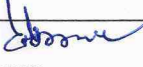
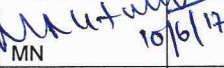


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		Rev. : 00

BHARAT HEAVY ELECTRICALS LIMITED,
RANIPET- 632 406.

TECHNICAL SPECIFICATION
FOR
ULTRA FILTRATION SYSTEM
(Pressurized System)

00	10.06.17	 YR 10/06/17	 KMS	 MN 10/6/17	Fresh issue
Rev. No.	Date	Prepared	Checked	Approved	Remarks

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1.0 SCOPE OF SUPPLY & WORK

The intent of this specification is to cover Design, Engineering, Manufacturing, Shop testing, Supply, Erection, Commissioning, Performance Guarantee test and handing over of Membrane based Ultra Filtration System (Pressurized) mentioned below.

The scope shall fully cover the requirement of the Design Criteria and Technical requirement of this specification for treating the feed water to meet the product water requirement of Plant. The scope of supply & services shall include but not limited to the following

- a) 4 x 33% automatic motor operated self-cleaning strainer with motor & accessories
- b) 8 sets [6 sets working streams (W) + 2 sets standby streams (S)] of Pressurized UF stream / skid / train of capacity 400 m³/hr each (or)
10 sets [8 sets working streams (W) + 2 sets standby streams (S)] of Pressurized UF stream / skid / train of capacity 300 m³/hr each
Each UF stream / skid / train shall consist of membrane modules, mounting frame, interconnecting piping & headers within streams / skid / train & other accessories necessary to complete the UF stream / skid / train.
- c) 1 lot piping for interconnecting all the equipment supplied by the bidder and other piping as per the terminal points (cl. no. 8) and scope marked in the P&ID drg. no. 1-WT-220-01030.
- d) 1 Lot complete valves (with actuator as applicable) required for the UF plant as per the P&ID drg. no. 1-WT-220-01030.
- e) 1 Lot Anchoring fasteners, packing materials and other fasteners for all the equipment supplied by the bidder.
- f) 1 set of UF backwash system consisting of 2 x100% UF backwash pump with motor and accessories, 2x100% UF air blower with motor & accessories, backwash tank, interconnecting piping, valves, instruments, etc.,
- g) 1 set Bulk Chemical Storage & Dosing System as specified in cl. no 4.2
- h) 2 set of VFD as per E,C&I spec. no. ROS 4165
- i) 1 lot of instruments, analyzers & accessories as per E,C&I spec. no. ROS 4165
- j) 1 set of junction boxes, solenoid valve enclosure box & accessories as per E,C&I spec. no. ROS 4165
- k) 1 set of instrumentation cable, cable trays & accessories as per E,C&I spec. no. ROS 4165
- l) 1 set of commissioning spares
- m) 1 set of mandatory spares
- n) 1 set of membrane module testing & repair kit as per cl. no. 16
- o) 1 set of recommended spares for 2 years O & M (optional)
- p) 3 years AMC for GRP/HDPE piping as per cl. no. 14
- q) Erection, Commissioning , PG test & handing over

Note. Items though not mentioned but needed to make the system complete for satisfactory performance of the UF System are also to be supplied unless otherwise specifically excluded.

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The scope for erection & commissioning and PG test requirements shall be as mentioned elsewhere in the specification.

- 1.1** It is not the intent to specify all the details of the design & manufacture. However, the equipment shall conform in all respects to high standard of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to Engineer / Customer, who will interpret the meaning of drawing & the specification and shall be entitled to reject any work or material, which is not in full accordance herewith.
- 1.2** In case of any deviation, the Bidder shall indicate the same, clause by clause in the deviation schedule. In the absence of the same it will be construed that the bid confirms strictly to the specification.
- 1.3** General terms & conditions, instructions to the bidder & other attachments referred to elsewhere are part of this specification.
- 1.4** Note. In case of any contradiction between different chapters / sections / annexures of the technical specification, bidder may bring it to the purchaser's notice prior to bid submission in the form of pre bid queries and get it clarified from the purchaser. Otherwise, the most stringent specification shall be applicable in case of contradiction as decided by the purchaser.

