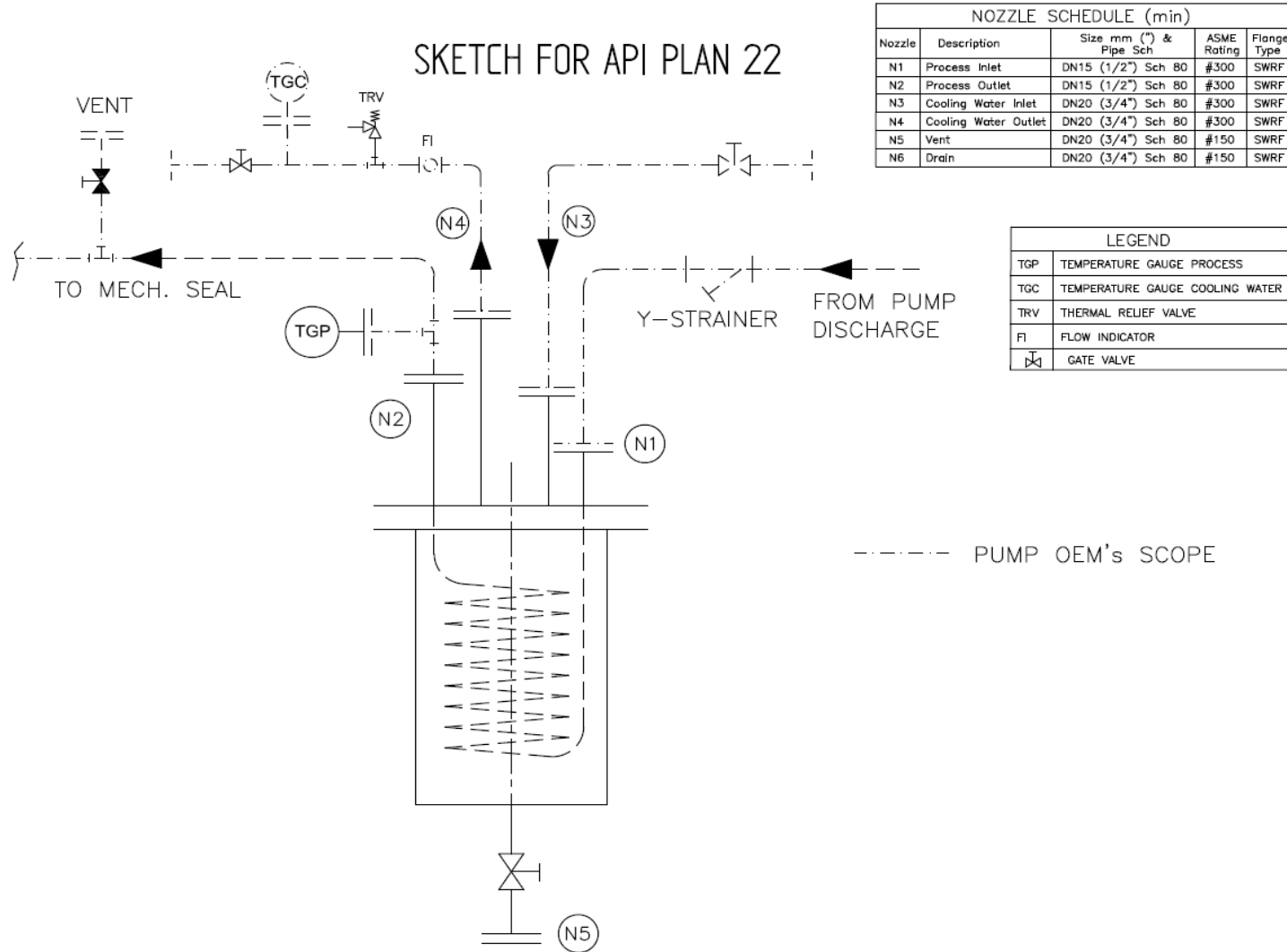


| NOZZLE SCHEDULE (min) |                      |                        |             |             |
|-----------------------|----------------------|------------------------|-------------|-------------|
| Nozzle                | Description          | Size mm (") & Pipe Sch | ASME Rating | Flange Type |
| N1                    | Process Inlet        | DN15 (1/2") Sch 80     | #300        | SWRF        |
| N2                    | Process Outlet       | DN15 (1/2") Sch 80     | #300        | SWRF        |
| N3                    | Cooling Water Inlet  | DN20 (3/4") Sch 80     | #300        | SWRF        |
| N4                    | Cooling Water Outlet | DN20 (3/4") Sch 80     | #300        | SWRF        |
| N5                    | Drain                | DN20 (3/4") Sch 80     | #150        | SWRF        |

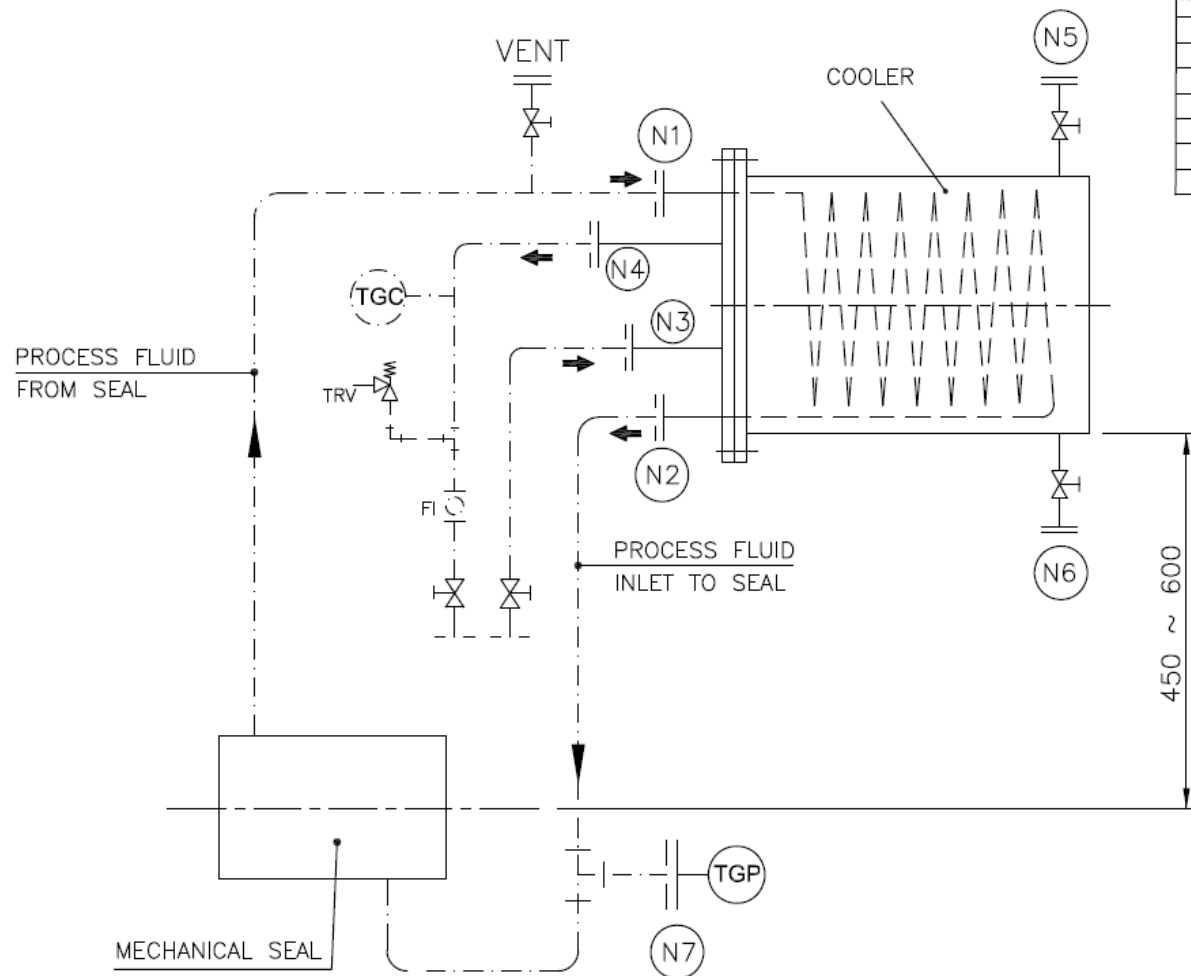
| LEGEND  |                                 |
|---|---------------------------------|
| TGP   | TEMPERATURE GAUGE PROCESS       |
| TGC   | TEMPERATURE GAUGE COOLING WATER |
| TRV   | THERMAL RELIEF VALVE            |
| FI  | FLOW INDICATOR                  |
|  | GATE VALVE                      |

----- PUMP OEM'S SCOPE

ANNEXURE-II  
STANDARD FLUSH PLANS AND AUXILIARY HARDWARE



SKETCH FOR API PLAN 23

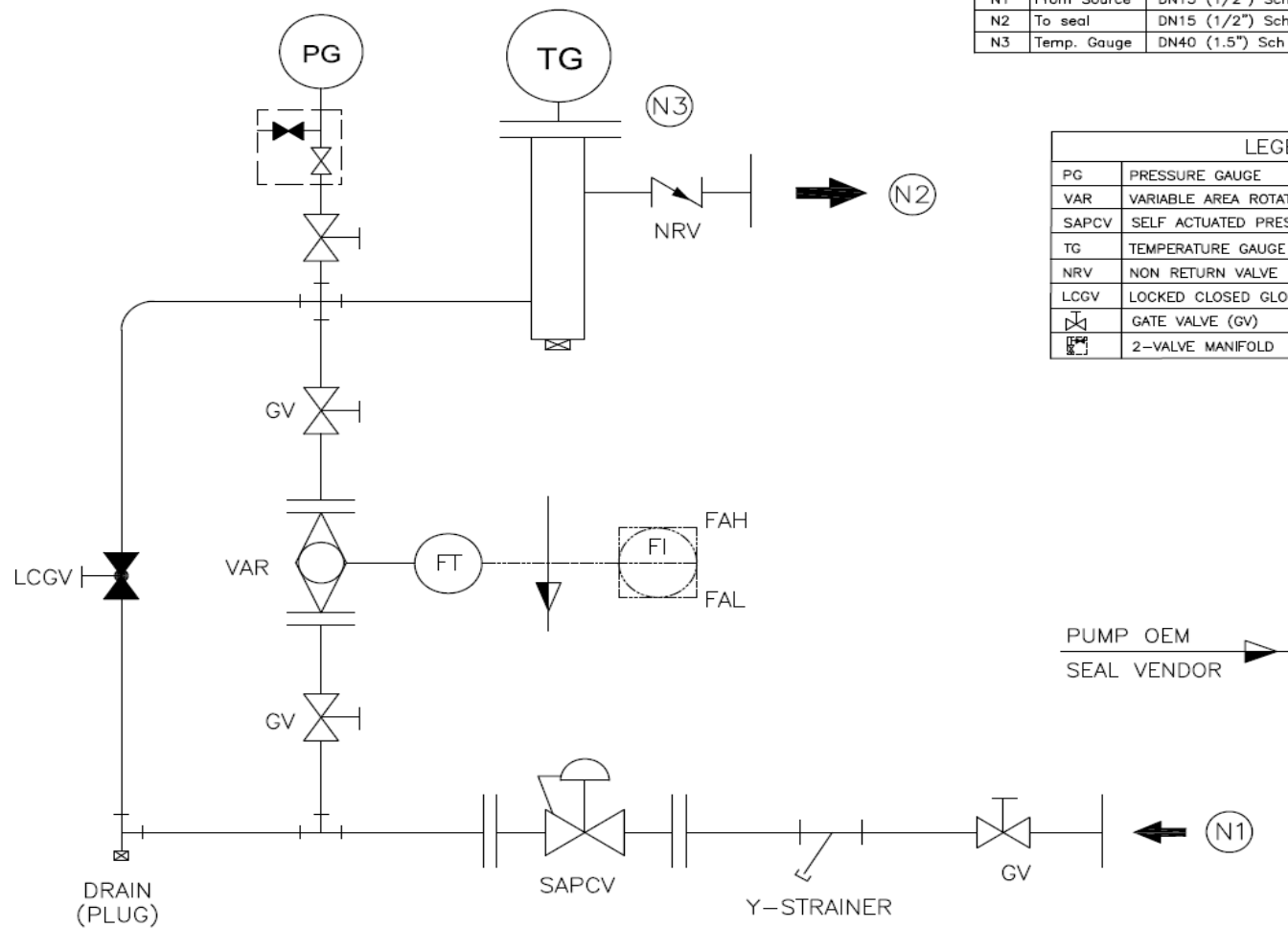


| NOZZLE SCHEDULE (min) |                       |                        |             |             |
|-----------------------|-----------------------|------------------------|-------------|-------------|
| Nozzle                | Description           | Size mm (") & Pipe Sch | ASME Rating | Flange Type |
| N1                    | Process Inlet         | DN15 (1/2") Sch 80     | #300        | SWRF        |
| N2                    | Process Outlet        | DN15 (1/2") Sch 80     | #300        | SWRF        |
| N3                    | Cooling Water Inlet   | DN20 (3/4") Sch 80     | #300        | SWRF        |
| N4                    | Cooling Water Outlet  | DN20 (3/4") Sch 80     | #300        | SWRF        |
| N5                    | Vent                  | DN20 (3/4") Sch 80     | #150        | SWRF        |
| N6                    | Drain                 | DN20 (3/4") Sch 80     | #150        | SWRF        |
| N7                    | Temp. Gauge - Process | DN40 (3/4") Sch 80     | #300        | SWRF        |

| LEGEND            |                                 |
|-------------------|---------------------------------|
| TGP               | TEMPERATURE GAUGE PROCESS       |
| TGC               | TEMPERATURE GAUGE COOLING WATER |
| TRV               | THERMAL RELIEF VALVE            |
| FI                | FLOW INDICATOR                  |
| Gate Valve Symbol | GATE VALVE                      |

----- PUMP OEM's SCOPE

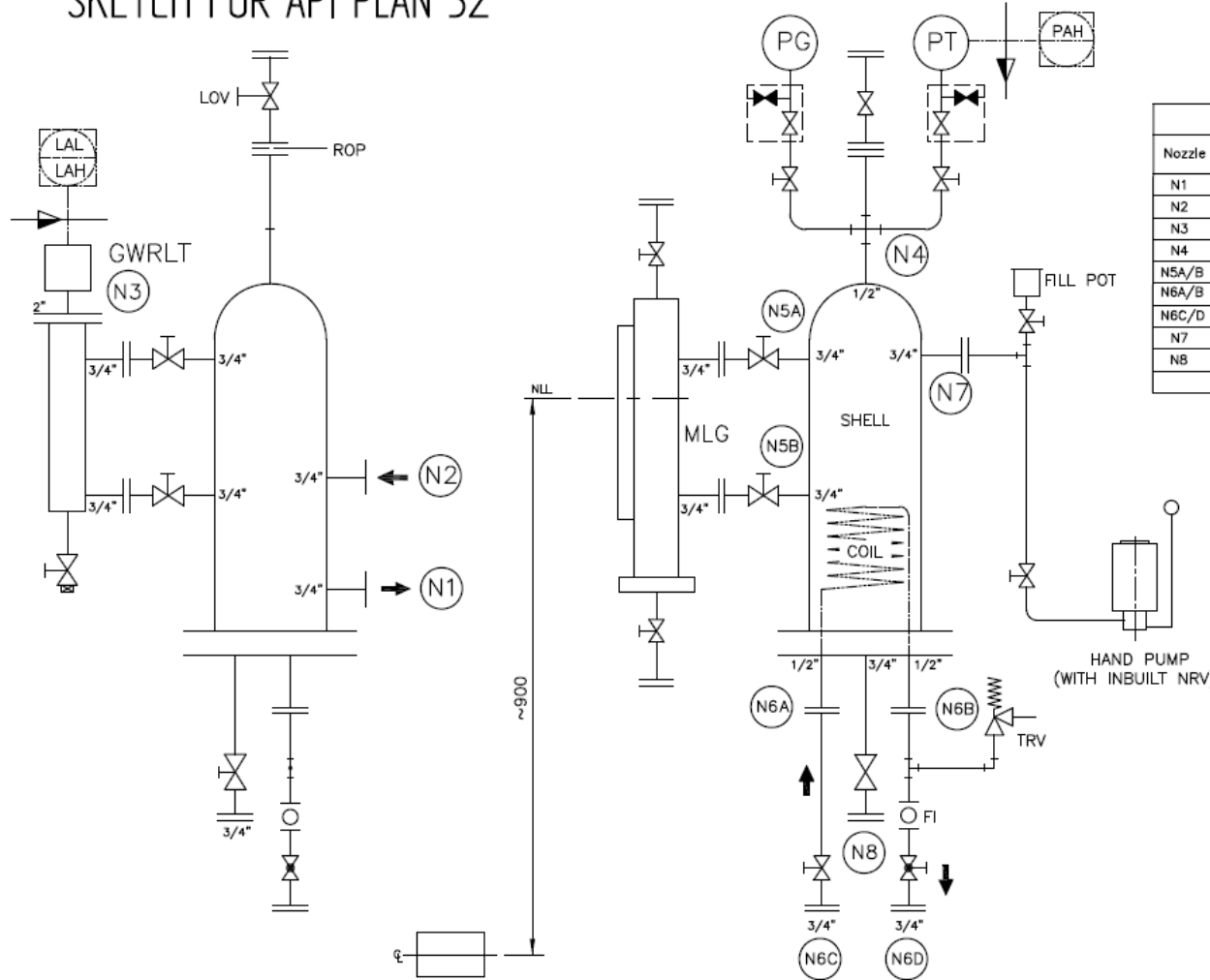
SKETCH FOR API PLAN 32



| NOZZLE SCHEDULE (min) |             |                        |             |             |
|-----------------------|-------------|------------------------|-------------|-------------|
| Nozzle                | Description | Size mm (") & Pipe Sch | ASME Rating | Flange Type |
| N1                    | From Source | DN15 (1/2") Sch 80     | #300        | SWRF        |
| N2                    | To seal     | DN15 (1/2") Sch 80     | #300        | SWRF        |
| N3                    | Temp. Gauge | DN40 (1.5") Sch 80     | #300        | SWRF        |

| LEGEND |                                      |
|--------|--------------------------------------|
| PG     | PRESSURE GAUGE                       |
| VAR    | VARIABLE AREA ROTATRANSMITTER        |
| SAPCV  | SELF ACTUATED PRESSURE CONTROL VALVE |
| TG     | TEMPERATURE GAUGE                    |
| NRV    | NON RETURN VALVE                     |
| LCGV   | LOCKED CLOSED GLOBE VALVE            |
| ⊠      | GATE VALVE (GV)                      |
| ⊠      | 2-VALVE MANIFOLD                     |

