

PRE BID CLARIFICATION SCHEDULE				
Project:	1 x 800MW KOTHAGUEM STPP, UNIT NO.12			
Package:	FUEL OIL UNLOADING AND STORAGE SYSTEM			
Sr.No.	Section/Clause/ Page No.	Statement of the referred clause	Clarification/ Confirm ation required	BHEL Reply
1	Pg.No. 14 of 406, Cl.No. 1.1.0	One (1) nos. HFO storage tanks of effective capacity 2000 m3 is envisaged. The tank shall be provided with steam floor coil heaters at the bottom of the tank to raise the temperature of oil from 5°C to the handling / tank maintenance temp. of 500C in 72 hrs. time and maintaining the temperature inside the tank at 500 C. The floor coil heater for the Fuel oil storage tanks shall have adequate nos. of sections and shall be regulated through one no. pneumatically operated modulating type control valve provided on steam supply line. This shall be actuated from tank temperature.	Referred clause calls for one no. pneumatically operated modulating type control valve, whereas in "P&ID for Steam and Condensate System for HFO Heating and Steam Tracing" shows two no. control valves. In general 50% of coils connected to steam control valve and remaining coils connected to manual valves. Both valves will be used during heating and only control valve used during maintenance. Please check and confirm.	System to be provided as per P&ID. Floor coil heater sections shall be pneumatically operated through two nos. control valve.
2	Pg.No. 14 of 406, Cl.No. 1.1.0	BTPN wagons are not equipped with heating facility. Hence, no heating of wagons is considered.	As no heating envisaged for wagons, please provide fuel oil temperature and viscosity to be considered for sizing unloading pumps suction & discharge piping and discharge head. Also as no heating envisaged for wagons, clarify the requirement of insulation and steam tracing for HFO unloading piping upto storage tank inlet.	BTPN wagons shall be brought to site at 40 deg. C, System shall be designed for viscosity corresponding to this temperature. Heating and insulation of unloading header to be provided as per specification. This is to maintain oil temperature inside the unloading header in all weather condition.

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3	Pg.No. 17 of 406, Cl.No. 3.1.0	Scope of supply by bidder shall comprise of but not necessarily limited to the following. P&I Diagrams may please be referred. 1) Three (3) (2W+1S) nos. LDO twin screw unloading pump motor set each of capacity 150 cum/hr. with twin simplex type strainers of matching capacity at the suction of each pump. 2) Two (2) (1W+1S) nos. LDO twin screw unloading pump motor set each of capacity 25 cum/hr. with twin simplex type strainers of matching capacity at the suction of each pump. 3) Three (3) (2W+1S) nos. HFO twin screw unloading pump motor set each of capacity 150 cum/hr. with twin simplex type strainers of matching capacity at the suction of each pump. 4) Two (2) (1W+1S) nos. HFO twin screw unloading pump motor set each of capacity 25 cum/hr. with twin simplex type strainers of matching capacity at the suction of each pump.	Referred clause calls for Twin Simplex strainer whereas in " Process & Instrumentation Diagram for HFO & LDO System" indicates one simplex strainer at each pump suction. Please clarify which one has to be considered.	Simplex strainer at the suction of each pump as shown in P&ID to be provided.
4	Pg.No. 21 of 406, Cl.No. 6.0.0	TERMINAL POINT	Terminal points for PRDS Spray water, Aux. Steam, condensate, Instrument air & Service water is not given in the referred clause. Please provide the same.	Terminal Point for Steam, Spray Water and IA shall be 5.0m from Tank dyke area. Further, piping to other area shall be in bidder scope. Bidder to note that Service water is not in bidder scope.

