Numaligarh Refinery Limited
Commercial Department

CORRIGENDUM NO. 2 TO NOTICE INVITING TENDER

Date : Nov. 03, 2017

Name of Work: Supply of centrifugal pump as per purchase specification Doc. No.: NRL-PS-201702 Rev.0 dtd.18.09.2017.

Tender no. : OC43000122 dated 13-10-2017

- The Annexure – III of the technical tender document has been changed and amended Annexure – III is enclosed. Bidder may consider the amended Annexure III during bid submission.

- Bidders (if any) who have already submitted their bids online, may if they wish, revise their bids during the bid submission period.

All other terms and conditions of the Tender Document remain unchanged.

CGM (Commercial & Legal)
Numaligarh Refinery Limited

CC:
→ NIC e-tender portal https://eprocure.gov.in/eprocure/app,
→ NRL website (www.nrl.co.in)

SL	ACTIVITY	INSP BY VENDOR	INSP BY TPIA	INSP BY NRL	RECORD
1)	Detailed Inspection & Test Plan after issue of PO/PR/PS including for all auxiliaries of the Pump skid like Pump driver, Lube oil console, API Plan, Instrumentation, Piping etc.	P	A	A*	X
2)	Inspection & Test Procedures like NDT, Hydro test, Performance test, Mechanical run test, Painting etc.	P	A	R**	X
3)	Pre inspection meeting, after issue of PO/PR/PS, agenda to be prepared by VENDOR	P	H		X
4)	Summary of all supplementary requirements as specified in the PO/PR/PS	P	A		X
5)	Sub order verification for Bought out items like Drivers, API Plan, LO Console, Piping etc.	P	R		X
6)	Inspection of Bought out items at Sub vendor's works for Drivers, API Plan, LO Console, Piping etc.	W	H		X
7)	Welding Procedure Specification & Procedure Qualification Records – Pressure retaining components of the Pump, API plan, Piping etc.	P	A		X
8)	Material Test Certificate in accordance with EN10204 3.1 / ISO10474 3.1B & meeting the requirements of Material specification, PR/PS/Design code – Pump components as Casing, Stuffing box, Bearing housing, Impellers, Shaft, Shaft sleeve, Wear rings, any other pressure retaining part / part exposed to process fluid. Also, oil pumps , oil filters , oil coolers, oil tank,	A	A		X
9)	Material Compliance Certificate for Gaskets, Fasteners, Gland Packing, Valves, Piping items, etc.	A	A		X
10)	Mechanical Seal (Testing & certificates / reports as per API 682 including Hydro test, Air test, Material certification)	A	A		X
11)	Coupling (Dynamic balancing report, Compliance certificate of Manufacturer)	A	A		X
12)	Manufacturer's Test Certificate / Calibration certificate for Instruments	A	A		X
13)	NDT Examination as per PR/PS/Design code				X
14)	Pump components as Casing, Stuffing box, Impellers, Shaft, Wear rings etc.	P	A		X
15)	API Plan	P	A		X
16)	Auxiliary piping, Plan piping	P	A		X
17)	Hydrostatic Pressure Test	P	H		
	a) All Pressure Casing components	P	H		X
	b) Auxiliary piping	P	H		X
	c) Plan Piping	P	H		X
	d) Cooling jacket of bearing, Stuffing box	P	H		X

"Compliance to NRL approved ITP would not relieve the vendor from delivering quality material/machinery and conformance to latest edition of relevant codes & standards and its performance & functionality in service"

SL	ACTIVITY	INSP BY VENDOR	INSP BY TPIA	INSP BY NRL	RECORD
	e) Pressure vessels	P	H		X
	f) Heat Exchangers	P	H		X
	g) Filters	P	H		X
	h) Other applicable items	P	H		X
18)	Dynamic balancing (including for Spares)				
	a) Individual Impellers	P	H		X
	b) Rotor assembly (as per PR/PS/Design code)	P	H		X
19)	Mechanical & Electrical run out of Shaft	P	R		X
20)	Lube Oil Console at sub vendor place				
	a) Pressure test	W	H		X
	b) Cleanliness check	W	H		X
	c) Mechanical running for 4 hours & Operation check	W	H		X
	d) Review of Material test certificates	A	A		X
	e) Review of Manufacturer's Test certificates & Reports for Motor, Pump, Instruments etc.	A	A		X
	f) Contract Drivers, & Instruments	W	A		X
	g) Check changeover valves	W	A		X
	h) Check Auto- Start, Running and stop of stand-by pumps	W	A		X
	i) Check controls and all instrument functions	W	A		X
21)	API Plan – Vessels, Coolers etc.				
	a) WPS / PQR	A	A		X
	b) NDT as per PR/PS/Design code	A	A		X
	c) Pressure test	W	H		X
	d) Visual & Dimensional check	W	H		X
	e) Review of Material test certificates	A	A		X
22)	Assembled Pump :				
	a) Performance Test as per PR/PS/Design code (with Mech run test) including Spare Rotor.	P	H	H**	X
	b) NPSH Test as per PR/PS/Design code	P	H	H**	X
	c) Vibration measurement as per PR/PS/Design code	P	H		X
	d) Sound level measurement	P	H		X

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SL	ACTIVITY	INSP BY VENDOR	INSP BY TPIA	INSP BY NRL	RECORD
	e) Mechanical running for 4 hours minimum (after stabilizing of Bearing temperature), with Bearing housing resonance test	P	H	H**	X
	f) Bearing temperature rise as per PR/PS/Design code : Bearing and lube oil.	P	H		X
	g) Strip test (Visual check & Wear ring clearance check)	P	H		X
23)	Complete unit Test / String Test (can be done with Performance / Mech Run test). Note-9 With all Job accessories: Motor / HPRT, coupling, seal, LO Console, Instruments, vibration/temp. probes , if required as per PR/PS/Design code	P	H		X
24)	Surface preparation & painting	P	A		X
25)	Final inspection of Complete Unit				
	a) Visual check for completeness & appearance	P	H		X
	b) Dimensional check	P	H		X
	c) DFT check of final painting	P	H		X
26)	Review of final documents, minimum as marked in the column for RECORDS	P	H	H**	X
27)	Final stamping & issue of Inspection release certificate.	H	H		X

LEGEND

1) Vendor,
2) TPAI – Third Party Inspection Agency Appointed By Vendor (LLOYDS, DNV & BVIS)
3) PMC – Project Mgt. Consultant,
4) Owner – NRL
5) H – Hold (Offer for Witness & Obtain Clearance),
6) W - Witness,
7) RN - Random Witness,
8) A – Review & Approve,
9) R – Review Only,
10) P – Perform,
11) X – Requirement of record.

NOTE

1) This is only an indicative ITP and vendor shall prepare a detailed ITP in line with above and specific technical requirements of applicable PR/PS/design code.
2) Vendor shall ensure that all test and measuring instruments are duly calibrated and calibration shall be valid at the time of inspection. Calibration procedure & records shall be reviewed by TPIA
3) Sub vendor for bought out items shall be from PMC / owner approved vendor list.
4) '*' indicates for category A, R only & '**' for Category A only

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5) PMI test shall be performed on all AS/SS pressure retaining pump components, auxiliary piping, API plan etc. At the time of pressure testing. PMI test shall be witness by TPIA
6) Foundation template, gage plate for base ring & foundation bolts shall be subject to a final inspection by TPIA including visual, dimensional check and review of test certificates.
7) Pump drivers shall be inspected at manufacturers shop as per relevant inspection & test plan.
8) No shipment of goods may be effected unless an 'inspection release certificate' has been submitted to seller.
9) Performance test for spare rotor to be done separately.
10) Vendor shall forward an ITP to NRL based on the technical input and relevant standard/ specification indicated in the purchase document and this typical indicative ITP. The ITP forwarded by the vendor shall be reviewed and approved by NRL. And, 3rd party inspection shall be carried out based on the approved ITP.
11) Vendor is also deemed solely responsible for compliance to relevant codes, standards, any applicable regulatory requirements and certifications, if required for the material/machinery under purchase.

"Compliance to NRL approved ITP would not relieve the vendor from delivering quality material/machinery and conformance to latest edition of relevant codes & standards and its performance & functionality in service"

Numaligarh Refinery Limited

(A Govt. of India Enterprise)

Single stage Centrifugal pump (Special Purpose Process Service) Purchase Specification

TAG NO.: 45-PA-025A, B & C, 45-PA-026A & B .

NRL – PS – 201702 REV.0 DTD. 18.09.2017

1. GENERAL

1.1. This specification along with equipment data sheets, applicable codes and standards, specifications attached, and referred to, describes the minimum requirements for design, selection, manufacture, inspection/testing, supply and supervision of erection & commissioning of the following '**SINGLE STAGE CENTRIFUGAL PUMPS**' for **M/s NUMALIGARH REFINERY**:

Equipment Tag No.

a) 45-PA-025A/B/C
b) 45-PA-026A/B

The new pumps shall be installed in the Crude Unloading facility at Numaligarh Refinery Marketing Terminal, Numaligarh.

1.2. In case of any conflict between this Job Specification and other enquiry documents, the governing order preference shall be:

1.2.1. Datasheets.

1.2.2. Job Specifications.

1.2.3. International Standards/Codes/recommended practices as applicable.

1.3. 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.

1.4. Along with compliance with this specification, vendor shall also have responsibility of furnishing equipment and accessories of proper design, materials and workmanship to meet the specified start-up and operating conditions.

2. SCOPE OF SUPPLY

Vendor's 'Scope of Supply' shall include the complete pump package along with the driver and other accessories and auxiliaries as described in data sheets and specifications, forming part of inquiry document. However, it shall be the responsibility of the vendor to ensure safe and satisfactory performance and maintainability of the offered equipment. For this purpose, in case vendor envisages additional equipment / instruments / control and safety devices, the same shall be offered by the vendor and included in his scope of supply. Such additional items shall be separately listed with acceptable reasons for their inclusion.

3. SAFETY

3.1. All controls shall operate in a fail-safe mode.

3.2. All electrical components & installations, instruments shall be suitable for the specified electrical area classification and grouping in which the equipment is installed.

3.3. Thermal relief valves 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).

4. UNITISATION 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.

5. LOADING & PENALTY CRITERIA

Enclosed Loading & Penalty Criteria shall be referred. (Refer attached Doc. No. NRMPS-IR-201713-LP Rev.0)

6. BID QUALIFICATION CRITERIA

The Bidder must be a manufacturer of API 610 pumps & must have supplied similar pumps to any petroleum Refinery in last 10 years for fluid service & operating condition (temperature & pressure) as mentioned in the Pump data sheets or higher.

Bidder must submit copy of Purchase order and satisfactory performance certificate for the same pump.

7. SPECIAL REQUIREMENTS

7.1. The pump package and associated equipment shall conform to API 610 latest edition.

7.2. Pumps shall be selected to have their rated operating point falling in the range of 80% to 110% of best efficiency point (BEP) flow.

7.3. Suction flange rating shall be same as that of discharge flange for all pumps.

7.4. No cast iron pressure containing parts shall be used for hydrocarbon service except for shaft driven lube oil pumps.

7.5. Pumps with inducers shall not be accepted.

7.6. Pumps shall be installed with bearing isolators. Bearing isolators shall be of non-contact type and shall meet the requirements of API 610.

7.7. Maximum allowable working pressure & temperature of the equipment shall be neither less than the design pressure & temperature specified in the data sheet nor less than those specified in specifications, codes & standards. Max. allowable case working pressure at 15 Deg. C & at specified design temperature shall be furnished by vendor in their proposal.