SKETCH FOR API PLAN 52

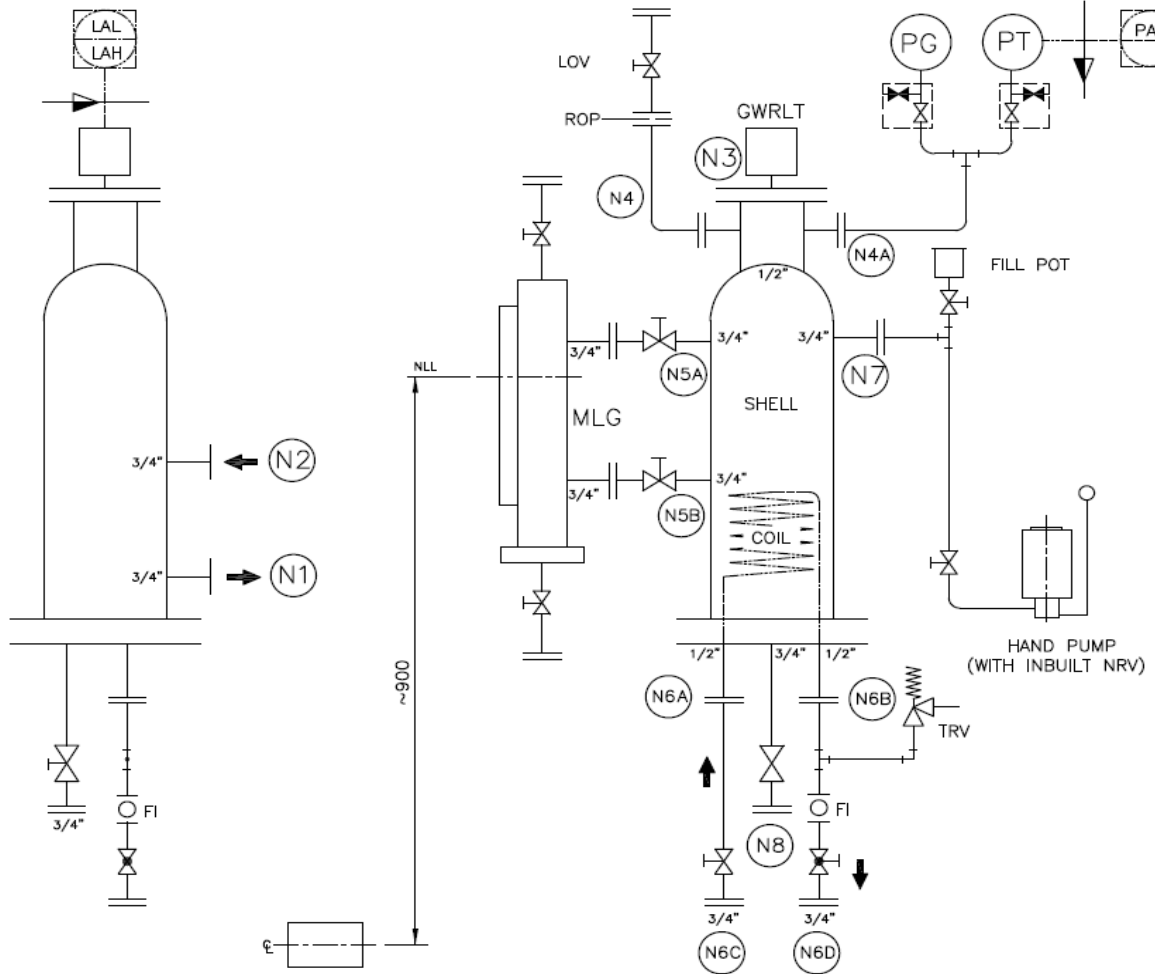


| NOZZLE SCHEDULE (min) |                              |                           |             |             |
|-----------------------|------------------------------|---------------------------|-------------|-------------|
| Nozzle                | Description                  | Size mm (") and Pipe Sch. | ASME Rating | Flange Type |
| N1                    | TO: Stuffing box             | DN20 (3/4") Sch 80        | #300        | SWRF        |
| N2                    | FROM: Stuffing box           | DN20 (3/4") Sch 80        | #300        | SWRF        |
| N3                    | Level Transmitter            | DN50 (2") Sch 40          | #300        | SWRF        |
| N4                    | Vent / Pr. Inst.             | DN15 (1/2") Sch 80        | #300        | SWRF        |
| N5A/B                 | Level Gauge                  | DN20 (3/4") Sch 80        | #300        | SWRF        |
| N6A/B                 | Cooling Water (at reservoir) | DN15 (1/2") Sch 80        | #300        | SWRF        |
| N6C/D                 | Cooling Water (at grade)     | DN20 (3/4") Sch 80        | #150        | SWRF        |
| N7                    | Fill Port                    | DN20 (3/4") Sch 80        | #300        | SWRF        |
| N8                    | Drain                        | DN20 (3/4") Sch 80        | #300        | SWRF        |
|                       | Reservoir Flange             | DN200 (8") Sch 40         | #300        | WNRF        |

| LEGEND |                           |
|--------|---------------------------|
| MLG    | MAGNETIC TYPE LEVEL GAUGE |
| PG     | PRESSURE GAUGE            |
| PT     | PRESSURE TRANSMITTER      |
| LT     | LEVEL TRANSMITTER         |
| ROP    | RESTRICTION ORIFICE PLATE |
| LOV    | LOCKED OPEN VALVE         |
| TRV    | THERMAL RELIEF VALVE      |
| FI     | FLOW INDICATOR            |
| GV     | GATE VALVE                |
| GV     | GLOBE VALVE               |
| 2V     | 2-VALVE MANIFOLD          |

PUMP OEM  
SEAL VENDOR

SKETCH FOR API PLAN 52

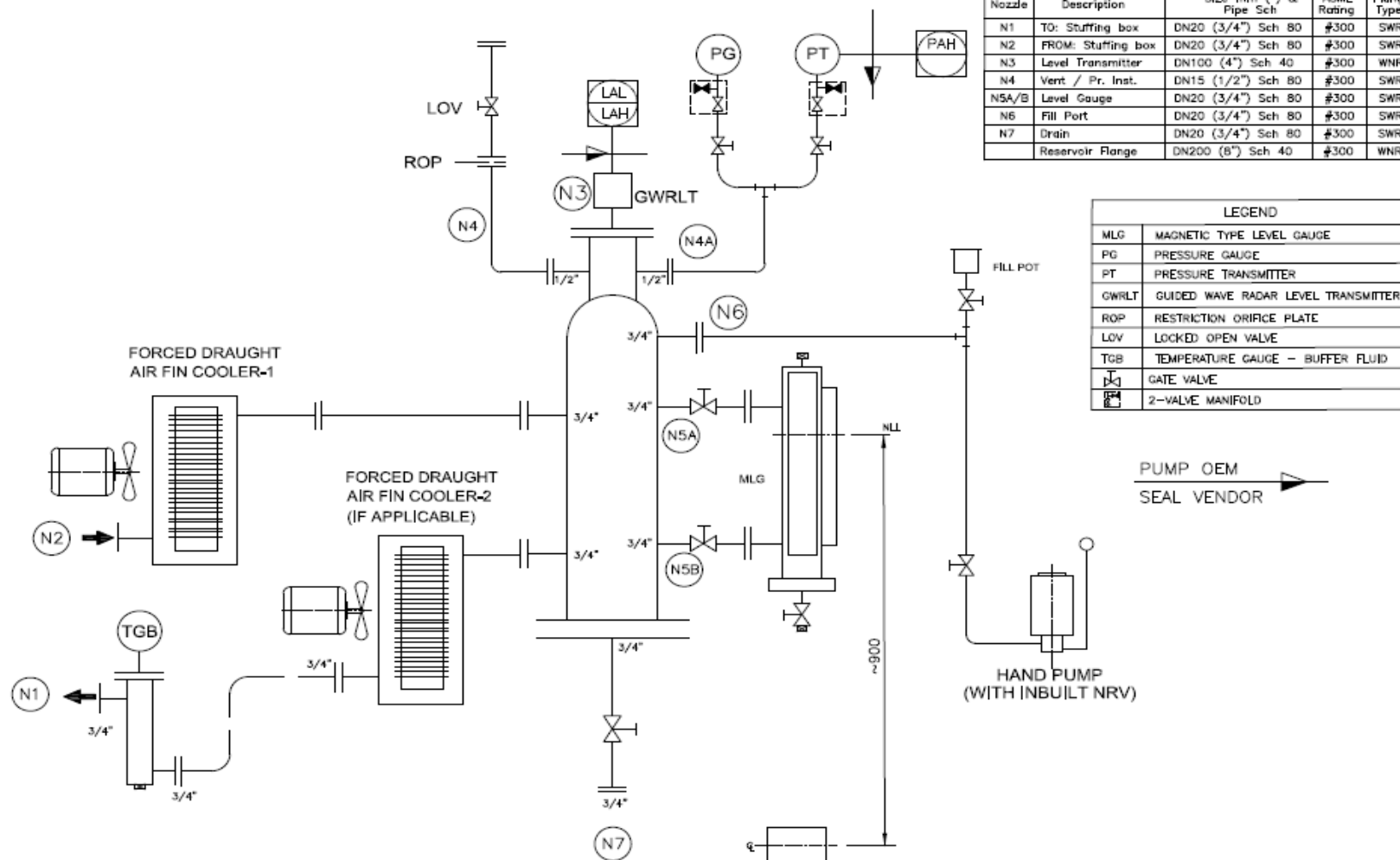


| NOZZLE SCHEDULE (min) |                              |                           |             |             |
|-----------------------|------------------------------|---------------------------|-------------|-------------|
| Nozzle                | Description                  | Size mm (") and Pipe Sch. | ASME Rating | Flange Type |
| N1                    | TO: Stuffing box             | DN20 (3/4") Sch 80        | #300        | SWRF        |
| N2                    | FROM: Stuffing box           | DN20 (3/4") Sch 80        | #300        | SWRF        |
| N3                    | Level Transmitter            | DN100 (4") Sch 40         | #300        | WNRF        |
| N4                    | Vent / Pr. Inst.             | DN15 (1/2") Sch 80        | #300        | SWRF        |
| N5A/B                 | Level Gauge                  | DN20 (3/4") Sch 80        | #300        | SWRF        |
| N6A/B                 | Cooling Water (at reservoir) | DN15 (1/2") Sch 80        | #300        | SWRF        |
| N6C/D                 | Cooling Water (at grade)     | DN20 (3/4") Sch 80        | #150        | SWRF        |
| N7                    | Fill Port                    | DN20 (3/4") Sch 80        | #300        | SWRF        |
| N8                    | Drain                        | DN20 (3/4") Sch 80        | #300        | SWRF        |
|                       | Reservoir Flange             | DN200 (8") Sch 40         | #300        | WNRF        |

| LEGEND |                                     |
|--------|-------------------------------------|
| MLG    | MAGNETIC TYPE LEVEL GAUGE           |
| PG     | PRESSURE GAUGE                      |
| PT     | PRESSURE TRANSMITTER                |
| GWRLT  | GUIDED WAVE RADAR LEVEL TRANSMITTER |
| ROP    | RESTRICTION ORIFICE PLATE           |
| LOV    | LOCKED OPEN VALVE                   |
| TRV    | THERMAL RELIEF VALVE                |
| FI     | FLOW INDICATOR                      |
|        | GATE VALVE                          |
|        | GLOBE VALVE                         |
|        | 2-VALVE MANIFOLD                    |

PUMP OEM  
SEAL VENDOR

SKETCH FOR API PLAN 52



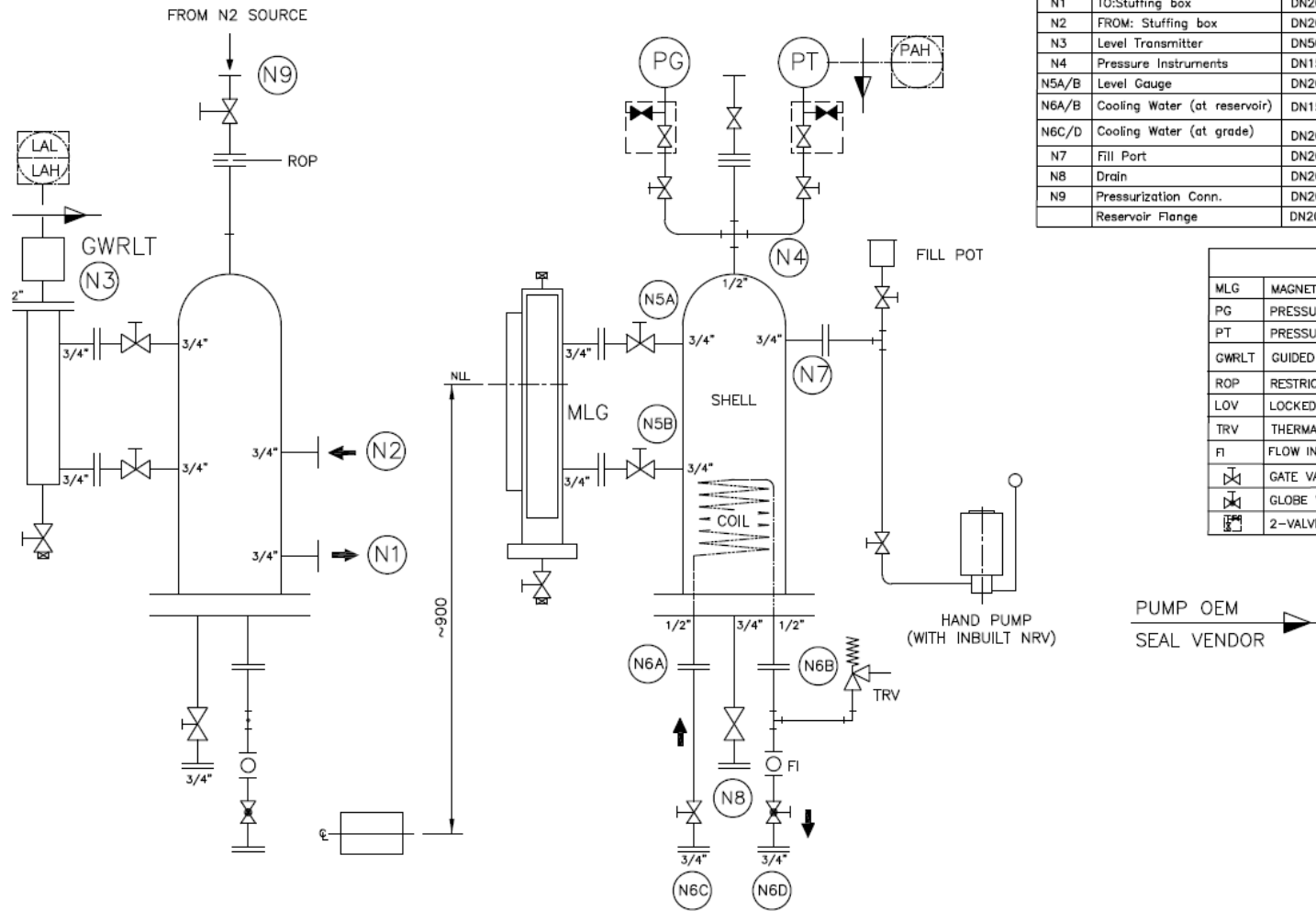
| NOZZLE SCHEDULE (min) |                    |                         |             |             |
|-----------------------|--------------------|-------------------------|-------------|-------------|
| Nozzle                | Description        | Size mm (") & Pipe Sch. | ASME Rating | Flange Type |
| N1                    | TO: Stuffing box   | DN20 (3/4") Sch 80      | #300        | SWRF        |
| N2                    | FROM: Stuffing box | DN20 (3/4") Sch 80      | #300        | SWRF        |
| N3                    | Level Transmitter  | DN100 (4") Sch 40       | #300        | WNRF        |
| N4                    | Vent / Pr. Inst.   | DN15 (1/2") Sch 80      | #300        | SWRF        |
| NSA/B                 | Level Gauge        | DN20 (3/4") Sch 80      | #300        | SWRF        |
| N6                    | Fill Port          | DN20 (3/4") Sch 80      | #300        | SWRF        |
| N7                    | Drain              | DN20 (3/4") Sch 80      | #300        | SWRF        |
|                       | Reservoir Flange   | DN200 (8") Sch 40       | #300        | WNRF        |

| LEGEND |                                     |
|--------|-------------------------------------|
| MLG    | MAGNETIC TYPE LEVEL GAUGE           |
| PG     | PRESSURE GAUGE                      |
| PT     | PRESSURE TRANSMITTER                |
| GWRLT  | GUIDED WAVE RADAR LEVEL TRANSMITTER |
| ROP    | RESTRICTION ORIFICE PLATE           |
| LOV    | LOCKED OPEN VALVE                   |
| TGB    | TEMPERATURE GAUGE - BUFFER FLUID    |
|        | GATE VALVE                          |
|        | 2-VALVE MANIFOLD                    |

PUMP OEM  
SEAL VENDOR

HAND PUMP  
(WITH INBUILT NRV)

SKETCH FOR API PLAN 53A



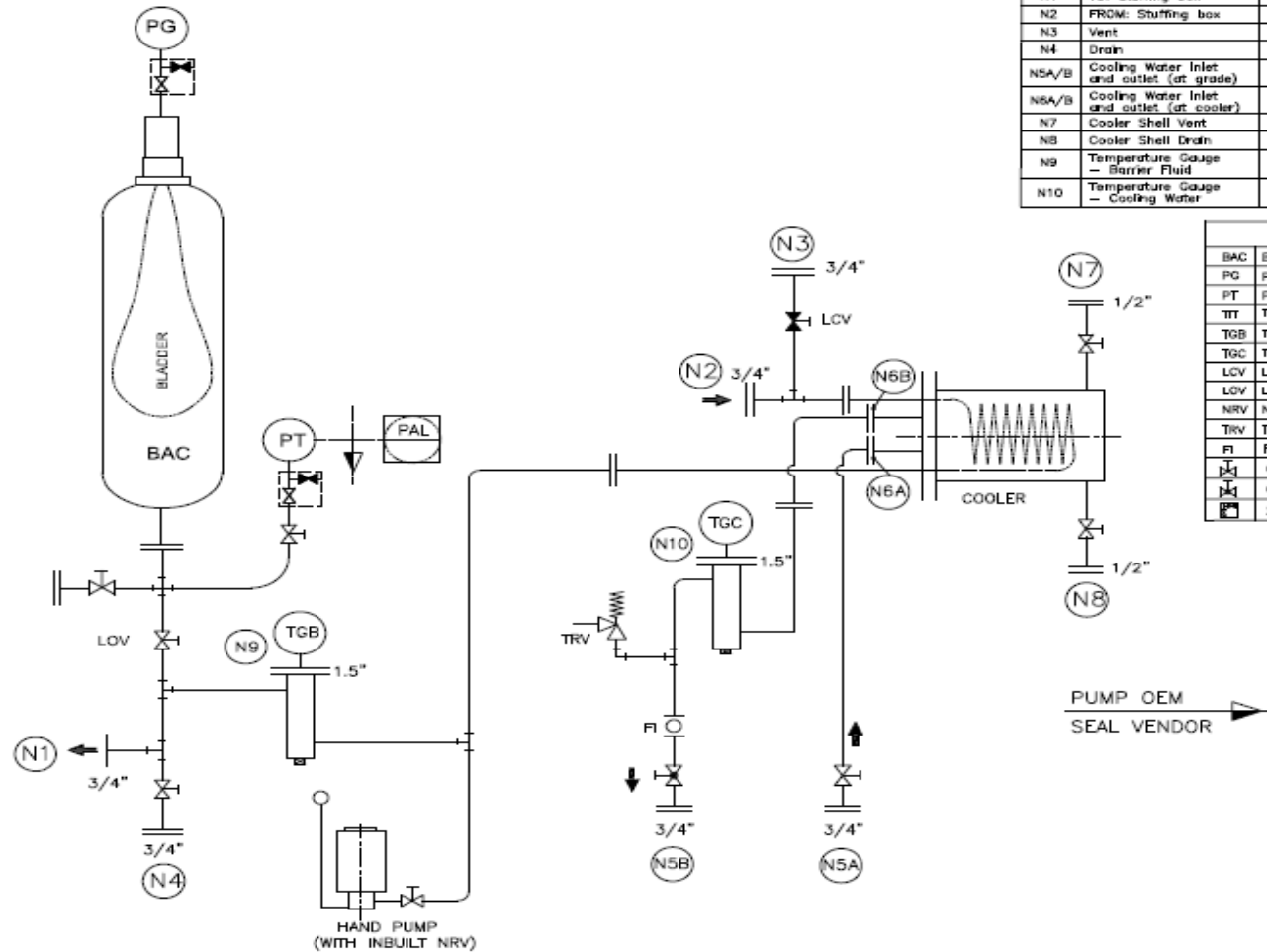
| NOZZLE SCHEDULE (min) |                              |                        |                         |
|-----------------------|------------------------------|------------------------|-------------------------|
| Nozzle                | Description                  | Size mm (") & Pipe Sch | ASME Flange Rating Type |
| N1                    | TO: Stuffing box             | DN20 (3/4") Sch 80     | #300 SWRF               |
| N2                    | FROM: Stuffing box           | DN20 (3/4") Sch 80     | #300 SWRF               |
| N3                    | Level Transmitter            | DN50 (2") Sch 40       | #300 SWRF               |
| N4                    | Pressure Instruments         | DN15 (1/2") Sch 80     | #300 SWRF               |
| N5A/B                 | Level Gauge                  | DN20 (3/4") Sch 80     | #300 SWRF               |
| N6A/B                 | Cooling Water (at reservoir) | DN15 (1/2") Sch 80     | #300 SWRF               |
| N6C/D                 | Cooling Water (at grade)     | DN20 (3/4") Sch 80     | #150 SWRF               |
| N7                    | Fill Port                    | DN20 (3/4") Sch 80     | #300 SWRF               |
| N8                    | Drain                        | DN20 (3/4") Sch 80     | #300 SWRF               |
| N9                    | Pressurization Conn.         | DN20 (3/4") Sch 80     | #300 SWRF               |
|                       | Reservoir Flange             | DN200 (8") Sch 40      | #300 WNRF               |

| LEGEND |                                     |
|--------|-------------------------------------|
| MLG    | MAGNETIC TYPE LEVEL GAUGE           |
| PG     | PRESSURE GAUGE                      |
| PT     | PRESSURE TRANSMITTER                |
| GWRLT  | GUIDED WAVE RADAR LEVEL TRANSMITTER |
| ROP    | RESTRICTION ORIFICE PLATE           |
| LOV    | LOCKED OPEN VALVE                   |
| TRV    | THERMAL RELIEF VALVE                |
| FI     | FLOW INDICATOR                      |
|        | GATE VALVE                          |
|        | GLOBE VALVE                         |
|        | 2-VALVE MANIFOLD                    |