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5	Pg.No. 47 of 406, Sr.No. 4	As described	Both referred clauses are contradicting about no. of working pumps. We are considering no. of working pumps shall be as per Pg.No. 17 of 406, Cl.No. 3.1.0. Please confirm.	Bidder understanding is correct. Standby and working pumps shall be as per Pg.No. 17 of 406, Cl.No. 3.1.0
	Pg.No. 17 of 406, Cl.No. 3.1.0	Scope of supply by bidder shall comprise of but not necessarily limited to the following. P&I Diagrams may please be referred. 1) Three (3) (2W+1S) nos. LDO twin screw unloading pump motor set each of capacity 150 cum/hr. with twin simplex type strainers of matching capacity at the suction of each pump. 2) Two (2) (1W+1S) nos. LDO twin screw unloading pump motor set each of capacity 25 cum/hr. with twin simplex type strainers of matching capacity at the suction of each pump. 3) Three (3) (2W+1S) nos. HFO twin screw unloading pump motor set each of capacity 150 cum/hr. with twin simplex type strainers of matching capacity at the suction of each pump. 4) Two (2) (1W+1S) nos. HFO twin screw unloading pump motor set each of capacity 25 cum/hr. with twin simplex type strainers of matching capacity at the suction of each pump.		
6	Pg.No. 50 of 406, Sr.No. 1	For pipe sizing velocity of fluid in various pipe lines shall be considered as follows unless otherwise stated in the specification :	Velocity of some of line sizes in " Process & Instrumentation Diagram for HFO System" is slightly exseedng over the referred velocity criteria. Also some of line sizes in " Process & Instrumentation Diagram for LDO System" over sized. Plesae clarify whether we have to follow velocity criteria for calculating minimum pipe size or we have to consider the pipe sizes given in diagram.	Minimum line size is specified in the P&ID. Bidder to consider bigger line size if required as per velocity criteria.
7	General		Please clarify the function of small capacity unloading pumps and confirm whether these pumps runs or not while main pumps are running.	These pumps will generally be used for initiating flow at the start and at the end when very small amount of oil is available in the header. However, these small pumps might run parallel with the main pumps. Bidder to design system accordingly.

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8	Pg.No. 15 of 406, Cl.No. 1.4.0	Two (2) nos. vertical centrifugal type pumps of capacity 10 cum/hr. is also envisaged in FO unloading area to pump the oil water mixture to oil water separator pits in these areas.	Referred clauses are contradicting about type of sump pumps in pump house and tank farm area. Please clarify which type of pumps to be used.	Sump pumps shall be vertical centrifugal pump. Screw as mentioned sump pumps shall be read as centrifugal.
	Pg.No. 329 of 406.	FOR SUMP PUMP AND OIL RECOVERY PUMP		
9	4.0.0 EXCLUSION; Page 20 of 406,	h) Exclusion as indicated in Electrical & C&I portion of technical specification	We have not find any exclusions relevent to electrical and C&I scope in respective specifications. Please provide.	Bidder to note that all information is available in the specification. If exclusion list is not available in electrical and C&I part of specification, then same is not applicable.
10	VOLUME : IIB/3, SECTION-IIIB, TECHNICAL SPECIFICATIO N FOR FUEL OIL UNLOADING & TRANSFERRI NG SYSTEM, Page 35 of 406	4.10.00 Thermal Insulation Refer Cl. No. 4.06.00 of Sec. IIIA of Vol-IIB.	We have not find this clause in the tender document. However we are considering VOLUME : IID, SECTION-II, THERMAL INSULATION (Page 53 of 406 to 64 of 406 of the tender specification) as thermal insulation specification. Please confirm.	Bidder understanding is correct. Insulation details given under Page 53 of 406 to 64 of 406 of the tender specification to be followed.
11	Specific Technical Requirements (C&I): Cl. No. 7; Page 179 of 406;	BHEL shall provide 230 VAC UPS supply feeder at a single point. Further distribution to various instruments shall be in Bidder's scope. Bidder to include necessary power istribution board in his scope. Any power supply other than the above, if required by any instrument/device, has to be derived by the Bidder and all necessary Hardware/ software for the same shall be in bidder's scope. Bidder to furnish UPS power requirement along with the bid.	From the referred clause we understand that UPS & UPS ACDB is in BHEL scope and ACDB to LCP power distribution is in bidder scope. Please confirm.	Confirm

