

RAJASTHAN RAJYA VIDYUT UTPADAN
NIGAM LTD.

2 X 660 MW, SUPER-CRITICAL TPS,
STAGE-V, UNIT # 7 & 8
AT
SURATGARH, RAJASTHAN

TECHNICAL SPECIFICATION
FOR
PORTABLE LUBE OIL PURIFICATION UNIT (PLOP)
ALONGWITH ACCESSORIES

VOLUME - II B

SPECIFICATION No: **PE-TS -392-167-N001 (REV 00)**



BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
PPEI, NOIDA, INDIA



TITLE

PREAMBLESPECIFICATION NO **PE-SS-999-100-Q-001**VOLUME **II B**SECTION **PREAMBLE**REV NO. **0** DATE 05.02.2008

SHEET 1 OF 1

1.0 Volume – II B :

This volume is sub- divided into following sections: -

Section – A : This section outlines the scope of enquiry

Section – B : This section provides : “ Project Information”.


Section- C : This section indicates tech. Requirements specific to the contract, not covered in Section – D.

Section – D : This section comprises of tech. Specifications of equipments complete with data sheet A,B&C.

Data Sheet – A specifics data and other requirements pertaining to the equipment.

Data sheet – B specifics data to be filled by the bidder (Data Sheet B is contained in Volume – III.

Data Sheet – C indicates data/ documents to be furnished after the award of contract as per agreed schedule by the vendor (as applicable).

	TITLE TECH. SPECIFICATIONS FOR PORTABLE LUBE OIL PURIFICATION UNIT (PLOP) RRVUNL – 2X660 MW SURAT GARH	SPEC. NO.: PE-TS-392-167-N001	
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FILLED-UP QUALITY PLAN AS MINIMUM REQUIREMENTS IS INCLUDED FOR PORTABLE OIL PURIFICATION UNIT.			



TITLE

SCOPE OF ENQUIRY


FOR

PORTABLE LUBE. OIL PURIFICATION UNIT

RRVUNL – 2-660 MW SURAT GRAH

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SCOPE OF ENQUIRY

	TITLE	SPECIFICATION NO. PE-TS-392-167-N001	
	SCOPE OF ENQUIRY FOR PORTABLE LUBE. OIL PURIFICATION UNIT RRVUNL – 2-660 MW SURAT GRAH	VOLUME	II B
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1.1 This specification is to cover enquiry for Design, Manufacture, Assembly, Inspection and Testing at Vendor's and/or his sub-vendors works, painting, proper packing and delivery to site of **Portable Lube Oil Purification Unit** each of **2000 LPH capacity**, as mentioned in different sections of this specification. The Portable Lube Oil Purifier shall be complete with all accessories, commissioning spares, special tools & tackles and consumables as required. Bidder's scope shall also include any other services etc. if called for in succeeding sections of the specification.

The tenderer shall also quote for the following:-

a) Recommended spares for 3 years of post-guarantee period operation.

1.2 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to the Engineer/Owner who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgement is not in full accordance herewith.

1.3 The omission of specific reference to any component/accessory necessary for the proper performance of portable LOP plant shall not relieve the bidder of the responsibility of providing such facilities to complete the supply of equipment at quoted prices.

1.3.1 In case of any deviation from this technical specification (Vol. IIB) and General Technical Conditions (Vol. IIC) , the same shall be indicated in the schedule of Deviations enclosed in Vol. III. In the absence of duly filled up schedules it will be deemed that the bid strictly conforms to the specification.

1.5 The bidder may quote for his standard, proven design of equipment and shall indicate any deviations from this specification in the enclosed schedule. **In the absence of duly filled deviation schedule, it shall be presumed that the offer conforms exactly to this specification.** The bidder shall also furnish the performance feedback data of the equipment from similar installations. However, the acceptance of the deviations / options is not binding on the Engineer / Owner.

1.6 The bids shall be in the English language and MKS Units.

1.7 Filled up Quality Plans as minimum technical requirements, are included in this specification in Vol. IIB Sec. D. Bidder is required to submit the enclosed Quality Plan with bidder's sign & stamp, or bring out specific deviations on it, while submitting the bid.

1.8 Similar to Quality Plan, bidder is required to furnish Field Quality Plan (FQP), if any, in Form no. PE-6041. FQP shall indicate all inspection/tests to be carried out at site covering the following:

- i) Receipt of material.
- ii) Storage or Conservation.
- iii) Pre-erection & Erection.
- iv) Pre-commissioning, commissioning & post commissioning.

1.9 BHEL's / RRVUNL's representatives shall be given access to the shop in which the equipment is being manufactured or tested and all test records shall be made available to him.



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SCOPE OF ENQUIRY
FOR
PORTABLE LUBE. OIL PURIFICATION UNIT
RRVUNL – 2-660 MW SURAT GRAH

- 1.10 The Equipment covered under this specification shall not be dispatched unless the same have been finally inspected, accepted and Material Dispatch Clearance Certificate (MDCC) is issued by BHEL / RRVUNL.



TITLE

PROJECT INFORMATION**PORTABLE LUBE OIL PURIFIER (PLOP)****RRVUNL - 2 x 660 MW, Super-Critical TPS,
Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan**

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SECTION – B**PROJECT INFORMATION**



TITLE

PROJECT INFORMATION

PORTABLE LUBE OIL PURIFIER (PLOP)

**RRVUNL - 2 x 660 MW, Super-Critical TPS,
Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan**

SPEC. NO.: PE-TS-392-137-N001

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PROJECT INFORMATION

1.0	Owner	Rajasthan Rajya Vidyut Utpadan Nigam Ltd., Jaipur
2.0	Consulting Engineer	TATA Consulting Engineers Ltd. 73/1, St. Marks Road, Bangalore – 560 001 Tel : 080 – 6622 6000 Fax : 080 – 22274874
3.0	Location of the plant	Prabat Nagar, Suratgarh Sriganganagar district, Rajasthan.
4.0	Latitude and longitude	Latitude : 29 deg. 10 min. N Longitude : 74 deg.01 min. E
5.0	Elevation above mean sea level	186 m (approximate)
6.0	Climatic conditions	
6.1	Temperatures : Monthly basis	
	Mean of daily max.	32.8 deg.C (in the month of May)
	Mean of daily min.	17.6 deg.C (in the month of Jan)
6.2	Temperatures : Annual basis	
	Mean of daily max.	32.3 deg.C
	Mean of daily min.	19.6 deg.C
	Highest temperature recorded	50 deg.C
	Lowest temperature recorded	(-) 2.8 deg.C
	Design Ambient Temperature for Electrical Equipment design	50 deg C
6.3	Relative humidity	Varies between 21% and 81%
6.4	Annual average rain fall	312 mm
6.5	Annual mean wind speed :	4 km / hr.
7.0	Wind load	



TITLE

PROJECT INFORMATION

PORTABLE LUBE OIL PURIFIER (PLOP)

**RRVUNL - 2 x 660 MW, Super-Critical TPS,
Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan**

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	Calculations for wind effect shall be in accordance with IS:875-1987(Part-3) taking into account the following:	
	a) Basic wind speed = 47 m/sec	
	b) Factor K1 = 1.07	
	c) Category of terrain = Category 2	
	d) K3 – as per IS 875	
8.0	Seismic data (As per IS: 1893 latest issue)	
	a) Zone	Zone II
	Designs & design coefficients shall be based on IS 1893:2002	
	Design condenser cooling water inlet temperature	33 Deg C
9.0	Auxiliary power supply:	
	Auxiliary electrical equipment to be supplied against this specification shall be suitable for operation on the following system:	
	a) For motors rated 160 kW and below.	415V AC, 3-phase, 3-wire effectively earthed.
	b) For motors rated above 160 kW and up to 1500 kW	6600V AC, 3-phase, 3-wire, 50 Hz, non-effectively earthed
	c) For motors rated above 1500kW	11000V AC, 3-phase, 3-wire, 50 Hz, non-effectively earthed
	d) For motor control centres	415V AC, 3-phase, 3/4-wire effectively earthed.
	e) DC motor starters, DC solenoids, DC alarm control and protection	220 V DC, 2-wire unearthed
	f) AC control & protective devices	110 V 1 phase, 50Hz, 2 wire AC supply. The single phase 110V AC supply shall be derived by VENDOR by providing 415V / 110 V Control transformers of adequate rating with MCCB / MCB on both the primary and secondary sides.
	g) Uninterrupted power supply	230 V, 1-phase, 50 Hz, 2-wire, AC

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SECTION – C

SPECIFIC TECHNICAL REQUIREMENTS

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1.0 **BRIEF SYSTEM DESCRIPTION**

Three (03) nos. of Portable Lube Oil Purifier of capacity **2000 LPH** is required for this project. This is used for periodically purifying the lube oil used in various equipment's such as Turbine driven Boiler feed pumps, fans, coal mills & other Boiler auxiliaries. The grade of oil used shall be as per data sheet enclosed herewith.