PUMP OEM  
SEAL VENDOR

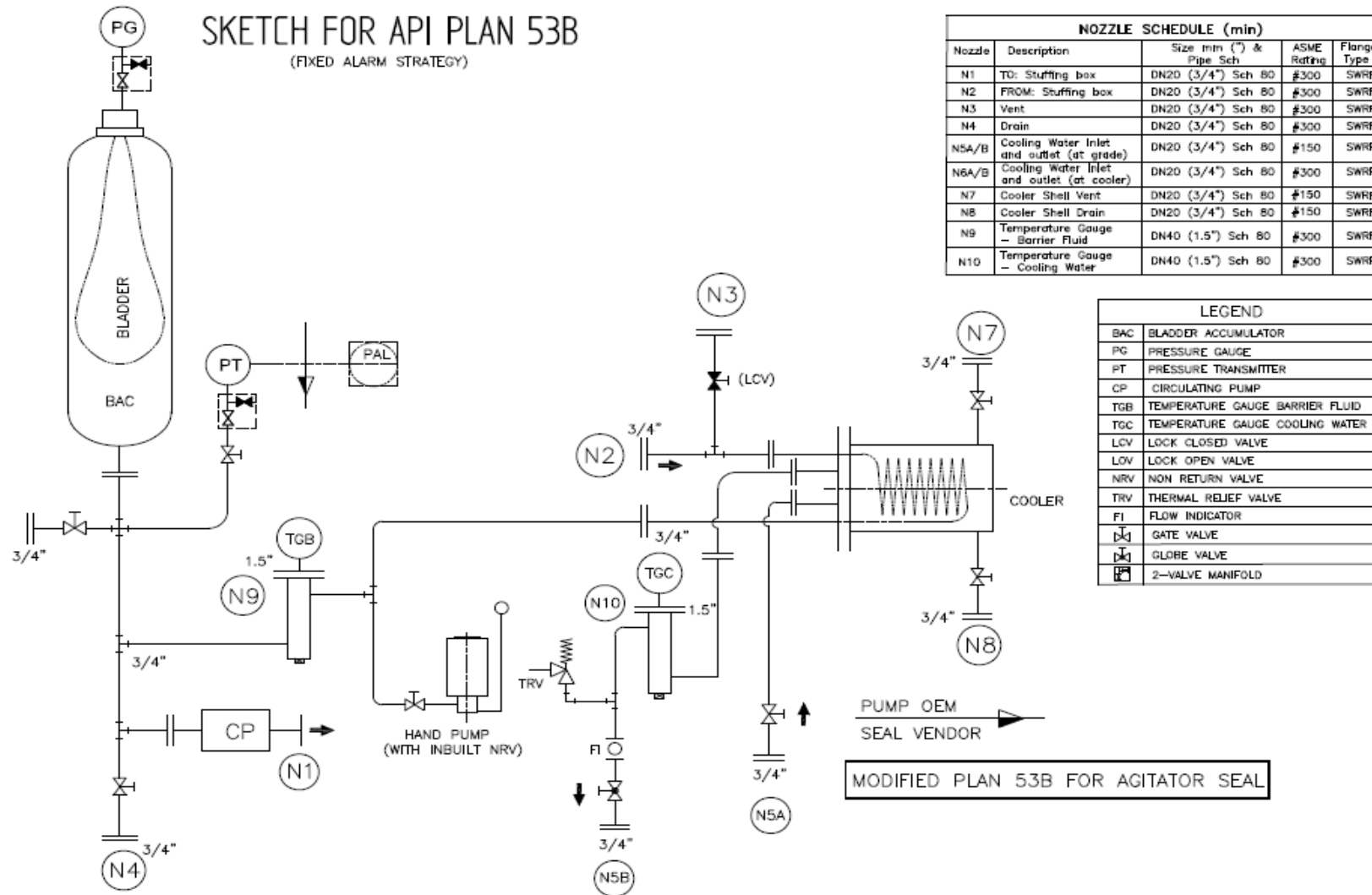


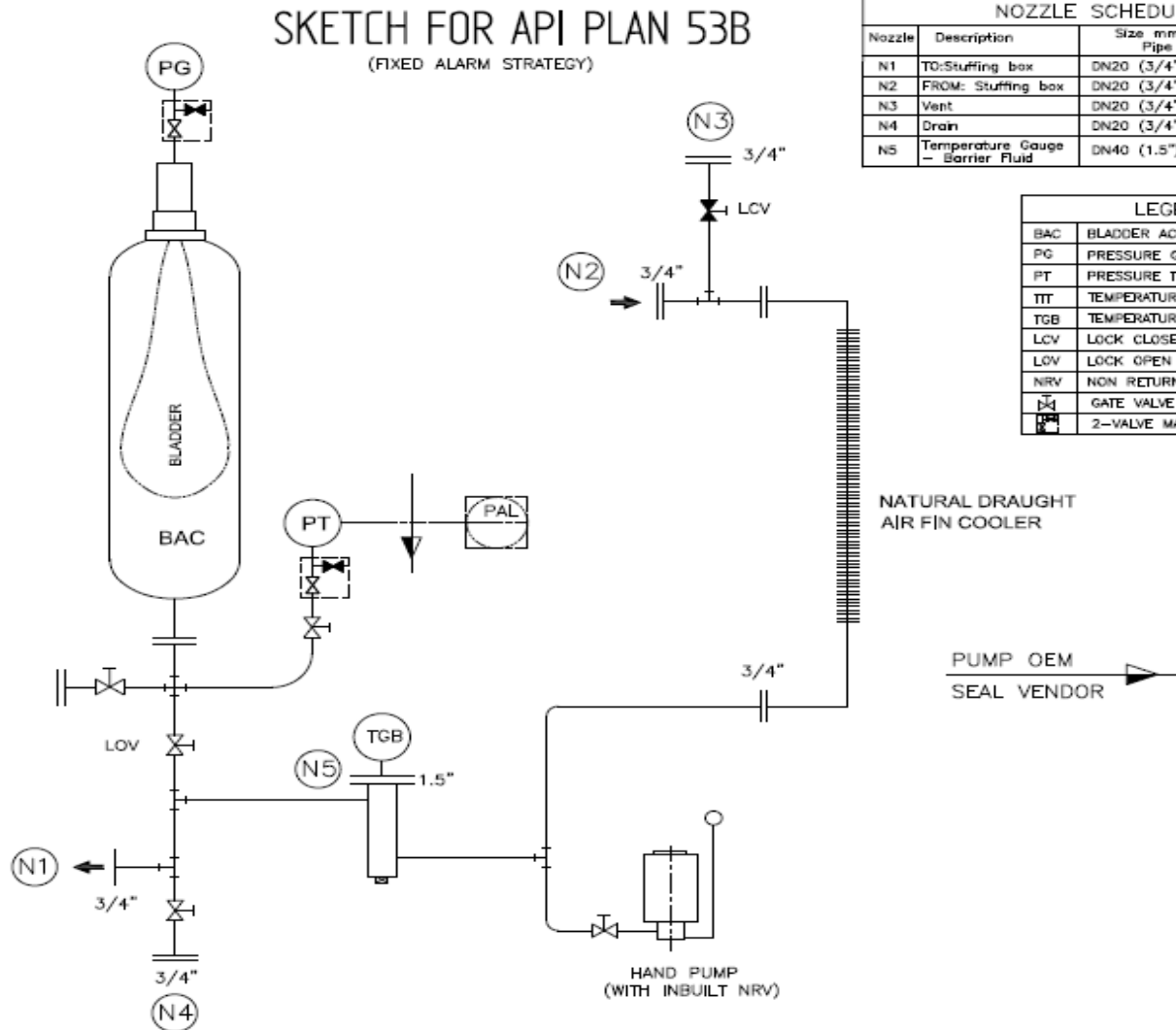
SKETCH FOR API PLAN 53B  
(FIXED ALARM STRATEGY)



| NOZZLE SCHEDULE (min) |  |                        |             |             |
|-----------------------|--|------------------------|-------------|-------------|
| Nozzle                | Description                                | Size mm (") & Pipe Sch | ASME Rating | Flange Type |
| N1                    | TO: Stuffing box                           | DN20 (3/4") Sch 80     | #300        | SWRF        |
| N2                    | FROM: Stuffing box                         | DN20 (3/4") Sch 80     | #300        | SWRF        |
| N3                    | Vent                                       | DN20 (3/4") Sch 80     | #300        | SWRF        |
| N4                    | Drain                                      | DN20 (3/4") Sch 80     | #300        | SWRF        |
| NSA/B                 | Cooling Water Inlet and outlet (at grade)  | DN20 (3/4") Sch 80     | #150        | SWRF        |
| N5A/B                 | Cooling Water Inlet and outlet (at cooler) | DN20 (3/4") Sch 80     | #300        | SWRF        |
| N7                    | Cooler Shell Vent                          | DN20 (3/4") Sch 80     | #150        | SWRF        |
| N8                    | Cooler Shell Drain                         | DN20 (3/4") Sch 80     | #150        | SWRF        |
| N9                    | Temperature Gauge - Barrier Fluid          | DN40 (1.5") Sch 80     | #300        | SWRF        |
| N10                   | Temperature Gauge - Cooling Water          | DN40 (1.5") Sch 80     | #300        | SWRF        |

| LEGEND |                                    |
|--------|------------------------------------|
| BAC    | BLADDER ACCUMULATOR                |
| PG     | PRESSURE GAUGE                     |
| PT     | PRESSURE TRANSMITTER               |
| TIT    | TEMPERATURE INDICATING TRANSMITTER |
| TGB    | TEMPERATURE GAUGE BARRIER FLUID    |
| TGC    | TEMPERATURE GAUGE COOLING WATER    |
| LCV    | LOCK CLOSED VALVE                  |
| LOV    | LOCK OPEN VALVE                    |
| NRV    | NON RETURN VALVE                   |
| TRV    | THERMAL RELIEF VALVE               |
| FI     | FLOW INDICATOR                     |
| GV     | GATE VALVE                         |
| GV     | GLOBE VALVE                        |
| 2V     | 2-VALVE MANIFOLD                   |



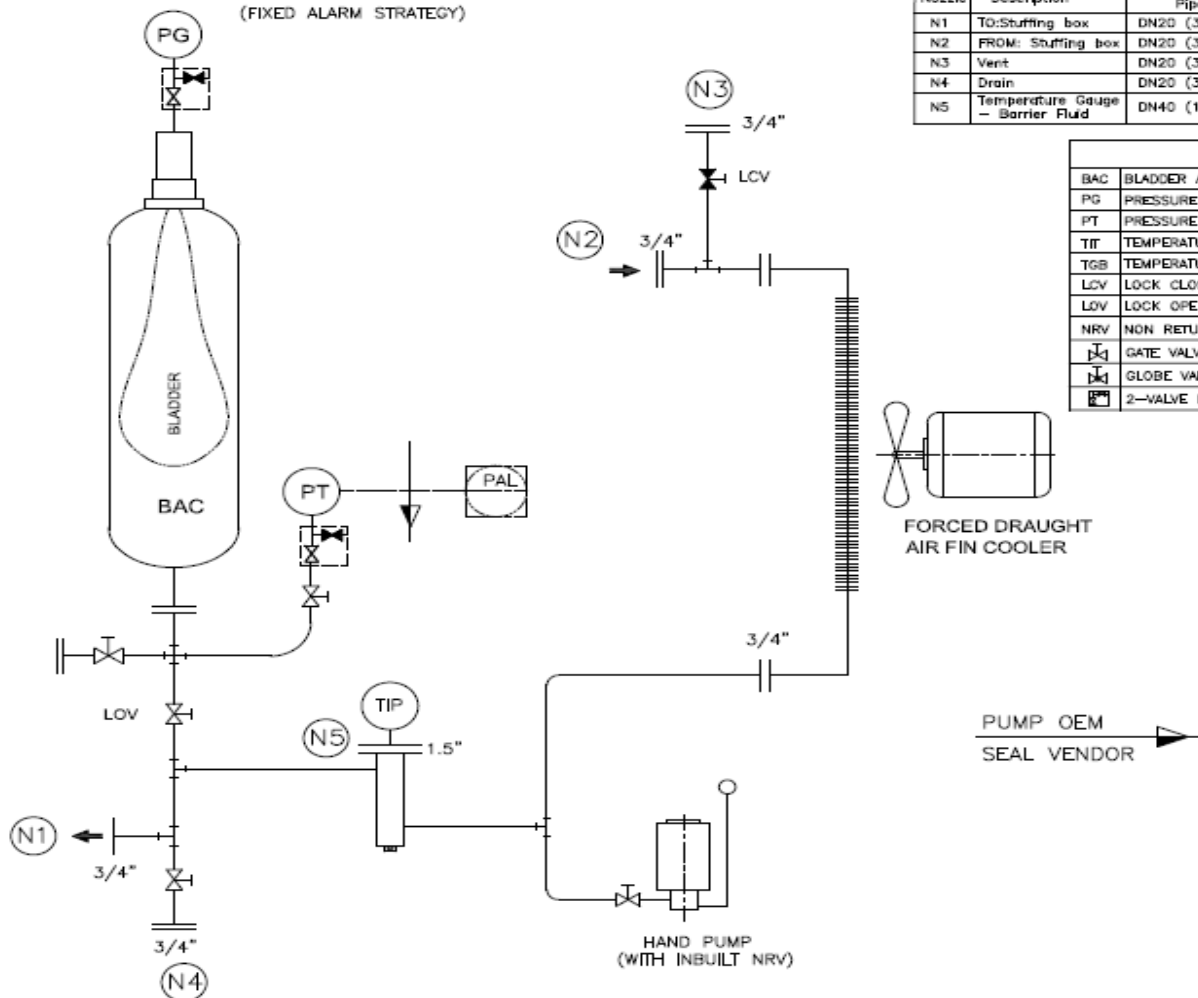


| NOZZLE SCHEDULE (min) |                                   |                        |             |             |
|-----------------------|-----------------------------------|------------------------|-------------|-------------|
| Nozzle                | Description                       | Size mm (") & Pipe Sch | ASME Rating | Flange Type |
| N1                    | TO: Stuffing box                  | DN20 (3/4") Sch 80     | #300        | SWRF        |
| N2                    | FROM: Stuffing box                | DN20 (3/4") Sch 80     | #300        | SWRF        |
| N3                    | Vent                              | DN20 (3/4") Sch 80     | #300        | SWRF        |
| N4                    | Drain                             | DN20 (3/4") Sch 80     | #300        | SWRF        |
| N5                    | Temperature Gauge - Barrier Fluid | DN40 (1.5") Sch 80     | #300        | SWRF        |

| LEGEND |                                    |
|--------|------------------------------------|
| BAC    | BLADDER ACCUMULATOR                |
| PG     | PRESSURE GAUGE                     |
| PT     | PRESSURE TRANSMITTER               |
| TIT    | TEMPERATURE INDICATING TRANSMITTER |
| TGB    | TEMPERATURE GAUGE BARRIER FLUID    |
| LCV    | LOCK CLOSED VALVE                  |
| LOV    | LOCK OPEN VALVE                    |
| NRV    | NON RETURN VALVE                   |
| 2V     | 2-VALVE MANIFOLD                   |

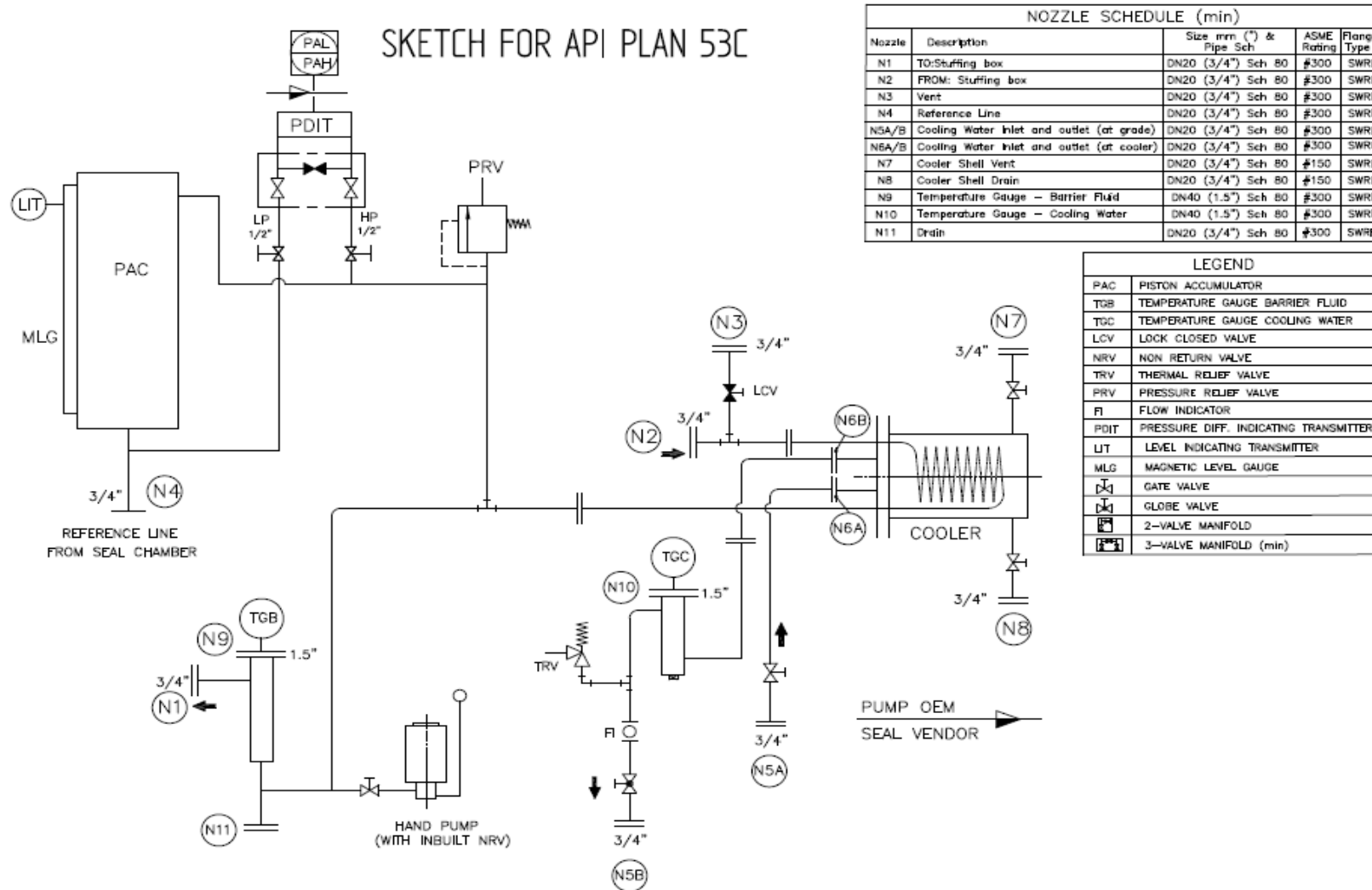
SKETCH FOR API PLAN 53B

(FIXED ALARM STRATEGY)