7.8. Pumps shall be directly driven by Electric motor.(Refer Electrical Job specification, Doc. No.NRMPS-IR-201714-ES Rev.0)

7.9. **Couplings** ***(Refer doc. No. NRMPS-IR-201716-CD Rev.0)***

7.9.1. Couplings shall be all metallic, non-lubricated, flexible element type (i.e. either diaphragm coupling or disc) with spacer. All coupling model shall be selected for a minimum service factor of 1.5 over driver rating.

7.9.2. Coupling guard shall be perforated and of non-sparking material .The guard shall be open at the bottom to permit manual shaft rotation. The guard shall be sufficiently rigid to withstand deflections as a result of bodily contact of nominally 100 kg.

7.9.3. The coupling shall have spacer of adequate length to enable maintenance of seal/bearings without dismantling any equipment of the train. The DBSE shall be more than the seal cartridge length.

7.9.4. Coupling for pumps with driver shall be as per API 610/API 671 as applicable.

7.10. Auxiliary Piping

7.10.1. It is envisaged that minimum piping work is required for the subject pump.

7.10.2. Bypass line shall be provided if the pump minimum flow is more than the Process Minimum Flow as specified in the data sheet. Vendor to clearly state if by-pass line is required for the quoted pump including the line sizing and schematic drawing.

7.10.3. All auxiliary piping interface connections shall be terminated with flanged valve at the equipment battery limit.

7.10.4. As a minimum piping material shall be stainless steel for seal flushing plans and shall be carbon steel for cooling water plans.

7.10.5. The purchaser will provide utilities (like water, steam etc.) at single point inlet / outlet at the edge of base-plate of the pump for seal cooler and/or bearing cooling. The terminating flanges at the skid edge shall be of 3/4"(min.) size. Vendor shall provide sight flow glass at each CW outlet.

7.10.6. Vendor must furnish in their offer the quantities of utilities required for respective pump items in the Utility & Lubricant Data in formats attached with the Enquiry Document. (Refer attached Doc. No. NRMPS-IR-201715-UD Rev.0) Cooling water shall be used for bearing/gland/seal cooling unless otherwise specified.

7.10.7. Equipment nozzles especially at purchaser's interface shall be as per purchaser's piping specifications (refer pump data sheet). Companion flanges along with gaskets and fasteners shall be supplied by the equipment vendor.

7.11. Equipment Noise Level

Equipment noise level (Driver + Driven equipment train + auxiliaries) shall not exceed 88 dBA when measured at One-meter distance from the equipment skid in any direction. Vendor to note that the above specified noise limit shall be guaranteed at site by the vendor.

7.12. **Equipment Layout**

These new pumps shall be installed at the existing location/foundation of the pumps. Equipment base plate should be designed to suit the existing foundation with no or minimum modification. However, bidder may suggest any strengthening of the foundation required for the new pumps. For pump foundation drawings refer to Annexure-I herein.

7.13. **Mechanical Seals**

7.13.1. Mechanical Seals shall be as per API Standard 682, 3rd Edition or later.

7.13.2. Stuffing Box dimensions shall be as per applicable API Standard.

7.13.3. The pump manufacturer shall obtain seal manufacturer recommendations regarding the above & furnish the same along with their proposal.

7.13.4. Mechanical seals and seal support systems shall be suitable for max shutoff pressure/casing design pressure under static condition.

7.13.5. Mechanical seals (as per API Std. 682, 3rd Ed. Or later) shall be from any

one of the following make:

7.13.5.1. EagleBurgmann India Private Limited.

7.13.5.2. Flowserve Sanmar Ltd.

7.13.5.3. John Crane (I) Ltd.

7.13.6. In case the offered mechanical seal is intended to be supplied by the Indian counterparts of the manufacturers specified in vendor list above, following requirements shall be met:

7.13.6.1. For standard mechanical seals, for which Seal Qualification tests (SQT) has been conducted by the principals, critical components such as Bellows, Springs and Seal Faces shall be sourced from their principals.

7.13.6.2. For Engineered seals, the complete mechanical seal along with sleeve and gland plate shall be sourced from their principals. Seal drawings shall be from principals/duly vetted by Principals.

7.13.6.3. Seal drawing shall be furnished from principals with technical bid.

7.13.7. For standard mechanical seals, SQT shall have been conducted on the proposed mechanical seal model(s). Related certificates shall be submitted with the equipment supply.

7.13.8. Any Mechanical seal offered under “Engineered Seal” category or seal having high dynamic sealing pressure (>= 20 Kg/cm2) shall be subjected to Seal Qualification Test (SQT) at manufacturer’s facility. All seals installed in one pump per item / tag shall undergo SQT 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 condition commensurate with either API 682 conditions or the conditions expected during operation in normal as well as startup / shutdown conditions, whichever is more stringent. However, for temperature, API limit of 260 degree C may be followed for testing. SQT certificates shall be furnished as a part of final documentation.

7.13.9. Mechanical seal shall be suitable for maximum shutoff pressure under static condition for pusher type seals. For Bellow seal, Mechanical seal shall be suitable up to bellow design pressure as a minimum.

7.13.10 Orientation of seal pot and auxiliary connections: The interface points for auxiliary connections (i.e. cooling water supply/return, other connections etc.) as well as the seal reservoir (if applicable) shall be located on the Left Hand Side, when viewed from non-drive end of pump, of the pump skid.

7.14. **Instrumentation**

7.14.1. The pump manufacturer shall supply necessary instruments for the pump as well as the seal support system (if applicable).

7.14.2. Any additional instrumentation required for the safe operation of the pump shall be clearly indicated by the vendors at the time of bidding and the same shall be included in their supply.

7.14.3. If Pump re-circulation line is applicable, necessary instrumentation like control valve, flow meter etc. shall be supplied by pump manufacturer. Supplied instruments shall be of reputed Make.

7.15. Electrical

Refer to Electrical job specification. Doc. No. NRMPS-IR-201714-ES Rev.0.

7.16. Inspection and Tests

7.16.1. The scope of inspection and tests shall be as per the Inspection & Test Plan format enclosed with the tender. Vendor shall take into consideration the complete testing requirements while committing equipment delivery schedules.

7.16.2. Owner and/or his Consultant may participate along with the 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.

Owner's inspection witness shall not relieve the manufacture/supplier from responsibility of furnishing equipment and accessories of proper design, materials, workmanship and reliability to meet or exceed the specified start-up and operating conditions.

7.16.3. 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.

8. SPARE PARTS

8.1. Mandatory spares

Vendor shall quote for the mandatory spare parts for each pump item as specified in the inquiry document (refer doc. NRMPS-IR-201712 Rev.0). Cost of mandatory spares shall be added to the equipment cost for commercial evaluation of the proposal.

Unit price of each of the listed spares shall be indicated separately in the Proposal. These items shall have equipment Tag no, drawing no, Model no, part no, metallurgy, etc.

8.2. Quotation of Spares for 2 Years Normal Operation

Vendor shall furnish along with the bid a quote for minimum recommended spares for 2 years normal & continuous operation of the complete pumping unit (including mechanical, electrical & instrumentation spares) required over & above the mandatory spares. Unit rates for each recommended spares shall be mentioned in the quotation. These may be ordered separately at owner's discretion.

The quote for the components shall have equipment Tag no, drawing no, Model no, part no, metallurgy, etc.

8.3. Commissioning Spares

Commissioning Spare Parts shall be procured along with the main equipment as per equipment manufacturer's recommendations. This includes the spares required for erection & commissioning of the pump-motor units. The list of such recommended spares shall be furnished along with the offer. Any commissioning spare consumed over and above the recommended commissioning spares during commissioning shall be supplied free of cost by the equipment vendor at site. Any leftover (unused) spares after commissioning, out of those included by vendor in his offer, shall be handed over to NRL.

8.4. Special Tools and Tackles

Vendor shall categorically specify requirement of special tools & tackles for maintenance or operation, if any, and shall be included in the vendor's scope of supply for each pump item.

9. VENDOR DATA AND DRAWING

Complete equipment load and GA drawing with all requisite information to decide pilling requirements, if any, shall be furnished within 15 days of order placement.

10. EQUIPMENT STORAGE

10.1. All pumps shall be packed for an outdoor storage period of 12 months.

10.2. All the openings shall be plugged & sealed condition during dispatch.

10.3. Instruments like gauges, speed indicators, probes, oiler etc. shall be removed from the main equipment and dispatched separately properly packed to avoid damage during transportation handling and erection.

10.4. In addition to the normal packing the pump and motor skids shall be separately covered with durable waterproof cover with opening for piping.

11. BEARING LUBRICATION:

Bearing & bearing housing shall be designed for oil lubrication using mineral (hydrocarbon) oil. Provision shall be made for Oil mist (purge) lubrication as per API 610 standards.

12. INITIAL FILL

The initial fill of lubricants, sealing fluid & other consumable shall not be included in the scope of supply of pump vendor. However, vendor shall furnish a list of recommended make oils for bearing lubrication & Seal Pot Buffer Liquid (if applicable) in the offer. Vendor shall furnish filled in lubrication requirements also.

13. INSTALLATION CRITERIA

All pumps shall be suitable for outdoor installation. No equipment shelter shall be envisaged.

14. UTILITY REQUIREMENTS

Vendor shall furnish filled in utility requirements, as per format attached (Refer doc. RMPS-IR-201715-UD Rev.0) in this enquiry document for items in the offer.

15. SUPERVISION

Vendor shall provide his services for supervision during commissioning.

Supervisory cost of 02 days per pump shall be considered for the purpose of commercial evaluation. The Vendor shall indicate in his proposal cost of providing the above services on per diem basis. Vendor may propose separate rates for foreign specialist and Indian specialist, in such case proposed break up ratio for the same shall be provided.

The Billing period for supervision of installation & commissioning shall be considered from the day OEM's engineers arrives at NRL site up to the day he/she leaves NRL.

NRL shall provide local conveyance & accommodation at NRL's guest house free of cost. However, food shall be in vendor's scope.

To & Fro travelling cost for 01(one) person for commissioning & installation from vendors works to NRL site, shall be reimbursed by NRL at actual subject to a maximum of Rs. 10,000.00 (one way) against submission of travel documents viz. Boarding pass/Air tickets/train tickets etc.