2.0 PROJECT INFORMATION

Owner	NTPC – Tamil Nadu Energy Company Ltd.
Project Title	Ultrafiltration Plant Package for NTECL-Vallur 3x500 MW TPS
Location	Located between Ennore creek and Kuruvimedu village of Ponneri, Taluk of Thiruvallur district in Tamil Nadu Site is located at a distance of about 20 Kms from Chennai city
Nearest Railway Station / Access Road	The nearest railhead, Kathivakkam is at a distance of 1 Km on trunk route section of Southern Railway from the project site. The National Highway exists at a distance of about 14 Kms from project site.

3.0 TECHNICAL REQUIREMENT

3.1 UF SYSTEM CAPACITY

1.	No. of UF streams	8 (6W + 2S) or 10 (8W + 2S)
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2.	Net average output per UF stream	400 m ³ /hr (9600 m ³ /day) for (6W+2S) configuration (or) 300 m ³ /hr (7200 m ³ /day) for (8W+2S) configuration
3.	Net average output from all the working UF streams	2400 m ³ /hr (57600 m ³ /day)
4.	Recovery per UF stream	95% minimum
5.	Gross Flux*	≤ 65 LMH

W – Working streams

S – Standby streams

Note*:

Gross flux = (Total permeate required per day including back wash requirement in m³ x 1000)/
(Total area of the membranes for all the working streams in m² x 24 hrs)

3.2 INLET WATER QUALITY FOR DESIGN

Feed water to UF system is filtered seawater tapped off from existing Horizontal Pressure Sand Filters (HPSF) outlet. The expected seawater quality at the HPSF outlet is provided below. However, UF system shall be designed considering worst values for all the parameters as provided in the below water analysis and raw seawater analysis enclosed separately as Annexure-L.

Sl. No.	Parameter	Unit	Value
1	Calcium as CaCO ₃	mg/l	960
2	Magnesium as CaCO ₃	mg/l	5160
3	Sodium as	mg/l	10145
4	Potassium as	mg/l	394
5	Bicarbonates (HCO ₃) as CaCO ₃	mg/l	92
6	Oil & grease	mg/l	Nil
7	Iron	mg/l	0.145
8	Manganese	mg/l	Nil
9	Strontium	mg/l	0.0
10	Barium	mg/l	0.0
11	Chloride as	mg/l	18531
12	Sulphate as	mg/l	2420
13	Nitrate as NO ₃	mg/l	0.124
14	Phosphate	mg/l	1.4
15	Carbonate	mg/l	0.0
16	Bromide	mg/l	0.0
17	Fluoride	mg/l	1.92
18	Silica (as SiO ₂)	mg/l	0.574
19	Colloidal silica	mg/l	Nil

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Sl. No.	Parameter	Unit	Value
20	pH	---	7.3
21	Total Hardness as CaCO ₃	mg/l	6120
22	Ca hardness as CaCO ₃	mg/l	960
23	Mg hardness as CaCO ₃	mg/l	5160
24	p-alkalinity as CaCO ₃	mg/l	Nil
25	m-alkalinity as CaCO ₃	mg/l	92
26	Turbidity	NTU	<2
27	Total Suspended Solids	ppm	2
28	Total Dissolved Solids	ppm	39280
29	Temperature	Deg C	25-30
30	Conductivity	μS/cm	42660
31	BOD	mg/l	Nil
32	COD	mg/l	100
33	Free Cl ₂	ppm	Nil

3.3 PERFORMANCE & GUARANTEE REQUIREMENT OF UF SYSTEM

The plant performance should meet the outlet water quality at UF outlet as indicated below:

Sl. No.	Guarantee Parameters	Unit	Value
1	Net Permeate Flow Rate from UF System (total)	m ³ /hr	2400
2	SDI ₁₅		<3
3	Recovery per skid	%	95 (min)
4	Turbidity	NTU	<0.5

- 1) Net permeate flow rate from each Ultra-Filtration streams shall be guaranteed and it shall not be less than 400 m³/hr. Net Permeate flow rate from the Ultra-Filtration Plant shall not be less than 2400 m³/hr.
- 2) For the design water quality and the permeate water capacity guaranteed, undiminished overall recovery of UF Plant shall not be less than 95% up to the end of 5 years of operation with replacement guarantee of membrane elements.
- 3) Availability factor of each UF skid delivering net permeate flow shall be not less than 95%.
- 4) Filtration Capacity of Ultra-Filtration System shall be guaranteed meeting the effluent quality and the same shall not be less than specified capacity.