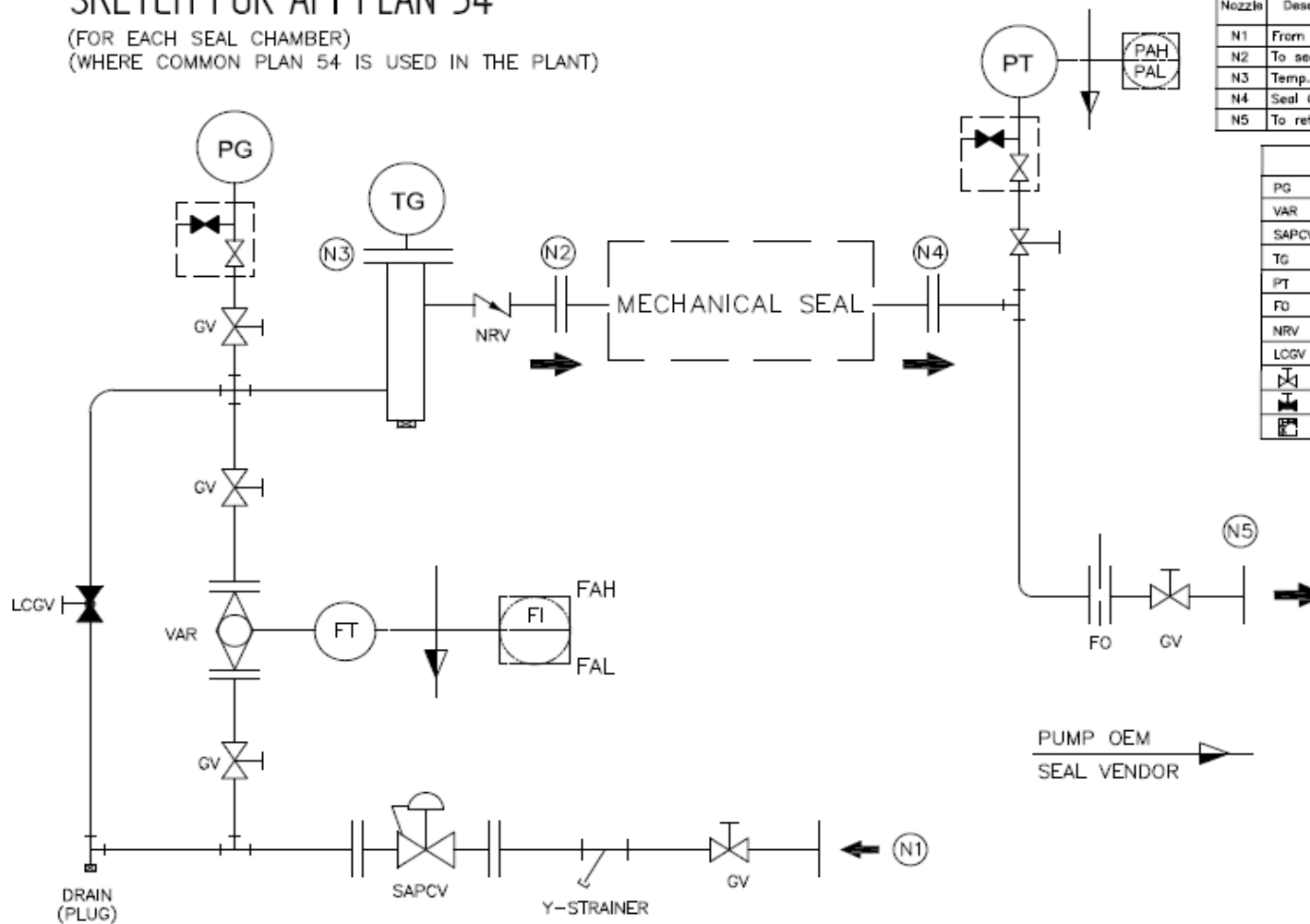
| NOZZLE SCHEDULE (min) |                                   |                        |             |             |
|-----------------------|-----------------------------------|------------------------|-------------|-------------|
| Nozzle                | Description                       | Size mm (") & Pipe Sch | ASME Rating | Flange Type |
| N1                    | TO: Stuffing box                  | DN20 (3/4") Sch 80     | #300        | SWRF        |
| N2                    | FROM: Stuffing box                | DN20 (3/4") Sch 80     | #300        | SWRF        |
| N3                    | Vent                              | DN20 (3/4") Sch 80     | #300        | SWRF        |
| N4                    | Drain                             | DN20 (3/4") Sch 80     | #300        | SWRF        |
| N5                    | Temperature Gauge - Barrier Fluid | DN40 (1.5") Sch 80     | #300        | SWRF        |

| LEGEND |                                    |
|--------|------------------------------------|
| BAC    | BLADDER ACCUMULATOR                |
| PG     | PRESSURE GAUGE                     |
| PT     | PRESSURE TRANSMITTER               |
| TIP    | TEMPERATURE INDICATING TRANSMITTER |
| TGB    | TEMPERATURE GAUGE BARRIER FLUID    |
| LCV    | LOCK CLOSED VALVE                  |
| LOV    | LOCK OPEN VALVE                    |
| NRV    | NON RETURN VALVE                   |
|        | GATE VALVE                         |
|        | GLOBE VALVE                        |
|        | 2-VALVE MANIFOLD                   |



### SKETCH FOR API PLAN 54

(FOR EACH SEAL CHAMBER)  
(WHERE COMMON PLAN 54 IS USED IN THE PLANT)

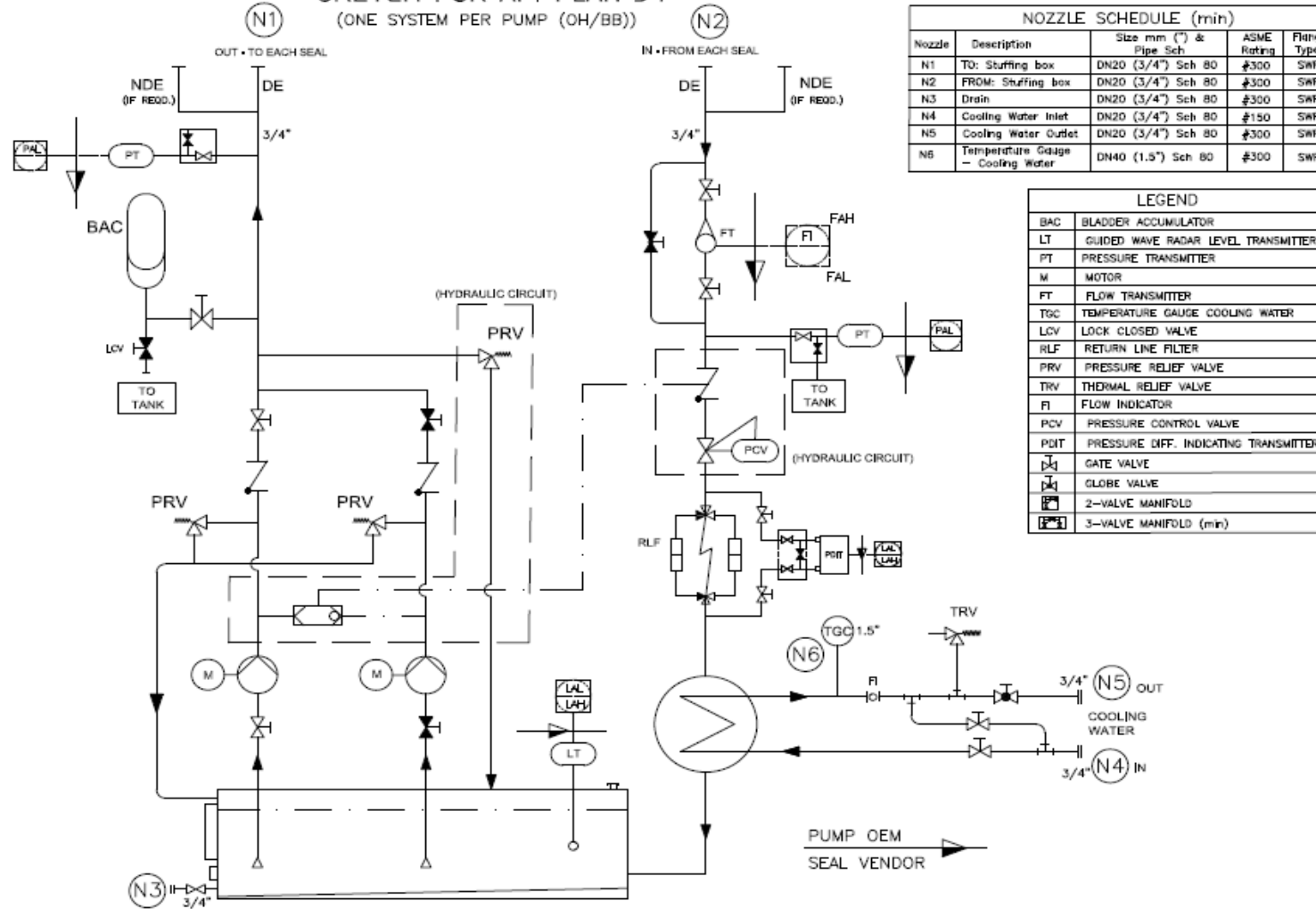


| NOZZLE SCHEDULE (min) |             |                        |             |             |
|-----------------------|-------------|------------------------|-------------|-------------|
| Nozzle                | Description | Size mm (") & Pipe Sch | ASME Rating | Flange Type |
| N1                    | From Source | DN15 (1/2") Sch 80     | #300        | SWRF        |
| N2                    | To seal     | DN15 (1/2") Sch 80     | #300        | SWRF        |
| N3                    | Temp. Gauge | DN40 (1.5") Sch 80     | #300        | SWRF        |
| N4                    | Seal Outlet | DN15 (1/2") Sch 80     | #300        | SWRF        |
| N5                    | To return   | DN15 (1/2") Sch 80     | #300        | SWRF        |

| LEGEND  |                                      |
|---------|--------------------------------------|
| PG      | PRESSURE GAUGE                       |
| VAR     | VARIABLE AREA ROTATRANSMITTER        |
| SAPCV   | SELF ACTUATED PRESSURE CONTROL VALVE |
| TG      | TEMPERATURE GAUGE                    |
| PT      | PRESSURE TRANSMITTER                 |
| FO      | FLOW ORIFICE                         |
| NRV     | NON RETURN VALVE                     |
| LCGV    | LOCKED CLOSED GLOBE VALVE            |
| GV      | GATE VALVE                           |
| FO      | LOCKED CLOSED GLOBE VALVE            |
| PAH/PAL | 2-VALVE MANIFOLD                     |

SKETCH FOR API PLAN 54

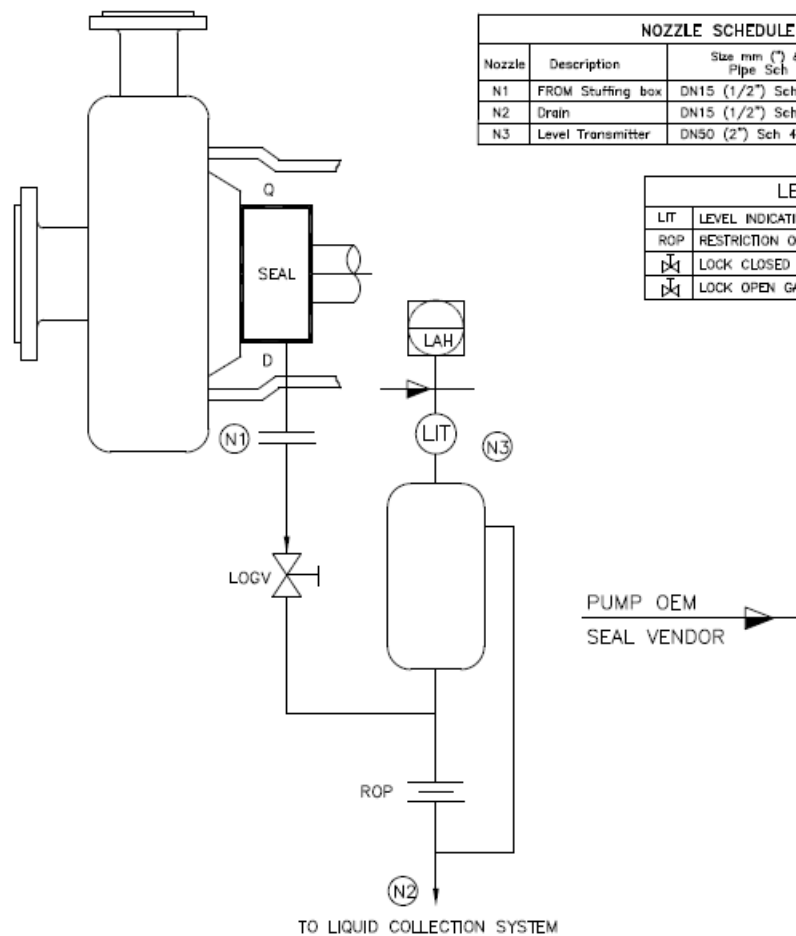
(ONE SYSTEM PER PUMP (OH/BB))



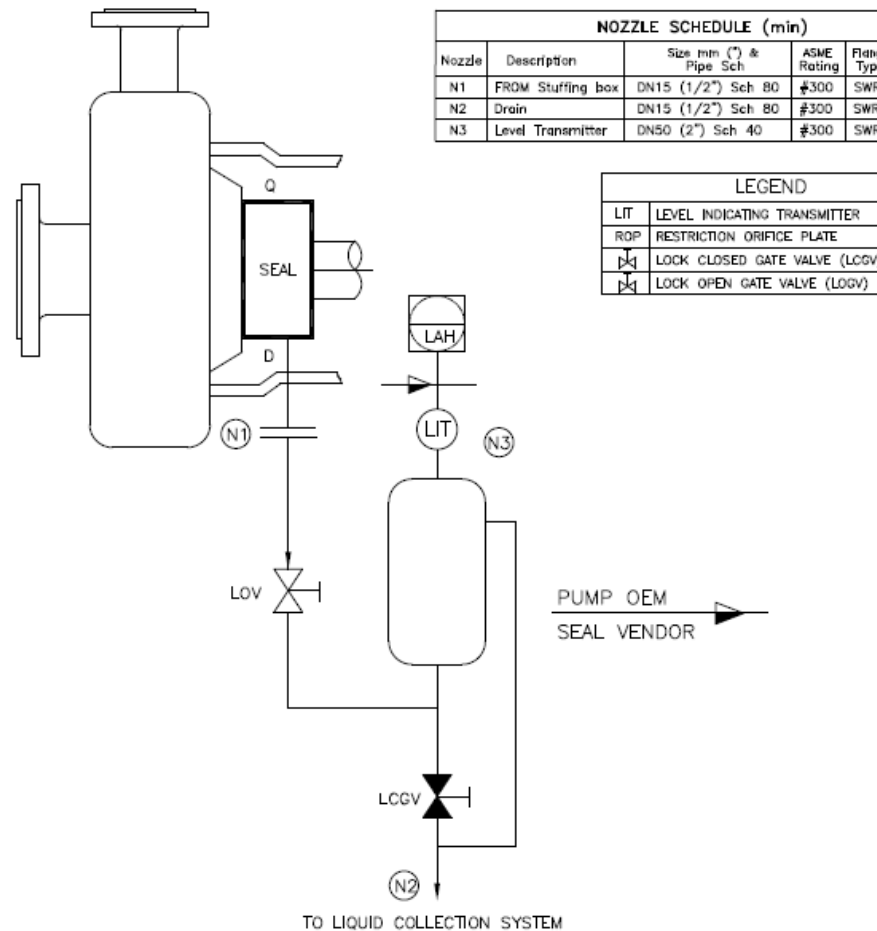
| NOZZLE SCHEDULE (min) |                                   |                         |             |             |
|-----------------------|-----------------------------------|-------------------------|-------------|-------------|
| Nozzle                | Description                       | Size mm (") & Pipe Sch. | ASME Rating | Flange Type |
| N1                    | TO: Stuffing box                  | DN20 (3/4") Sch 80      | #300        | SWRF        |
| N2                    | FROM: Stuffing box                | DN20 (3/4") Sch 80      | #300        | SWRF        |
| N3                    | Drain                             | DN20 (3/4") Sch 80      | #300        | SWRF        |
| N4                    | Cooling Water Inlet               | DN20 (3/4") Sch 80      | #150        | SWRF        |
| N5                    | Cooling Water Outlet              | DN20 (3/4") Sch 80      | #300        | SWRF        |
| N6                    | Temperature Gauge - Cooling Water | DN40 (1.5") Sch 80      | #300        | SWRF        |

| LEGEND |                                       |
|--------|---------------------------------------|
| BAC    | BLADDER ACCUMULATOR                   |
| LT     | GUIDED WAVE RADAR LEVEL TRANSMITTER   |
| PT     | PRESSURE TRANSMITTER                  |
| M      | MOTOR                                 |
| FT     | FLOW TRANSMITTER                      |
| TGC    | TEMPERATURE GAUGE COOLING WATER       |
| LCV    | LOCK CLOSED VALVE                     |
| RLF    | RETURN LINE FILTER                    |
| PRV    | PRESSURE RELIEF VALVE                 |
| TRV    | THERMAL RELIEF VALVE                  |
| FI     | FLOW INDICATOR                        |
| PCV    | PRESSURE CONTROL VALVE                |
| PDI    | PRESSURE DIFF. INDICATING TRANSMITTER |
|        | GATE VALVE                            |
|        | GLOBE VALVE                           |
|        | 2-VALVE MANIFOLD                      |
|        | 3-VALVE MANIFOLD (min)                |