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Numaligarh Refinery Limited
(A Govt. of India Enterprise)

DOCUMENTS TO BE SUBMITTED

Single stage Centrifugal pump Purchase
(*Special Purpose Process*)

DOC. NO. NRMPS-IR-201710-DS REV.0 DTD. 18.09.2017

Sl. No.	Description	With Bid	Post Order			Remarks
			For review	For Record	With manual (final)	
1	Cross Sectional Drawings (with Bill of material & Part Nos.) for Pump			✓	✓	
2	Pre-commissioning & commissioning procedures for the complete pump package			✓	✓	
3	GAD-Sealing system-seal plan			✓	✓	
4	Cross-sectional Drawings (with Bill of Materials & Part Nos.)- Gear Box/Couplings/Fluid Couplings			✓	✓	
5	Cross-sectional Drawings (with Bill of Materials & Part Nos.)- Sealing systems – Mechanical seal		✓		✓	
6	Dynamic balancing report (as applicable)			✓	✓	
7	Analysis Reports – Lateral critical speed analysis / Torsional critical speed analysis					
8	General Arrangement & Foundation drawing showing main as well as all associated equipment / skids (driven equipment, drive transmission devices, driver (turbine / motor / engine), lube oil system, details of foundation bolts, their location, foundation bolt pocket dimensions, foundation load data (static & dynamic), estimated quantity & detail.	✓	✓		✓	
9	Data Sheets for Couplings		✓		✓	
10	Coupling field alignment diagram			✓	✓	
11	List of Mandatory Spares (indicating exact name of the part, part no. and material of construction)	✓	✓		✓	
12	Quotation for recommended spare parts for two years of normal operation (indicating exact name of the part, part no. and material of construction)	✓		✓	✓	
13	List of recommended commissioning spares (indicating exact name of the part, part no. and material of construction)	✓		✓	✓	
14	List of recommended Special Tools & Tackles (indicating exact name of the part and part no.)	✓		✓	✓	
15	Supporting documents as per equipment qualification.	✓				
16	GAD for Pump			✓	✓	
17	Test Procedure(s) : Witness tests as specified in data sheets / other specs enclosed in the inquiry / MR or as required by approved ITP/QAP			✓	✓	
18	Curve for pump power-shaft speed v/s torque			✓	✓	
19	Installation, Operation & Maintenance manuals - Pump			✓	✓	
20	Data Sheets alongwith performance curves - Pump	✓	✓		✓	

Notes :

1. "TICK" denotes applicability.
2. Final documentation shall be submitted in hard copy (02 prints) and soft (two CDs/DVDs).
3. 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.
4. Bill of Material shall form part of the respective drawing.

Numaligarh Refinery Limited

(A Govt. of India Enterprise)

SITE UTILITY DATA

Single stage Centrifugal pump Purchase
(Special Process Purpose)

DOC. NO. NRMPS-IR-201711-SU REV.0 DTD. 18.09.2017

1. SITE DATA INFORMATION PLANT LOCATION

This section presents brief details of Plant Location.

Plant Location	:	Numaligargh (ASSAM)
State	:	Assam
Nearest Important Town	:	
Nearest Railway Station	:	Golaghat
Nearest Port	:	
Nearest National Highway	:	NH-39
Nearest Airport	:	Jorhat
Source of Water	:	EXISTING
Rainy season (Monsoon)	:	

METEOROLOGICAL DESIGN DATA

Relevant meteorological design data towards preparing process engineering specifications is as follows:

Sl. No.	Parameter		Minimum	Normal / Average	Maximum / Design
	(A) METEROLOGICAL DATA				
1	Elevation above mean sea level, m				
2	Barometric pressure, mbar				
3	Ambient temperature, ^{0}C		tmin= 5.0	tnor = 35	tmax= 38
4	Relative humidity, %		@ tmin	73%@ tnor	85%@ tmax= 38 ^{0}C
5	Rainfall Data:	(a) For 1-hour period		90 mm	
		(b) For 24-hour period		160 mm	
		(c) Annual			
6	Wind Data	(a) Wind velocity	36-140 kmph		
		(b) Prevailing wind direction	Northeast to South west		
7	Earthquake Design Criteria		As per IS: 1893 Seismic Factor – 0.04		
	(B) DATA FOR EQUIPMENT DESIGN				
1	Design dry bulb temperature, ^{0}C				35
2	Design wet bulb temperature, ^{0}C				27
3	Low ambient temperature for MDMT, ^{0}C				5
4	Design air temperature for air cooled exchangers where ***followed*** by water cooling, ^{0}C				35
5	Design air temperature for air cooled exchangers Where ***not followed*** by water cooling, ^{0}C				35
6	Coincident temperature and relative humidity for Air Blower / Air Compressor design.				

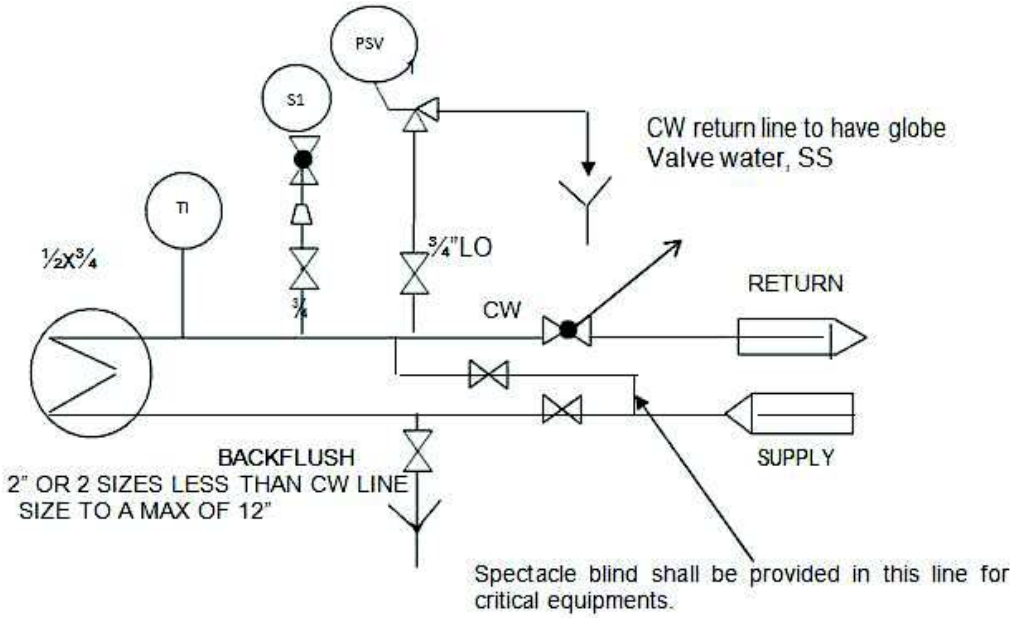
2. UTILITY SPECIFICATIONS

	Parameter	Minimum	Normal	Maximum	Mech Design
1	MEDIUM PRESSURE (MP) STEAM				
	Pressure, kg/cm2a	14.5	15.5	16.0	17.5/FV
	Temperature, oC	215	220	225	240
2	LOW PRESSURE (LP) STEAM				
	Pressure, kg/cm2a	4.5	5.0	5.5	7.5/FV
	Temperature, oC	155	165	170	200
3	COOLING WATER				
	Supply Pressure, kg/cm2a	4.5	5.0	6.0	9.0
	Return Pressure, kg/cm2a	3.0	3.5	4.5	9.0
	Supply Temperature, oC		33	35	70
	Return Temperature, oC			45	70
4	PLANT AIR				
	Pressure, kg/cm2a	4.5	6.5	7.5	11.5
	Temperature, oC	Amb	Amb	Amb	65
5	INSTRUMENT AIR				
	Pressure, kg/cm2a	4.5	6.5	7.5	11.5
	Temperature, oC	Amb	Amb	Amb	65
6	FUEL GAS				
	Pressure, kg/cm2a		4.0	4.5	8.0
	Temperature, oC		Amb	Amb.	65
7	INERT GAS				
	Pressure, kg/cm2a		5.5	6.5	10.0
	Temperature, oC		Amb	Amb.	65

3. Flare System

Pressure, back pressure/Operating/Design : 1.7/ 2.7 / 4.5 Kg/cm2A
Temperature, Operating/Design : Ambient / 250 ˚C

4. Typical cooling water piping and instrumentation at heat exchangers



Note 1: backwash will be collected via UG header and sent to ETP on gravity flow.

5.0 WATER QUALITY

Parameters	Units	Cooling Water Quality
pH		7.0 -7.5 (max-7.8)
Cond	microS/cm	300-500
TDS	ppm CaCO3	200--400
Turbidity	NTU	<30
T. Hard	ppm CaCO3	100-250
Ca.Hard	ppm CaCO3	50-150
Mg. Hard	ppm CaCO3	50-100
M.Alk	ppm CaCO3	30-50
Silica	ppmSiO2	10--20
Chloride	ppmCl	20--50
Sulfate	SO4	100-200
Total Iron	ppm Fe	< 1.0
Ortho PO4	ppmPO4	8--10
Delta PO4	ppmPO4	<0.5
Meta PO4	ppm PO4	2--3
Org PO4	PPM PO4	2--3
Zinc	ppm Zn	1.0-2.0
FC	ppm Cl	0.3-0.5
COC	Recomm	3.0

Numaligarh Refinery Limited
(A Govt. of India Enterprise)

MANDATORY SPARE PARTS

Single stage Centrifugal pump Purchase
(*Special Process Purpose*)

DOC. NO. NRMPS-IR-201712-MS REV.0 DTD. 18.09.2017

Equipment Tag No. : 45-PA-025A/B/C (3 units), 45-PA-026A/B (2 units)

Total no. of Units Installed : 5.

Sl	Part Description	Quantity Required Per Tag	Remarks
A	**MECHANICAL**		
a	Dynamically balanced rotor	1 set (01 impeller & shaft in case of single stage pump)	
b	Mechanical seals	1 set	
c	Bearings	1 set	
d	Gaskets & O-rings	4 set	
B	**Coupling Spares**		
	a. Hub	1 set	
	b. Disc pack	1 set	
	c. Spacer	1 set	
C	**ELECTRICALS**		
a	Bearings	1 set	
b	Terminal / Bushing.	1 set	

Notes:

1. The word 'Set' means the quantity for full replacement of that part in equipment.
2. The bidder shall **INCLUDE** prices of all the mandatory spares (as defined above and as applicable to the proposed design of the equipment) **IN BASE PRICE.** 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.
3. Spare parts shall be identical in all respects to the parts fitted on the main equipment, including dimensions, material of construction and heat treatment.
4. The bidder is advised to furnish the above checklist, duly completed and consolidated, along with the techno-commercial offer (i.e. both unpriced and priced copies).
5. The word 'TYPE' means the Make, Model no., Type, Range, Size/ Length, Rating, Material as applicable.
6. Wherever % age is identified, Bidder shall supply next rounded figure.
7. This is a typical checklist for mandatory spare parts. Bidder to fill in this checklist separately for each quoted pump item in his offer.

Numaligarh Refinery Limited
(A Govt. of India Enterprise)

LOADING & PENALTY CRITERIA

Single stage Centrifugal Pump Purchase
(Special Purpose Process Service)

DOC. NO.NRMPS-IR-201713-LP REV.0 DTD.18.09.2017

1. SCOPE

This specification describes the loading & penalty criteria applicable to the Singles Stage Centrifugal Pumps (Special purpose process) and applicable to each pump.

2. PERFORMANCE GUARANTEES

Loading and penalty criteria shall be based on the guaranteed performance of the Pump. The parameter for loading shall be the Break Kilowatt (BKW) of the Pump at the guaranteed (certified) operating point specified in the data sheets.

2.1. PUMPS

Bidder shall furnish the guaranteed values for BKW of pumps 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.

3. LOADING CRITERIA

3.1. Total Cost

The total cost of each pump item (including all working & standby units) for evaluation purposes shall be computed as under:

TOTAL COST OF A PUMP ITEM FOR EVALUATION PURPOSES = A + B + C

Where:

A = Capital cost of each pump Item (including all working & standby items) including cost of Mandatory Spares, commissioning spares and special tools & tackles

B = Differential operating cost as defined hereunder

C = N X No. of days**(#)** X Per diem rate

Where,

N = No. of pumps including operating as well as standby.

(#) *No. of days to be considered for supervision and commissioning of each pump is 02 (two).*

3.2. Differential operating cost

3.2.1. Differential operating cost (B) is defined as under:

$B \text{ (in Rupees)} = N_{op} \times (BKW_E - BKW_R) \times C_F \times 8000 \times D_F$

Where,

N_{op} = Number of operating units

BKW_E = Guaranteed shaft power (kW) for the pump quoted by the bidder under evaluation.