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12	LCP & JUNCTION BOXES SPECIFICATIO N, , Page 251 of 406	2.00.00 CONTROL DESKS & PANELS: -----	In referred clause we have not understand the requirement of control desk. We understood that we have to provide one Local Control Panel (LCP) to terminate/connect all the instrumentation cables/ signal cable through junction box to this LCP. Interfacing with DCS from this LCP is on BHEL scope. As per the scope matrix there is no requirement of Control desks and other description given in the respective specifications; and is not clear. Please eloborate the scope and purpose of control desks.	Control desk is not in bidder scope.
13	General		Specification for Power, control & Instrumentatio Cables is not given. Please provide.	Cables are in BHEL scope. Hence, details are not covered in the specification.
14	Process & Instrumentation Diagram for HFO & LDO System	Single isolation valve to be provided in the suction strainer and unloading Pumps drain line.		Double isolation valve to be provided in the suction strainer and unloading Pumps drain line.
15	Additional Technical Requirement			Additional Tech req. enclosed under Annexure-I

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16	Pre Qualifying Requirement			Clarification to the bidders As per FOHS PQR, supplier should have prior experience of Rail Tanker Unloading and should have Designing / Manufacturing capability of the system. Bidders who have not executed any rail tanker unloading system, with consultant for designing also will not be considered for prequalification for the above project.

6.01.04 Relief Valve

- a) Each pump shall have relief valve either built-in with the body or end plate, or attachable as specified elsewhere for protection against damage due to accidental closure of discharge valve & pressure build up.
- b) The capacity of the relief valve shall be at least that of the pump to ensure the full discharge of liquid through the bypass line to the suction side of the pump during accidental pressure build up.

6.01.05 Jacketed Body

HFO pumps and strainers at pump suction and discharge shall be of steam-jacketed type.

6.01.06 Timing Gear

Timing gear shall be provided to transmit torque from one rotor shaft to another and to maintain the proper angular relationship of the rotors. Proper lubricating arrangement for this shall be provided.

6.01.07 Coupling

- a) Pump shall be connected to its drive by means of flexible coupling.
- b) Coupling guard shall be provided.

6.01.08 Baseplate

Common baseplate for the pump and motor shall be provided. The baseplate shall be suitably drilled for the anchor bolts. The baseplate shall have drip pan and suitable draining arrangement.

6.01.09 Material of Construction

For material of construction for the vital parts of the pump, Annexure-I shall be referred.

6.01.10 Drive Motor

The design and construction of the drive motor shall be as specified in specification for electric motor presented in Volume- VA.

The drive motors for Oil Handling System shall also comply with the following requirement.

- a) Enclosure shall be sufficiently strong so as to withstand internal explosion that may occur within the motor. The enclosure shall also be provided with such devices as may be necessary to protect the motor from damage if an electrical defect such as sparking, occurs

accidentally due to internal fault in the apparatus like failure of insulation/fracture of conductor/loose connection.

- b) The surface temperature of the enclosure shall be kept within such value so as not to ignite the oil vapour, in which motor is working, under any condition of operation.
- c) The enclosure shall be constructed complying requirements of flameproof construction: IS-2148.
- d) Ratings of pump motor shall be selected considering maximum expected viscosity of the fluid being pumped.

6.02.00 Pipes, Fittings, Valves and Specialties

6.02.01 Pipe Line

- a) The pipes shall be designed for the maximum operating pressure and temperature as per ANSI B 31.1 or IBR Codes whichever is more stringent. The bidder shall indicate design pressure and temperature of various pipelines.
- b) Pipe supports shall be located as per ANSIB 31.1. Flexible supports shall be used to accommodate thermal expansion.