4.0 TECHNICAL SPECIFICATION - MECHANICAL

4.1 DESIGN CRITERIA

UF plant shall be operated and controlled through PLC based control system. Complete Ultra-filtration plant, is conceived with multiple skid/trains /streams. The product water is envisaged to be stored in storage tank & further fed to existing

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Desalination plant. It shall be possible to operate the Ultrafiltration plant to its full design capacity or in part capacity by isolation of any of the skid/train/stream. This operational flexibility built into the scheme shall be achievable through control system.

Operation of UF Plant shall be completely automatic through common PLC system. PLC system (excluded from bidder's scope) will be provided by customer. Bidder shall furnish control logics and render all technical assistance in operating their system through PLC system.

UF system shall include, but not be limited to the following:

- a) Ultra filtration (UF) system complete with all equipments and components except storage tanks shall be installed on skid(s).
- b) Ultrafiltration system shall be designed to allow multiple starts and stops without affecting the service life of the membranes. The system may experience extended periods of no flow. System design shall protect the system against periods of no flow as recommended by membrane manufacturer.
- c) The number of UF trains/streams/skids shall be designed on N+2 philosophy where N is the number of Working streams (6 nos. or 8 nos. as the case may be) and 2 is the number of stand-by streams.
- d) Provisions for local grab sampling points shall be available at various points throughout the system to monitor UF Filter performance. Minimum sample points with sample valves shall be provided on the UF system for but not limited to:
 - i) UF Filter feed,
 - ii) Strainer backwash
 - iii) UF filtrate water
 - iv) UF backwash
 - v) UF neutralized backwash water

Sample ports on the feed, concentrate and permeate (to enable evaluation of system performance) & Sample port on each pressure vessel permeate outlet to facilitate troubleshooting.

e) UF system shall be provided with 4x33% automatic motor operated self-cleaning strainers at inlet with about 100-150 micron size and shall be designed to clean one section of the strainer media at a time, on differential pressure.

f) UF membranes shall be hollow-fiber, pressurized type. Membrane materials shall be Polyvinylidene di fluoride (PVDF) or Polyethersulfone (PES). Gross maximum design flux rate shall not be more than 65 l/m²/h. Filtration direction shall be Out-to-In or In-to-Out. Design UF recovery shall not be less than 95%. Pore size of membrane shall not be more than 0.04 microns.

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g) Visible inspection window built into the filtrate discharge pipe or any other arrangement as per manufacturer's standard shall be provided so that in the event of fiber breakage, the affected module shall be easily identifiable on the Rack.

For Direct Integrity Testing, arrangement and facilities like air pressure system, gaskets, instruments, valves, fittings and any other equipment as required shall be provided as per manufacturer's standard practice to detect any leak from fibres/modules.

Fiber Repair Kit (Concentrate tube plug, Air supply apparatus, glue-5nos., repair pins, knife or diagonal cutters etc.), Oil-free compressor, Personal protection equipment (gloves, safety glasses, etc.) shall be provided by the Bidder. Bidder shall also furnish the Fiber Repair Protocol from OEM.

h) An on-line membrane flushing system shall be provided to flush the UF membranes prior to shutting down.

i) Skid mounted Membrane cleaning system, CIP and chemically enhanced backwashing (CEB) systems shall be provided. Chemicals like sodium hypochlorite, sodium hydroxide and Hydrochloric/Sulphuric acid or **as per membrane manufacturer standard practice** shall be used for chemical cleaning / backwashing.

j) Intentionally left blank

k) One (1) UF Permeate storage tank (RCC-BHEL scope) is provided to store UF permeate water.

l) All the pumps, blowers in UF system shall be designed with a redundancy of N+1 (N =No. of working pumps).

m) CIP system shall be capable of being used for adding chemicals to restore organically and inorganically fouled membranes including biocides and membrane preservative chemicals in the event a membrane train will be shut down for an extended period.

n) The cleaning system shall be connected to the UF trains with permanent hard pipes.

o) Trans-membrane pressure drop shall initiate backwash of UF. During backwashing if the differential pressure across membranes exceeds a set point the UF system shall automatically shut down.

p) Filtration time (the time before backwashing is initiated), shall be adjustable.

q) Inlet and outlet UF manifolds shall be provided with level transmitters and on/off automatic valves to detect and vent trapped air in manifolds and avoid hydraulic shocks to membranes.