BKW_R = Lowest quoted (guaranteed) pump BKW (amongst the technically acceptable bidders).

C_F = Cost of Electric Power, **6.50** Rupees per kWh.

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 (DF) is defined as under:

$$D_F = \sum_{N=2}^{n=k+1} \left\{ \frac{1}{\left\{1 + \left(\frac{X}{100}\right)\right\}^n} \right\}$$

Where:

k = Number of operating years for which loading is to be done as specified i.e. **5** Years

X = Percentage rate of interest **13.25% per year**

Note: The above formula considers one year time for start-up of operation.

3.2.3. The maximum loading to be applied however shall not exceed 10% of the totalcapital cost of each pump item i.e. (A) as defined in 3.1.

4. PENALTY CRITERIA

During the performance test at the vendor's works, in case the pump(s) fail to meetthe guaranteed values, the following procedure shall be followed.

4.1. Pump

In case during shop performance tests, the BKW consumed by the pump (as defined under clause 2.1) exceeds the stipulated guaranteed value by more than 4% the subject pump gets rejected.

However for excess power (kW) consumed over and above the guaranteed BKW upto a maximum of four percent the bidder shall be penalized for extra energy consumption for each pump having tested BKW greater than the guaranteed value, as defined hereunder:

The penalty shall be worked out on the basis of differential operating cost (P_C) as under:

$$P_C \text{ (in Rupees)} = M_F \times (BKW_T - BKW_G) \times C_F \times 8000 \times D_F$$

Where,

BKW_T = Pump BKW as obtained from shop test results

BKW_G = Guaranteed Pump BKW as defined in 2.1.

M_F = $$\text{Multiplying Factor} = \frac{\text{Number of operating units } (N_{op})}{\text{Total No. of Units } (N)}$$

4.2. The maximum penalty to be charged for non-conformance to guaranteed valuesduring the shop performance test of all pump(s) of an Item Number put together (including all working & standby units), shall not exceed **10**% of the total capital cost i.e. (A) as defined in 3.1.

This penalty shall be independent of any other penalties specified elsewhere in the bid/inquiry documents.

Numaligarh Refinery Limited
(A Govt. of India Enterprise)

ELECTRICAL JOB SPECIFICATION

Single Stage Centrifugal Pump Purchase
(*Special Purpose Process Service*)

DOC. NO. NRMPS-IR-201714-ES- REV.0 DTD.18.09.2017

1. SCOPE

The specification covers the design, manufacture, testing, packing and supply of three phase induction motors to NRL site.

2. CODES AND STANDARDS:

The squirrel cage induction motors and their components shall comply with the latest edition of following standards issued by BIS unless otherwise specified:

2.1. IS-5 Colours for ready mixed paints and enamels.
2.2. IS-325 Three phase induction motors.
2.3. IS 900 Code of practice for installation and maintenance of induction motors
2.4. IS-1076 Preferred numbers.
2.5. IS-1231 Dimensions of three phase foot mounted induction motors.
2.6. IS-1271 Thermal evaluation and classification of electrical insulation.
2.7. IS-2148 Flame proof enclosures of electrical apparatus.
2.8. IS-2223 Dimensions of flange mounted AC induction motors.
2.9. IS-2253 Designation for type of construction and mounting arrangement of rotating electrical machines.
2.10. IS-2254 Dimensions of vertical shafts motors for pumps.
2.11. IS-2968 Dimensions of slide rails for electric motors.
2.12. IS 3043 Code of practice for earthing
2.13. IS-4029 Guide for testing three phase induction motors.
2.14. IS-4691 Degrees of protection provided by enclosure for rotating electrical machinery.
2.15. IS-4722 Rotating electrical machines.
2.16. IS 4728 Terminal marking and direction of rotation forrotating electrical machinery
2.17. IS 4800 : Part 5 Enamelled round winding wires:Part 5 Wiresfor elevated temperatures
2.18. IS-4889 Method of determination of efficiency of rotating electrical machines.
2.19. IS-6362 Designation of methods of cooling of rotating electrical machines.
2.20. IS 6455 Single row radial ball bearings
2.21. IS 6457 Single row cylindrical roller bearings
2.22. IS-7816 Guide for testing insulation resistances of rotating machines.
2.23. IS-8223 Dimensions and output series for rotating electrical machines.
2.24. IS-8789 Values and performance characteristics for three phase induction motors.
2.25. IS-12065 Permissible limits of noise level for rotating electrical machines.
2.26. IS-12075 Mechanical vibration of rotating electrical machines.
2.27. IS 12360 Voltage bands for electrical installations including preferred voltages and frequency
2.28. IS-12802 Temperature rise measurement of rotating electrical machines.
2.29. IS-12824 Type of duty classes of rating assigned to rotating electrical machines.
2.30. IS-12615 Energy efficient Induction motors-Three phase squirrel cage.

The motor shall also confirm to the provisions of Indian Electricity rules and other statutory regulations currently in force in the country. Further, the Inductance, vibration and any other parameter limits if not covered by IS standards, but covered by IEC/ IEEE standards then the latest version of IEC/IEEE standards should be considered by the vendor.

3. GENERAL REQUIREMENTS:

3.1. The offered equipment shall be brand new, energy efficient with state of art technology and proven field track record.

3.2. Vendor shall ensure availability of spare parts and maintenance support services for the offered equipment at least for 15 years from the date of supply.

3.3. Insulation

Unless otherwise specified in the motor datasheet, motors shall be provided with class 'B' insulation as a minimum. In case of motors with class 'F' insulation the permissible temperature rise above the specified ambient temperature shall be limited to those specified in the applicable Indian standards for class 'B' insulation.

3.4. Bearing and lubrication:

Unless otherwise specified, the bearings shall be adequate to absorb the axial thrust produced by the motor itself or due to shaft expansion.

Bearings shall be capable of grease injection from outside without removal of covers with motors in the running condition. The bearing boxes shall be provided with necessary features to prevent loss of grease or entry of dust/moisture e.g. labyrinth seal. Where grease nipples are provided, these shall be associated, where necessary, with appropriate located relief devices which ensure passage of grease through the bearings.

Pre-lubricated sealed bearings maybe considered provided a full guarantee is given for 4 to 5 years of trouble free service without the necessity of re-lubrication.

3.5. Marking:

Reference of Standard IS: 12615 shall be prominently displayed in addition to data specified in IS: 325, the motor manufacturer shall add the appropriate efficiency class after the efficiency value on the nameplate.

4. TECHNICAL REQUIREMENTS:

4.1. The motor should be designed as per requirement of the pump. It should not be under rated.

4.2. For designing the motor, following Area Classification need to be considered:

4.2.1. Hazardous area classification: Zone-2
4.2.2. Gas group: IIA/IIB
4.2.3. Enclosure type: Ex-N or Ex-D
4.2.4. Ingress protection: IP 65 with motor canopy
4.2.5. Temp class: T3

4.3. For designing the motor Local control station (LCS), following Area Classification need to be considered:

4.3.1. Hazardous area classification: Zone-2
4.3.2. Gas group: IIA/IIB
4.3.3. Enclosure type: Ex-N or Ex-D
4.3.4. Ingress protection: IP 65 with canopy
4.3.5. Temp class: T3
4.3.6. For the motors cable entry size should be decided considering cable size required for the motor and the distance of cable from electrical panel/ substation to the motor. Cable sizing from Voltage drop calculation is in the scope of vendor.
4.3.7. Cable glands should be supplied with the motors as per Hazardous area classification.
4.3.8. Motors should have weather protection canopies.
4.3.9. Cable Terminal box and Cable entry position should be decided during engineering stage and should be confirmed from NRL. If existing cable can be used in the new motors, then the Terminal box of the motors should be towards left when viewed from motor NDE. Cable entry should be on side of Terminal box towards NDE side. It should not be from bottom of the terminal box.

4.3.10. The motor terminal box should have Bi-metallic lugs for power cable connection.
4.3.11. The motor should be supplied with Local Control Station (LCS) for each motor as per Hazardous area classification. Each LCS should consist of a moving Iron ammeter, Auto/manual switch, Start and stop switches.
4.3.12. The cable entry size should be suitable for a 10 core x 2.5 sq mm CU control cable. Cable entry Provision should be for 2 nos. of cables. Cable glands should also be supplied with the LCS. Space heater as per standard.
4.3.13. Vendor should quote for minimum commissioning spares viz. cooling fan, terminal box, terminal strips etc.
4.3.14. All motor performance datasheets and GA drawings should be furnished to NRL after engineering and before motor manufacturing.

5. INSPECTION AND TESTING:

5.1. All the routine tests and other acceptance tests shall be witnessed by NRL inspector along with third party inspection at manufacturer's shop. The vendor shall give NRL at least 4 weeks' notice for sending his representative to carryout final inspection and witness the tests

5.2. All tests shall be carried out at manufacture's shop under his care and expense.

5.3. The manufacture shall submit all internal test records of the tests carried out by him on the bought-out items, motor sub-assembly and complete motor assembly to the inspector before offering the motors for final inspection and testing.

5.4. The manufacture shall periodically carry out the following type tests as per applicable Indian Standards for all the frame sizes and ratings of motors:

5.4.1. Full load test and measurement of voltage, current, power and slip.
5.4.2. Measurement of starting torque, starting current, full load torque and pull out torque.
5.4.3. Measurement of efficiency and p.f. at 100 percent, 75 percent and 50 % load.
5.4.4. Temperature rise test.
5.4.5. Momentary overload test.
5.4.6. Measurement of vibration.
5.4.7. Measurement of noise level.
5.4.8. Over speed test.

The above tests must be carried out as per standard code and practice. The manufacture shall maintain test records and submit to NRL at the time of final inspection & testing. In no case, the test records shall be more than 5 years old. In special cases where the type tests are asked to be carried out, these shall be witnessed by NRL.

5.5. The manufacture shall carry out routine tests as per applicable Indian Standards on all the motors. Routine test not limited to the following shall form part of acceptance testing:

5.5.1. General check as per approved GA drawing (overall and mounting dimensions, terminal boxes, cable entries & gland sizes, lubrication, free rotation of shaft and cooling system).
5.5.2. Measurement of clearance in the terminal box.
5.5.3. Verification of type of terminals.
5.5.4. Verification of direction of rotation.
5.5.5. Measurement of winding resistance, inductance.
5.5.6. Insulation resistance test (before and after high voltage test)
5.5.7. High Voltage test
5.5.8. No load running measurement of voltages, current, powers input and speed.

5.5.9. Locked rotor measurement of voltages, currents, power input and torque (at reduced voltage).
5.5.10. Noise measurement.
5.5.11. Vibration measurement (with half key)
5.5.12. Shaft voltage & current measurements.
5.5.13. Testing of accessories/auxiliaries for correct functioning.

5.6. Though the motors shall be accepted on the basis of the satisfactory results of the tests at the manufacturer's works, it shall not absolve the vendor from liability regarding the proper functioning of the motor coupled to the driven equipment at site.

6. SPECIAL CONDITION FOR BIDDERS:

6.1. The motors offered shall be from EIL approved vendors only.

EIL approved vendors for LT Squirrel Cage Motors are: ABB, BHARAT BIJLEE, CGL, KEC, LAXMI HYDRAULICS PVT LTD. (SOLAPUR), ALSTOM, SIEMENS, ELGI, JYOTI, NGEF, SEW, NORD, HINDUSTAN MOTORS, LENZE.