2.0 **EQUIPMENT TO BE PROVIDED BY TENDERER**

2.1.0 Three (03) nos. portable oil purification unit of capacity **2000 LPH** as specified in section 'D'.

The scope of **supply for each unit** shall be as follows:-

- 2.1.1 One (1) centrifuge oil purifier with drive.
- 2.1.2 One (1) indirect water bath electric oil heater with accessories.
- 2.1.3 One (1) dirty oil feed pump complete with drive.
- 2.1.4 One (1) clean oil discharge pump complete with drive.
- 2.1.5 One (1) Polishing filter, if required, to achieve the purity levels specified.
- 2.1.6 One (1) anti-flood device tank.
- 2.1.7 Valves, fitting inter-connecting piping and accessories.
- 2.1.8 Instruments and Controls as shown in tender drawing enclosed herewith.
- 2.1.9 All required electrical accessories including disconnect switches, fuses, relays, starters & cabling.
- 2.1.10 One local control panel mounting the electrical switches, starters, relays, push buttons, controls and annunciating devices etc.
- 2.1.11 one local instrument mounting board panel.
- 2.1.12 Common base plate for the complete unit, support plates, anchor bolts and nuts, sleeves, inserts, lifting lugs, eye bolts etc. Base plate shall be drip lip type with drain connection.
- 2.1.13 A suitable trolley shall be provided with push handle for mounting portable oil purification unit. The control panel shall be mounted on the trolley itself.
- 2.1.14 Ten meters of flexible hose conforming to BS: 1435 or equivalent with clamp/coupling shall be provided at inlet & outlet. Also provide water inlet/drain & oil drain connections with 3 meters of flexible hose alongwith clamp/cap. Suitable hose pipe storing / mounting arrangement shall be provided on the trolley itself.
- 2.1.15 Spares, Consumables and Special tools & tackles.

(i) Commissioning Spares and Consumables

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The bidder shall supply spares and consumables for the purification unit required for start-up. A list of all spares and consumables to be supplied shall be submitted alongwith the bid.

(ii) Recommended Spares

The bidder shall submit a list of recommended spares for the purification unit for three years of normal operation. These are to be quoted separately and unit prices to be indicated to enable placement of a separate order later, if required.

(iii) Special Tools & Tackles

The bidder shall submit one complete set of special tools & tackles required for the erection. assembly, disassembly and maintenance of the equipment. A list of such tools & tackles to be supplied shall be submitted alongwith the bid.

3.0 GENERAL TECHNICAL REQUIREMENTS

3.1.0 MECHANICAL

3.1.1 The oil heater shall be capable of heating oil from a minimum temperature of 30°C to 65°C in a single pass. The heating elements shall be arranged in stages to be ON/OFF depending on inlet oil temperature.

3.1.2 The portable unit shall be trolley mounted with push handle. Ten meters of flexible hose conforming to BS:1435 or equivalent with clamp/coupling shall be provided at inlet & outlet. The oil feed pump shall be suitable for negative suction upto 4 MLC. The control panel shall be integrally mounted.

3.1.3 The discharge pump shall be designed such that it is capable of developing 2.5 to 3.0 kg/sqcm(a) pressure after polishing filter at the rated flow.

3.1.4 The material of the pump shall be as follows:

Casing	-	CI-IS210-FG-260
Vanes / Gears	-	EN-8
Shaft	-	EN-8/9


3.1.5 Each pump shall have a normal capacity of at least 10% greater than that of the purifying unit.

3.1.6 Bypass connection shall be provided for the feed pump to match capacity with oil transfer pump.

3.1.7 The suction strainer shall be Y-type with SS-316 mesh. Necessary blow down valves shall be provided.

3.1.8 All drain valves and sampling valves shall be 2 nos. in series.

3.1.9 A sampling tank of 5 litres capacity shall be provided at sampling points.

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3.1.10 All isolating valves shall be plug type of AUDCO make or equivalent. The material shall be carbon steel.

3.1.11 Portable oil purifier unit shall be provided with polishing filter, if required with suitable bypass arrangement.

3.1.12 Centrifuge shall be designed for continuous operation.

3.1.13 The purification shall be such that the lubrication value of the oil shall be maintained and no additives/ inhibitors shall be removed. The acidity shall not increase after purification. The neutralisation no. of oil before and after centrifuging shall be tested as per DIN 51558 or as per ASTM D 974 and total acidity as per ASTM D 943-54 or IP 157/64.

3.1.14 The particle size in purified oil content in the oil after purification shall as per CODE 15/12 OF ISO 4406, to be demonstrated with inlet oil quality conforming to code 21/18 as per ISO 4406.

3.2.0 INSTRUMENTATION & CONTROL

3.2.1 All necessary instruments and controls and interlocks shall be provided for the safe and trouble free operation of the system. The instruments and control requirement are given in the flow diagram enclosed with the specification.

3.2.2 On actuation of the anti seal loss device caused due to loss of water seal in centrifuge, the solenoid valve on the inlet to the purification system shall close and the motors of the centrifuge and the dirty and clean oil pumps shall trip.

3.2.3 On low water level in the heater the heaters shall also be switched off.


3.2.4 Whenever low pressure/no flow is detected, solenoid valve in oil feed line shall close & trip centrifuge through pressure / flow switch.

3.2.5 A control and annunciation panel (skid mounted) shall be provided for the purification system. It shall incorporate control switches complete with Red and Green indicating Lamps for Motors, Solenoid valves, heaters etc.

3.2.6 The following events shall be annunciated in the panel.

- i) Loss of water seal in the centrifuge.
- ii) Low water level in Electric immersion heater.
- iii) High oil temperature at heater outlet.
- iv) Polishing filter choked.
- v) Centrifuge motor tripped.
- vi) Clean & Dirty oil pump motor tripped.
- vii) No oil flow.

3.2.7 Necessary interlocks for preventing centrifuge operation in case feed and discharge pumps are not operating, shall be provided

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3.2.8 All gauges shall be mounted on separate mounting rack. (Skid mounted).

3.3.0 ELECTRICAL

3.3.1 Portable oil purification skid shall be supplied complete with all drive motors as applicable to the system, control panel, starters for drive motors, heaters, interconnecting power and control cables etc. for skid mounted equipment.

3.3.2 Starters required for motors and switch fuse unit for heaters shall be a part of control panel.

3.3.3 Flexible power cable of 25 meters in length for connecting the trolley to the 415V, 3-Ø power supply source along with plug suitable for 5 pin industrial socket of 63 amps. shall be provided with the trolley. Details of plug shall be furnished to successful bidder.

3.3.4 Power and control cables for interconnecting tenderer's equipments on the trolley shall be provided complete with cable glands, lugs, and other accessories etc.

3.3.5 Necessary reeling arrangement for incoming flexible power cable shall be provided by the bidder.

3.3.6 Each equipment on the trolley shall be connected to the earthing core of the incoming flexible cable through suitable arrangement.

3.3.7 Sizes of power cables, ratings of switch fuse unit, contactors etc. for motor feeders and other feeders shall be subjected to purchaser's approval.

3.3.8 further to this, project specific technical requirement for motor are as follow :