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r) UF normal and chemical enhanced backwashing frequency shall be adjustable individually and controlled from the control system including number of cycles before chemically enhanced backwashing is initiated. Time duration of these backwash cycles shall also be adjustable from the control system.

s) Spent chemicals from the chemically enhanced backwashing shall be neutralized and discharged to existing brine storage tank.

t) Turbidity transmitter shall be provided to measure UF filtrate turbidity with high turbidity alarm interlocked to shut down UF system if high turbidity is sustained for a pre-set time. Automatic on/off valves and filtrate flow transmitters shall be provided to automatically conduct air integrity test of UF membrane modules.

u) After the manufacture, following tests for membrane shall be demonstrated at membrane manufacturer's works in the presence of customer's representative.

- 1) Bubble Point Test in one batch
- 2) Integrity test (Pressure decay test/vacuum hold test) for 1 % of total membrane population.

v) The responsibility for conducting the test (Bubble Point, Integrity) will be with the Contractor and Contractor shall make all the arrangements for carrying out tests at membrane manufacturer's works. In case such test facilities are not available at manufacturer's works, the test may be carried out at any other test facility with the approval of customer. All cost associated with testing at membrane manufacturer's works or at any other test facility shall be borne by the bidder & shall be included in the contract price.

w) Integrity test shall be carried out in accordance with ASTM D 6908-06, Standard Practice for Integrity Testing of Water Filtration Membrane Systems (Pressure decay test/vacuum hold test) and approved test procedure. Bidder shall submit the test procedure for purchaser's approval within two months of award.

4.2 BULK CHEMICAL STORAGE & DOSING SYSTEM

This Facility shall comprise of bulk chemical storage, Chemical preparation and dosing system as envisaged by the bidder required for Ultrafiltration (UF) system.

a) An outdoor located Chemical storage (for Acid & Alkali) system shall be provided to accommodate all the equipments and adequate storage area.

b) Chemical storage area for NaOCl shall be envisaged under the shed.

c) Chemical storage facilities shall generally be designed to hold one (1) month requirements, Chemical dosing tanks to hold one (1) day requirement unless stated otherwise.

d) Contractor shall note that minimum requirements of chemicals & dosage rates are specified/identified in Data sheets & shall include the same necessarily. However, for the design adopted for the UF system, if it is required to increase

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the specified dosage rate and/or required to include any other chemical treatment/dosing, storage, handling & dosing facilities for the same shall be included and shall be supplied within the quoted price.

e) Acid storage and dosing system (if applicable as required for the process)

Two (2) numbers of Bulk Acid storage tanks, Two (2) numbers of Acid measuring tanks along with Acid unloading cum transfer pumps, Acid dosing pumps.

f) Alkali storage and dosing system (if applicable as required for the process)

Two (2) numbers of Bulk storage tanks for Alkali, One (1) number of Alkali preparation tank, One (1) number of Activated Carbon filter for Alkali, Two (2) numbers of Alkali measuring tanks, Alkali unloading pumps, Alkali transfer cum re-circulation pumps, Alkali dosing pumps.

g) NaOCl storage and dosing system (if applicable as required for the process)

Two (2) numbers of NaOCl storage tanks, Two (2) numbers of NaOCl measuring tanks along with NaOCl unloading cum transfer pumps, NaOCl dosing pumps.

h) One (1) number emergency safety showers with eye wash units in the Chemical Storage Handling facility at each location such as Acid/Alkali Storage area, Chemical storage area and Chemical preparation & doing equipments area.

i) Complete CIP system including tank(s), pumps, cartridge filter(s), associated equipments, piping, valves etc.

j) All pumps of Chemical Storage, Cleaning System, Dosing System etc. shall be supplied with a redundancy of N+1 unless stated otherwise.

k) The UF chemical cleaning waste shall be led to neutralization pit and after neutralization shall be pumped to existing Effluent collection tank in desalination plant.

Any other equipment(s) required to meet the system requirement for integrating the proposed Ultra-filtration Plant shall also be provided.