6.2. The bidder should be OEM or authorised supplier of the product.

6.3. Bidder should load the third party inspection charges in the offer and shall mention the name of the Third Party for factory inspection.

7. SPECIAL CONDITION OF CONTRACTS:

7.1. Copies of CRMS / CMRI certificates for FLP / ATEX certification/Increased safety motors with PESO certification need to be provided.

7.2. New supplied motors GA drawing verification with the existing ones if required at NRL site will be under vendor scope. For any query/information required, the vendor has to visit NRL site prior to delivery.

7.3. Followings drawings and documents to be submitted in soft copies as well as hard copies.

7.3.1. Motor data sheet. It should mention Rotor Bar quantity also.
7.3.2. Factory test report. Certified type test copies
7.3.3. Hot and cold thermal withstand characteristics curves
7.3.4. Torque vs. slip curve
7.3.5. Load vs. frequency curve
7.3.6. Load vs. pf curve.
7.3.7. Torque vs. current curve
7.3.8. Speed vs. time curve
7.3.9. Load performance curve
7.3.10. Motor winding diagram
7.3.11. Motor dimensional drawing
7.3.12. Motor guarantee certificate
7.3.13. Motor GA Drawing mentioning all the components
7.3.14. Motor spare parts list with part numbers.

8. PACKING AND DESPATCH:

8.1. The motor and it's accessories (if any) shall be released for packing and despatch only after satisfactory inspection and acceptance by the purchaser's representative.

8.2. All the motors shall be separately packed for protection and ease of handling during transportation. The equipment shall be properly packed for transportation by air/rail/road. The equipment shall be wrapped in polythene sheets before being

placed in crates/cases to prevent damage to finish. Crates/cases shall have skid bottom for handling. Special notations such as 'Fragile', 'This side up', 'Centre of gravity', 'Weight', 'Owner's particulars', 'PO Nos' etc. shall be clearly marked together with other details as per purchase order.

8.3. Exposed components of motor like shafts, keys, couplings and terminal boxes shall be wrapped with suitable PVC clothes.

8.4. The equipment maybe stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage in areas with heavy rains/high humidity and high ambient temperature conditions.

9. GUARANTEE:

9.1. The vendor shall guarantee that the motor and it's accessories shall be free from all inherent defects in design, workmanship and material and that they will give trouble free and continuous service under the operating and design conditions, reckoned from the day on which the material is installed and commissioned or 18 months from the date of arrival at site whichever is later.

9.2. In the event of failure / damage during transportation or within agreed guaranteed period of motor and its accessories covered under guarantee, the vendor shall have the following choices:

9.2.1. The Motor or the defective component taken back to their works by the supplier for repairs / or replacement free of charge.

9.2.2. Repairing or replacing the motor or its defective component at site free of charge.

Numaligarh Refinery Limited
(A Govt. of India Enterprise)

UTILITY & LUBRICATION DATA FORMAT

Single Stage Centrifugal PumpPurchase
(*Special Purpose Process Service*)

DOC. NO.NRMPS-IR-201715-UD Rev.0

UTILITY & LUBRICATION DATA FORMAT

ITEM NO.						
PUMP MODEL						
SERVICE						
LIQUID						
SEAL PLAN						
OP. TEMP.						
COOLING PLAN REQD.						
BKW						
MOTOR RATING						
RPM						
UTILITY CONSUMPTION	**BUFFER/ BARRIER LIQ. PRESS. (KG/CM2)**					
	LP STEAM QTY. (NM3/HR)					
	TOTAL COOLING WATER (LPM) PER PUMP					
	CONNECTION TO FLARE PER PUMP (REQD./ NOT REQD)					
	INTERFACE WITH DCS					
	N2 REQD.					
	CASING VENT (YES/NO)					
NOZZLE ORIENTATION (SUCT./DISC.)						
NOZZLE SIZE NPS/DN (SUCT./DISC.)						
VAP. PRESS (KG/CM2A)						
LAH/LAL/PAH/ PAL						
PUMP MCF (M3/HR)						
BASE PLATE SIZE (MM X MM)						
WGT. (KGS)						

NUMALIGARH REFINERY LIMITED (A GOVT. OF INDIA ENTERPRISE)	CENTRIFUGALPUMP	DATASHEET NO. NRMPS-IR-201716-CD Rev.0

1	**GENERAL**										
2	Project :	NUMALIGARH REFINERY PROJECT				Job No. :					
3	Owner:	**M/s NRL**				Site :	**NRL, INDIA**				
4	Purchaser :	**M/s NRL**				Unit :	**NRMT**		Unit No.:	**45**	
5	Item No. :					Service :					
6	No. of Units :		Working :		Standby :						
7	Applicable to:		■Proposal		☐ Purchase		☐ As Built				
8	■: Scope, Option & Information specified by Purchaser. ☐ : Information required from and options left to vendor. Vendor to cross ( ) the selected option.										
9	☐ Driver:	Type:				Manufacturer:			Model:		
10		Nameplate Power (kW):				Service Factor:		S.No.:		Tag No.:	
11	☐ Driven Unit:					Manufacturer:			Model:		
12		Serial No.:							Tag No.		
13	Coupling Type:	☐ Flexible Element		☐ Gear		☐ Quill Shaft	☐ Other:				
14	☐ Manufacturer:			Model:		Size:		Assy. Dwg. No.:			
15											
16	☐ **CONDITIONS CONSIDERED FOR COUPLING SELECTION**					☐ **RATINGS**					
17	Conditions		Torque (kgf-m)	@ rpm			Torque (kgf-m)	@ rpm	Serv. Factor		
18	Normal					Normal					
19	Driven Rated Load					Peak					
20	Maximum Steady State					Momentary					
21	Maximum Transient					Shaft Juncture (Driving)					
22	Trip Condition					Shaft Juncture (Driven)					
23	Continouos Cyclic										
24	Other:										
25	☐ Frequency of Transients (Events/Time):					☐ Non-synchronus exciting frequency:					
26	■ Coupling Minimum Required Service Factor, SF: **1.5**					☐ Actual SF					
27	☐ Ambient Temperature (°C)nvv:		Maximum:			Minimum:					
28	Environment :	☐ Hyd. Chloride	☐ Hyd. Sulphide	■ Other: Offshore Platform							
29	**LUBRICATION**										
30	☐ Continuous	☐ Batch	■ Non-Lubricated			☐ Viscosity :		cP @	C		
31	☐ Filtration Microns:					☐ Pressure (kg/cm²g)		☐ Temp. (°C):			
32						☐ Flow (m^3/hr)					
33	**COUPLING DATA**										
34	☐ Shaft Separation (including thermal growth) (mm B.S.E):										
35		@ Ambient Temp.:		@ Normal Operation:			@ Maximum Transient:				
36	☐ Motor Rotor Float (mm):			☐ Limited End Float (mm):							
37	☐ Marine Type Required			☐ Flex-Hub Type Required (2.2.2)			☐ Electrically Insulated				
38	☐ Required Misalignment Capability :										
39		Steady State :	Angular ( ) :		Parallel Offset (mm):		Axial (mm):				
40		Transient :	Angular ( ) :		Parallel Offset (mm):		Axial (mm):				
41	☐ Maximum Allowable Misalignment :										
42		Steady State :	Angular ( ) :		Parallel Offset (mm):		Axial (mm):				
43		Transient :	Angular ( ) :		Parallel Offset (mm):		Axial (mm):				
44	☐ Component Balance	-**OR**-	■ Component Balance & Assembly Check Balance	-**OR**-	Component Balance with Assy. Balance						
45	☐ Residual Unbalance Check of Assembled Couplings					☐ Balance Repeatability Check					
46	■ Check sensitivity of Balance Machine										
47	☐ Max. Allowable Residual Unbalance	g-mm	Driver End :			Driven End :					
48	☐ Max. Actual Residual Unbalance	g-mm	Driver End :			Driven End :					
49	☐ Torsional Stiffness (kg-mm/Rad):										
50	☐ WR² (kg-m²):		Driver End :			Driven End :					
51	☐ Spacer Lateral Natural Frequency :			☐ Torque Capacity of Hub/Shaft Interface for keyless fits (kgf-m):							
52	**Flexible-Element Coupling:**										
53	☐ Initial Deflection (mm):		☐ Pre-Stretch	☐ Compression		☐ Max. Axial Deflection (mm):					
54	☐ Calculated Axial Natural Frequency:					☐ Test of ANF:		☐ Actual ANF:			
55	☐ Maximum Enclosure Temperature at Max. Continuous speed (C):										
56	REMARKS:										
57											
58											
59											
60											
61											

62	**MATERIALS**				
63	Component	Drive End Materials		Driven End Materials	
64	Hub / Flange				
65	Spacer				
66	Sleeve				
67	Flexible-Element				
68	Flexible-Element Guard				
69	Bolts				
70	Nuts				
71	☐ Protective Coating :		■ Vendor Standard	☐ Other:	
72	☐ Internal Teeth Hardness : Rockwell C		Drive End Actual :	Driven End Actual :	
73	☐ External Teeth Hardness : Rockwell C		Drive End Actual :	Driven End Actual :	
74	**COUPLING HUB MACHINING**				
75				Drive End	Driven End
76	☐ Type (Integral / Cylinderical / Taper)				
77	☐ Keyed or Hydraulically Fitted				
78	☐ Taper (Note-1)				
79	☐ Keyway Dimensions and Number				
80	☐ Nominal Bore Diameter (mm)				
81	☐ Interference Fit (mm) : Max. | Min.			|	|
82	☐ Puller Holes				
83	☐ Trim Balance Holes				
84	**COUPLING GUARD**				
85	■ Co-ordinator : **Pump Vendor**			☐ Purge Gas:	☐ Dry Air Purge:
86	■ Flanged Cylindrical :	☐ Base Mount:		☐ Purge Connection Size & Type:	
87	☐ Air Tight:	■ Oil Tight:		☐ Purge m^3/hr Required:	
88	■ Spark Resistant			☐ Oil Mist Cooling	☐ Gas ooling
89	☐ Transparent Window for Each Oil Spray Point:			■ Contract Guard to be used during Shop Test	
90	☐ Vent Connection:			☐ Additional Guard Details:	
91	☐ 1 inch NPT with Filter Breather				
92	☐ 1 inch Flanged, Rating & Facing :				
93	**ACCESSORIES (Vendor to mark as required)**				
94	☐ Prime Eqpt. supplier to furnish one set of Plug & Ring Gauges (Appe. D)			☐ Hydraullic Installation/Removal Tooling (To include Hand Pump(s), Pressure Gauge(s), Fittings & Hose(s)) By :	
95	☐ Lapping Tools				
96	☐ Drill Template for Internal Flanged Hubs by:			☐ Coupling Manufacturer	☐ Purchaser
97	☐ Coupling Manufacturer	☐ Purchaser		☐ Puller By Coupling Manufacturer / Vendor	
98	☐ Two-Piece Stop Rings by Coupling Manufacturer			☐ Moment Simulator	☐ Solo Plate