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PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Units 7 & 8, at Suratgarh, Rajasthan MOTOR & ACTUATOR	SHEET 06 of 13
<p>1.0 <u>AC & DC MOTORS</u></p> <p>1.1. HT motors of rating above 1500kW shall be suitable for 11kV, 3 phase, 50Hz power supply. Motors above 160kW and up to 1500kW shall be suitable for 6.6kV, 3 phase, 50Hz. Motors rated 160kW and below shall be suitable for 415V, 3 phase, 50 Hz power supply.</p> <p>1.2. All LT motors shall be energy efficient class – I in line with IS: 12615. However, the starting current shall be limited to 600% (inclusive of 20% tolerance) of full load current.</p> <p>1.3. The motor rating shall be arrived at considering 15% margin over the duty point input or 10% over the maximum demand of the driven equipment, whichever is higher, considering highest system frequency. Motors shall be capable of starting and accelerating the load with the applicable method of starting without exceeding acceptable winding temperatures when supply voltage is 80% of the rated voltage for HT motors and 85% for LV motors. HT motors shall also be capable of satisfactory operation at full load at a supply voltage of 80% of the rated voltage for 5 min. commencing from hot condition. DC motors shall be suitable for the DC system voltage of 220V. Motor shall be capable of starting and accelerating the load with the applicable method of starting, without exceeding acceptable winding temperatures, when the supply voltage is in the range of 85% to 110% of rated motor voltage.</p> <p>1.4. Motors shall be capable of running for one second if the supply voltage drops to 70% of the rated voltage. If such operation is envisaged for a period of one second, the pull out torque of the motor shall be at least 205% of full load torque.</p> <p>1.5. Motors shall withstand for 1 second the voltage and torque stresses developed due to the vector difference between the motor residual voltage and the incoming supply voltage equal to 150% of the rated voltage during fast changeover of buses.</p> <p>1.6. Locked rotor current of the HT motors rated 1500 kW and below shall be limited to 600% (inclusive of 20% tolerance) of the full load current of the motors and motor rated above 1500 kW shall be limited to 450% (inclusive of 20% tolerance) of full load current of the motor.</p> <p>1.7. The locked rotor withstand time under hot condition at 110% rated voltage shall be more than the starting time at minimum permissible voltage specified above by at least three seconds or 15% of the accelerating time whichever is greater. Provision of speed switch shall be avoided to the extent possible.</p> <p>These motors shall be designed to withstand at least 5% harmonics in the supply voltage.</p> <p>1.8. The degree of protection for the motor enclosure (including terminal box) shall be IP-55 for outdoor. For single core cable termination, gland plates shall be of non-magnetic material. All motors located in hazardous area shall have flame proof enclosure.</p>		
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<p>1.9. All HT motors shall be provided with vibration pads for mounting vibration detectors. Vibration monitoring devices shall be provided on DE and NDE side in X & Y direction with remote DCS monitoring, alarms and tripping</p> <p>1.10. Motors rated 1000kW and above shall be provided with differential protection. These motors shall be provided with star connected stator windings. The 3 nos. current transformers, one for each phase shall be mounted in a separate compartment in the neutral side terminal box. The three phases shall be connected to form the star point after they pass through the CTs. The CTs shall be of relay accuracy and the CT characteristics shall be compatible with the differential relay. The additional 3 nos. CTs of identical characteristics shall be provided in the 11kV/6.6 kV switchgear panel.</p> <p>1.11. The terminal box of motor shall be of suitable size, suitable to terminate and maintain the cables easily. Terminal box shall be suitable to rotate at 90 degrees.</p> <p>1.12. The ring oiling system shall be adequate for starting and continuous operation of the motor for at least one half hour without pressure oiling system in operation.</p> <p>1.13. For 11kV & 6.6 kV motors, 6-nos. duplex RTD s for winding shall be provided for remote monitoring, alarm and tripping at DCS. Each bearing shall be provided with one duplex RTD for temperature remote monitoring, alarm and tripping at DCS. 6 nos. spare RTDs shall be provided for winding in HT motors.</p> <p>1.14. The maximum double amplitude vibrations for motors shall be as per IS 12075.</p> <p>1.15. Maximum noise level measured at a distance of 1.5 meter from the outer surface of the motor shall not exceed 85 db (A).</p> <p>1.16. Cable boxes of all 11kV & 6.6 kV motors shall be Phase segregated & shall be provided with quick disconnecting type terminal connectors to facilitate easy disconnection and removal of the motors without requiring unsealing or otherwise disturbing the external cable connections and leaving the phase segregated terminal box intact. The terminal boxes shall have fault withstand capacity equal to at least rated short circuit level of system voltage for 0.25 sec. The terminal boxes shall be reversible to suit cable entry from top or bottom and suitable for termination of FRLS, XLPE armoured cables.</p> <p>1.17. The star connection side terminal box should have sufficient capacity to accommodate CT's for differential protection for motor above 1000kW.</p> <p>1.18. The insulation system for 11000 V AC & 6600 V AC motors shall withstand the negative or positive 0.3 / 3.0 microsecond wave (2.7 pu rated peak line to earth operating voltage) switching surges originating from non-effectively earthed power system. All 11000V AC & 6600 V AC motors shall have BIL and power frequency withstand voltage as per relevant standards.</p> <p>1.19. Motor bearing shall be insulated wherever required.</p> <p>1.20. All HT motors shall be with VPI insulation or better</p>		
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<p>1.21. All HT motors / LT motors 15 kW and above shall be provided with external greasing arrangement</p> <p>1.22. CACW motor shall be provided with water leakage detector with remote alarms and tripping.</p> <p>1.23. All HT motors / LT motors 30 kW and above shall be provided with space heaters using 240 V AC supply. However, for all the actuators, irrespective of its rating, space heaters shall be provided using 240V AC supply.</p> <p>1.24. All motors below 15 kW shall be provided with sealed ZZ bearings</p> <p>1.25. Each motor shall have two earthing terminals.</p> <p>1.26. All motors for outdoor duty shall have detachable metal canopy.</p> <p>1.27. HT motors shall be designed for operation as follows:</p> <ol style="list-style-type: none"> Upto 1000kW – Vacuum circuit breakers/SF6. Above 1000kW-Vacuum circuit breakers/SF6. All motors shall be suitable for DOL starting. <p>1.28. Separate terminal boxes to be provided for space heater, RTDs for windings/bearings, vibration monitors etc. All terminal boxes shall be provided with two earth studs for termination of protective earth conductor. Double compression type brass cable glands and crimping type copper lugs shall be provided for termination.</p> <p>1.29. Provision shall be made at DCS to monitor, integrate running hours, nos. of starts and stop recording for all motors.</p> <p>1.30. The terminals of all motors shall be suitable for terminating Aluminium conductor, XLPE insulated, armoured cables, the sizes of which will be intimated by the Purchaser.</p> <p><u>2.0 ACTUATOR</u></p> <p><u>2.1. GENERAL TECHNICAL REQUIREMENT</u></p> <p>2.1.1. Actuator shall be weatherproof type with enclosure conforming to IP-64 degree of protection. It should be suitable for out door use without the need for canopy. If the IP-68 degree of protection is required due to occasional submergence, the purchaser shall specify the depth and duration of such submergence.</p> <p>2.1.2. The actuator shall be suitable for installation in any position without lubrication leakage or other operational difficulty.</p> <p>2.1.3. All actuators shall be supplied with non integral starters for open & close. The main gearbox of the actuator shall be special grease filled.</p> <p>2.1.4. Each actuator should have a hand wheel for emergency manual operation. Clockwise operation of hand wheel shall cause clockwise movement of the</p>		
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<p>output drive. The hand wheel shall be clearly marked with an arrow and the word CLOSE.</p> <p>2.1.5. The hand wheel shall automatically disengage when the power to the motor is restored i.e. power drive shall have a preference over manual drive.</p> <p>2.1.6. The manual effort should not exceed 400 N (push / pull). A top bevel gear set (side mounted hand wheel) shall be employed to reduce the manual effort.</p> <p>2.1.7. Each actuator shall have a local mechanical position indicator. It should be suitable to indicate 0 – 100% position of the valve (continuous type).</p> <p>2.1.8. In order to minimise the amount of spare parts required, parts and sub-assemblies limit / torque switches, limit switch counter gear assembly, torque switch drive assembly, mechanical position indicator assembly etc. individually interchangeable / replaceable throughout the models selected.</p> <p>2.1.9. The actuator shall be painted with corrosion resistant epoxy resin paint. Paint shade shall be Grey (Shade 631) as per IS-5.</p> <p>2.1.10. In order to prevent condensation, a space heater shall be provided in the switch compartment, suitable for continuous operation. Actuator mounting dimensions shall be according to ISO-5210. For rising stem applications, the design must allow the removal of actuator from the output drive without disturbing the function of valve.</p> <p>2.2. LIMIT AND TORQUE SWITCHES</p> <p>2.2.1. Independent torque and limit switches shall be provided in the actuator. A minimum of two position limit switches and two torque switches, one each for each direction of travel, having 4 NO + 4 NC potential free contacts, shall be supplied. If called for in the data sheet, two additional limit switches shall be provided for intermediate positions.</p> <p>2.2.2. Torque switch dial shall be graduated directly in “kg-m” for easy setting to desired value within the range specified. Separate dials shall be provided for CLOSE and OPEN torque switches.</p> <p>2.2.3. Two additional limit switches with 2NO + 2NC contacts, each adjustable at any intermediate position, shall be provided in the actuator.</p> <p>2.2.4. The rating of both torque and limit switches shall be 240 V AC, 5 Amps. The switches shall individually be enclosed to a minimum of IP-64 protection class.</p> <p>2.2.5. Torque and limit switches shall have only stainless steel flaps for better protection against environmental condition.</p> <p>2.2.6. Limit switches shall be operated by gear driven cams, which are mechanically linked to the driving devices. The counter gear used for counting and tripping the limit switches shall be of metallic construction like brass etc. No plastic gearing shall be allowed.</p>		
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~~2.2.7. To guarantee proper function under high ambient temperatures, torque and limit switch sensing shall be of mechanical type.~~