The Contractor shall envisage any additional system required to meet the guarantees and same shall also be provided

4.3 PIPING

Bidder shall comply fully to the technical requirements specified in the Annexure A (Technical requirement for piping, valves & fittings)

- a. Line Sizing – As per cl. no. 3.02 of Annexure – A (Technical requirement for piping, valves & fittings)
- b. MOC - As per Annexure – B (Piping MOC)

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4.4 VALVES

Bidder shall comply fully to the technical requirements specified in the Annexure-A (Technical requirement for piping, valves & fittings)

- a. MOC - As per Annexure – D (Valves MOC)

Pneumatic operated valves shall be supplied with pneumatic actuators & accessories as per specification given in E,C&I spec. no. ROS 4165

4.5 EQUIPMENT SPECIFICATION

4.5.1 AUTOMATIC MOTOR OPERATED SELF-CLEANING STRAINER

Sl. No.	Description	Parameters / Data
1.	Quantity	4 x 33%
2.	Make & Model	Vendor to specify
3.	Location	Outdoor
4.	Type	Screen type automatic motor operated self-cleaning strainer suitable for online cleaning
5.	Filter Element Pore Size	100-150 micron
6.	Filter Element Area	Vendor to specify
7.	Area of the strainer	Minimum 3 times the area of connecting pipe
8.	Design flow per strainer	842 m ³ /hr
9.	Design pressure	6 kg/cm ²
10.	Test pressure	1.5 times of design pressure
11.	Min / Max allowable flow per strainer	Vendor to specify
12.	Pressure drop at clean condition	<0.1 kg/cm ² at design flow
13.	Pressure drop at 50% clogged condition	<0.3 kg/cm ²
14.	DP to initiate flushing cycle	0.3 kg/cm ² (or) preset time through PLC
15.	Designed Min/Max flow for online flushing	Vendor to specify
16.	Waste water per back wash cycle	<0.1 m ³
17.	Duration of back wash / cleaning	Vendor to specify
18.	Back wash frequency per day	Vendor to specify
19.	Inlet and out let nozzle size	Shall be sized to limit the velocity less than 2.4 m/s at the design flow

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Sl. No.	Description	Parameters / Data
20.	Material of construction	
a.	Casing	Duplex Stainless Steel
b.	Perforated sheet	Duplex Stainless Steel
c.	Wire mesh	Duplex Stainless Steel
d.	Screen	Duplex Stainless Steel
21.	Flange standard	ANSI B16.5 #150
22.	Accessories for each strainer	Pneumatic operated valve with feedback for automatic backwashing, blow off, air release & drain shall be provided
23.	Power supply input	3 Phase, 415 V, 50 Hz
24.	Control Voltage	24 V DC
25.	Motor	As per E,C&I spec. no. ROS 4165
a)	Motor rating	Vendor to specify

4.5.2 EQUIPMENT SPECIFICATION (ULTRAFILTRATION SKIDS)

1.	No. of UF Streams	: 8 (6W + 2S) or 10 (8W + 2S)
2.	No. of blocks per stream	: Bidder to specify. No. of membrane module per block and no. of rows per block shall also be specified.
3.	Location	: Under shade
4.	UF Module Type	: Pressurized, Dead end
5.	Net output capacity / stream	: 400 m ³ /hr (9600 m ³ /day) for (6W+2S) configuration (or) 300 m ³ /hr (7200 m ³ /day) for (8W+2S) configuration
6.	Recovery	: 95 % (min)
7.	Membrane Pressure Vessel Dia.	: Bidder to specify
8.	MOC of Pressure Vessel	: Bidder to specify
9.	Rating of Pressure Vessel	: Bidder to specify.
10.	Type of membrane mounting	: vertical
11.	Membrane Type	: Hollow Fiber, Chlorine tolerant (bidder to specify the no. of ppm-hours for the life of the membrane)
12.	Membrane material	: PVDF or PES
13.	Surface area of membrane	: Bidder to specify.

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14.	Membrane pore size	: ≤ 0.04 microns
15.	Gross Flux	: ≤ 65 LMH
16.	Membrane flow mode / configuration	: out to in / in to out. Bidder to specify.
17.	Membrane and skid/train assembly per stream	: Total as a skid/train with membranes modules in vertical position
18.	Size of the skid/train per stream	: Bidder to specify. All the UF streams / skids / trains to be accommodated within the UF shed space of 28 x 21 x 6 m(maximum) as per the attached layout sketch (including membrane removal & handling space)
19.	Trans Membrane Pressure (TMP) for normal operation	: Not to exceed 8.5 MWC
20.	Backwash waste water disposal scheme	: It is envisaged to discharge UF backwash waste water to the inlet (5m elevation from UF train bottom) of Effluent Collection Tank without any intermediate pumping. UF system design shall take care of this requirement.