99	**APPLICABLE SPECIFICATIONS**	**PREPARATION FOR SHIPMENT**			
100	■ API 671, 4th Edn.	■ Outdoor Storage for more than **12 Months**			
101	■ Others : Job Specification	☐ Expected Storage Time (Months) :			
102		☐ Shipping	☐ Domestic	☐ Storage	☐ Indoor
103	☐ Coordination Meeting Attendance Required		■ Export		Outdoor
104	REMARKS:				
105	1. 1° included angle / ½ dia. Inch. per foot length / ¾ dia. inch. per foot length				
106	2. Vendor shall submit separate filled-in Data sheet for each Coupling (High Speed & Low Speed) during detail engineering stage.				
107					
108					
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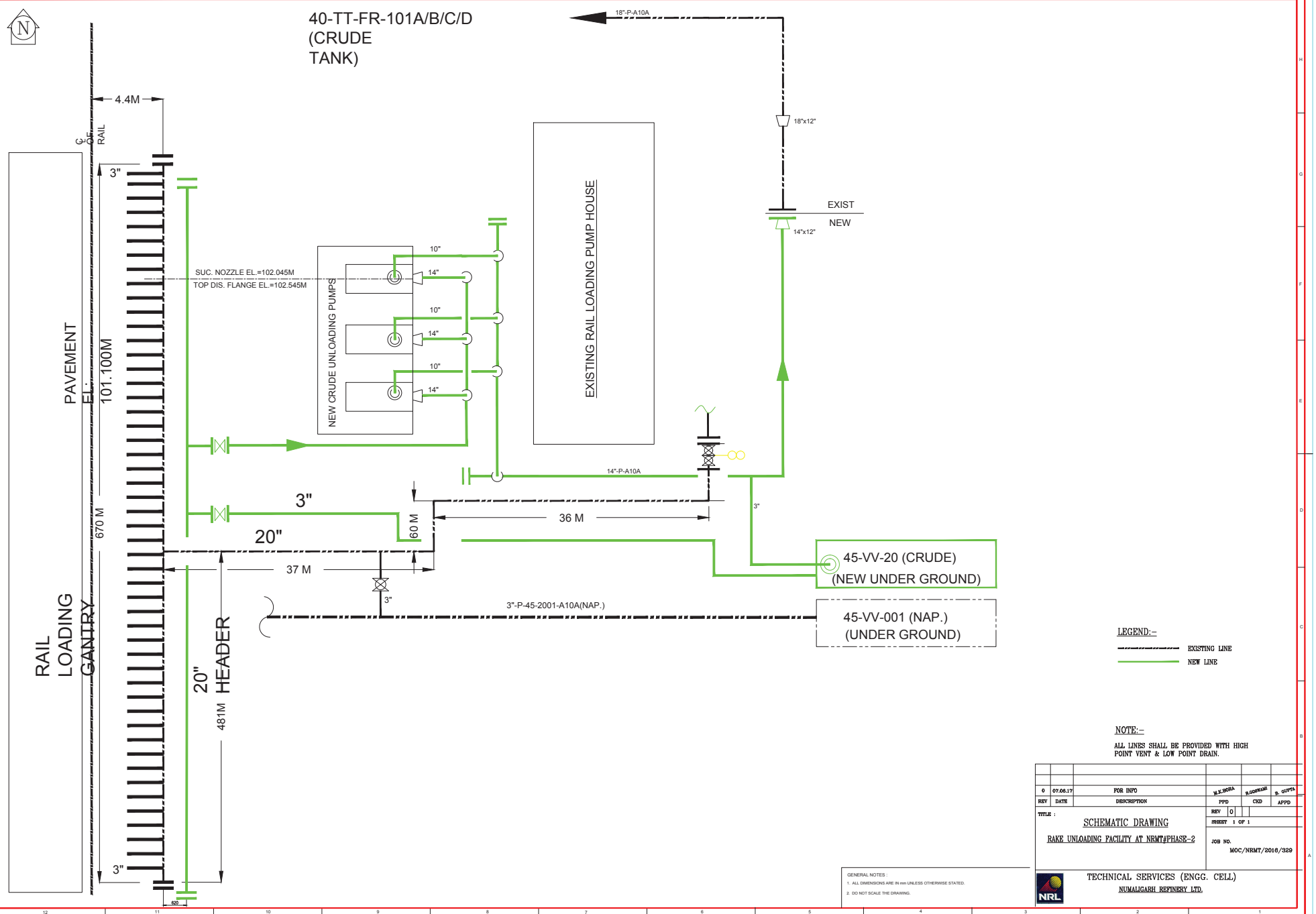
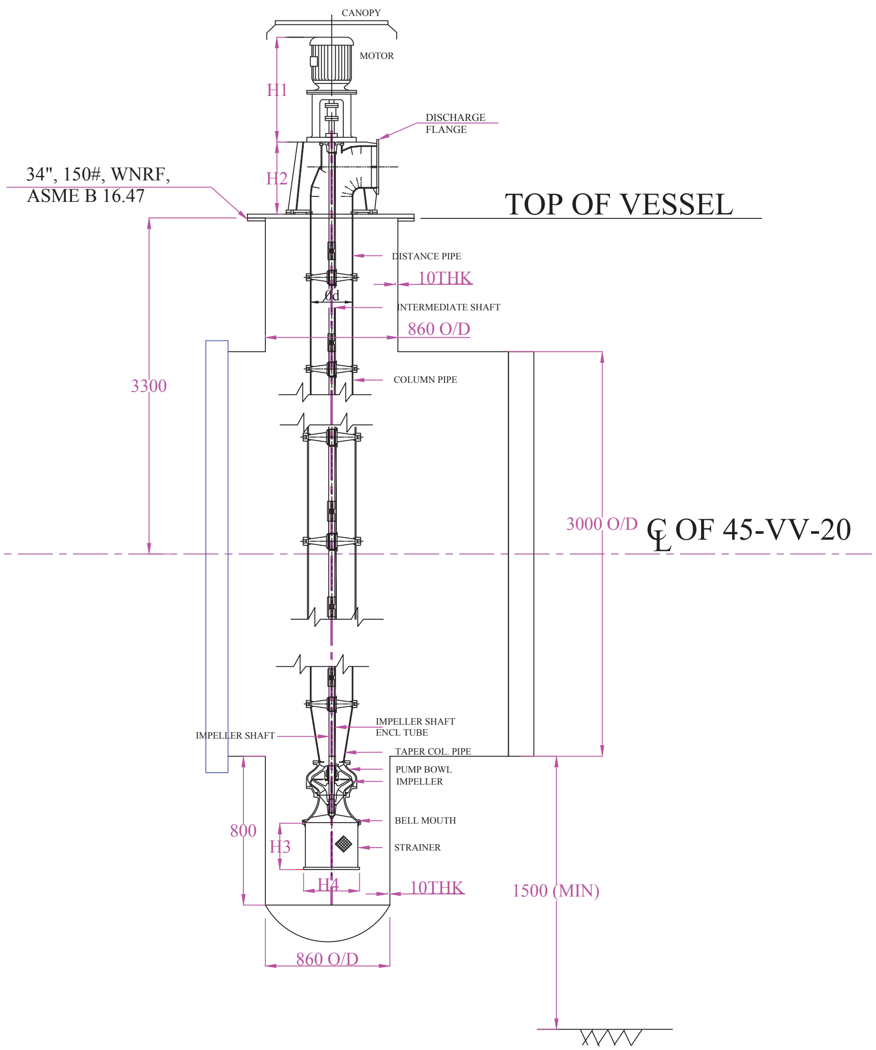
115					
116					


40-TT-FR-101A/B/C/D
(CRUDE
TANK)
18"-P-A10A
18"x12"
EXIST
NEW
14"x12"
4.4M
C OF RAIL
3"
PAVEMENT
EL.
101.100M
670 M
SUC. NOZZLE EL.=102.045M
TOP DIS. FLANGE EL.=102.545M
NEW CRUDE UNLOADING PUMPS
10"
14"
EXISTING RAIL LOADING PUMP HOUSE
14"-P-A10A
3"
20"
60 M
36 M
37 M
45-VV-20 (CRUDE)
(NEW UNDER GROUND)
3"-P-45-2001-A10A(NAP.)
45-VV-001 (NAP.)
(UNDER GROUND)
RAIL
LOADING
GANTRY
20"
481M
HEADER
620
LEGEND:-
EXISTING LINE
NEW LINE
NOTE:-
ALL LINES SHALL BE PROVIDED WITH HIGH
POINT VENT & LOW POINT DRAIN.
GENERAL NOTES :
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. DO NOT SCALE THE DRAWING.
0 07.06.17 FOR INFO M.K.BORA R.AGNIHARI B. GUPTA
REV DATE DESCRIPTION PPD CKD APPD
TITLE :
SCHEMATIC DRAWING
RAKE UNLOADING FACILITY AT NRMT#PHASE-2
REV 0
SHEET 1 OF 1
JOB NO.
MOC/NRMT/2016/329
TECHNICAL SERVICES (ENGG. CELL)
NUMALIGARH REFINERY LTD.



VENDOR SHALL FURNISH FOLLOWING DIMENSIONS AND VALUE

SL.NO.	DESCRIPTION	DIMENSIONS (mm)
1	H1	
2	H2	
3	H3	
4	H4	

SL.NO.	DESCRIPTION	VALUE (MT)
5	RECOMMENDED CRANE/MONORAIL CAPACITY FOR MAINTENANCE	
6	MAX. ERECTION WT.	
7	MAX. MAINTENANCE WT.	

GENERAL NOTES :

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. DO NOT SCALE THE DRAWING.
3. PRE-FABRICATION DRAWING SHALL BE SUBMITTED FOR REVIEW & APPROVAL.

REV	DATE	DESCRIPTION	PPD	CKD	APPD
0	30.05.17	FOR COMMENTS	M.K.BORA	R.GOSWAMI	B. GUPTA

TITLE : SCHEMATIC OF VERTICAL PUMP

(ITEM NAME- CRUDE SICK VESSEL TRANSFER PUMP)

REV 0

SHEET 1 OF 1

JOB NO. MOC/NRMT/2016/00329

TECHNICAL SERVICES (ENGG. CELL)

NUMALIGARH REFINERY LTD.

NUMALIGARH REFINERY LIMITED

DOCUMENT NO.	TAG NO. 45-PA -25 A/B/C	SHEET 1 OF 2
CLIENT	JOB NO.	