~~2.3. ELECTRIC DRIVE FOR ACTUATOR (MOTOR)~~

~~2.3.1. All motors shall be specifically designed for valve actuator operation, which is characterised by high starting torque, low stall torque & low inertia. All motors shall be high starting torque type to facilitate 'unseating' of valve.~~

~~2.3.2. Motor shall be suitable for power supply of 415 V, 3 ph, 50 Hz, AC.~~

~~2.3.3. Motor shall be squirrel cage induction type and shall generally conform to IS 325.~~

~~2.3.4. Motor shall have minimum class 'F' insulation with temperature rise restricted to class 'B' under the design ambient temperature.~~

~~2.3.5. Motor shall be of totally enclosed surface cooled (TESC) type with IP 67 protection class after mounting on actuator.~~

~~2.3.6. Motor shall have three thermostats connected in series, one in each phase of stator winding, for protection against overheating.~~

~~2.3.7. Motor shall be suitable for operation under voltage variation of + 10%, frequency variation of + 5% and combined voltage & frequency variation of 10% absolute.~~

~~2.3.8. Motor shall be suitable for direct on-line (DOL) starting and starter shall be non integral to the motor.~~

~~2.3.9. It should be possible to separate the motor from the lubricant filled gearing of the actuator allowing easy replacement of motor without losing any lubricant regardless of mounting position.~~

~~2.3.10. Finish shall be provided on the motor body to ensure better heat dissipation.~~

~~2.3.11. It shall be possible to change the output rpm of the actuator, if required, at the site at a later date, without hampering the mounting arrangement and loss of any lubricant.~~

2.4. CODES & STANDARDS

All the equipment specified herein shall comply with the requirements of the latest issue of the relevant National & International standards.

The design and materials used for the components shall also comply with the relevant National & International standards.

As a minimum requirement, the following standards shall be complied with :

Electric motor operated actuators:IS 9334

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Degrees of protection provided by enclosures at low:IS 2147
voltage switch gear and control gear

Flame Proof enclosure at electrical apparatus:IS 2148
Specification for three phase induction motors:IS 325

AC contactor for voltages not exceeding 1000 V:IS 2959

Degree of protection provided by enclosures for :IS 4691
Rotating electrical machinery

Specification for rotating electrical machines:IS 4722
For other code refer Section D28.

~~2.5. OTHER REQUIREMENTS OF ACTUATOR.~~

~~2.5.1. Common potential free contact shall be available to annunciate the fault condition to the remote control station or DCS.~~

~~2.5.2. The following individual relay / potential free contacts shall be provided for the remote indication:-~~

- ~~- Actuator OPEN.~~
- ~~- Actuator CLOSE~~
- ~~- Actuator fault feed back~~
- ~~- Thermal overload relay shall be provided to trip the actuator in case of overload~~
- ~~2.6. The DC and AC actuator shall be provided with accessories viz., Torque limit switch, end of travel switch, adjustable limit switch, hand wheel motor, thermostat, etc. Complete actuator shall be tested at factory as per IS 9334. All actuators should have minimum 2 limit switches for each position, and should have position transmitters wherever required.~~

3.0 TESTS

3.1. All routine & acceptance tests as per relevant IS shall be conducted on motors. For all AC and DC motors of rating below 100kW, type test certificates shall be furnished. If the test reports are not found in order by Purchaser then these tests shall be conducted by the Vendor without any cost implication.

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<p>3.2. Type test shall be carried out on one no. of each type and rating of motor of rating 100kW and above, which shall be witnessed by Purchaser.</p> <p>3.3. Efficiency and loss measurements shall be done for all LT motors as per relevant standard (Being energy efficient motors.) as routine test.</p> <p>3.4. For 11000V AC & 6600V AC motors, in addition to all the tests specified above, polarisation index test shall be carried out as a routine test on each motor (the minimum value of polarisation index for all motors shall be 2 when determined according to IS: 7816).</p> <p>3.5. Noise level measurement test shall be conducted on one motor of each type.</p> <p>3.6. Vibration measurement shall be taken for each motor of 45kW & above.</p> <p>3.7. Dielectric tests to establish the insulation withstand level of motors as indicated above shall be performed on a sample coil (identical to those to be used in the motor quoted for) for each type of motor. These tested sample coils shall not be used in the motors to be supplied.</p> <p>4.0 For technical particulars refer datasheet A.</p> <p>5.0 MOTOR MODULES All the motors shall be controlled as follwos :</p> <p>5.1 Up to 50kW :- MPCB - Contactor (MPCB shall be with adjustable S/C and O/L protection)</p>		
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4.0.0 INFORMATION TO BE FURNISHED ALONGWITH THE OFFER BY THE BIDDER.

The bidder shall submit four (04) sets of the following drawings and data along with the bid without which the offer will be deemed incomplete.

- 4.1.0 Un-prices Bill of Quantities (BOQ) for main package.
- 4.2.0 Dimensioned outline drawing giving overall dimensions, material.
- 4.3.0 Flow diagram & electrical wiring diagram for the equipment offered.
- 4.4.0 Datasheet containing all the information regarding equipment offered.
- 4.5.0 Reference list, Catalogue & Technical bulletins for various items being offered.
- 4.6.0 Any deviations from the specification / data sheet & reasons thereof.
- 4.7.0 Schedules as in Vol. III.
- 4.8.0 Quality Plan for the equipment offered in the format enclosed with this specification.
- 4.9.0 Field quality plan, if applicable
- 4.10.0 List of commissioning and recommended spares, if any.
- 4.11.0 List of tools & tackles, if applicable
- 4.12.0 List of consumables / lubricants, if applicable

5.0.0 DRAWING


For general arrangement and terminal point details refer enclosed drawings nos. PE-DG-392-167-N101 in Volume II B Sec. D.


6.0.0 QUALITY PLAN

The bidder shall furnish quality plan along with the offer and the same shall be finalized before the issue of LOI.

Detailed quality plan shall be submitted by the successful tenderer after the placement of order for each project during contract execution for final approval by BHEL / its customer. BHEL / its customer shall indicate Customer Hold Points (CHP) in the approved quality plan beyond which work shall not proceed without the approval of BHEL / its customer for any particular project during final execution.

The quality plans enclosed in volume-II-B 'D' of the specification are for bidder's guidance only and are not exhaustive. The bidder shall comply with these and other minimum requirements specified in the specification and shall furnish his own quality plan in BHEL/Customer formats in the event of order based on the guidance given as above for BHEL/Customer's approval.

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1.0

GENERAL

This standard specification covers the design, materials, construction features, manufacturing process, inspection and testing requirements, painting and packing requirements of Oil Purification Unit complete with all accessories as specified hereinafter.

2.0

CODES AND STANDARDS

2.1

The design, manufacture, inspection and testing of the equipment shall comply with the requirements of the latest national and international codes and standards wherever applicable. Wherever the specific code requirements are specified herein,. the same shall be adhered to.

3.0

DESIGN AND CONSTRUCTIONAL FEATURES

3.1

CENTRIFUGE

3.1.1

Each oil purification unit shall be provided with a Centrifuge to separate moisture and solid particles from the oil.

3.1.2

The Centrifuge may be tubular bowl type or disc stack type complete with drive motor and all necessary accessories. The transmission from drive motors to the Centrifuge may be through gears or belt.

3.1.3

The Centrifuge bowl design and other operating parameters shall ensure that the purity levels as specified in Data Sheet-A shall be achieved at the through put capacity specified in the Data Sheet-A for the given specification of oil.

3.1.4

Heavier phase discharge from the Centrifuge, mainly water, shall go to drain through a small tank, the level of which may be utilised for signalling the flooding of the Centrifuge due to loss of water seal or due to clogging in the heavy phase drain pipe. The purifier shall be equipped with sight glasses or inspection ports to provide indication of the flow of the purified and the separated water.

3.1.5

The materials of construction for the different components shall be as indicated in Data Sheet-A.

3.1.6

All rotating parts of the Centrifuge shall be dynamically balanced as per VDI 2060 Q 6.3 or ISO 1940 G 6.3 and shall operate without objectionable noises or vibration. The noise levels when operating shall be indicated by the bidder for the machine offered.

3.2

OIL HEATER

3.2.1


Each unit shall be equipped with an indirect water bath type electric oil heater for preheating the oil. The heater shall be shell and tube type with oil in tubes and water on shell side which gets heated by electric immersion elements.

3.2.2

The heater shall be designed to heat the oil at the rated flow from a minimum. temperature to the required temperature as indicated in Data Sheet - A. The heater shall be complete with its fuse, starter, automatic temperature switch and indication.