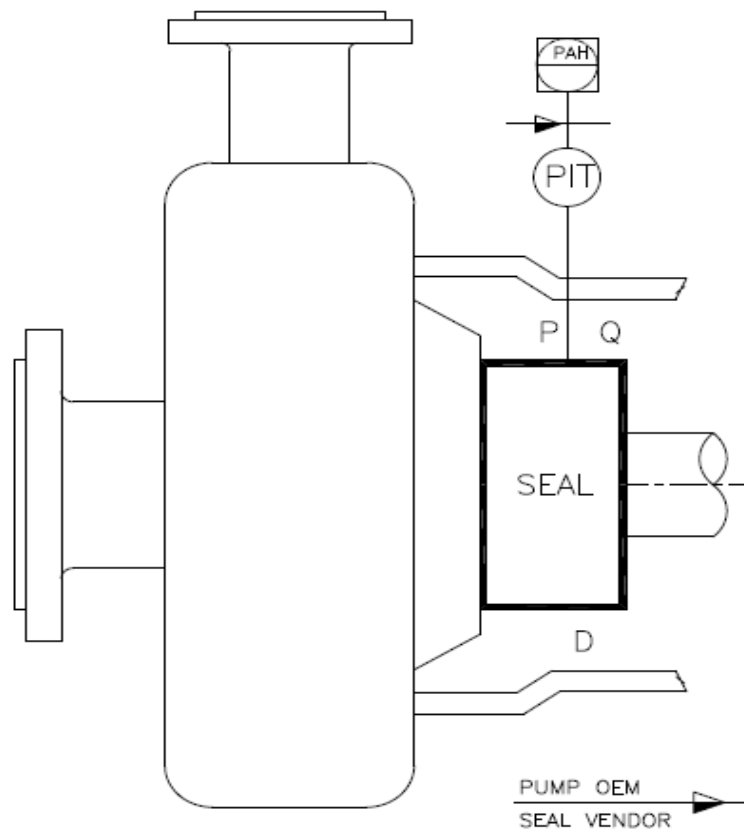
SKETCH FOR API PLAN 65A



SKETCH FOR API PLAN 65B

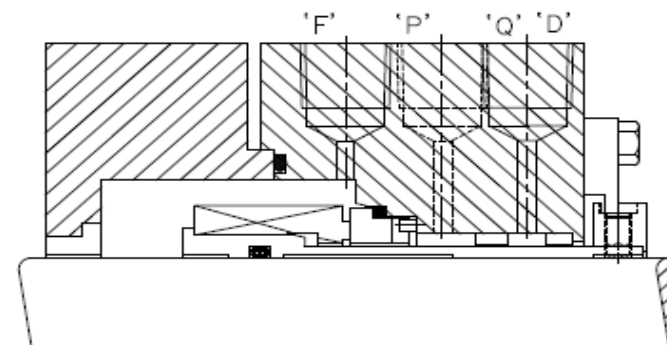


SKETCH FOR API PLAN 66A & 66B

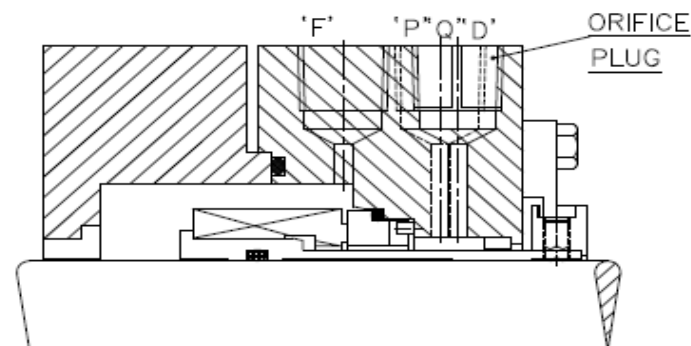


| LEGEND |                                 |
|--------|---------------------------------|
| PIT    | PRESSURE INDICATING TRANSMITTER |
| F      | FLUSHING                        |
| Q      | QUENCH                          |
| D      | DRAIN                           |
| P      | CONNECTION FOR PIT              |

API PLAN 66A

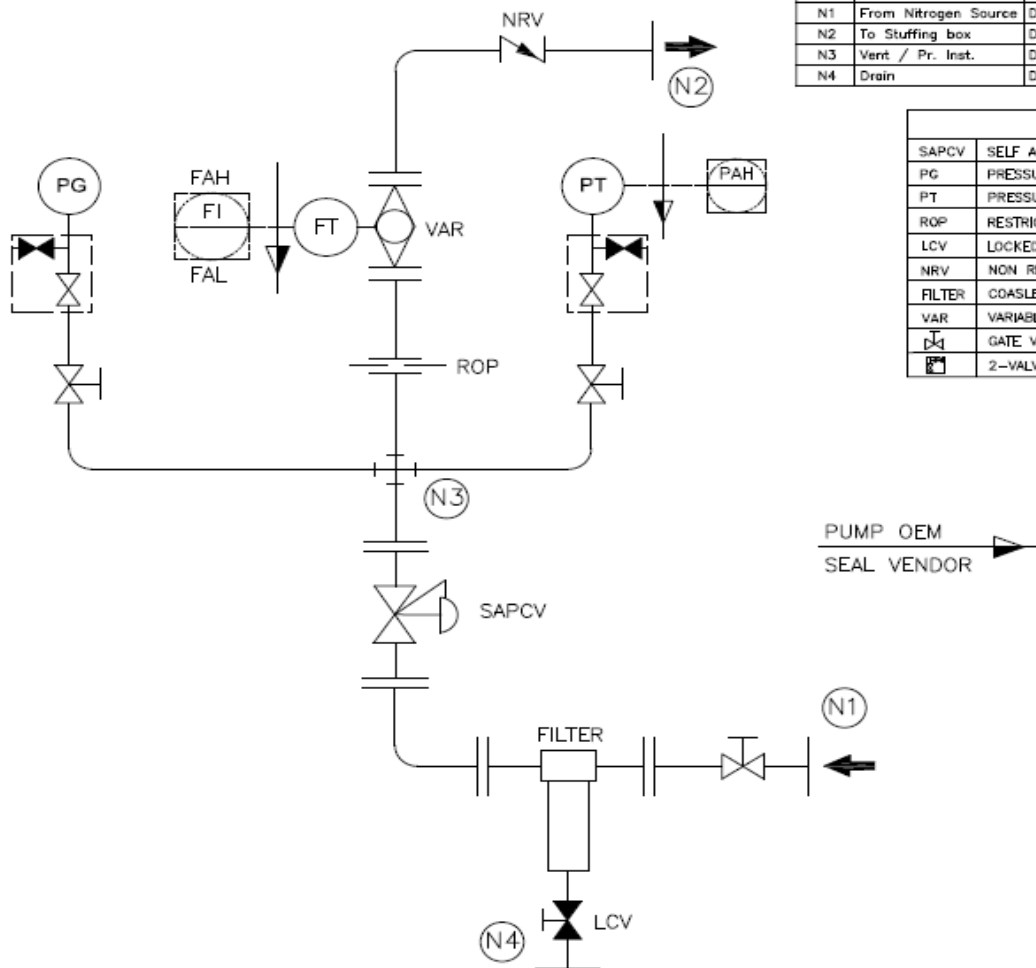


API PLAN 66B



ANNEXURE-II  
STANDARD FLUSH PLANS AND AUXILIARY HARDWARE

SKETCH FOR API PLAN 72



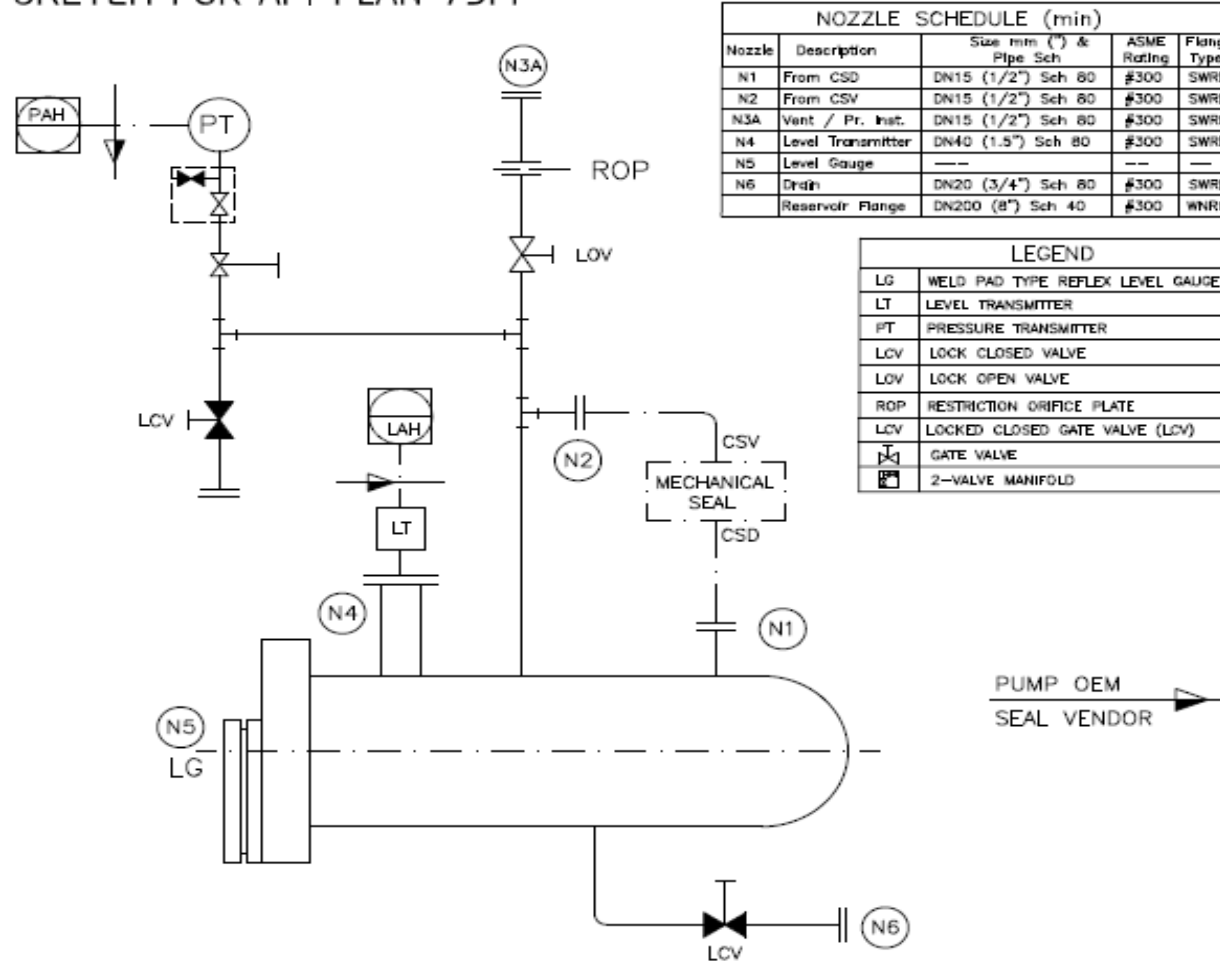
| NOZZLE SCHEDULE (min) |                      |                        |             |             |
|-----------------------|----------------------|------------------------|-------------|-------------|
| Nozzle                | Description          | Size mm (") & Pipe Sch | ASME Rating | Flange Type |
| N1                    | From Nitrogen Source | DN15 (1/2") Sch 80     | #300        | WNRF        |
| N2                    | To Stuffing box      | DN15 (1/2") Sch 80     | #300        | WNRF        |
| N3                    | Vent / Pr. Inst.     | DN15 (1/2") Sch 80     | #300        | WNRF        |
| N4                    | Drain                | DN15 (1/2") Sch 80     | #300        | WNRF        |

| LEGEND           |                                      |
|------------------|--------------------------------------|
| SAPCV            | SELF ACTUATED PRESSURE CONTROL VALVE |
| PG               | PRESSURE INDICATOR                   |
| PT               | PRESSURE TRANSMITTER                 |
| ROP              | RESTRICTION ORIFICE PLATE            |
| LCV              | LOCKED CLOSED VALVE                  |
| NRV              | NON RETURN VALVE                     |
| FILTER           | COALESCING TYPE FILTER               |
| VAR              | VARIABLE AREA ROTATRANSMITTER        |
| Gate Valve       | GATE VALVE                           |
| 2-Valve Manifold | 2-VALVE MANIFOLD                     |

PUMP OEM  
SEAL VENDOR

ANNEXURE-II  
STANDARD FLUSH PLANS AND AUXILIARY HARDWARE

SKETCH FOR API PLAN 75M

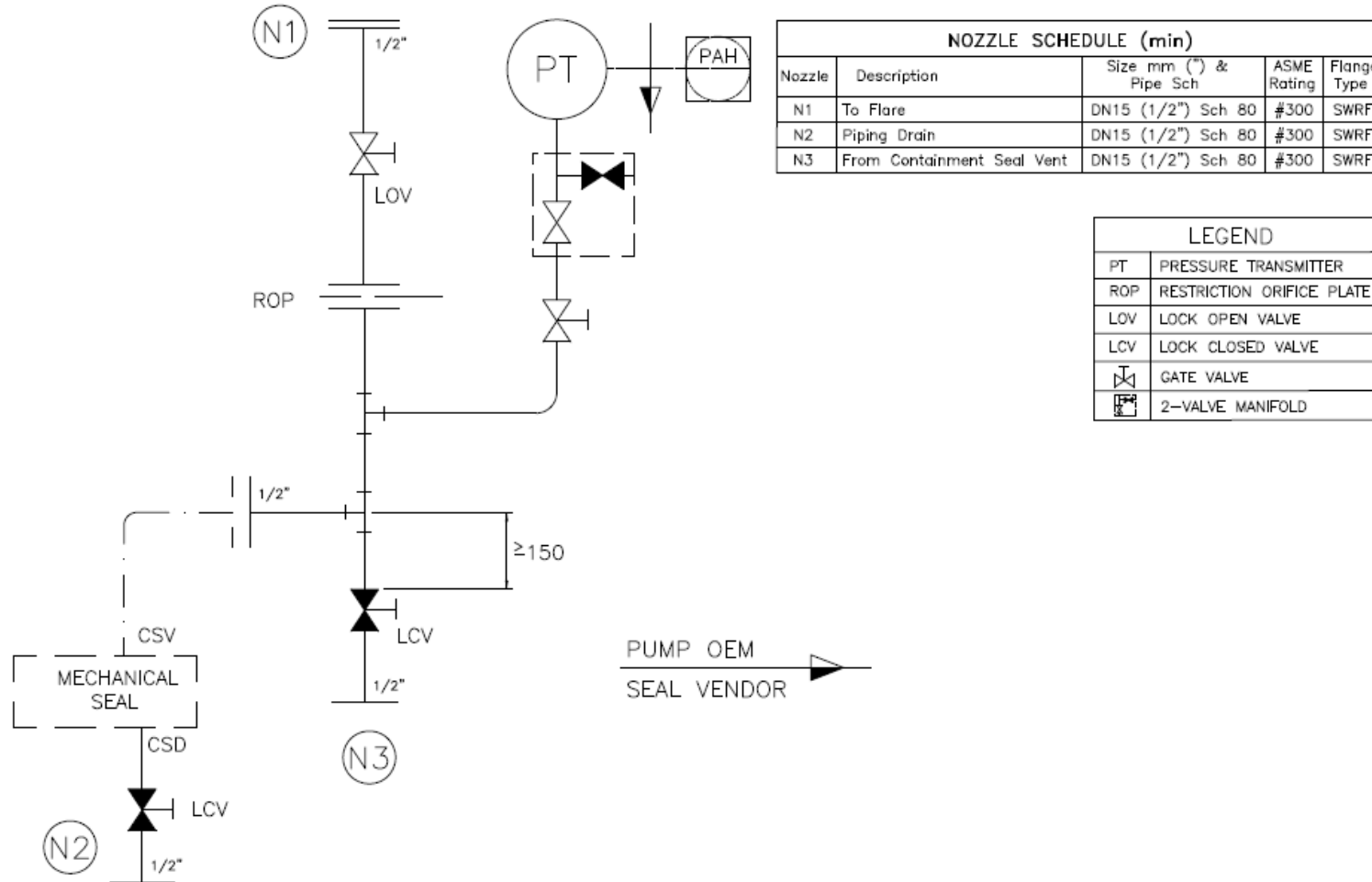


| NOZZLE SCHEDULE (min) |                   |                        |             |             |
|-----------------------|-------------------|------------------------|-------------|-------------|
| Nozzle                | Description       | Size mm (") & Pipe Sch | ASME Rating | Flange Type |
| N1                    | From CSD          | DN15 (1/2") Sch 80     | #300        | SWRF        |
| N2                    | From CSV          | DN15 (1/2") Sch 80     | #300        | SWRF        |
| N3A                   | Vent / Pr. Inst.  | DN15 (1/2") Sch 80     | #300        | SWRF        |
| N4                    | Level Transmitter | DN40 (1.5") Sch 80     | #300        | SWRF        |
| N5                    | Level Gauge       | ---                    | ---         | ---         |
| N6                    | Drain             | DN20 (3/4") Sch 80     | #300        | SWRF        |
| Reservoir Flange      |                   | DN200 (8") Sch 40      | #300        | WNRF        |

| LEGEND |                                  |
|--------|----------------------------------|
| LG     | WELD PAD TYPE REFLEX LEVEL GAUGE |
| LT     | LEVEL TRANSMITTER                |
| PT     | PRESSURE TRANSMITTER             |
| LCV    | LOCK CLOSED VALVE                |
| LOV    | LOCK OPEN VALVE                  |
| ROP    | RESTRICTION ORIFICE PLATE        |
| LCV    | LOCKED CLOSED GATE VALVE (LCV)   |
| +      | GATE VALVE                       |
| +      | 2-VALVE MANIFOLD                 |


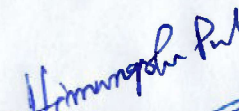
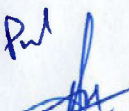

THE LIQUID COLLECTION POT MAY BE IN VERTICAL ORIENTATION

# SKETCH FOR API PLAN 76



बोलीकर्ता / आपूर्तिकर्ताओं / ठेकेदारों से गुणवत्ता प्रबंधन  
प्रणाली अपेक्षाओं हेतु विनिर्देश

## SPECIFICATION FOR QUALITY MANAGEMENT SYSTEM REQUIREMENTS FROM BIDDERS / SUPPLIERS / CONTRACTORS

|             |            |                                     |   |  |   |   |
|-------------|------------|-------------------------------------|---|--|---|---|
| 3           | 29-09-2025 | General Revision                    | <br>QMS Standards<br>Committee | <br>QMS Standards<br>Committee | <br>AK | <br>MN |
| 2           | 12-06-2020 | General Revision                    | QMS Standards<br>Committee  | QMS Standards<br>Committee   | SKB   | SKS   |
| 1           | 12-03-2015 | General Revision                    | QMS Standards<br>Committee  | QMS Standards<br>Committee   | MPJ   | SC  |
| 0           | 04-06-2009 | Issued as Standard<br>Specification | QMS Standards<br>Committee  | QMS Standards<br>Committee   | SCT   | ND  |
| Rev.<br>No. | Date       | Purpose                             | Prepared by   | Checked by   | Standards<br>Committee<br>Convener  | Standards<br>Bureau<br>Chairman   |
| Approved by |            |                                     |   |  |   |   |

---

## Abbreviations:

|     |  |
|-----|--|
| EIL | Engineers India Limited                        |
| ISO | International Organization for Standardization |
| MR  | Material Requisition                           |
| PO  | Purchase Order                                 |
| PR  | Purchase Requisition                           |
| QMS | Quality Management System                      |

## QMS Standards Committee

**Convener:** Mr. Anil Kumar

**Members:** Mr. Himangshu Pal (SCM-Inspection)  
Mr. Ravindra Kumar (Const.)  
Mr. Vinod Kumar (CQA)  
Mr. Swapnil Vaishnav (Projects)  
Mr. Vijay Kumar Garg (SCM)  
Mr. Raju Kumar Pandey (Equipment Division)

---

## CONTENTS

| Clause | Title                                     | Page No. |
|--------|---|----------|
| 1.0    | SCOPE.....                                | 4        |
| 2.0    | DEFINITIONS .....                         | 4        |
| 3.0    | REFERENCE DOCUMENTS .....                 | 4        |
| 4.0    | QUALITY MANAGEMENT SYSTEM – GENERAL ..... | 4        |
| 5.0    | QUALITY SYSTEM REQUIREMENTS.....          | 4        |
| 6.0    | AUDITS .....                              | 6        |
| 7.0    | DOCUMENTATION REQUIREMENTS .....          | 7        |

## 1.0 SCOPE

This specification establishes the Quality Management System requirements to be met by BIDDER for following purpose:

- QMS requirements to be met by suppliers/contractors after award of work/during contract execution.