CENTRIFUGAL PUMP DATA SHEET (API 610 LATEST EDITION)

■ Scope option & information specified by purchaser Information Reqd. from & option left to vendor. Vendor to cross the selected option ☒

PROJECT: CRUDE UNLOADING FACILITY AT NRMT		SERVICE: CRUDE UNLOADING PUMP (ELECTRIC MOTOR DRIVEN)	
MANUFACTURER *		SIZE *	QUANTITY : 3 (2W +1S) NOS
CONSTRUCTION CODE:	■610	ANSI	OTHER (NFPA 20 / EQUIV.) *
NO STAGES *			
MODEL *		SERIAL NO. *	
SIZE & TYPE	HORIZONTAL CENTRIFUGAL PUMP		
NO. PUMPS REQUIRED : 3	NO. MOTOR DRIVEN: 3	NO. DIESEL ENGINE DRIVEN NA	
	PUMP ITEM NO. 45-PA -25 A/B/C	PUMP ITEM NO. NA	
	MOTOR ITEM NO. 45/PA/MT/25A/B/C	DIESEL ENGINE ITEM NO. NA	
	MOTOR PROVIDED BY PUMP VENDOR	DIESEL ENGINE PROVIDED BY NA	
	MOTOR MOUNTED BY PUMP VENDOR	DIESEL ENGINE MOUNTED BY NA	

OPERATING CONDITIONS

LIQUID HANDLED CRUDE OIL	CAPACITY (m3/hr)	TEMPERATURE ('C) MAX 38
PUMPING TEMP ('C) AMB	MINIMUM NORMAL: 380 MAX: 400	REL. HUMIDITY (%), MAX 85 MIN.
	DISCHARGE PRESSURE(kg/cm2a) : 7.2	ALTITUDE (m)
SPECIFIC GRAVITY 0.840 – 0.900	SUCTION PRESSURE(kg/cm2a)	☐ INDOORS ☐HEATED ROOF
VAPOUR PRESSURE (kg/cm2a) 0.3	MAX 0.5 RATED	■ OUTDOORS ■UHEATED SU■
VISCOSITY (CSt) 4.18	DIFF. PRESSURE (kg/cm2a) : 6.7	☐ WINTERIZATION TROPICALIZATION
CORROSION/EROSION CAUSED BY N/A	DIFF. HEAD (mlc): 81	AREA CLASSIFICATION: HAZARDOUS
	NPSH AVAILABLE (m) : 2.5	(ZONE-2 GAS GR. IIA & IIB CL T3)
	HYDROLIC POWER (kW) *	ATMOSPHERIC PRESSURE (kg/cm2a)

PERFORMANCE BY PUMP VENDOR*

PROPOSAL CURVE *	MIN. CONTINOUS FLOW(m3/hr) *	NPSH REQ'D (mH2O) *
SPEED (rpm) *	THERMAL STABLE *	3% HEAD DROP (m) *
EFFICIENCY(%) *	MAX. HEAD RATED IMPELLER(m) *	SUCTION SPECIFIC SPEED *
RATED POWER (Kw) *	MAX. POWER RATED IMPELLER(kW) *	MAX. NOISE LEVEL (dBA) 88 VIBRATION LEVEL *

CONSTRUCTION

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONN	SIZE	LOCATION
SUCTION	*	150# (N-4)	RF sm. fin.	END	DRAIN	*	*
DISCHARGE	*	150# (N-4)	RF sm. fin.	TOP	VENT	*	*
BAL DRUM					PRESS.GAUGE	*	*
					WARM UP	*	*

CASING MOUNT *	IMPELLER DIAMETER RATED: * MAX: * MIN: *	
☐ CENTERLINE FOOT	ROTATION VIEWD FROM CPLG *	BEARING(TYPE and NO) BY VENDOR
☐ NEAR CENTERLINE BRACKET	☐ CW ☐ CCW	RADIAL BALL THRUST BALL *
☐ VERTICAL INLINE	IMPELLER MOUNTED	LUBRICATION TYPE (NOTE-11) API 614
☐ VERTICAL BARREL SUMP	☐ BTWN BRGS OVERHUNG	■ GREASE RING OIL OIL MIST
CASING SPLIT AXIAL RA■AL	PACKING YES	☐ FLOODED FLINGER PRESSURE
CASING TYPE : BY VENDOR	MANUFACTURER *	COUPLING & GUARD BY VENDOR *
☐ DIFFUSER STAGG. VOLUTE	TYPE *	■ MANUFACTURER *
☐ SINGLE VOLUTE DOUBLE VOLUTE	SIZE/NO. RINGS	■ TYPE ☐FLEXIBLE *
☐ BARREL VERT. DOUBLE	MECHANICAL SEAL OR PACKING	DRIVER HALF COUPLING MOUNTED BY
MAXIMUM ALLOWABLE PRESSURE (kg/cm2g) *	■ API CODE-682 (latest seal plan)	■ PUMP MFG DRIVER MFG PURCHASER
AT MAX. PUMP T.	MANUFACTURER	GLAND TYPE/MAT'L *
	MODEL NO.	GLAND PLATE TAPS REQ'D *
HYDROTEST PRESSURE (kg/cm2g) *	MFG CODE	☐ QUENCH FLUSH DRAIN VENT
	■ MOUNTING PLATE	■ MOUNTING STOOL
	■ MOUNTING PLATE GASKET	■ BALANCING DEVICE
	■ FOUNDATION BOLTS	☐ SUCTION STRAINNER

MATERIALS (BY VENDOR)

■ Material Class(API-610): S-5	■CASE WEAR RINGS 11-13% Chr. Stl Hardened	BASEPLATE
■ CASING KCS	■IMPELLER WEAR RINGS 11-13% Chr. Stl	☐ MATERIAL / TYPE
■ IMPELLER KCS	■SHAFT	☐ API 610 STD NO.
SELF LUBRICATING BEARING BUSH *		■ SKID SIZE (LxWxH) * WT(kg) *

NOTES:

1. * denotes data to be furnished / confirmed by pump vendor.
2. Vendor to complete the data sheet and submit along with the offer.
3. Material Certificate of conformance is required.
4. Vendor shall supply suitable companion flanges in carbon steel material.
5. Vendor to provide corrosion resistant material coupling guard.
6. Pump, Engine, Controller (shall be housed in control pannel) and other associated auxiliaries shall be mounted on common base frame.
7. Pumpset shall be suitable for parallel operation. Vendor shall submit a combined curve for parralel operation.
8. Casing design pressure shall be 17kg/cm2 (G) @ 65 Deg C.
10. All pumps will be installed at outdoors. Accordingly vendor has to take all precautions.
11. Oil or Grease lubricated. In case of Grease lubrication, Bearing shall be self life type with seal on both ends.
12. The motor along with start-stop push buttton and gland should be Flame Proof (FLP-Exd IIA/IIB)
13. .Stainless steel nameplate is required stating at least the following information: Purchase Order number, Pump Description, Pump Duty Point, Pump Driver Power, Supplier's name and serial number, Size and type of pump (including the impeller size), Maximum allowable working temperature and pressure in SI unit.
14. Manual Control Stop/Start Panel shall be furnished with pump.
15. Start up/commisioning spare parts and list for 2 year operational spare parts should be supplied with pump.
16. Vendor has to submit QAP.
17. The supplier shall be responsible for providing preparation for shipment.
18. Surface preparation and painting as per manufacture's standard or as per NRL standard.

NUMALIGARH REFINERY LIMITED

Document No.	TAG No. 45-PA -25 A/B/C	SHEET 2 OF 2
Client:	Job No.	

CENTRIFUGAL PUMP DATA SHEET (API 610 LATEST EDITION)

PROJECT : CRUDE UNLOADING FACILITY AT NRMT — SERVICE: CRUDE UNLOADING PUMP (ELECTRIC MOTOR DRIVEN)

AUXILIARY PIPING

☐ SEAL FLUSH PIPING PLAN *	☐ AUXILIARY FLUSH PLAN *	☐ COOLING WATER PIPING PLAN
☐ TUBING ☐ CARBON STEEL	☐ TUBING ☐ CARBON STEEL	☐ TUBING ☐ CARBON STEEL
☐ PIPE ☐ STAINLESS STEEL	☐ PIPE ☐ STAINLESS STEEL	☐ PIPE ■ STAINLESS STEEL
	☐ EXT.SEAL FLUSH FLUID	☐ TOTAL COOLING WATER REQ'D(m3/hr)
PIPING ASSEMBLY	☐ (m3/hr) ☐ (kg/cm2a)	☐ PACKING COOLING INJECTION REQ'D
☐ THREADED ☐ FLANGED	☐ PRESS.SWITCH PRESS.IND.	☐ (L/hr) ☐ (kg/cm2a)
☐ SEAL WELDED ☐ SOCKET WELDED	☐ SIGHT FLOW INDICATOR	☐ RESERVOIR SIZE
REMARKS:		☐ LEVEL GAUGE
		☐ HEAT EXCHANGER
		☐ TEMPERATURE INDICATOR

INSPECTION & TESTING (REFER REMARKS 1)

TEST	NON WIT.	WIT.	OBSERVED		
PERFORMANCE	☐	■	☐	■ CASTING REPAIR PROCED.APPRVL.REQD.	☐ INSPECTION REQD. FOR
IMPELLER BALANCING	■	☐	☐	☐ INSPECTION REQD. FOR NOZZLE WELDS	☐ MAG. PARTICLE ☐ DYE PENETRANT
HYDRO	■	☐	☐	☐ MAG. PARTICLE ☐ DYE PEN.	☐ RADIOGRAPH ☐ ULTRASONIC
NPSH	☐	■	☐	■ MATERIAL CERT. REQ'D FOR	
■ SHOP INSPECTION				■ CASING ■ IMPELLER	INSPECTION REQD. FOR CASTING
☐ DISMANTLE & INSPECT AFETR TEST				■ SHAFT	☐ RADIOGRAPH ■ ULTRASONIC
■ PERFORMANCE TEST OF ENGINE				■ GOVERNOR TEST	■ DYE PENETRANT
■ SPEED Vs BHP				■ OVERLOAD TEST	
■ SPECIFIC FULE Vs BHP					

MOTOR DRIVER By Vendor (Refer Remarks 2)

■ POWER (Kw) *	■ TEMPERATURE RISE ('C) CLASS B	■ BEARINGS Antifriction / thrust *
■ REVS(rpm) *	■ FULL LOAD AMPS *	■ LUBE *
■ FRAME *	■ LOCKED ROTOR AMPS *	VERTICAL SHAFT ☐ SOLID ☐ HOLLOW
■ VILOTS/PHASE/CYCLE By NRL	■ INSULATION *	☐ VERTICAL THRUST CAPACITY(kg)
■ TYPE SQUIRREL CAGE	■ MANUFACTURER	UP * DOWN *
■ ENCLOSURE TYPE IP-55	■ WINDING & BEARING RTD	
■ MOTOR HEATER YES	☐ FIRE PUMP CONTROLLER	

WEIGHTS

MOTOR DRIVEN (NA)		REMARKS
WEIGHT OF PUMP (kg) *		
WEIGHT OF BASEPLATE (kg) *		
WEIGHT OF MOTOR (kg) *		
WEIGHT OF GEAR (kg) *		
WEIGHT OF CONTROLLER (kg) *		
TOTAL WEIGHT (kg)		

REMARKS

1) INSPECTIONS AND TESTS (EACH PUMP)

SHOP TEST / INSPECTION	REQD.	WITNESSED	
Material Certificates	Yes	------	
Performance/Sound Level	Yes	Yes	
Dimensions and Inspection after test	Yes	Yes	
Hydrostatic	Yes		

2) Motor shall be installed at outdoors and accordingly vendor has to take all precautions .

NUMALIGARH REFINERY LIMITED

DOCUMENT NO.	TAG NO. 45-PA -26 A/B	SHEET 1 OF 2
CLIENT	JOB NO.	