3.2.3

The heating elements shall be arranged in a group and shall operate in all on/off mode for maintaining oil temperature at the required value. The grouping in parallel shall ensure that failure of any one element shall not impair the heater completely and shall have provision for

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easy removal and replacement. The set points of the thermostats for cutting-in and out shall be suitably chosen to avoid very frequent operation.

3.2.4 The heater shall be complete with oil inlet, oil outlet, drain, vent, overflow, make-up and quick filling connections and shall be fitted with level sight glasses for indicating water level.

3.2.5 The material of construction for heater shell, tubes, insulation, painting shall be as specified in Data Sheet-A.

3.3 FEED AND DISCHARGE PUMPS

3.3.1 The feed and discharge pumps shall be positive displacement rotary type and complete with drives, safety relief valves, bypass valve for matching capacity with the system, coarse strainer at inlet and other accessories as required.

3.3.2 The suction lift and the net discharge pressure required at the rated flow are as indicated in the Data Sheet-A.

3.3.3 The capacity of the discharge pump shall be selected to allow for the increase in oil volume due to aeration and turbulence after centrifuging.

3.3.4 The design, construction and testing of the pumps shall be in accordance with the standards of the Hydraulic Institute of USA or equivalent manufacturer's standard.

3.3.5 The materials of construction shall be as specified in Data Sheet-A.

3.3.6 A common drive for the pumps shall be preferred.

3.4 POLISHING FILTER

Filter if provided shall maintain the lubricating value of oil and shall not remove any additives/inhibitors present in the oil. The filter shall be provided with a bypass connection and pressure switch for initiating alarm in case of filter choking. The filter vessel shall be designed and fabricated in accordance with ASME code for unfired pressure vessels. It shall be provided with safety relief valve for protection against over-pressurisation.

3.5 VALVES, PIPES, FITTINGS AND ACCESSORIES


3.5.1 The oil purification unit shall be complete with valves, fittings and interconnecting piping. All valves, fittings and piping materials shall conform to the specifications in Data Sheet-A of Section-D and Section-C. In case of any discrepancy between Section-D and Section-C the requirement in Section-C shall prevail.

3.5.2 Slip-on type mating counter flanges of appropriate pressure rating shall be furnished at all terminal points of supply. Suitable sampling connections with valves shall be provided as shown in the tender drawing and as per Data Sheet-A and Section-C.

3.6 MOTORS, CONTROL PANELS, CABLES, CONTROLS AND INSTRUMENTATION

These shall conform to the specifications enclosed herewith.

3.7 INTERLOCKS AND PROTECTIONS.

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3.7.1 The following interlocks and protections shall be provided for each unit.


- A) The Centrifuge Motor and the Pumps Motor shall trip in case of any one of the following faults:
- i) Loss of water Seal or Excessive Water in oil - signalled through Float switch in Antiflood tank.
 - ii) Belt failure (if applicable) - Signalled by limit switch.
 - iii) No flow of oil from oil tank to centrifuge - Signalled by flow switch.
- Under the above conditions the inlet solenoid valve shall close and the heater shall be switched off while tripping the unit.
- B) The Heater shall be switched off under any one of the following faults :
- i) High oil temperature - above 70°C
 - ii) High water temperature - above 90°C
 - iii) Low water level
- C) The electric heating elements shall be grouped in 2 or more steps and the oil temperature shall be controlled by thermostats on the oil discharge piping by switching heaters ON and OFF in steps.
- D) The solenoid shall be rated for continuous operation suitable for 240V, 1- phase & 50 C/S and shall be as per specifications enclosed.
- E) In addition to the above, the necessary interlock and protection for the safe operation of the system based on the bidder's experience shall also be included.

3.7.2 ANNUNCIATION

Annunciation system consisting of window type annunciation as a part of control panel shall be provided to give visual and audible indications on occurrence of any of the following faults :

- a) Loss of water seal
- b) Centrifuge motor tripped due to any protective interlocks
- c) High oil temperature at heater outlet
- d) Low water level in heater.
- e) Polishing filter choked .
- f) Centrifuge belt failure (if applicable)

Two nos. of spare windows shall be provided.

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3.7.3 ACKNOWLEDGE, RESET AND TEST FACILITIES

The following shall be provided:

- a) One push button for testing the annunciation, when this is pressed all lamps will flash and alarm will sound.
- b) One push button for clearing the audible alarm, the visual indication shall remain ON.
- c) One push button for clearing the visual alarm after the fault is cleared. If RESET button is pressed before the fault is cleared the lamp shall remain ON.
- d) After acknowledging one fault by clearing the audible alarm, the alarm circuit shall be ready to operate for another fault. Silencing the Horn in conjunction with one fault shall not disable the Horn from sounding if another fault occurs.

The above Annunciation shall be a part of the control Panel.

3.7.4 LOCAL CONTROL PANEL

The control panel provided shall conform to the section enclosed. The panel shall contain and shall be complete with all the necessary switches, fuses, contactors and relays for the Centrifuge motor and pump motor, push buttons, indicating lamps, main incoming fuse unit, main switch, volt meter with selector switch, ammeters, internal wiring, circuit diagram, device labels, terminal boards, cable glands, ground bus and grouting legs etc. The panel shall be of free standing type, dust tight, weather and vermin proof and shall be mounted on the common base plate as the unit.


4.0 SHOP INSPECTION AND TEST

4.1 The quality assurance of the system shall be as per the enclosed annexure quality assurance system and Quality Plan.

4.2 Scope of inspection and testing shall include but not limited to the following.

4.2.1 THE CENTRIFUGE & COMPLETE UNIT.

- a) Identification of material of important components, like Bowl body, Bowl hood, Discs, Shaft spindle, Gears, Worm, Frame etc.
- b) Static & Dynamic balancing of rotating parts.
- c) Running test of the complete unit for
 - i) Capacity
 - ii) RPM, Leakage, Vibrations and Noise Levels.
 - iii) Discharge Pressure at rated flow.
 - iv) Pressure drop across filter.
 - v) Oil temperature at heater outlet.

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- vi) Overall dimensions.
- vii) Surface temperature of oil heater.
- viii) Operation of all instruments and thermostats and switches,.
- ix) Sequential operation of interlocks, protections and alarms.
- x) Power consumption of the Motors and Heater and complete unit.
- xi) Starting time.
- xii) Test for moisture content in the purified oil to prove the performance.


The supplier shall submit for the approval of the purchaser, the complete test procedure of the Centrifuge and complete unit taking into account all of the above tests.

4.2.2 INDIRECT ELECTRIC OIL HEATER

- a) Approving welding procedure specifications, qualifying the same and the welders for the requisite welding positions.
- b) Identification and correlation with Test Certificate of material for tank, heater, tubes etc.
- c) Testing of Heating Element for wattage, high voltage and insulation resistance as per IS-4159.
- d) Hydrotest of header and tube assembly.
- e) Checking of properties of insulating glass wool as per IS-3690.
- f) Checking for dimensions and leakage by water fill test before insulation.

4.2.3 POLISHING FILTER (IF PROVIDED)

- a) Approving welding procedure specifications and qualifying the same and the welders for requisite welding positions.
- b) Identification and correlation with test certificate the material of construction of shell, dished and flanges, nozzles.
- c) Dimensional inspection of dished ends as per applicable code.
- d) Dye penetrate test on inside and outside of dished ends at knuckle radius, straight face around centre hole.
- e) Approval of radiographs, if radiography is required.
- f) Dye penetrate test on weld seams as per the code.
- g) Verification of stress relieving charges if the same is required.

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- h) Internal and external cleaning of the vessel.
- i) Dimensional, Visual inspection of the fabrication vessel.
- j) Hydrotest of the vessel.

4.2.4 FEED & DISCHARGE PUMPS


- a) Testing of test bars for mechanical and chemical tests for castings & forgings. In case of castings the test bars shall be poured from the same ladle of castings they represent and shall bear original Heat marks. In case of forgings, integral test bars shall be provided. Both castings and forgings shall bear original heat/cast marks.
- b) Identification and Correlation with Test Certificate of shaft material.
- c) Hydraulic test of the pump casing at twice the design pressure or 1.5 times the shut off-pressure whichever is higher. Test pressure to be maintained for a minimum period of 30 minutes.
- d) Dye penetrate examination on all rotors to ensure freedom from surface defects as per ASTM E 165 and evaluation of indications as per NB 2546 ASME III.
- e) Performance tests of each pump with unit motors as per the standards of Hydraulic Institute standards of U.S.A. or equivalent manufacturer's standards.
- f) Examination by selective opening after performance test.