All pipe supports overground and on pipe rack shall be provided by the bidder.
- c) All piping shall be provided with vents at the highest points and drains at the lowest points. Moreover, drains shall be provided for emptying of oil pipes at convenient locations. Pipes shall be given slope towards proper direction.
- d) HFO oil line shall be traced by steam tracers.
- e) Oil pipeline shall be generally butt-welded connection except at the equipment. All flange connections shall be perfectly oil tight by gaskets.
- f) Stubs for instruments and other connections as required shall be supplied and erected by bidder.
- g) For material of construction of pipes refer Annexure III.
- h) Pipe, valves and specialties of steam line should have IBR (1950 edition) approval.
- i) For detail stipulation on piping, valves & specialties refer section-I of Volume-IID of this specification.

6.02.02 Valves

Valves shall be designed as per the following guidelines in general:

- a) Valves shall be used to start, stop or regulate flow. All valves shall be suitable for most stringent condition i.e. flow, temperature and pressure under which they may be required to operate.
- b) Gate valves shall be used for isolation purpose for all sizes in steam and condensate service.
- c) Globe valves shall be used for regulation purpose in steam, condensate and compressed air lines.
- d) Check valve shall be used for all sizes in steam, condensate, compressed air and oil line.
- e) Gate or Ball or plug valve shall be used in oil lines.
- f) Gate and globe valves shall preferably be of such design as to permit re-packing while in service.
- g) Open and shut direction shall be indicated on each valve. All valves shall be provided with brass discs showing the tag numbers.
- h) All gate and globe valves shall be raising stem type unless mentioned otherwise.
- i) Valves offered shall be from the approved manufacturer.
- j) Motor and gearbox of motor operated valves shall be designed to operate the valve against max. operating pressure in the line when the pressure on the other end of the valve is nil.

The limit switch shall restrict the valve-movement between its limits of travel by stopping the motor.
- k) For material of constructions of valve, refer Annexure-III.

6.02.03 Strainers

- a) There shall be Simplex Strainers on the Fuel Oil Line.
- b) The strainer shall have basket type straining elements permitting easy removal and replacement.
- c) The open area ratio (i.e. straining area to the inlet area ratio) shall be at least 6:1.
- d) The strainer shall have screen of stainless steel (AISI-316) construction with wire diameter of about 0.01 inch and open area of about 50%.
- e) Strainer body shall be made of Cast steel. No Cast Iron component shall be used in F.O. system.
- f) Each strainer shall be provided with a pair of counter flanges and associated bolts, nuts and gaskets. Material of counter flanges shall be

of tested quality steel conforming to IS-2062. All strainers shall also be provided with oil drip plates beneath them for collection of oil.

- g) Bolts and nuts shall be as per IS-1363. Gaskets shall be minimum 3 mm thick and made of compressed asbestos fiber as per IS-2712.

6.02.04 Steam Traps with Strainers

- a) The steam traps shall be inverted bucket or thermodynamic type complete with integral or separate strainers.
- b) Traps shall have carbon steel body with stainless steel internals to AISI 316.
- c) Y-type strainers whether integral with steam traps or otherwise shall have body of Cast Steel Class 150 material and perforated metal screen of type AISI-316 stainless steel with about 0.8 mm perforation. The strainer shall have screwed blow off connections fitted with removable plug. The free hole area shall be at least three (3) times the internal pipe area.
- d) Numbers and location of steam traps shall be selected by the Bidder.

6.02.05 Fuel Oil Heaters

- a) Each heater shall be located adjacent to each fuel oil pump preferably on a common structural steel base plate with suitable drip lip and plugged drain connection.
- b) The heater shall be shell and tube type heat exchanger designed as per TEMA/IS-4503 or equivalent to meet the performance requirements as given. The heat exchanger shall be shell/straight tube single pass type having oil flow through the tubes. Care shall be taken in design and construction to prevent oil leakage into steam space.
- c) Suitable lugs for gripping the insulation material shall be provided on the heater shell.
- d) Each heater shall be furnished with cast steel flanged relief valves to protect the heater from excess pressure and air vents with valves in the oil and the steam compartment. Steam trap outlets and all drains shall be brought to one common point.