Notes.

- 1) Necessary clamping arrangements shall be in bidder's scope.
- 2) The layout shall be made such that the necessary clear spacing shall be provided between two adjacent UF skids for maintenance & walkway purpose. The skid piping / header shall not project out of the UF skid/train boundary area.
- 3) Necessary spacing (minimum 600 mm) between adjacent membrane module rows shall be provided to facilitate easy maintenance, assembly & removal of membrane modules from the interconnecting piping/rack, without disturbing other adjacent modules. Bidder to clearly indicate the spacing between adjacent membrane module rows in their typical skid/train assembly drawing.
- 4) The membrane modules shall be connected to the respective headers with rigid piping with quick remove couplings (flexible hoses are not allowed).
- 5) Provision shall be provided for carrying out the bubble test / leak test for each membrane module.
- 6) Necessary clearance shall be provided between the roof shed and the UF skids/trains for lifting the membrane elements/maintenance.

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- 7) The membrane mounting frame MOC shall be corrosive resistant suitable for seashore environment having sufficient strength and rigidity to support the all membrane modules, headers, inter connecting piping etc. Typical skid/train arrangement shall be submitted along with the bid.
- 8) The total net permeate quantity of 2400 m³/hr is required continuously to cater to the requirement of downstream system. In addition, the permeate water requirement for UF backwash, chemical cleaning and other UF plant process requirement if any are also to be included. Bidder shall confirm the adequacy of the capacity of the stream for all these requirements. If required, Bidder can make upward revision of the output quantity per stream. UF backwash system & Chemical cleaning system shall be Common for all the streams and shall cater to the requirement of one complete stream at a time.
- 9) Foundation bolts with necessary packing materials and fasteners required for the UF skids shall be supplied by the bidder. All the fasteners & foundation bolt MOC shall be duplex stainless steel.

4.5.3 UF BACKWASH TANK:

1.	No. of Tank	1 no.
2.	Location	Outdoor
3.	Tank capacity	Bidder to specify as per process requirement
4.	Design / Test pressure	Bidder to specify
5.	MOC	FRP
6.	Tank thickness	As per cl. no. 3.07 of Annexure – F

Note:

- a. Nozzle sizes for inlet, outlet, overflow & drain shall be indicated by the bidder in their offer.
- b. Strainer shall be provided in the outlet nozzle of Backwash tank. The MOC of the strainer shall be SS316 and the surface area shall be 2 times the area of the pipe.
- c. In addition to the above, technical requirements specified in the Annexure – F (Technical Requirements - Pressure & Storage Vessels) to be fulfilled by the bidder.

4.5.4 UF BACK WASH PUMP & UF CIP Pump

Construction details

- Type : Horizontal, Centrifugal, single stage, end suction.
- Type of impeller : Closed / semi-open
- Shaft seal : Mechanical seal, API Plan-11

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- Support : Foot
- Coupling type : Flexible (Spacer type)
- Bearing type : Antifriction
- Bearing Lubrication : Sump Oil
- Nozzle orientation : Vendor to Specify

ELECTRIC MOTOR: As per enclosed E,C&I spec. no. ROS 4165

COUPLING

- a. Type : Flexible (Spacer type)
- b. Application : To connect pump and Motor
- c. Length : Suitable to remove DE bearings, seal without disturbing motor and pump mounting.
- d. Accessories : Coupling guard, duplex stainless fixing fasteners, flange gaskets etc.

BASE FRAME & ACCESSORIES

Carbon steel with epoxy coated base frame to mount the above Pump, Motor, and coupling guard. Foundation bolts are also to be supplied along with the base frame.

SCOPE OF SUPPLY PER SET OF PUMP ASSEMBLY

- a. Pump assembly mounted on a common base frame, coupling with guard, Electric motor & Mounting fasteners. : 1 set.
- b. Foundation Bolts, Nuts& washers : 1 set.
- c. Original filling of lubricants, grease etc. : 1 set.