4.2.5 VALVES, FITTINGS & PIPINGS

- a) Testing of test bars for mechanical and chemical tests for castings & forgings. In case of castings, the test bars shall be poured from the same ladle of castings they represent and shall bear original heat marks. In case of forgings integral test bars shall be provided. Both castings and forgings shall bear original heat/cast marks.
- b) Identification and correlation with test certificate of trim material.
- c) Dye penetrate and hardness checking of hard faced surface, if any.
- d) Blue matching of lapped surfaces.
- e) Hardness checking of spindle, seat ring etc.
- f) Dimensions, Hydraulic and Pneumatic tests as per the governing code.
- g) Physical, Chemical, Hydraulic tests and dimensions of pipes and fittings as per the relevant specifications.

4.2.6 ELECTRIC MOTORS

- a) Inspection and testing of motors shall be as per enclosed L.V. Squirrel Cage induction motor specification.

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b) Routine tests as per the governing specifications.

4.2.7 CONTROL PANEL

a) Compliance with approved drawings / data sheet / specification.

b) Visual check for workman ship.

c) Wiring continuity, functional / simulation check.

d) Calibration of Instruments, relays / meters.

e) High voltage test.

f) Insulation resistance measurement.

4.2.8 PRESSURE GAUGES, THERMOMETERS AND FLOW METER

a) Routine tests as per the specifications.

4.2.9 SOLENOID VALVE, FLOAT SWITCHES, ETC.

a) Verification of type test certificates for electrically operated solenoid valves, pressure switches etc. In the absence of these certificates, type tests shall be carried out.

b) Routine tests as per the specifications.

5.0 TEST AT SITE

After installation at site the purifier system shall be tested for sound and trouble free operation as envisaged. The controls and interlocks and annunciation system shall be operated to ensure the smooth and safe operation.

6.0 PERFORMANCE GUARANTEE

6.1 Each oil purification unit shall be capable of the specified flow capacity of the contaminated lubricating oil per hour and achieve the solids and water separation to attain the purity levels specified herein. The oil at the outlet of the unit shall not contain any free moisture. Cleanliness of purified oil at the outlet of purifier shall be as per code 15/12 of ISO- 4406.

6.2 The Tenderer shall specify the percentage of oil in the heavy phase drain of the centrifuge and shall guarantee the above specified figures.

6.3 The tenderer shall guarantee the discharge pressure of the pump at the rated capacity and the total power consumption.

6.4 The tenderer shall guarantee the total power consumption of the complete unit.



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These guarantees shall be indicated in the schedule of guarantees in Vol.- III..

7.0 NAME PLATE

Each component and the unit shall have a permanently attached brass metal tag indicating the following parameters in Hindi and English.

- a) Manufacturer's name and trade mark.
- b) Size / capacity / rating.
- c) Design Parameters.


8.0 DOCUMENTS AND DATA TO BE SUBMITTED WITH THE BID

The bidder shall submit following drawings / data and documents alongwith the bid without which the offer will be deemed incomplete.

- 8.1 P&I diagram for the system offered.
- 8.2 Dimensioned outline drawing giving overall dimensions, material of construction, type of end connection & weight.
- 8.3 Electrical circuit diagram.
- 8.4 General arrangement of control panel.
- 8.5 General arrangement of heater.
- 8.6 Data Sheet B, with all particulars/data duly filled in.
- 8.7 Reference list.
- 8.8 Catalogue & technical bulletins for various items.
- 8.9 Any deviations from the specification/data sheet & reasons thereof.
- 8.10 Schedules as in Vol. III.
- 8.11 Quality Plan for the equipment offered in the format enclosed with this specification.
- 8.12 Field quality plan.
- 8.13 List of recommended spares for three years operation.

9.0 DOCUMENTS AND DATA AFTER AWARD OF CONTRACT

The drawings / data and other documents as required in Data Sheet -C shall be furnished after award of contract.


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DATA SHEET –A


CUSTOMER	:	RRVUNL
PROJECT	:	2X660 MW SURATGARH, STAGE-5, UNIT-7/8
SERVICE	:	PURIFICATION OF LUBE OIL
DRAWING REF	:	REFER SAMPLE DRG
DESIGNATION	:	PORTABLE OIL PURIFIER (TROLLEY MOUNTED)
1. TYPE	:	CENTRIFUGE WITH POLISHING FILTER
2. CAPACITY	:	2000 LPH
3. NUMBER REQD	:	THREE (03) NO. FOR PROJECT.
4. PERFORMANCE REQUIREMENTS:		
PARTICLE SIZE IN PURIFIED OIL	:	AS PER CODE 15/12 OF ISO 4406 To be demonstrated with inlet oil quality conforming To code 21/18 as per ISO 4406.
MOISTURE IN PURIFIED OIL	:	0.05% BY VOLUME (MAX)
OUTLET PRESSURE AT RATED FLOW	:	3.0 Kg/cm ² (a) AFTER FILTER
HEATER CAPACITY	:	TO HEAT OIL FROM 30°C TO 65°C With possibility to cut Heater Elements in steps.

5. CONSTRUCTION AND MATERIAL REQUIREMENTS :**5.1 CENTRIFUGE**

TYPE	:	TUBULAR / DISC STACK
DRIVE	:	ELECTRIC MOTOR
TRANSMISSION	:	THROUGH GEARS / BELT
MATERIALS	:	
FRAME / GEAR HOUSING	:	CI-IS-210 / FG -260
BOWL BODY / COVER	:	SS
DISC / BOWL NUT	:	SS 316
DRIVE SPINDLE	:	EN-8 / EN-9

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	FEED NOZZLE :	SS 316	
	BALANCING :	REQD. AS PER MANUFACTURER'S PRACTICE	
5.2	OIL HEATER :		
	TYPE :	INDIRECT WATER BATH ELECTRIC	
	THERMOSTATS :	TOTAL 3 NOS. (2 FOR OIL & 1 FOR WATER)	
	SHELL MATERIAL :	MS IS-2062 & MIN. 5.0 MM THICK	
	TUBES MATERIAL :	COPPER TO IS-2501	
	INSULATION :	GLASS WOOL IS: 3690 40 MM THICK	
	ELECTRIC HEATING ELEMENTS :	AS PER IS:4159 ESCORTS MAKE OR EQUIVALENT REPUTED	
	ACCESSORIES :	LEVEL SIGHT GLASS	
		FLOAT SWITCH FOR LOW LEVEL ALARM & HEATER TRIP	
		MAKE-UP CONNECTION, DRAIN & OVERFLOW CONNECTION WITH VALVE	
		BYPASS WITH VALVE.	
5.3	FEED PUMP		
	TYPE :	POSITIVE DISPLACEMENT ROTARY	
	SUCTION HEAD CONSIDERED AVAILABLE :	FLOODED SUCTION MAX (-) 4 MLC TO BE	
	CASING MATERIAL :	CI- IS 210 -FG 260	
	SHAFT/ROTOR MATERIAL :	EN - 8/9	
	DRIVE :	MOTOR COMMON WITH CENTRIFUGE OR DISCHARGE PUMP	
	CAPACITY :	10% HIGHER THAN CENTRIFUGE CAPACITY	
5.4	DISCHARGE PUMP :		
	TYPE :	POSITIVE DISPLACEMENT ROTARY	
	PRESSURE AT OUTLET :	3 Kg/cm2(a) AFTER FILTER AT RATED FLOW	
	CASING MATERIAL :	CI- IS 210- FG 260	
	SHAFT/ROTOR MATERIAL :	EN - 8/9	

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DRIVE		:	MOTOR COMMON WITH CENTRIFUGE OR FEED PUMP	
CAPACITY		:	10% HIGHER THAN CENTRIFUGE CAPACITY	
5.5 STRAINER :				
Y-TYPE CAST CARBON STEEL BODY WITH SS-316 MESH, 12 MESH, & BLOW DOWN VALVES TO BE PROVIDED.				
6. PIPING AND VALVES:				
PIPE MATERIAL		:	SA-106 GR B SEAMLESS	
VALVE TYPE		:	PLUG VALVES, LEAK PROOF, SELF LUBRICATING	
RATING /CLASS		:	150	
BODY MATERIAL		:	CARBON STEEL	
TRIM MATERIAL		:	CARBON STEEL	
STANDARD APPLICABLE		:	BS-5353 OR EQUIVALENT	
7. POLISHING FILTER (IF REQUIRED) :				
SHELL MATERIAL		:	CARBON STEEL	
FILTER ELEMENTS		:	FILTER PAPER / IMPREGNATED FIBRES BONDED WITH EPOXY RESIN	
ACCESSORIES REQUIRED		:	PRESSURE SWITCH TO INDICATE CHOKING, VENT & RELIEF VALVE, ETC.	
8. INSTRUMENTS AND CONTROL REQUIRED :				
AS PER DRAWING PE-DG-MOU-167-N001.				
9. REMARKS :				
SEE SECTION - C FOR SPECIFIC REQUIREMENTS.				
10. SAMPLE PROPERTIES OF OIL : TURBINE LUBE OIL				
10.1	Oil Brand		SERVO PRIME - 46 (IOC) TURBINOL - 46 (HPC)	
10.2	Kinematic viscosity at 37.8 °C		41.4 - 50.6 CST	

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10.3		Density at 15°C	0.9 gm/ml	
10.4		Viscosity Index	96	
10.5		Temperature of Oil	Ambient	
10.6		Pour point	(-) 6°C	
10.7		Flash point	210°C	
10.8		Neutralisation no.	0.15 - 0.2 mg of KOH/gm	
10.9		Emulsion characteristics	40-40-0 (30 minutes)	



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DATA SHEET-C

DOCUMENTS & DATA TO BE SUBMITTED AFTER THE AWARD OF THE CONTRACT.