6.02.06 Hangers and Supports (if applicable)

Design of hangers, supports and auxiliary supporting steel members shall comply with the requirements of ANSI B 31.1 as a minimum. Fabrication of steel hangers shall be in accordance with the requirements of MSS-SP-58 Section-5 (ANSI B 31.1). Selection of location, type and rating of hangers/supports are included in Tenderer's Scope. Bidder would consider the following guidelines in general :

- a) Pipe hangers shall be concentric with webs of structural steel supporting member. Brackets and structural framing are generally not acceptable and will be subject to Engineer's review. Attachments to bracing members will not acceptable.
- b) All supports shall have adequate thread engagements. The amount of thread engaged and that available for further adjustment shall be plainly visible and sight holes shall be provided where necessary. All the threaded connections shall be provided with lock nuts. Each adjustable rod shall be provided with lock nuts.
- c) All rigid and non-rigid supports and restraints shall be provided with sufficient adjustment after installation to allow for subsequent readjustment.
- d) Supports shall be designed so that they can not become disengaged by movements of the supported pipes.
- e) All supports shall be continuous, coupling shall not be used. Each rod of a double hanger shall be designed for the full hydrotest load of the hanger. Rods of less than 9.5 mm dia. for support of pipe 50 mm NB and smaller or less than 12.5 mm dia. for support of pipe 65mm NB and larger shall not be used.
- f) The hot lines shall be supported with flexible connections to permit axial and lateral movements without restraint or binding at any supporting element.
- g) Expansion loops wherever necessary shall be provided in auxiliary steam and HFO line in order to restrict end forces and movements.
- h) If an outdoor saddle support is assumed to permit sliding movement of pipe over the support, consideration shall be given in selection of supporting material at the interface so that no rust formation takes place and actual sliding movement becomes feasible in practice.
- i) The supports shall be so interspaced as to minimise sagging of the pipes and to keep them within permissible limits where pipes are full with the conveying media.
- j) Type of hangers and components of all piping shall be selected as per sound engineering practice and approval shall be obtained from the Purchaser/Consultant.

6.02.07 Fabrication : Piping System

- a) The piping systems shall be constructed in accordance with the requirements of ANSI B-31.1. The requirements of IBR, (with latest amendments) wherever more stringent than ANSI B- 31.1, shall be complied with for the piping systems which are under the purview of IBR.

- b) Piping shall be fabricated in the shop in the largest practicable sections to minimize the number of field weld joints. The choice of field weld joint location shall be based on the traverse of the pipe through walls, floors, sleeves or other restrictive areas.
- c) All workmanship shall be accomplished using methods and procedures of best recognized pipe fabrication and must be done in a good and workmanlike manner in accordance with latest revisions of applicable ANSI standards, ASME codes, PFI standards and IBR as applicable.
- d) Flanged or welded nozzles, branch connections, welding outlets, adaptors and taps shall be true and faced at right angles to the axis of the pipe to ensure accurate fit. Connections shall not extend inside the pipe.
- e) Bends and offsets shall be made true to the sizes, dimensions, angles and radii, with ends true and faced at right angles to the axis of the pipe. All 90 degree elbows shall be long radius type unless otherwise stated.

Access holes for field radiography shall be provided in fabricated piping for which 100 percent radiographic examination is required by governing code. Access holes for shop radiography shall be provided only if the area to be radiographed is not accessible through the ends of the pipe.