## 2.0 DEFINITIONS

### 2.1 Bidder

For the purpose of this specification, the word “BIDDER” means the person(s), firm, company or organization who is under the process of being contracted by EIL / Owner for delivery of some products (including service). The word “Bidder” is considered synonymous to supplier, contractor or vendor.

### 2.2 Project Quality Plan (PQP)

Document tailored from Standard Quality Management System Manual of BIDDER, specifying how the quality requirements of the project will be met.

### 2.3 Owner

Owner means the owner of the project for which services / products are being purchased and includes their representatives, successors and assignees.

## 3.0 REFERENCE DOCUMENTS

- Specification for Documentation Requirements from Contractors (Doc. No. 6-78-0002)
- Specification for Documentation Requirements from Suppliers (Doc. No. 6-78-0003)

## 4.0 QUALITY MANAGEMENT SYSTEM – GENERAL

Unless otherwise agreed with EIL / Owner, the BIDDER proposed quality system shall fully satisfy all relevant requirements of ISO 9001 “Quality Management Systems – Requirements.” Evidence of compliance shall be current certificate of quality system registration to ISO 9001 or a recent compliance audit recommending registration from a certification agency. The quality system shall provide the planned and systematic control of all quality related activities for execution of contract. Implementation of the system shall be in accordance with BIDDER’S Quality Manual and PROJECT specific Quality Plan.

## 5.0 QUALITY SYSTEM REQUIREMENTS

5.1 BIDDER shall prepare and submit for review / record, Project Quality Plan / Quality Assurance Plan for contracted scope / job. The BIDDER’S Quality Plan shall address all of the applicable elements of ISO 9001, identify responsible parties within BIDDER’S organization, for the implementation / control of each area, reference the applicable procedures used to control / assure each area, and verify the documents produced for each area. The Project Quality Plan shall necessarily define control or make reference to the relevant procedures, for design and engineering, purchase, documentation, record control, bid evaluation, inspection, production/manufacturing, preservation, packaging and storage, quality control at construction site, pre-commissioning, commissioning and handing over (as applicable) in line with contract requirement and scope of work.

- 5.2 BIDDER shall identify all specified or implied statutory and regulatory requirements and communicate the same to all concerned in his organization and his sub contractor's organization for compliance.
- 5.3 BIDDER shall deploy competent and trained personnel for various activities for fulfilment of PO / contract. BIDDER shall arrange adequate infrastructure and work environment to ensure that the specification and quality of the deliverable are maintained.
- 5.4 BIDDER shall do the quality planning for all activities involved in delivery of order. The quality planning shall cover as minimum the following:
- Resources
  - Product / deliverable characteristics to be controlled.
  - Process characteristics to ensure the identified product characteristics are realized
  - Identification of any measurement requirements, acceptance criteria
  - Records to be generated
  - Need for any documented procedure
- The quality planning shall result into the quality assurance plan, inspection and test plans (ITPs) and job procedures for the project activities in the scope of bidder. These documents shall be submitted to EIL/Owner for review/approval, before commencement of work.
- 5.5 Requirements for sub-ordering of outsourced items /sub-contracting / purchasing of services specified in MR/ contract / tender shall be adhered to. In general all outsourced items will be from approved vendors of EIL. Wherever requirements are not specified, or approved sub vendors do not exist, the sub-contractor shall establish and maintain a system for purchasing / sub-contracting to ensure that purchased product / service conforms to specified requirements in concurrence with EIL / Owner. Criteria for selection of sub-contractor, evaluation, re-evaluation, maintenance of purchasing data and verification of purchased product (sub-contractor services), constitute important components of this requirement.
- 5.6 BIDDER shall plan and carry production and service provision under controlled conditions. Controlled conditions shall include, as applicable
- a) the availability of information that describes the characteristics of the product
  - b) the availability of work instructions
  - c) the use of suitable equipment
  - d) the availability and use of monitoring and measuring devices
  - e) the implementation of monitoring and measurement
  - f) the implementation of release, delivery and post-delivery activities
- 5.7 BIDDER shall validate any processes for production and service provision where resulting output cannot be verified by subsequent monitoring and measurement. This includes any process where deficiencies become apparent only after the product is in use or service has been delivered.
- 5.8 BIDDER shall establish a system for identification and traceability of product / deliverable throughout product realization. Product status with respect to inspection and testing requirements shall be identified.
- 5.9 BIDDER shall identify, verify, protect and safeguard EIL / Owner property (material / document) provided for use or incorporation into the product. If any Owner / EIL property is lost, damaged or otherwise found to be unsuitable for use, this shall be reported to the EIL / Owner.

BIDDER shall ensure the conformity of product / deliverable during internal processing and delivery to the intended destination. Requirements mentioned in the MR/ tender shall be adhered to.

- 5.10 BIDDER shall establish system to ensure that inspection and testing activities are carried out in line with requirements. Where necessary, measuring equipment shall be calibrated at specified frequency, against national or international measurement standards; where no such standard exists, the basis used for calibration shall be recorded. The measuring equipment shall be protected from damage during handling, maintenance and storage.
- 5.11 BIDDER shall ensure effective monitoring, using suitable methods, of the processes involved in production and other related processes for delivery of the scope of contract.
- 5.12 BIDDER shall monitor and measure the characteristics of the product/deliverable to verify that product requirement has been met. The inspection (stage as well as final) by BIDDER and EIL / Owner personnel shall be carried out strictly as per the approved ITPs or ITPs forming part of the contract. Product release or service delivery shall not proceed until the planned arrangements have been satisfactorily completed, unless otherwise approved by relevant authority and where applicable by Owner / EIL.
- 5.13 BIDDER shall establish and maintain a documented procedure to ensure that the product which does not conform to requirements is identified and controlled to prevent its unintended use or delivery
- 5.14 All non-conformities (NCs) / deficiencies found by the BIDDER'S inspection / surveillance staff shall be duly recorded, including their disposal action shall be recorded and resolved suitably. Effective corrective actions shall be implemented by the BIDDER so that similar NCs including deficiencies do not recur. The BIDDER shall take appropriate actions to address the Risks and Opportunities in the project.
- 5.15 All deficiencies noticed and reported by EIL / Owner shall be analysed by the BIDDER and appropriate corrective actions shall be implemented. BIDDER shall intimate EIL / Owner of all such corrective action implemented by him.
- 5.16 BIDDER should follow the standards, specifications and approved drawings. Concessions/Deviations shall be allowed only in case of unavoidable circumstances. In such situations Concession/deviation request must be made by the BIDDER through online system of EIL vendor portal for document exchange. URL of EIL vendor portal for document exchange is <http://edocx.eil.co.in/vportal>. BIDDER shall have documented procedure for control of documents.
- 5.17 All project records shall be carefully kept, maintained and protected for any damage or loss until the project completion, then handed over to EIL / Owner as per contract requirement (Refer Specification Nos. 6-78-0002 - Specification for Documentation Requirements from Contractors and 6-78-0003 - Specification for Documentation Requirements from Suppliers), or disposed as per relevant project procedure.

## 6.0 AUDITS

BIDDER shall plan and carry out the QMS audit for the job. Quality audit program shall cover design, procurement, construction management and commissioning as applicable including activities carried out by sub-vendors and sub-contractors. This shall be additional to the certification body surveillance audits carried out under BIDDER'S own ISO 9001 certification scheme.

The audit programs and audit reports shall be available with bidder for scrutiny by EIL / Owner. EIL or Owner's representative reserves the right to attend, as a witness, any audit conducted during the execution of the WORKS.

In addition to above, EIL, Owner and third party appointed by EIL/Owner may also perform Quality and Technical compliance audits. BIDDER shall provide assistance and access to their systems and sub-contractor / vendor systems as required for this purpose. Any deficiencies noted shall be immediately rectified by BIDDER.

## 7.0 DOCUMENTATION REQUIREMENTS

BIDDER shall submit following QMS documents immediately after award of work (Within one week) for record / review by EIL / Owner/ TPIA(Third Party Inspection Agency), as applicable:

- Organization chart (for complete organization structure and for the project)
- Project Quality Plan/Quality Assurance Plan
- Job specific Inspection Test Plans, if not attached with PR
- Job Procedures
- Inspection/Test Formats

In addition to above QMS documents, following documentation shall be maintained by the BIDDER for submission to EIL / Owner on demand at any point of time during execution of the project:

- Quality Manual
- Certificate of approval for compliance to ISO9001 standard
- Procedure for Control of Non-conforming Product
- Procedure for Control of Documents
- Sample audit report of the QMS internal and external audits conducted during last one year
- Customer satisfaction reports from at least 2 customers
- Project QMS audit report
- Technical audit reports for the project
- Corrective action report on the audits

Documents as specified above are minimum requirements. BIDDER shall submit any other document/data required for completion of the job as per EIL/Owner instructions.

आपूर्तिकर्ताओं से प्रलेखन  
अपेक्षाओं हेतु विनिर्देश

## SPECIFICATION FOR DOCUMENTATION REQUIREMENTS FROM SUPPLIERS

|                    |             |                                  |                         |                         |                                     |                                  |
|--------------------|-------------|----------------------------------|-------------------------|-------------------------|-------------------------------------|----------------------------------|
| 3                  | 29-09-2025  | General Revision                 | QMS Standards Committee | QMS Standards Committee | AK                                  | MN                               |
| 2                  | 01-06-2020  | General Revision                 | QMS Standards Committee | QMS Standards Committee | SKB                                 | SKS                              |
| 1                  | 12-03-2015  | General Revision                 | QMS Standards Committee | QMS Standards Committee | MPJ                                 | SC                               |
| 0                  | 04-06-2009  | Issued as Standard Specification | QMS Standards Committee | QMS Standards Committee | SCT                                 | ND                               |
| <b>Rev. No.</b>    | <b>Date</b> | <b>Purpose</b>                   | <b>Prepared by</b>      | <b>Checked by</b>       | <b>Standards Committee Convener</b> | <b>Standards Bureau Chairman</b> |
| <b>Approved by</b> |             |                                  |                         |                         |                                     |                                  |

## Abbreviations:

|          |                               |
|----------|-------------------------------|
| DCI      | Document Control Index        |
| EIL      | Engineers India Limited       |
| EPS      | Electronic Procurement System |
| FOA      | Fax of Acceptance             |
| IC       | Inspection Certificate        |
| IRN      | Inspection Release Note       |
| ITP      | Inspection and Test Plan      |
| LOA      | Letter of Acceptance          |
| LR       | Lorry Receipt                 |
| MR       | Material Requisition          |
| ODC      | Over Dimension Consignment    |
| PO       | Purchase Order                |
| PR       | Purchase Requisition          |
| PVC      | Polyvinyl Chloride            |
| QAP      | Quality Assurance Plan        |
| QMS      | Quality Management System     |
| RPO      | Regional Procurement Office   |
| TPIA     | Third Party Inspection Agency |
| URL      | Universal Resource Locator    |
| V-Portal | Vendor Portal                 |

## QMS Standards Committee

**Convener:** Mr. Anil Kumar

**Members:** Mr. Himangshu Pal (SCM-Inspection)  
Mr. Ravindra Kumar (Const.)  
Mr. Vinod Kumar (CQA)  
Mr. Swapnil Vaishnav (Projects)  
Mr. Vijay Kumar Garg (SCM)  
Mr. Raju Kumar Pandey (Equipment Division)



## 1.0 SCOPE

This specification establishes the Documentation Requirements from Suppliers.

All documents/data against the PO / PR / MR shall be developed and submitted to EIL/Owner by the suppliers for review / records, in line with this specification.

## 2.0 DEFINITIONS

### 2.1 Supplier

For the purpose of this specification, the word “SUPPLIER” means the person(s), firm, company or organization who has entered into a contract with EIL / Owner for delivery of some products and/or services. The word is considered synonymous to bidder, contractor or vendor.

### 2.2 Owner

Owner means the owner of the project for which services / products are being purchased and includes their representatives, successors and assignees.

## 3.0 REFERENCE DOCUMENTS

- Specification for Quality Management System Requirements from Bidders (Doc. No. 6-78-0001)

## 4.0 DOCUMENTATION REQUIREMENTS

### 4.1 Order Acknowledgement and Assigning Project Manager

After placement of order, Supplier shall acknowledge order through V-Portal within 7 days of receipt of FOA/PO. Supplier shall assign a Project Manager for that order through online portal and provide requisite details. Project Manager details shall include e-mail address, mailing address, mobile/telephone nos., fax nos. and name of Project Manager. All the system generated emails pertaining to that order shall be sent to the assigned Project Manager.

### 4.2 Documents/Data to be submitted by the Supplier

4.2.1 The Supplier shall submit the documents and data against the PO/PR/MR as per the list given in respective PO/PR/MR.

4.2.2 Review of the supplier drawings/ documents by EIL would be only to review the compatibility with basic designs and concepts and in no way absolve the supplier of his responsibility/contractual obligation to comply with PR requirements, applicable codes, specifications and statutory rules/regulations. Any error/deficiency noticed during any stage of manufacturing/execution/inspection/ installation shall be promptly corrected by the supplier without any time and cost implications, irrespective of comments on the same were received from EIL during the drawing review stage or not.

4.2.3 Unless otherwise specified, submission of documents for Review/Records shall commence as follows from the date of Fax of Intent /Letter of Intent/ Fax of Acceptance (FOA)/ Letter of Acceptance (LOA):

|                          |   |  |
|--------------------------|---|--|
| QMS                      | - | 1 week                                 |
| Document Control Index   | - | 2 weeks                                |
| Other Documents/Drawings | - | As per approved Document Control Index |

4.2.4 Documents as specified in PO/PR/MR are minimum requirements. Supplier shall submit any other document/data required for completion of the job as per EIL/Owner instructions.

#### 4.3 Style and Formatting

4.3.1 All Documents shall be in ENGLISH language and in M.K.S(Meter-Kilogram-Second) System of units.

4.3.2 Before forwarding the drawings and documents, contractor shall obtain the title block from EIL and ensure that the following information are properly mentioned in each drawing:

- Purchase Requisition Number
- Name of Equipment / Package
- Equipment / Package Tag No.
- Name of Project
- Client
- Drawing / Document Title
- Drawing / Document No.
- Drawing / Document Revision No. and Date

#### 4.4 Review and Approval of Documents by Supplier

4.4.1 All, the Drawing/Documents shall be reviewed, checked, approved and duly signed/stamped by supplier before submission. Revision number shall be changed during submission of the revised supplier documents and all revisions shall be highlighted by clouds. Whenever the supplier requires any sub-supplier drawings to be reviewed by EIL, the same shall be submitted by the supplier duly reviewed, approved and stamped by the supplier. Direct submission of sub-supplier's drawings without contractor's / suppliers' approval shall not be entertained.

#### 4.5 Document Category

Following review codes shall be used for review of supplier Drawings/Documents:

- |               |   |   |
|---------------|---|---|
| <b>Code 1</b> | - | No comments. Proceed with Manufacture / Fabrication / Construction as per the document.                         |
| <b>Code 2</b> | - | Proceed with Manufacture / Fabrication / Construction as per commented document. Revised document required.     |
| <b>Code 3</b> | - | Document does not conform to basic requirements as marked. Resubmit for review.                                 |
| <b>Code R</b> | - | Document is retained for Records. Proceed with Manufacturing / fabrication as per Tender/ Contract Requirement. |
| <b>Code V</b> | - | Void, Document is returned as invalid.  |

Document is marked as Void under following conditions:

- a) Wrong item drawing uploaded.
- b) Superseded or obsolete submission.
- c) Duplicate submission.
- d) Out of sequence submission.
- e) Mismatch in document name and title under which document uploaded.
- f) Document not legible.
- g) For PMC projects, document not signed and stamped by contractor and DEC

## 4.6 Methodology for Submission of Documents to EIL/Owner

### 4.6.1 Document Control Index (DCI)

Supplier shall create and submit Document Control Index (DCI) for review based on PO/PR/MR along with schedule date of submission of each drawing/document on EIL Vendor Portal. The DCI shall be specific with regard to drawing/document no. and the exact title. Proper sequencing of the drawings/documents should be ensured in schedule date of submission.

### 4.6.2 Submission of Drawings/Documents / Data

Drawings/documents, data and DCI shall be uploaded on the EIL Vendor Portal as per approved DCI. The detailed guidelines for uploading documents on EIL Vendor Portal are available on URL: <http://edocx.eil.co.in/vportal>

### 4.6.3 Statutory Approvals

Wherever approval by any statutory body is required to be taken by Supplier, the Supplier shall submit copy of approval by the authority to EIL.

### 4.6.4 Manufacturing Schedule

Supplier shall prepare milestone based (milestones such as document submission, sub ordering, manufacturing, Inspection, dispatches, etc.) manufacturing schedule for the order, to meet delivery as per FOA/PO terms. Supplier shall submit manufacturing schedule to concerned Regional Procurement Office (RPO) of EIL, with a copy to Head office monitoring team/Owner for review within 7 days from date of FOA/PO. Same shall be uploaded in the EPS portal of EIL i.e., <https://www6.eil.co.in/epsinspection/supp>

### 4.6.5 Schedule and Progress Reporting

Supplier shall submit Monthly Progress Report (MPR) on or before the 9<sup>th</sup> of every month indicating following milestone-based progress details as minimum:

- Drawing submission and approval status and schedule for submission of revised drawing / fresh Drawing requiring approval as per approved DCI
- Sub-ordering plan/details for all major items indicating item description, sub-order number, Date of sub-ordering, sub-vendor name, Location, contractual delivery data and expected delivery dates at main vendor's shop and other critical details requiring timely receipt of sub-ordered items at shop.
- Shop manufacturing progress indicating major milestone progress, in case of missing any milestone date, catch up plan for the same and expected dispatch date from shop and expected delivery date at site.
- Area requiring special attention/concern and proposed action plan to resolve the same.

First Monthly Progress Report (MPR) shall be submitted within 2 weeks from FOA/LOA. In case of exigencies, EIL/Owner can ask for report submission as required on weekly/fortnightly/ad-hoc basis depending upon supply status and supplier shall furnish such reports promptly without any price implication. Format for progress report shall be submitted by the Supplier during kick off meeting or within 2 weeks of receiving FOA/LOA, whichever is earlier.

## 4.7 Inspection and Testing

### 4.7.1 Quality Assurance Plan/Inspection and Test Plan

If Inspection and test plans (ITP) are attached with MR/PR same shall be followed along with additional tests requirement (if any) mentioned in MR/ PR. However for cases wherein EIL Standard ITPs not available/ have not been attached with MR/PR, Supplier shall submit within one week of receiving FOA/LOA, the Quality Assurance Plan for inspection & testing at various stages of production, quality control records for critical bought out items/ materials and site assembly & testing as may be applicable to the specific order and obtain approval from concerned Regional procurement Office of EIL/third party inspection agency, as applicable.

For Package equipment contracts, the supplier shall prepare a list of items/ equipment and their inspection categorization plan for all items included in the scope of supply immediately after receipt of order and obtains approval for the same from EIL. The items shall be categorized into different categories depending upon their criticality for the scope of inspection of TPIA and/or EIL.