Material of construction

Sl. No.	Description	UF Back Wash Pump	UF CIP Pump
1	Casing	ASTM 890 Gr 5A / ASTM 995 Gr 5A / ASTM 744 CN3MN or equivalent having PREN > 40	SS316
2	Impeller	ASTM 890 Gr 5A / ASTM 995 Gr 5A / ASTM 744 CN3MN or equivalent having PREN > 40	SS316
3	Shaft	ASTM A 473 S32760 or equivalent	SS410
4	Shaft sleeve	ASTM A 473 S32760 or equivalent	SS316

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Sl. No.	Description	UF Back Wash Pump	UF CIP Pump
5	Mechanical seal	ASTM 890 Gr 5A / ASTM 995 Gr 5A / ASTM A 312 S31254 / equivalent	SS316
6	Wear Rings	Duplex stainless steel	SS316
7	Bearing Housing	Cast Iron 30B or equivalent	
8	Fasteners	Duplex stainless steel	
9	Shims for Motor	SS316	

All steel material in contact with seawater shall have a Pitting Resistance Equivalent Number (PREN) greater than 40

DESIGN DETAILS

Sl. No.	Description	Unit	UF back wash pump	UF CIP Pump
01	Duty point Flow	m ³ /Hr	Bidder to specify	Bidder to specify
02	Head to be developed by the pump	MWC	As per process requirement	As per process requirement
03	Suction Head	MWC	flooded	flooded
04	NPSH reqd	MWC	Bidder to specify	Bidder to specify
05	Efficiency	%	Bidder to specify	Bidder to specify
06	No. of pump assemblies	Sets	1W+1S	1W+1S
08	Speed	RPM	Bidder to specify	Bidder to specify
09	Medium handled	-	Filtered sea water	Chemical solution
10	Temperature	°C	20-40	20-40
11	Parallel operation	-	No	No
12	VFD operation	-	Yes* (VFD is in bidder's scope)	No

Note: In addition to the above, technical requirements specified in the Annexure – G (Technical Requirements – Low Pressure Pumps) are to be fulfilled by the bidder.

* VFD shall confirm to requirement mentioned in E,C&I spec. no. ROS 4165

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4.5.5 CHEMICAL STORAGE & DOSING SYSTEM

1.	Acid Unloading Cum Transfer Pumps	As per datasheet given in the Annexure H
2.	Bulk Acid Storage & Preparation Tanks	As per datasheet given in the Annexure H
3.	Acid Dosing Pumps	As per datasheet given in the Annexure H
4.	Alkali Unloading Pumps & Alkali Transfer Cum Recirculation Pumps	As per datasheet given in the Annexure H
5.	Bulk Alkali Storage Tanks & Preparation Tanks	As per datasheet given in the Annexure H
6.	Alkali Measuring Tanks	As per datasheet given in the Annexure H
7.	Alkali Dosing Pumps	As per datasheet given in the Annexure H
8.	NaOCl Unloading Cum Transfer Pumps	As per datasheet given in the Annexure H
9.	Bulk NaOCl Storage & Preparation Tanks	As per datasheet given in the Annexure H
10.	NaOCl Dosing Pumps	As per datasheet given in the Annexure H
11.	UF CIP TANK	
a)	No. of Tank	1 no.
b)	Location	Outdoor
c)	Tank capacity	Bidder to specify as per process requirement
d)	Design / Test pressure	Bidder to specify
e)	MOC	FRP
f)	Tank thickness	As per cl. no. 3.07 of Annexure – F

Note. In addition to the above, technical requirements specified in the Annexure – F (Technical Requirements - Pressure & Storage Vessels) for tanks and Annexure –I (Technical Requirements – Metering Pumps) for dosing pumps to be fulfilled by the bidder.