The supplier shall after the award of contract submit following documents for purchaser's approval/vetting as per enclosed Annexure-II.

- i) All certified final drawings & data sheets as mentioned in clause 8.0.
- ii) Operating & maintenance instruction manual.
- iii) Bill of quantities for valves, instruments, relays, controllers and other components.
- iv) Cross sectional drawing of
 - a) Centrifuge with drive.
 - b) Pumps.
 - c) Polishing filter
 - d) Heater.
- v) Performance characteristics for
 - a) Pumps.
 - b) Motor starting characteristics.
- vi) Quality Plan / Inspection / Test reports / Certificates as agreed between the buyer & supplier.
- vii) Storage Instructions.
- viii) List of recommended spares for three years operation.

The above list is only indicative. However the successful bidder shall prepare a detailed schedule of drawings/ documents which shall be mutually agreed upon & same shall be indicated in the contract document / ordering specification.

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QUALITY PLAN

Manufacturer's Name & Address :			MANUFACTURING QUALITY PLAN						Project :				
			Item : Portable Lube oil purification unit			QP No. : Rev. no. Date : 11 Page No			Package : Portable Lube oil purification unit				
									PO No. :				
									Contractor :				
Sr. No.	Component/ Operation	Characteristic	Class	Type of check	Quantum of check	Reference document	Acceptance norms	Format of records		Agency			Remarks
									D*	M	C	N	
1	2	3	4	5	6	7	8	9		10			11

A	Centrifuge Materials												
1	Bowl / Disc body	Chem & Mech. Properties	MA	Lab test	One/batch	AL 111 2377 02	AL 111 2377 02	Conform ance report	*	P	V	V	
2	Bowl / Disc hood	-do-	MA	Lab test	One/batch	AL 111 2377 02	AL 111 2377 02	-do-	*	P	V	V	
3	Top disc	-do-	MA	Lab test	One/batch	AL 111 5204 03	AL 111 5204 03	-do-	*	P	V	V	
4	Distributor	-do-	MA	Lab test	One/batch	AL 111 5204 03	AL 111 5204 03	-do-	*	P	V	V	
5	Bowl / Disc Spindle	-do-	MA	Lab test	One/batch	AL 111 2541 03	AL 111 2541 03	-do-	*	P	V	V	
6	Pump housing	-do-	MA	Lab test	One/batch	CI , IS 210 FG 260	CI , IS 210 FG 260	-do-	*	P	V	V	
7	Horizontal shaft	-do-	MA	Lab test	One/batch	AL 111 1650 06	AL 111 1650 06	-do-	*	P	V	V	
8	Impeller	-do-	MA	Lab test	One/batch	AL 111 1650 01	AL 111 1650 01	-do-	*	P	V	V	
B	Centrifuge in process												
1	Bowl / Disc body	Surface defects	MA	DPT	100%	ASTM E 165	No surface defect	I.R.	*	P	V	V	
2	Bowl / Disc Spindle	Surface defects	MA	DPT	100%	ASTM E 165	No surface defect	I.R.	*	P	V	V	
3	Bowl / Disc Complete	balancing	MA	Dynamic balancing	100%	ISO 1940	ISO 1940 Gr. 6.3	I.R.	*	P	V	V	*
C	Heater												
1	Tube (Copper)	Chemical composition	MI	Lab test	One / batch	IS 2501	IS 2501 or BS 2871	T.C.	*	P	V	V	
2		Bend test	MI	Lab test	One / batch	IS 2501	IS 2501	T.C.	*	P	V	V	If applicable

Manufacturer/ Sub contractor	Contractor	Legend: * records identified with “*” shall be essentially included by contractor in QA documentation. M-Manufacturer/sub contractor , C- Contractor nominated inspection agency N- Customer P-Perform, W- Witness, V- Verification All “W” indicated in column “N” shall be “CHP” of Customer if applicable.										
							Reviewed by		Name & sign. Of approving authority & seal			

Manufacturer's Name & Address :			MANUFACTURING QUALITY PLAN						Project :				
			Item : Portable Lube oil purification unit			QP No. : Rev. no. Date : 11 Page No			Package : Portable Lube oil purification unit				
									PO No. :				
									Contractor :				
Sr. No.	Component/ Operation	Characteristic	Class	Type of check	Quantum of check	Reference document	Acceptance norms	Format of records		Agency			Remarks
									D*	M	C	N	
1	2	3	4	5	6	7	8	9		10			11

3	Tube assembly	Leak proof	MA	Hyd. Test	100%	1.5 x Dis. Pressure	No leakage	I.R.	*	P	W	V	
4	Shell tank material	Chem & mech composition	MI	Lab test	One / batch	IS 2062	IS 2062	T.C.	*	P	V	V	
5	Tank fabrication	Dimensions	MI	Measurement	100%	ALIL drg.	ALIL drg.	I.R.	*	P	V	V	
6		Surface defects	MA	DPT	100%	ASTM E 165	No surface defect	I.R.	*	P	V	V	
7		Leakage	MA	Water fillup	100%	For 24 hours	No leakage	I.R.	*	P	V	V	
8		Insulation	MA	Matl. Check	Sample	IS 8183	IS 8183	T.C.	*	P	V	V	
9	Heating element	IR , HV & leakage current	MA	Electrical test	Sample	IS 4159	IS 4159	T.C.	*	P	V	V	
10	WPS,PQR,WPQ	As per ASME sect IX – If already qualified by reputed agency records will be shown.											
D	Control panel												
1		Dimension	MI	Measurement	100%	Approved Drg.	Approved Drg.	I.R.	*	P	V	V	
2		Interlock & operation	MA	Visual	100%	Approved Drg.	Approved Drg.	I.R.	*	P	V	V	
3		I.R. before and after HV	MA	Megger test	100%	500 V DC	More than 1 M Ohm	I.R.	*	P	V	V	
4		HV test	MA	HV test	100%	2KV for 1 min.	No failure	I.R.	*	P	V	V	
5		Bill of material	MI	Visual	100%	Approved Drg.	Approved Drg.	I.R.		P	V	V	
6		Degree of protection	MA	Electrical test	Type test	Approved Drg. IS 19347	IS 19347	T.C.	*	P	V	V	

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			Reviewed by	Name & sign. Of approving authority & seal

Manufacturer's Name & Address :			MANUFACTURING QUALITY PLAN						Project :				
			Item : Portable Lube oil purification unit			QP No. : Rev. no. Date : 11 Page No			Package : Portable Lube oil purification unit				
									PO No. :				
									Contractor :				
Sr. No.	Component/ Operation	Characteristic	Class	Type of check	Quantum of check	Reference document	Acceptance norms	Format of records		Agency			Remarks
									D*	M	C	N	
1	2	3	4	5	6	7	8	9		10			11