### 4.7.2 Inspection Requirements:

Supplier shall perform internal inspection as per ITP/ approved QAP at their works based on approved documents/drawings. Upon satisfactory internal inspection, supplier shall raise inspection call through Inspection call Module of EPS (<https://www6.eil.co.in/epsinspection>) to concerned Regional Procurement Office (RPO) of EIL/ TPIA/ Owner with advance notice as per contract along with Internal test reports. Where inspection is not in the scope of EIL and is carried out by nominated Third Party Inspection agency (TPIA), Inspection Release Note (IRN) issued by the nominated TPIA along with Manufacturer's Test Certificate (MTC) shall be uploaded in EIL EPS Portal (<https://www6.eil.co.in/epsinspection>).

All changes w.r.t. PR shall be recorded through agreed variations or Concessions & Deviations. Conflict, if any, between PR / Job specifications and approved drawings, shall be brought to the notice of EIL / owner by the supplier/ contractor. Decision of EIL / owner will be binding on the supplier and to be complied without time and cost implications.

Identified bought out items/ raw material shall be procured under TPIA as per ITP.

### 4.7.3 Inspection Release Note (IRN)/ Inspection Certificate (IC)

IRN/ IC shall be issued by EIL Inspector/ third party inspection agency on successful inspection, review of test reports/ certificates as per specifications & ITP/ agreed quality plan (as applicable) and only after all the drawings/documents as per DCI are submitted and are accepted under review code-I or code R. Supplier shall ensure that necessary documents/manufacturing and test certificates are made available to EIL/TPIA as and when desired.

Note 1: Non fulfilling above requirement shall result into appropriate penalty or with- holding of payment as per conditions of PO/PR/MR.

Note 2: For items where IRN/IC is issued by TPIA, supplier to ensure that following as a minimum must be mentioned by TPIA in IRN/IC:

- a) PR document number
- b) List of drawings/documents with EIL approval code
- c) Tests witnessed, documents reviewed



Final Documentation shall be bound in Hard board Plastic folder(s) of size 265 mm x 315 mm (10½-inch x 12½-inch) and shall not be more than 75 mm thick. It may be of several volumes and each volume shall have a volume number, index of volumes and index of contents of that particular volume. Where number of volumes are more, 90mm thickness can be used. Each volume shall have top PVC sheet of minimum 0.15 mm thick duly fixed and pressed on folder cover and will have 2 lever clips. In case of imported items documents, 4 lever clip shall also be accepted. All four corners of folders shall be properly metal clamped. Indexing of contents with page numbering must be incorporated by supplier. Spiral/Spico bound documents shall not be acceptable. As mentioned above, books should be in hard board plastic folders with sheets punched and having 2/4 lever clips arrangement.

Each volume shall contain on cover a Title Block indicating package Equipment Tag No. & Name, PO/Purchase Requisition No., Name of Project and Name of Customer. Each volume will have hard front cover and a reinforced spine to fit thickness of book. These spines will also have the title printed on them. Title shall include also volume number (say 11 of 15) etc.

#### 4.11.4 Submission of Soft Copies

Supplier shall submit to EIL, the scanned images files as well as the native files of drawings/documents, along with proper index.

In addition to hard copies, Supplier shall submit soft copies of all the final drawings and documents in pen drive or any other specified medium with proper identification tag, all text documents prepared on computer, scanned images of all important documents (not available as soft files), all relevant catalogues, manuals available as soft files (editable copies of drawings/text documents, while for catalogues/manuals/proprietary information and data, PDF files can be furnished). All soft files shall be appropriately named, systematically indexed, and duly bookmarked in PDF format to facilitate ease of reference and access.

All the above documents shall also be uploaded on the EIL Vendor Portal and if applicable on Client Server also.

#### 4.11.5 Completeness of Final Documentation

Supplier shall get the completeness of final documentation verified by EIL/TPIA, as applicable, and attach the Format for Completeness of Final Documentation (Format No. 3-78-0004) duly signed by EIL Inspector or TPIA as applicable to the final document folder.

**COMPLETENESS OF FINAL DOCUMENTATION**

Name of Supplier/Contractor :  
 Customer :  
 Project :  
 EIL's Job No. :  
 Purchase Order No./ Contract No. :  
 Purchase Requisition No./ Tender No. : Rev. No.:  
 Name of the Work/ Equipment :  
 Tag. No. :  
 Supplier's/ Contractor's Works Order No. :

Certified that the Engineering Documents/ Manufacturing & Test Certificates submitted by the supplier (as per Index sheet mentioned in Annexure-1) are complete in accordance with the Vendor Data Requirements of Purchase Requisition / Tender.

|             |         |             |         |
|-------------|---------|-------------|---------|
| Signature   | : ..... | Signature   | : ..... |
| Date        | : ..... | Date        | : ..... |
| Name        | : ..... | Name        | : ..... |
| Designation | : ..... | Designation | : ..... |
| Department  | : ..... | Department  | : ..... |

Supplier/Contractor

EIL/TPIA



# अपकेंद्रीय क्षैतिज पम्प के लिए निरीक्षण और परीक्षण योजना (विशेष प्रयोजन प्रक्रिया)

## INSPECTION AND TEST PLAN FOR PUMP CENTRIFUGAL HORIZONTAL (SPECIAL PURPOSE PROCESS)

|                 |             |                           |                    |                   |                                     |                                  |
|-----------------|-------------|---------------------------|--------------------|-------------------|-------------------------------------|----------------------------------|
| 4               | 23.05.20    | REVISED AND RE-ISSUED     | TV                 | RMR               | RKS                                 | SKS                              |
| 3               | 20.03.14    | REVISED AND RE-ISSUED     | TKK                | RKS               | SCG                                 | SC                               |
| 2               | 18.06.13    | REVISED AND RE-ISSUED     | TKK                | RKS               | SCG                                 | DM                               |
| 1               | 21.01.08    | REVISED AND RE-ISSUED     | SMG                | SS                | MVKK                                | VC                               |
| 0               | 23.07.02    | ISSUED FOR IMPLEMENTATION | VKJ                | TVD               | AKB                                 | GRR                              |
| <b>Rev. No.</b> | <b>Date</b> | <b>Purpose</b>            | <b>Prepared by</b> | <b>Checked by</b> | <b>Convener Standards Committee</b> | <b>Chairman Standards Bureau</b> |
|                 |             |                           |                    |                   |                                     | <b>Approved by</b>               |

**Abbreviations:**

|     |   |                                      |             |   |  |
|-----|---|--------------------------------------|-------------|---|--|
| AS  | : | Alloy Steel                          | NPSH        | : | Net Positive Suction Head                    |
| COC | : | Certificate of Compliance            | PESO        | : | Petroleum and Explosives Safety Organization |
| DFT | : | Dry Film Thickness                   | PMI         | : | Positive Material Identification             |
| EIL | : | Engineers India Limited              | PO          | : | Purchase Order                               |
| EPC | : | Engineering Procurement Construction | PQR         | : | Procedure Qualification Record               |
| EN  | : | European Norms                       | PR          | : | Purchase Requisition                         |
| HT  | : | Heat Treatment                       | QAP         | : | Quality Assurance Plan                       |
| HV  | : | High Voltage                         | RT          | : | Radiography Testing                          |
| IC  | : | Inspection Certificate               | Specs.      | : | Specifications                               |
| IRN | : | Inspection Release Note              | SQT         | : | Seal Qualification Test                      |
| ITP | : | Inspection and Test Plan             | SS          | : | Stainless Steel                              |
| LCP | : | Local Control Panel                  | Temp        | : | Temperature                                  |
| MOM | : | Minutes of Meeting                   | TPI or TPIA | : | Third Party Inspection Agency                |
| KW  | : | Kilo Watt                            | UCP         | : | Unit Control Panel                           |
| MRT | : | Mechanical Run Test                  | UT          | : | Ultrasonic Testing                           |
| MTC | : | Material Test Certificate            | VDR         | : | Vendor Data Requirement                      |
| MV  | : | Medium Voltage                       | VFD         | : | Variable Frequency Drive                     |
| NDT | : | Non Destructive Testing              | WPS         | : | Welding Procedure Specification              |
|     |   |                                      | WPQ         | : | Welders Performance Qualification            |

**Inspection Standards Committee**

**Convener:** Mr. R.K. Singh

**Members:**

|                     |   |  |                     |
|---------------------|---|--|---------------------|
| Mr. Rajesh Sinha    | Mr. Himangshu Pal                             | Mr. Chandrashekhar                           | Mr. Avdhesh Agrawal |
| Mr. Mahendra Mittal | Mr. R Muthuramalingam<br>(RPO Representative) | Mr. Tarun Kumar / Mr. Mahesh Gupta, Eqpt Div |                     |

### 1.0 SCOPE:

This Inspection and Test Plan covers the minimum testing requirements of Pump Centrifugal Horizontal (Special Purpose Process)

### 2.0 REFERENCE DOCUMENTS:

PO/PR/ Standards referred there in/ Job specifications /Approved documents.

### 3.0 INSPECTION AND TEST REQUIREMENTS:

| SL. NO     | STAGE/ACTIVITY   | CHARACTERISTICS   | QUANTUM OF CHECK | RECORD               | SCOPE OF INSPECTION |          |  |
|------------|--|---|------------------|----------------------|---------------------|----------|--|
|            |  |   |                  |                      | SUB SUPPLIER        | SUPPLIER | EIL/TPIA                                     |
| <b>1.0</b> | <b>Procedures / Documents</b>  |   |                  |                      |                     |          |  |
| 1.1        | Pressure test, MRT, Performance test, NPSH tests, NDT as applicable, Heat Treatment as applicable, Dynamic Balancing Test of Impeller, Nozzle load test, String Test as applicable and other procedure as applicable | Documented Procedures                                     | 100%             | Procedures           | -                   | H        | R  |
| 1.2        | WPS, PQR, WPQ -<br>1) Qualification for Overlay<br>2) Repair welding procedures  | Welding procedure Qualification, Welder parameters        | 100%             | WPS/PQR/ WPQ Records | -                   | H        | W- New,<br>R – Existing<br>(Note-3)          |
| 1.3        | Pre-Inspection meeting   | Verification of technical requirements as per PR/contract | 100%             | MOM                  | -                   | H        | W/R<br>(For <160KW)<br><br>H<br>(For >160KW) |

| SL. NO | STAGE/ACTIVITY   | CHARACTERISTICS  | QUANTUM OF CHECK | RECORD  | SCOPE OF INSPECTION |          |               |
|--------|--|--|------------------|---|---------------------|----------|---------------|
|        |  |  |                  |   | SUB SUPPLIER        | SUPPLIER | EIL/TPIA      |
| 2.0    | <b>Material Inspection</b>   |  |                  |   |                     |          |               |
| 2.1    | Incoming Material<br>Casing, Stuffing Box, Impeller,<br>Shaft Material, Wear rings &<br>Bearing Housing (As applicable)            | Visual & Dimensions,<br>Chemical Properties /<br>Physical Properties, Heat<br>Treatment as per Specs<br>UT for Shaft & Other<br>Forgings and (#)Wear ring<br>differential hardness                 | 100%             | MTC , HT Chart,<br>Inspection Report,<br>COC for #  | H                   | H        | R<br>(Note-4) |
| 2.2    | Accessories-<br>Buffer Liquid Reservoir,<br>Barrier/Buffer Liquid Cooler,<br>Mechanical Seal, Seal Plan<br>Cooling (As applicable) | Pressure Test & Seal<br>Qualification test (As<br>applicable) for Mechanical<br>seal, Reservoir, coolers<br>Dynamic balancing of seal<br>and coupling.   | 100%             | MTC/ Inspection<br>& Test Record,<br>Pressure test report<br>and COC/ SQT<br>(if applicable) for<br>Mechanical Seal | H                   | H        | R<br>(Note-4) |
| 2.3    | Piping & Hardware Items-<br>Valves, Flanges, Pipes, Fittings,<br>Gaskets, Fasteners, Instruments<br>etc (As applicable)            | Visual &<br>Other Requirement as per<br>purchase specification /<br>Approved Documents   | 100%             | MTC & Inspection<br>Report  | H                   | H        | R<br>(Note-4) |
| 2.4    | Motor / VFD (As applicable)<br>*(supplier/sub supplier to arrange<br>TPIA certification)   | 1) Type test/ Routine test of<br>Motor, VFD & Other test<br>requirement as per<br>purchase specification /<br>Approved Documents<br>2) MTC review<br>3) PESO Certificate review<br>(As applicable) | 100%             | MTC & Inspection<br>Report  | H                   | H*       | W<br>(Note-7) |
| 2.4.1  | Combined testing of motor &<br>VFD (As applicable)<br>*(supplier/sub supplier to arrange<br>TPIA certification)                    | 1) Routine Test & Type Test<br>2) PESO requirement<br>(As applicable)  | 100%             | MTC & Inspection<br>/ Test Records  | H                   | H*       | W<br>(Note-7) |

| SL. NO     | STAGE/ACTIVITY   | CHARACTERISTICS  | QUANTUM OF CHECK               | RECORD                                 | SCOPE OF INSPECTION |          |                            |
|------------|--|--|--------------------------------|--|---------------------|----------|----------------------------|
|            |  |  |                                |  | SUB SUPPLIER        | SUPPLIER | EIL/TPIA                   |
| 2.5        | Steam Turbine (As applicable)  | MRT of Turbine & & Other checks as per approved QAP (Note-8) | 100%                           | MTC & Inspection Report / Test Records | H                   | H        | W (Note-6)                 |
| 2.6        | Gear box (As applicable)   | MRT of gear box & Other checks as per approved QAP (Note-8)  | 100%                           | MTC & Inspection Report                | H                   | H        | W (Note-6)                 |
| 2.7        | Lube Oil system (As applicable)  | Functional test & Other checks as per approved QAP (Note-8)  | 100%                           | MTC & Inspection Report                | H                   | H        | W (Note-6)                 |
| 2.8        | LCP/UCP (As applicable)  | Functional Test & Other checks as per approved QAP (Note-8)  | 100%                           | MTC & Inspection Report                | H                   | H        | W (Note-6)                 |
| <b>3.0</b> | <b>In Process Inspection</b>   |  |                                |  |                     |          |                            |
| 3.1        | NDT (As applicable) for Casing, Impeller, Stuffing Box, Shaft Casing to Nozzle butt weld | Surface and Internal imperfections                           | 100%                           | Test Reports, RT films & NDT report    | -                   | H        | R                          |
| 3.2        | Pressure test before Assembly of Pump casing (In un-painted condition) & stuffing box    | Leak Tightness Check   | Each Set                       | Inspection and Test Records            | -                   | H        | R                          |
| 3.3        | Impeller / Rotor assembly  | Dynamic Balancing  | Each Impeller / Rotor assembly | Inspection and Test Records            | -                   | H        | W - 1 per Tag<br>R - Spare |

| SL. NO     | STAGE/ACTIVITY  | CHARACTERISTICS  | QUANTUM OF CHECK | RECORD   | SCOPE OF INSPECTION |          |   |
|------------|---|--|------------------|--|---------------------|----------|---|
|            |   |  |                  |  | SUB SUPPLIER        | SUPPLIER | EIL/TPIA  |
| 3.4        | Nozzle Load test<br>(As applicable if specified in PR)              | Stiffness of base-plate and Suction/Discharge Nozzles  | 100%             | Inspection Report  | -                   | H        | R - For existing, reports as per quoted model<br><br>W - 1 per model if reports are not available |
| <b>4.0</b> | <b>FINAL INSPECTION</b>   |  |                  |  |                     |          |   |
| 4.1        | Testing of Pumps  | 1) Performance test<br>2) NPSH (R) (As applicable)<br>3) MRT for 4 hours duration<br>(To measure Vibration Limits, Noise level, Bearing Temp Rise) | Each Pump        | Inspection and Test Records, Calibration records of driver | -                   | H        | H   |
| 4.2        | Dismantle inspection of pump after performance test / MRT (4 hours) | 1) Visual insp. of casing inside surface<br>2) Wear ring area visual Check<br>3) Clearance measurement<br>4) Examination of Mechanical seal        | Each Pump        | Inspection and Test Records                                | -                   | H        | W   |
| 4.3        | Unitization of Pump with job driver on a common job base Frame      | Alignment of pump with driver and Check Direction of Rotation  | Each Set         | Inspection and Test Records                                | -                   | H        | W   |

| SL. NO     | STAGE/ACTIVITY   | CHARACTERISTICS  | QUANTUM OF CHECK | RECORD  | SCOPE OF INSPECTION |          |          |
|------------|--|--|------------------|---|---------------------|----------|----------|
|            |  |  |                  |   | SUB SUPPLIER        | SUPPLIER | EIL/TPIA |
| 4.4        | Complete Unit String Test along with all accessories (As applicable) | Mechanical Performance of the Train (Vibration Limits, bearing/oil temperature, Driver parameters and controls)  | Each Set         | Inspection and Test Records                   | -                   | H        | H        |
| 4.5        | Testing of auxiliary piping (If applicable)                          | Leak Tightness   | Each Set         | Inspection and Test Records                   | -                   | H        | R        |
| 4.6        | Job Instruments if applicable  | Compliance to PR requirements  | 100%             | MTC & Statutory certification (As applicable) | W                   | H        | R        |
| 4.7        | Testing and Measuring Instruments                                    | Validity of calibration & accuracy   | 100%             | Calibration Report                            | W                   | H        | R        |
| 4.8        | Final Pump skid Assembly & Spares verification                       | Visual, Nozzle dimensions including foundation dimensions of base frame, Battery Limits Check, Overall skid completeness check and PMI Check of all SS & AS components and welds on Skid | 100%             | Inspection Report                             | -                   | H        | H        |
| <b>5.0</b> | <b>Painting</b>  |  |                  |   |                     |          |          |
| 5.1        | Surface Preparation & Painting of all Carbon Steel Parts of Skid     | Visual Inspection for workmanship, Panting Scheme, Paint Shade, Painting DFT Check   | 100%             | Inspection Report                             | -                   | H        | R        |
| 5.2        | Pickling & Passivation for Stainless Steel Parts (As applicable)     | Visual Inspection for workmanship  | 100%             | Inspection Report                             | -                   | H        | R        |

| SL. NO     | STAGE/ACTIVITY   | CHARACTERISTICS                                      | QUANTUM OF CHECK | RECORD                           | SCOPE OF INSPECTION |          |          |
|------------|--|--|------------------|----------------------------------|---------------------|----------|----------|
|            |  |  |                  |                                  | SUB SUPPLIER        | SUPPLIER | EIL/TPIA |
| 5.3        | Packing & Preservation                                   | Visual Inspection for workmanship                    | 100%             | Inspection Report                | -                   | H        | -        |
| <b>6.0</b> | <b>Documentation &amp; IC/IRN</b>                        |  |                  |                                  |                     |          |          |
| 6.1        | Stamping and review of inspection documents, issue of IC | Review of documents for compliance as per PR.        | 100%             | Inspection Certificate (IC)      | -                   | -        | H        |
| 6.2        | Review of final documentation of supplier                | Compilation of documents as per VDR attached with PR | 100%             | Dossier / Completion certificate | -                   | H        | H        |

**Legend:** H- Hold (Do not proceed without approval), P-Perform, RW - Random Witness (As specified or 10% (minimum 1 number of each size and type of Bulk item)), R-Review, W-Witness (Give due notice, work may proceed after scheduled date).

**NOTES (As applicable):**

1. This document describes the generic test requirements. Any additional test or Inspection scope if specified in contract documents shall also be applicable. (Unless otherwise agreed upon)
2. Acceptance Norms for all the activities shall be as per PO/PR/Standards referred there in /Job Specification /Approved Documents.
3. WPS/PQR/WPQ Shall be qualified & certified by a reputed TPIA.
4. Certifications shall be as per EN 10204 Type 3.1 except for Mechanical seal & wear ring hardness.
5. Bought out items to be procured from EIL/Client approved suppliers.
6. Third Party Inspection Certifications shall be as per EN 10204 Type 3.2 and TPIA shall be arranged by supplier.
7. Inspection Test Requirements of Motors shall be as per EIL ITP 6-81-1064 (MV Motors), 6-81-1031 (HV Motors), 6-81-1038 (MV VFDs), 6-81-1050 (HV VFDs).
8. Separate QAPs for Steam Turbine, Gear Box, Lube Oil System & Local Control Panel (LCP/UCP) and all other bought out / sub-ordered items (As applicable) shall be submitted for EIL/ TPIA review / approval.
9. For EPC jobs, all inspection shall be carried out by TPIA, unless notified otherwise.