- f) The pipe wall shall be reinforced in accordance with requirements of the Power Piping Code. ANSI B-31.1 where necessary, to compensate for large locally applied external forces, dead weight loads, or hydrostatic test loads.
- g) Internal surfaces of pipe shall be ground smooth and flush after drilling operations. Alternately the final hole sizing may be accomplished by reaming.

6.02.08 Bending

- a) Bend thinning allowance on straight pipe prior to bending shall be applied as per ANSI B 31.1. For bends of 5D or higher radius, the difference between maximum and minimum diameters shall not exceed 8 percent of average measured outside diameter of the pipe before bending.
- b) All bends in 65 mm NB and larger piping shall be made hot. Bends in 50 mm NB and smaller piping may be made cold only when commercially available bending shoes are used. Finished bends shall be smooth in contour and free from buckles and distortion.
- c) Pipe bends may be fabricated by the incremental induction heating process. Circumferential butt welds or longitudinal welds (where seamless piping has been specified) shall not be used in the arc of

the pipe bends, without Engineer's permission. After bending, such welds, where permitted, shall be re-examined and re-inspected.

- d) All piping bends are subject to heat treatment as required by the original material specification unless otherwise approved by the Engineer.
- e) All pipe bends in 65 mm NB and larger piping shall be examined ultrasonically after fabrication for wall thickness conformance. Measurements shall be taken in accordance with PFI Standard ES-20 using the "Pulse Echo" method. Data reports containing information as recommended in PFI Standard ES-20 shall be forwarded to the Engineer for record purposes.
- f) Where examination of pipe bends indicates that wall thinning has resulted in less than code required minimum wall thickness repair by weld deposit shall be allowed only where the affected area is 150 mm or less as measured along the outside arc and with Engineer's approval. Repairs in excess of this amount shall not be permitted.
- g) Pipe elbows with mitering bend is not permitted.

6.02.09 Branch Connections

- a) Branch connections shall be in accordance with ANSI B-31.1 or IBR whichever is applicable. All branch connection welds shall be full penetration except as permitted by ANSI B- 31.1/IBR.
- b) Socket welding and threaded connections on pipelines shall be made by forged outlet fittings. The holes in pipe headers made for these connections shall be drilled to the same size as the fitting inside diameter. All burrs shall be removed and threaded fitting shall be repeated after welding.
- c) For branch connection, additional reinforcements shall be provided wherever necessary by the applicable codes including supply of necessary material by the contractor at his own cost.
- d) The design and fabrication details for the instrument stub connection is included in Bidder's scope. Materials for instrument connection shall be the same as that of the pipe to which it is attached. Fittings ratings shall be in accordance with those specified for the main process pipe.

6.02.10 End Preparation, Cutting etc.

- a) For steel pipes, end preparation for butt-welding shall be done by machining/flame cutting.
- b) Socket weld end preparation shall be saw/machine cut.

- c) For tees, laterals and other irregularities details, cutting template shall be used for accurate cutting and cutting shall follow the outline of the template.

Alignment Considerations

- a) The pipes joined by welding shall be aligned correctly within the existing tolerances on diameter, wall thickness and out of roundness, which shall be preserved during welding.
- b) All flange facings shall be true and perpendicular to the axis of the pipe with bolt holes being off center.

6.02.11 Welding

In addition to the requirements spelt out in Section : VII of Vol.II-A, the followings shall be taken into consideration:

- a) Welding Process
 - i) Welding under this specification shall be done by one of the following processes :
 - Manual oxy-acetylene welding process
 - Manual shielded metal arc process
 - Manual inert gas tungsten arc process (TIG)
 - ii) Automatic or semi-automatic welding shall be done only with the specific approval of the Purchaser/Consultant.
 - iii) Socket weld joint shall be done with low hydrogen type covered electrodes with manual shielded metal arc process.
 - iv) Welding at any joint should be completed uninterrupted. If this procedure cannot be followed for some reason, the weld shall be insulated for slow and uniform cooling.
 - v) As far as possible welding shall be carried out in flat position. If not possible, welding shall be done in a position as close to flat position as possible.
 - vi) As a rule no backing ring shall be used for circumferential butt welds.
- b) Alignment and Spacing
 - i) Components to be welded shall be aligned and spaced. Root opening shall be as under :
 - For wall thickness 2.5 mm or under and for all thickness