CENTRIFUGAL PUMP DATA SHEET (API 610 LATEST EDITION)

■ Scope option & information specified by purchaser Information Reqd. from & option left to vendor. Vendor to cross the selected option ☒

PROJECT: CRUDE UNLOADING FACILITY AT NRMT SERVICE: CRUDE SICK VESSEL TRANSFER PUMP (ELECTRIC MOTOR DRIVEN)

MANUFACTURER * SIZE * QUANTITY : 2 (1W +1S) NOS

CONSTRUCTION CODE: ■ 610 ANSI OTHER (NFPA 20 / EQUIV.) * NO STAGES *

MODEL * SERIAL NO. *

SIZE & TYPE VERTICAL CENTRIFUGAL PUMP (TYPE- VS 1)

NO. PUMPS REQUIRED : 3	NO. MOTOR DRIVEN: 3	NO. DIESEL ENGINE DRIVEN NA
	PUMP ITEM NO. 45-PA -26 A/B	PUMP ITEM NO. NA
	MOTOR ITEM NO. 45/PA/MT/26A/B	DIESEL ENGINE ITEM NO. NA
	MOTOR PROVIDED BY PUMP VENDOR	DIESEL ENGINE PROVIDED BY NA
	MOTOR MOUNTED BY PUMP VENDOR	DIESEL ENGINE MOUNTED BY NA

OPERATING CONDITIONS		SITE CONDITIONS
LIQUID HANDLED CRUDE OIL	CAPACITY (m3/hr)	TEMPERATURE (°C) MAX 38
PUMPING TEMP (°C) AMB	MINIMUM NORMAL: 45 MAX: 50	REL. HUMIDITY (%), MAX 85 MIN.
	DISCHARGE PRESSURE(kg/cm2a) : 10	ALTITUDE (m)
SPECIFIC GRAVITY 0.840 – 0.900	SUCTION PRESSURE(kg/cm2a):	☐ INDOORS ☐ HEATED ROOF
VAPOUR PRESSURE (kg/cm2a) 0.3-0.5	MAX 1 RATED	■ OUTDOORS ■ UNHEATED SU■
VISCOSITY (CSt) 4.18	DIFF. PRESSURE (kg/cm2a) : 9	☐ WINTERIZATION ☐ TROPICALIZATION
CORROSION/EROSION CAUSED BY N/A	DIFF. HEAD (mlc): 105 @ top mounting flg	AREA CLASSIFICATION: HAZARDOUS
	NPSH AVAILABLE (m) : Flooded Suction	(ZONE-2 GAS GR. IIA & IIB CL T3)
	HYDROLIC POWER (kW) *	ATMOSPHERIC PRESSURE (kg/cm2a)

PERFORMANCE BY PUMP VENDOR*		
PROPOSAL CURVE *	MIN. CONTINOUS FLOW(m3/hr) *	NPSH REQ'D (mH2O) *
SPEED (rpm) *	THERMAL STABLE *	3% HEAD DROP (m) *
EFFICIENCY(%) *	MAX. HEAD RATED IMPELLER(m) *	SUCTION SPECIFIC SPEED *
RATED POWER (Kw) *	MAX. POWER RATED IMPELLER(kW) *	MAX. NOISE LEVEL (dBA) 88 VIBRATION LEVEL *

CONSTRUCTION

NOZZLES	SIZE	RATING	FACING	LOCATION	MISC. CONN	SIZE	LOCATION
SUCTION	*	*	*	*	DRAIN	*	*
DISCHARGE	*	150# (N-4)	RF sm. fin.	*	VENT	*	*
BAL DRUM					PRESS.GAUGE	*	*
					WARM UP	*	*

CASING MOUNT *	IMPELLER DIAMETER RATED: * MAX: * MIN: *	BEARING(TYPE and NO) BY VENDOR	
☐ CENTERLINE FOOT	ROTATION VIEWD FROM CPLG *	RADIAL BALL THRUST BALL *	
☐ NEAR CENTERLINE BRACKET	☐ CW ☐ CCW	LUBRICATION TYPE (NOTE-11) ARU 14	
☐ VERTICAL INLINE	IMPELLER MOUNTED	☐ GREASE ☐ RING OIL ☐ MIST	
☐ VERTICAL BARREL SUMP	☐ BTWN BRGS OVERHUNG	☐ FLOODED ☐ FLINGER PRESSURE	
CASING SPLIT AXIAL RADIAL	PACKING YES	COUPLING & GUARD BY VENDOR *	
CASING TYPE : BY VENDOR	MANUFACTURER *	■ MANUFACTURER *	
☐ DIFFUSER STAGG. VOLUTE	TYPE *	■ TYPE ☐ FLEXIBLE *	
☐ SINGLE VOLUTE DOUBLE VOLUTE	SIZE/NO. RINGS	DRIVER HALF COUPLING MOUNTED BY	
☐ BARREL VERT. DOUBLE	■ MECHANICAL SEAL ☐ PACKING	■ PUMP MFG DRIVER MFG PURCHASER	
MAXIMUM ALLOWABLE PRESSURE (kg/cm2g) *	■ API CODE-682 3rd. Edition or later	AT MAX. PUMP T.	MANUFACTURER
	MODEL NO.	GLAND TYPE/MAT'L *	
HYDROTEST PRESSURE (kg/cm2g) *	MFG CODE	GLAND PLATE TAPS REQ'D *	
	■ MOUNTING PLATE	☐ QUENCH FLUSH DRAIN VENT	
	■ MOUNTING PLATE GASKET	■ MOUNTING STOOL	
	■ FOUNDATION BOLTS	■ BALANCING DEVICE	
		■ SUCTION STRAINNER	

MATERIALS (BY VENDOR)

■ Material Class(API-610): S-5	■ CASE WEAR RINGS 11-13% Chr. Stl Hardened	BASEPLATE
■ CASING KCS	■ IMPELLER WEAR RINGS 11-13% Chr. Stl	☐ MATERIAL / TYPE
■ IMPELLER KCS	■ SHAFT	☐ API 610 STD NO.
SELF LUBRICATING BEARING BUSH *		■ SKID SIZE (LxWxH) * WT(kg) *

NOTES:

1. * denotes data to be furnished / confirmed by pump vendor.
2. Vendor to complete the data sheet and submit along with the offer.
3. Material Certificate of conformance is required.
4. Vendor shall supply suitable companion flanges in carbon steel material.
5. Vendor to provide corrosion resistant material coupling guard.
6. Pump, Engine, Controller (shall be housed in control pannel) and other associated auxiliaries shall be mounted on common base frame.
7. Surface preparation and painting as per manufacture's standard or as per NRL standard.
8. Casing design pressure shall be 17kg/cm2 (G) @ 65 Deg C.
10. All pumps will be installed at outdoors. Accordingly vendor has to take all precautions.
11. Oil or Grease lubricated. In case of Grease lubrication, Bearing shall be self life type with seal on both ends.
12. The motor along with start-stop push buttton and gland should be Flame Proof (FLP-Exd IIA/IIB)
13. .Stainless steel nameplate is required stating at least the following information: Purchase Order number, Pump Description, Pump Duty Point, Pump Driver Power, Supplier's name and serial number, Size and type of pump (including the impeller size), Maximum allowable working temperature and pressure in SI unit.
14. Manual Control Stop/Start Panel shall be furnished with pump.
15. Start up/commisioning spare parts and list for 2 year operational spare parts should be supplied with pump.
16. Vendor has to submit QAP.
17. The supplier shall be responsible for providing preparation for shipment.

NUMALIGARH REFINERY LIMITED

Document No.	TAG No. 45-PA -26 A/B	SHEET 2 OF 2
Client:	Job No.	

CENTRIFUGAL PUMP DATA SHEET (API 610 LATEST EDITION)

PROJECT : **CRUDE UNLOADING FACILITY AT NRMT** SERVICE: **CRUDE SICK VESSEL TRANSFER PUMP (ELECTRIC MOTOR DRIVEN)**

AUXILIARY PIPING

☐ SEAL FLUSH PIPING PLAN *	☐ AUXILIARY FLUSH PLAN *	■ COOLING WATER PIPING PLAN
☐ TUBING ☐ CARBON STEEL	☐ TUBING ☐ CARBON STEEL	☐ TUBING ☐ CARBON STEEL
☐ PIPE ☐ STAINLESS STEEL	☐ PIPE ☐ STAINLESS STEEL	☐ PIPE ■ STAINLESS STEEL
	☐ EXT.SEAL FLUSH FLUID	☐ TOTAL COOLING WATER REQ'D(m3/hr)
PIPING ASSEMBLY	☐ (m3/hr) ☐ (kg/cm2a)	☐ PACKING COOLING INJECTION REQ'D
☐ THREADED ☐ FLANGED	☐ PRESS.SWITCH PRESS.IND.	☐ (L/hr) ☐ (kg/cm2a)
☐ SEAL WELDED ☐ SOCKET WELDED	☐ SIGHT FLOW INDICATOR	☐ RESERVOIR SIZE
REMARKS:		☐ LEVEL GAUGE
		☐ HEAT EXCHANGER
		☐ TEMPERATURE INDICATOR

INSPECTION & TESTING (REFER REMARKS 1)

TEST	NON WIT.	WIT.	OBSERVED
PERFORMANCE	☐	■	☐
IMPELLER BALANCING	■	☐	☐
HYDRO	■	☐	☐
NPSH	☐	■	☐

■ SHOP INSPECTION	■ CASTING REPAIR PROCED.APPRVL.REQD.	☐ INSPECTION REQD. FOR
☐ DISMANTLE & INSPECT AFETR TEST	☐ INSPECTION REQD. FOR NOZZLE WELDS	☐ MAG. PARTICLE ☐ DYE PENETRANT
■ PERFORMANCE TEST OF ENGINE	☐ MAG. PARTICLE ☐ DYE PEN.	☐ RADIOGRAPH ☐ ULTRASONIC
■ SPEED Vs BHP	■ MATERIAL CERT. REQ'D FOR	
■ SPECIFIC FULE Vs BHP	■ CASING ■ IMPELLER	INSPECTION REQD. FOR CASTING
	■ SHAFT	☐ RADIOGRAPH ■ ULTRASONIC
	■ GOVERNOR TEST	■ DYE PENETRANT
	■ OVERLOAD TEST	

MOTOR DRIVER By Vendor (Refer Remarks 2)

■ POWER (Kw) *	■ TEMPERATURE RISE ('C) CLASS B	■ BEARINGS Antifriction / thrust *
■ REVS(rpm) *	■ FULL LOAD AMPS *	■ LUBE *
■ FRAME *	■ LOCKED ROTOR AMPS *	VERTICAL SHAFT ☐ SOLID ☐ HOLLOW
■ VILOTS/PHASE/CYCLE By NRL	■ INSULATION *	☐ VERTICAL THRUST CAPACITY(kg)
■ TYPE SQUIRREL CAGE	■ MANUFACTURER	UP * DOWN *
■ ENCLOSURE TYPE IP-55	■ WINDING & BEARING RTD	
■ MOTOR HEATER YES	☐ FIRE PUMP CONTROLLER	

VERTICAL PUMPS

■ PIT/SUMP DEPTH (m) *	GUIDE BUSHINGS	FLOAT & ROD		
■ PUMP LENGTH (m) *	☐ BOWL ■ LINE SHAFT	■ CS ☐ SS ☐ BRZ ☐ NONE		
■ MIN.SUBMERGENCE REQ'D (m) *	GUIDE BUSHINGS LUBE	■ PUMP THUST(kg)	UP	DOWN
COLUMN PIPE/SUCTION STRAINNER: **CS/SS**	☐ WATER ☐ OIL ☐ GREASE	.@MIN FLOW	*	*
■ FLANGED ☐ THREADED	☐ FLOAT SWITCH	.@DESIGN FLOW	*	*
LINE SHAFT	FLUSHING ■ SELF ☐ EXT	.@RUN OUT	*	*
☐ OPEN ☐ ENCLOSED				

WEIGHTS

MOTOR DRIVEN (NA)		REMARKS
WEIGHT OF PUMP (kg) *		
WEIGHT OF BASEPLATE (kg) *		
WEIGHT OF MOTOR (kg) *		
WEIGHT OF GEAR (kg) *		
WEIGHT OF CONTROLLER (kg) *		
TOTAL WEIGHT (kg)		

REMARKS

1) INSPECTIONS AND TESTS (EACH PUMP)

SHOP TEST / INSPECTION	REQD.	WITNESSED	
Material Certificates	Yes	------	
Performance/Sound Level	Yes	Yes	
Dimensions and Inspection after test	Yes	Yes	
Hydrostatic	Yes		

2) Motor shall be installed at outdoors and accordingly vendor has to take all precautions .