E	Motor												
1	For centrifuge	Type test	MI	Elect. Test	Type test	IS 325	IS 325	T.C. (type)	*	P	V	V	
2		Routine test	MI	Elect. Test	100%	IS 325	IS 325	T.C.	*	P	V	V	
3		Flame proofness	MA	-Do-	Type test	IS 2148	IS 2148	T.C.	*	P	V	V	CMRS T.C.
F	Rotameter	Performance & accuracy	MA	Measurement	100%	Mfg. Spec./ ADS	Mfg. Spec./ +/- 2%	T.C.	*	P	V	V	
G	Thermometer	Performance & accuracy	MA	Measurement	100%	Mfg. Spec.	Mfg. Spec./ +/- 1%	T.C.	*	P	V	V	
H	Pressure gauge	Performance & accuracy	MA	Measurement	100%	Mfg. Spec.	Mfg. Spec./ +/- 1%	T.C.	*	P	V	V	
I	Thermostat	Performance & accuracy	MA	Measurement	100%	Mfg. Spec.	Mfg. Spec./ ADS	T.C.	*	P	V	V	
J	Level Switch	Performance & accuracy	MA	Measurement	100%	Mfg. Spec.	Mfg. Spec./ ADS	T.C.	*	P	V	V	
K	Pipes & fittings	Leakage	MA	Hyd. Test	100%	Approved drg.	No leakage	T.C.	*	P	V	V	
L	Valves	Leak test for body & seat	MA	Hyd. Test	100%	Mfg. Spec.	Mfg. Spec.	T.C.	*	P	V	V	
		Chem. & mech properties for body	MI	Lab tests	One per batch	ASTM 105 or equivalent	ASTM 105 or equivalent	T.C.	*	P	V	V	
M	Strainer	Leak-tightness	MA	Hyd. Test	100%	Mfg. Std.	Mfg. Std.	T.C.	*	P	V	V	
N	Complete centrifuge unit												
1	Mechanical run test	Capacity	MA	Measurement	100 %	** LPH on SP46 oil at disc. Pressure of 1.5Kg/cm2	** LPH on SP46 oil	I.R.	*	P	W	W	** As per approved drawing
2		Vibration	MA	-do-	-do-	ALIL std.	7.1 mm/s	I.R.	*	P	W	W	
3		Noise level	MA	-do-	-do-	-	85 dbA Max.	I.R.	*	P	W	W	

Manufacturer/ Sub contractor	Contractor	Legend: * records identified with “*” shall be essentially included by contractor in QA documentation. M-Manufacturer/sub contractor , C- Contractor nominated inspection agency N- Customer P-Perform, W- Witness, V- Verification All “W” indicated in column “N” shall be “CHP” of Customer if applicable.										
							Reviewed by			Name & sign. Of approving authority & seal		


Manufacturer's Name & Address : 		
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4		Sequential operation & interlocks	MA	Visual	-do-	Approved drg.	Approved drg.	I.R.	*	P	W	W	
5		Moisture content of dirty & clean oil	MA	Lab report on samples	100%	Moisture in clean oil 0.03 % to 0.05% max. (300 PPM to 500 PPM) from initial of 1.5% (15000 PPM)	Moisture in clean oil 0.03 % to 0.05% max. (300 PPM to 500 PPM) from initial of 1.5% (15000 PPM)	I.R.	*	P	V	V	Oil samples will be collected sealed in front of Inspector.
6		Particle size of inlet & outlet oil	MA	VISUAL	Type test	ISO 4406	Particle size of oil Inlet should be 21/18 & Out let should be 15/12	Type test certificate	*	P	V	V	Type test certificate (less than 5 years old) shall be provided
7	Overall dimension	Dimensions & layout & make of BOM	MI	Measurement & Visual	100 %	Approved drg.	Approved drg.	I.R.	*	-	P	-	
8	Painting	Paint shade	MI	Visual	Sample	Painting shall be as per agreed painting schedule between BHEL & ALIL		IR	-	P	V	-	

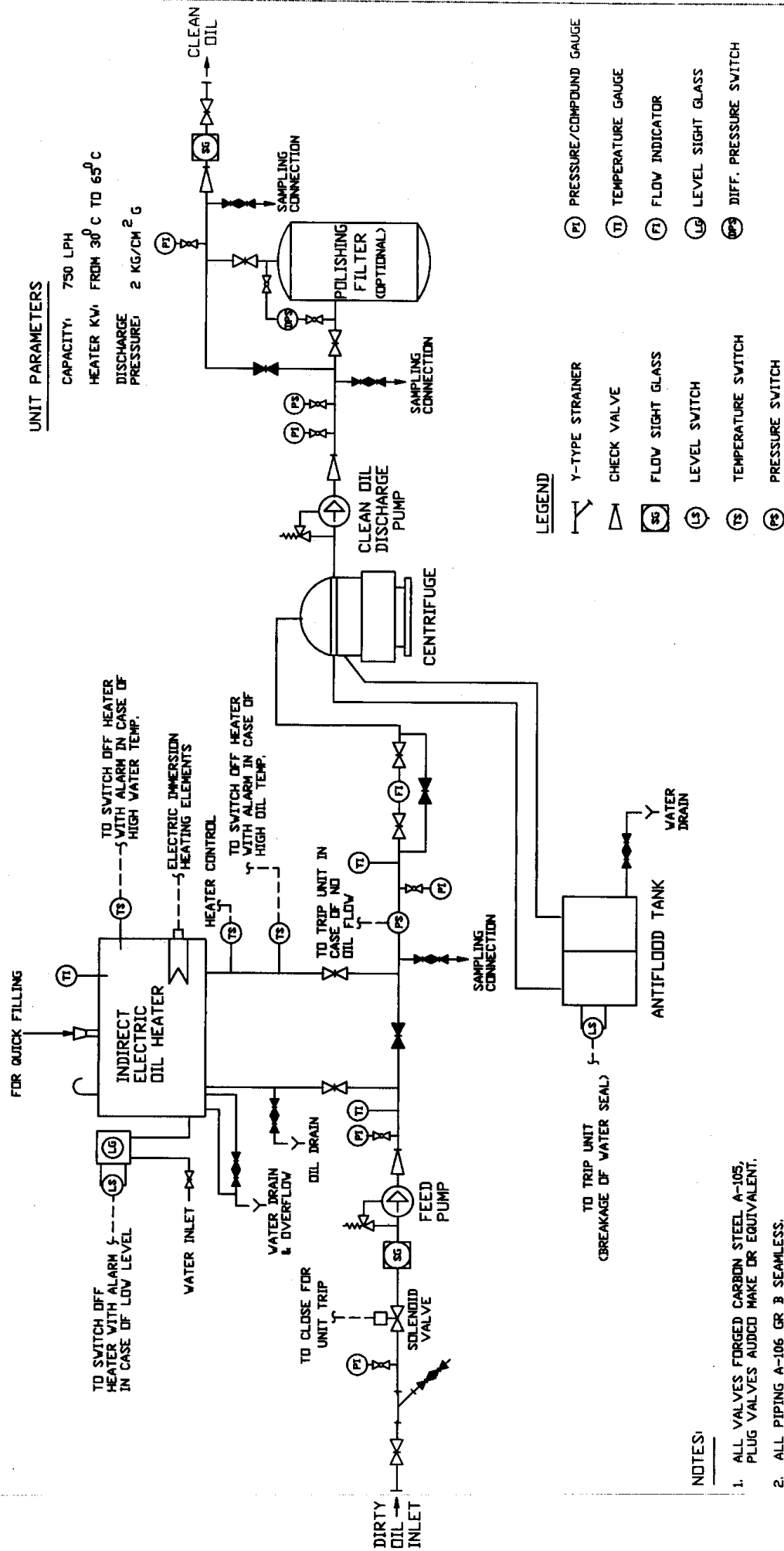
* Bowl balancing is carried out to reduce the vibrations (which are measured during final inspection N2)

** if Type test certificate (less than 5 year) is not available, the Type test to be carried out.

Manufacturer/ Sub contractor	Contractor	Legend: * records identified with “*” shall be essentially included by contractor in QA documentation. M-Manufacturer/sub contractor , C- Contractor nominated inspection agency N- Customer P-Perform, W- Witness, V- Verification All “W” indicated in column “N” shall be “CHP” of Customer if applicable.		
			Reviewed by	Name & sign. Of approving authority & seal

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SAMPLE DRAWING



1. ALL VALVES FORGED CARBON STEEL A-105, PLUG VALVES AUDDCI MAKE DR EQUIVALENT.
2. ALL PIPING A-106 GR B SEAMLESS.
3. HEATER TUBES COPPER TO IS 2501 DR IS 1345.
4. ANTIFLOOD TANK SHALL BE OF CARBON STEEL MATERIAL.
5. PRESSURE GAUGE ROOT ISOLATION VALVES SHALL BE 1/2 NB SIZE WITH SOCKET WELD ENDS FOR WELDING ISNB C STEEL IMPULSE PIPE.
6. TEMP. GAUGE AND TEMP. SWITCHES SHALL BE SUPPLIED COMPLETE WITH THERMOWELL
7. ENTIRE PURIFICATION EQUIPMENT SHALL BE MOUNTED UPON A SUBSTANTIAL METAL BASE HAVING A RAISED LIP AROUND THE OUTSIDE WITH A DRAIN CONNECTION.
8. SCHEME IS ONLY TENTATIVE. FINAL SCHEME SHALL BE AS PER APPROVED VENDER DRAWING.

[illegible]