in oxy-acetylene welding 1.0 mm - 2.0 mm

For wall thickness over 2.4 mm 2.0 mm - 3.0 mm

Special care shall be taken for fitting and alignment in case of inert gas tungsten arc welding. Flame heating for adjustment of ends is not permitted without the approval of the Purchaser/Consultant.

- ii) A wire spacer of proper diameter may be used for the weld root opening but must be removed after tack welding and before application in root pass.
- ii) Tack welding for the alignment of pipe joints shall be executed carefully and shall be free from defects since tack welds form a part of final welding. Defective welds shall be removed prior to the welding of joints. Electrode size for tack welding shall be selected depending upon the root opening.

Tacks should be equally spaced as follows :

For 65 mm NB pipe and smaller - 2 tacks

For 80 mm NB to 300 NB pipe - 4 tacks

For 350 mm NB and larger pipes - 6 tacks

c) **Welding Technique**

- i) Root pass shall be made with respective electrodes/ filler wires. The size of the electrodes shall not be greater than 3.25 mm (10 SWG). Welding shall be done with direct current values recommended by the electrode manufacturers.
- ii) Upward technique shall be adopted for welding pipes in horizontally fixed position. For pipes with wall thickness less than 3 mm, oxy-acetylene welding is recommended.

6.03.12 General Instruction for Erection

In addition to the requirements spelt out in S-VI of Vol-II A, the general guidelines for erection are as follows :

- a) All workmanship shall be accomplished using accepted methods in accordance with IBR and applicable ANSI standards, ASME codes, PFI standards and MSS specifications. Erection of pipes and appurtenances shall comply with the requirements of ANSI B 31.1.
- b) All pipes of size 65 mm NB and above shall be shop fabricated. Pipes of size 50 mm and below shall be field run.

- c) All field welding, stress relieving and heat treatment shall be done as per the procedure submitted by the Contractor and approved by the Purchaser/Consultant.
- d) For instrument connections, pipe stubs including the instrument tubing up to the root valve(s) shall be installed by the Contractor. The erection of instruments is also included under the scope of this specification.
- e) All drips and drains for piping and equipment shall terminate on the ground level at suitable point unless otherwise noted.
- f) The Contractor shall be responsible for correct orientation of all valves so that seats, stem and hand wheels will be in desired locations.

7.00.00 **CONTROL & INSTRUMENTATION**

7.01.00 **Control and Operation Philosophy**

- 7.01.01. The HFO and LDO/ HSD pressurising system control shall be realized in plant Distributed Digital Control & Management Information System (DDCMIS). There shall also be provision for local start/stop operation.

The pressurising pumps shall, however, be automatically tripped in the event of any of the followings:

- a) low level in the connected storage tanks
- b) pump suction temperature lower than 55°C (for HFO only).

The stand by pressurising pump shall be automatically started in the event of either low pressure in respective pump discharge header or tripping of any of the running pumps.

- 7.01.02 Steam flow to each HFO heater shall be independently regulated by means of automatic control valve on steam line and actuated from heater outlet oil temperature. The motorised valves on steam supply lines to HFO heaters shall have start/stop facilities from local and also remote from DDCMIS.

- 7.01.03 Individual recirculation control valve shall be provided for each HFO and each LDO/ HSD pressurising pump to maintain the pump discharge.

7.02.00 **Annunciations**

For safe and reliable operation control of the Fuel Oil System all necessary annunciations are to be provided which shall include but not be limited to the followings :

- a) high differential pressure across each strainer in HFO line at pressurizing pump suction and at heater outlet.