अग्निरोधक नियंत्रण स्टेशन  
के लिए  
विनिर्देश

SPECIFICATION  
FOR  
FLAMEPROOF CONTROL STATIONS

|             |          |  |             |            |                              |                           |
|-------------|----------|--|-------------|------------|------------------------------|---------------------------|
| 6           | 29.9.20  | REVISED AND ISSUED AS STANDARD SPECIFICATION | NNB/ RKS    | ANPS       | SA                           | SM                        |
| 5           | 24.02.16 | REVISED AND ISSUED AS STANDARD SPECIFICATION | NNB/AK      | ANPS       | BRB                          | SC                        |
| 4           | 11.04.11 | REVISED AND ISSUED AS STANDARD SPECIFICATION | PS          | ANPS       | UAP                          | DM                        |
| 3           | 24.08.07 | REVISED AND ISSUED AS STANDARD SPECIFICATION | ANPS        | UAP        | JMS                          | VC                        |
| 2           | 30.01.02 | REVISED AND ISSUED AS STANDARD SPECIFICATION | UAP         | AAN        | VPS                          | GRR                       |
| Rev. No     | Date     | Purpose                                      | Prepared by | Checked by | Standards Committee Convenor | Standards Bureau Chairman |
| Approved by |          |  |             |            |                              |                           |

**Abbreviations:**

|      |   |
|------|---|
| AC   | Alternating Current   |
| BIS  | Bureau of Indian Standards  |
| CEA  | Central Electricity Authority   |
| CT   | Current Transformer   |
| DC   | Direct Current  |
| FRLS | Flame Retardant Low Smoke   |
| FRP  | Fibre Reinforced Plastic  |
| GI   | Galvanised Iron   |
| IEC  | International Electro-technical Commission                            |
| IP   | Ingress Protection  |
| IS   | Indian Standards  |
| LED  | Light Emitting Diodes   |
| LV   | Low Voltage   |
| MR   | Material Requisition  |
| NABL | National Accreditation Board for Testing and Calibration Laboratories |
| PB   | Push Button   |
| PESO | Petroleum and Explosives Safety Organisation                          |
| PVC  | Poly Vinyl Chloride   |
| SMD  | Surface Mounted Device  |
| SWG  | Standard Wire Gauge   |
| XLPE | Cross Linked Poly Ethylene  |

**Electrical Standards Committee**

**Convenor:** Ms. Sumita Anand

**Members:** Mr. Parag Gupta  
Mr. M. K. Sahu  
Ms. Arvind N. P. Singh  
Mr. Harish Kumar  
Ms. Shalini Verma  
Mr. Raman Sood  
Mr. V. K. Jain  
Ms. Shirali Aggarwal  
Mr. Ayush Mathur (Projects)  
Mr. Rajesh Sinha (Inspection)

## CONTENTS

|     |   |   |
|-----|---|---|
| 1.0 | SCOPE.....                              | 4 |
| 2.0 | CODES AND STANDARDS.....                | 4 |
| 3.0 | GENERAL REQUIREMENTS.....               | 4 |
| 4.0 | SITE CONDITIONS.....                    | 4 |
| 5.0 | CERTIFICATION .....                     | 4 |
| 6.0 | TECHNICAL REQUIREMENTS.....             | 5 |
| 7.0 | INSPECTION, TESTING AND ACCEPTANCE..... | 6 |
| 8.0 | PACKING AND DESPATCH .....              | 7 |

## 1.0 SCOPE

This specification covers the requirements of design, manufacture, testing, packing and supply of flameproof control stations and accessories suitable for installation in locations handling flammable liquids and gases/ vapors.

## 2.0 CODES AND STANDARDS

2.1 The equipment shall comply with the requirements of latest revision of the following standards issued by BIS:

|                  |   |
|------------------|---|
| IS-5             | : Colours for ready mixed paints and enamels.   |
| IS-1248          | : Direct acting indicating analogue measuring instruments and their accessories.                          |
| IS / IEC 60079-0 | : Electrical apparatus for explosive gas atmospheres (General Requirements).                              |
| IS / IEC 60079-1 | : Electrical apparatus for explosive gas atmospheres (Equipment Protection by Flameproof Enclosures "d"). |
| IS / IEC 60529   | : Degree of protection provided by enclosures (IP Code).  |
| IS / IEC 60947   | : LV switchgear and control gear.   |

2.2 In case of imported equipment, only IECEx (or equivalent, if more stringent than the applicable IEC) certified equipment shall be used.

2.3 The equipment shall also conform to the provisions of CEA Regulations with latest amendments and other statutory regulations currently in force in the country.

2.4 In case Indian standards are not available for any equipment, standards issued by IEC or equivalent agency (if more stringent than IEC) shall be applicable.

2.5 In case of any conflict between requirements specified in various applicable documents for the project, the most stringent requirement shall govern. However, Owner/ EIL's decision in this regard will be final and binding.

## 3.0 GENERAL REQUIREMENTS

3.1 The offered equipment shall be brand new with state of art technology and having proven field track record. No prototype equipment shall be offered.

3.2 Vendor shall ensure availability of spare parts and maintenance support services for the offered equipment for at least 10 years from the date of supply.

## 4.0 SITE CONDITIONS

The equipment shall be suitable for installation and satisfactory operation in classified hazardous locations in tropical, humid and corrosive atmosphere as prevalent in refineries, petrochemical and fertilizer plants. Unless otherwise specified, a design ambient temperature of 40° C and an altitude not exceeding 1000 m above mean sea level shall be considered.

## 5.0 CERTIFICATION

The equipment shall have test certificates issued by NABL-approved/ Central Government labs in India/ IECEx-approved/ equivalent labs). All equipment (indigenous & imported) shall also have valid statutory approvals as applicable for the specified location and marking as per IS/ IEC 60079 or IEC 60079 and as required by statutory authorities. All indigenous flameproof equipment shall have valid BIS license.

## 6.0 TECHNICAL REQUIREMENTS

### 6.1 Construction

- 6.1.1 The enclosures of the control stations shall be made of cast light metal alloy, unless otherwise specified. The enclosures of the control stations intended for use in units handling sulphuric acid/ other corrosive materials shall be made of stainless steel grade SS-316L, if specified in MR/ tender.
- 6.1.2 The control stations shall be suitable for use in outdoor open locations and shall have minimum IP-55 degree of protection. They shall preferably be provided with integral canopy. However, where the enclosure has been certified without integral canopy, a separate canopy can be accepted. The separate canopy shall be made of at least 1.6 mm (16 gauge) galvanised sheet steel/ FRP/ stainless steel minimum SS-304 (as specified in purchase specifications). The canopy shall be suitable for providing protection against rain from top, back and two sides.
- 6.1.3 The control station enclosure shall be provided with gaskets for IP, if required by equipment certification. Gaskets, wherever provided, shall be made of non-inflammable and self-extinguishing material.
- 6.1.4 All metal surfaces shall undergo manufacturer's standard cleaning/ painting/ powder coating cycle. After surface preparation, the equipment shall be painted with two coats of epoxy based final paint or epoxy powder coated with minimum coating thickness of 80 microns, with colour shade as below:
- Flame proof (Gas group IIA/ IIB) : Dark admiralty grey shade 632 of IS-5/ RAL 7031
  - Flame proof (Gas group IIC) : Light yellow shade 355 of IS-5/ RAL 1012
- All unpainted parts shall be suitably treated to prevent rust formation/ corrosion. If these parts are moving then these shall be greased. Grease, which does not solidify, shall be applied to flamepath. However, in case of Stainless Steel control stations, finish shall be Electropolish/ Buffed/ equivalent finish.
- 6.1.5 Equipment shall be marked as per IS/IEC 60079.
- 6.1.6 All accessories like nuts, bolts, washers etc. and operating shaft of push buttons, switches etc. shall be made of stainless steel SS-304. Alternatively, Nickel-plated brass material may be used for the operating shafts of push buttons, switches etc.
- 6.1.7 The control stations shall be provided with two earthing studs (minimum M10 bolt, nut with spring and plain washer) with lugs on the external surface of the enclosures suitable for termination of 8 SWG GI wire. No screw type fixing arrangement shall be allowed.
- 6.1.8 The control station shall be provided with two cable entries at bottom, and one entry to be blocked with flameproof nickel plated brass sealing plug, unless otherwise specified. Required number of flameproof double compression nickel plated brass cable glands shall be provided. The cable termination chamber of the control station shall be large enough to provide a minimum space of 100mm between top of the cable gland and bottom of the terminal block.
- 6.1.9 The control stations shall have external fixing lugs for mounting on wall or column. The holes provided on these lugs shall be of oblong type.
- 6.1.10 A tag plate indicating Tag Number shall be provided on each control station. A nameplate shall be provided to indicate the Name of Manufacturer, test certificate number, serial number, BIS license number, applicable gas group etc. as per IS/IEC 60079 and any additional marking required by statutory authority like approval no. etc. The nameplates shall be engraved type or laser-marked and permanently fixed on the equipment. In case the standard details given above are embossed on the enclosures, the same need not be repeated on the name plate. All

tag plates shall be engraved, 3 ply laminate fixed with screws and name plate shall be Al anodized or SS-304 engraved or laser-marked and fixed with rivets.

- 6.1.11 All flameproof control stations shall be suitable for 240V AC as well as 110V/ 220V DC control supply.

## 6.2 Component Specification

- 6.2.1 Push buttons for START/ OPEN and STOP/ CLOSE shall be of GREEN and RED colour respectively. The STOP push button shall be mushroom type with stay put feature and lockable in pressed position. Refer Sketch 1 for wiring and other details for various types of local control stations.
- 6.2.2 All selector switches shall have minimum two poles for each position. Each position of switch shall be indelibly marked on the control station. Exact configuration of selector switch (e.g. LOCAL-OFF-REMOTE) shall be as per datasheet/ MR requirement.
- 6.2.3 All ammeters shall be of moving iron type having an accuracy class of 1.5 and suitable for 1 Ampere CT secondary. Minimum size of ammeter shall be either 72mm x 72 mm or 65 mm diameter. 80% of the scale length shall cover 100% of the CT primary current uniformly and the balance 20% of the scale shall cover 100-800% of the CT primary. A red mark corresponding to the full load current of the motor shall be provided on the ammeter dial. The ammeter front glass shall be toughened.
- 6.2.4 Indicating lamp(s) wherever provided shall be clustered LED type or SMD chip type LED with colour lens of minimum 25mm diameter.

## 6.3 Terminals & Wiring

- 6.3.1 The control stations shall be provided with sufficient number of terminals. More than 2 wires per terminal shall not be permitted. If required, additional terminal with shorting link may be used. Each terminal for external cable connection shall be suitable for termination of 2.5 mm<sup>2</sup> (unless otherwise specified) stranded copper conductor. Tinned copper lugs shall be provided for cable termination wherever applicable.
- 6.3.2 All internal wiring shall employ 1.5 mm<sup>2</sup>, 660V/ 1100V grade, FRLS type, XLPE/ PVC insulated copper conductor wires. All termination shall be with suitable lugs.

## 7.0 INSPECTION, TESTING AND ACCEPTANCE

- 7.1 During fabrication, the equipment shall be subjected to inspection by EIL/ Owner or by an agency authorized by the Owner, as per agreed Inspection Test Plan. Manufacturer shall furnish all necessary information concerning the supply to EIL/ Owner's inspector. All routine/acceptance tests shall be carried out at manufacturer's works under his care & expense.
- 7.2 Type test certificates from NABL-approved/ Central Government Labs in India/ IECEx-certified/ equivalent Labs, Manufacturer's works test reports, applicable PESO approval and BIS license shall be shown to the inspection agency on demand during inspection. The certificates, BIS license and PESO approval must be valid at the time of despatch.
- 7.3 Test certificates of bought out components shall be submitted to the inspection agency, as per Inspection and Test Plan no. 6-81-1006.
- 7.4 All equipments shall be subjected to various routine / acceptance tests as per Inspection and Test Plan no. 6-81-1006.

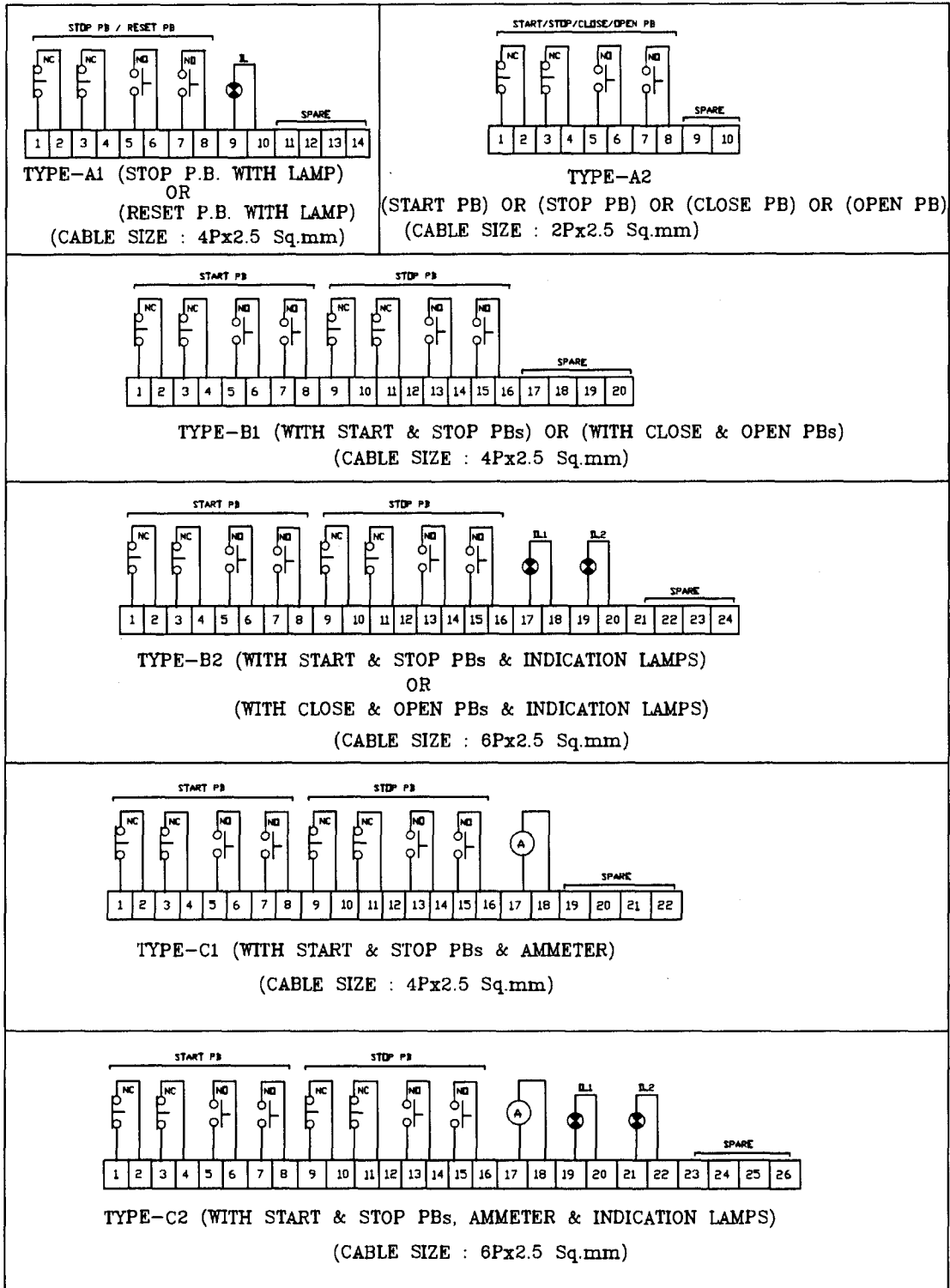
## 8.0 PACKING AND DESPATCH

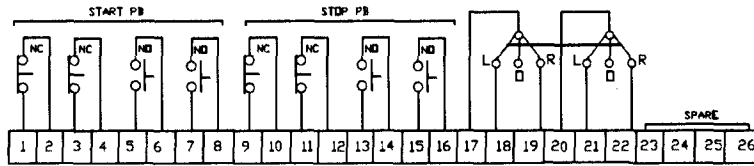
All the equipment shall be divided into several sections for protection and ease of handling during transportation. The equipment shall be properly packed for the selected mode of transportation, i.e. by ship/ rail or trailer, and shall be wrapped in polythene sheets before being placed in crates/ cases to prevent damage to finish. The crates/ cases shall have skid bottom for handling. Special notations such as 'Fragile', 'This side up', 'Center of gravity', 'Weight', 'Owner's particulars', 'PO no.' etc., shall be clearly marked on the packages together with other details as per purchase order.

The equipment may be stored outdoors for long periods before installation. The packing should be suitable for outdoor storage in areas with heavy rains and high ambient temperature unless otherwise agreed. A set of instruction manuals for installation, testing and commissioning, a set of operation & maintenance manuals and a set of final drawing shall be enclosed in a waterproof cover along with the shipment.

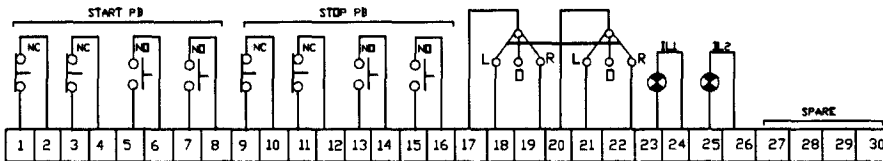
SKETCH-1

WIRING DETAILS OF LOCAL CONTROL STATIONS

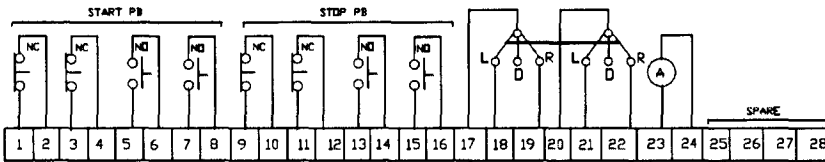




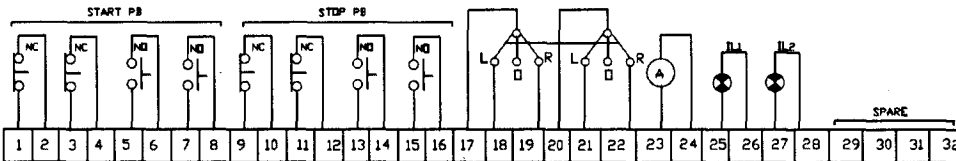
TYPE-D1 (WITH START & STOP PBs & L-O-R SELECTOR SWITCH)  
(CABLE SIZE : 6Px2.5 Sq.mm) (REFER NOTE-11)



TYPE-D2 (WITH START & STOP PBs, L-O-R SELECTOR SWITCH & INDICATION LAMPS)  
(CABLE SIZE : 12Px2.5 Sq.mm) (REFER NOTE-11)



TYPE-E1 (WITH START & STOP PBs, AMMETER & L-O-R SELECTOR SWITCH)  
(CABLE SIZE : 6Px2.5 Sq.mm) (REFER NOTE-11)



TYPE-E2 (WITH START & STOP PBs, AMMETER, L-O-R SELECTOR SWITCH & INDICATION LAMPS)  
(CABLE SIZE : 12Px2.5 Sq.mm) (REFER NOTE-11)