4.5.6 AIR SCOUR BLOWER

- | | |
|-------------------|-------------------------------------|
| 1) No. of Blowers | : 2 x 100% / common for all modules |
| 2) Location | : outdoor |
| 3) Operation | : Intermittent / continuous |
| 4) Type of blower | : Positive displacement –Twin lobe |

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5) Scope per set of Blower

- | | |
|------------------------------------|-----------------------|
| a. Air Blower | : 1 No. |
| b. Electric Motor | : 1 No. |
| c. 'V' Belt & pulleys | : 1 Set |
| d. Belt Guard | : 1 No. |
| e. Base plate & discharge silencer | : 1 No. |
| f. Anti vibration mountings | : 1 Set |
| g. Inlet filter & Silencer | : 1 No. |
| h. Pressure Relief Valve | : 1 No. |
| i. Pressure Gauge | : 1 No. |
| j. Filter restrictor Indicator | : 1 No. |
| k. Non-Return Valve | : 1 No. |
| l. Flexible discharge connection | : 1 No. |
| m. Acoustic hood | : 1 No. |
| n. Other Accessories | : 1 Set as per P &ID. |

6) Material of construction

- | | |
|--------------------|----------------|
| a. Casing | : Cast Iron |
| b. Impeller (Lobe) | : Cast Iron |
| c. Shaft | : Carbon Steel |
| d. Fasteners | : GI |

7) Design Details

- | | | |
|-------------------------|-------|--|
| a. Design Flow capacity | m3/hr | : As per process requirement |
| b. Total Discharge Head | psig | : As per process requirement |
| c. Speed | rpm | : bidder to Specify |
| d. Desired Noise level | dBA | : 85 (1 m Distance)
(without enclosure) |
| e. Drive | | : Belt driven by Electric Motor. |

8) Construction details

- | | |
|-----------------|------------------------------------|
| a. Blower type | : Positive displacement –Twin lobe |
| b. Driver type | : 'V' pulley & belt drive |
| c. Bearing Type | : Anti-friction bearing. |

9) ELECTRIC MOTOR :

As per enclosed E,C&I spec. no. ROS 4165

- | | |
|----------------------------|---------------------|
| 10) Motor rating (maximum) | : bidder to specify |
|----------------------------|---------------------|

11) BASE FRAME :

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Epoxy coated steel base frame to mount the above blower, motor, belt guard and accessories. Necessary anti-vibration mountings, foundation bolts, adjusting screws, special tools etc., shall be supplied along with.

5.0 GENERAL DESIGN REQUIREMENTS

The common requirements for the system are stated in the general design requirements. However, the requirements indicated in the technical specification for mechanical equipment section 4 shall be strictly complied with.

5.1 COMMON REQUIREMENTS

1. Only latest revision of standards shall be used.
2. Sampling connections and air vent at the top most point of piping and vessels shall be provided at all stages of the Unit.
3. The size of the overflow pipes of all storage tanks shall be one size higher than inlet pipe sizes of these tanks.
4. All the piping & valves are to be located to facilitate easy accessibility and operation from the ground level.
5. The direction of Flow shall be indicated by an arrow at regular intervals on all pipelines.
6. MOC of all the fasteners & foundation bolt shall be duplex stainless steel. Foundation bolts with necessary packing materials and fasteners required for all the equipment in bidder's scope shall be supplied by the bidder.

6.0 ELECTRICAL, CONTROL & INSTRUMENTATION

The requirement of Electrical, Control & Instrumentation are specified in E,C&I spec. no. ROS 4165

7.0 GENERAL LAYOUT ASPECTS

a) In developing the layout, a system approach shall be adopted to ensure that all the subsystems are optimally laid out both from the view point of capital cost as well as running costs.

b) Ultrafiltration system except Storage tank(UF Permeate water/Chemical) shall be provided under shelter without side wall (s) and all the equipments shall be protected against sunlight and rain. The height of such shed(s) shall be adequate to have sufficient head room for erection and maintenance.

Maintenance space shall be provided for all the rotating equipments. Electrically operated mono-rail hoist (excluded from bidder's scope) is envisaged for handling of all rotating equipments & their drives.

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The UF Skids/Tanks etc shall be provided with required platform, ladders etc to facilitate approach to manholes/hand-holes, sight-glass, operation & maintenance of valves, instruments etc.

7.1 PIPING LAYOUT

Outdoor Piping shall be laid above ground on pipe sleepers/ pedestals or pipe trestles. **Inside the building pipes to be laid over ground for easy access and maintenance.**

Overhead Clearance of trestles/equipments above roads shall be minimum 8 meters and shall be minimum 2.3 meters in other areas. Adequate clearance should be provided around equipments to facilitate ease of operation & maintenance. The clearance shall not be less than 0.9 m around pumps, and minimum 1.5 meter at drive end. Clearance between vessels shall be of the order of 1.2 to 1.5 m

8.0 TERMINAL POINTS

1. Bidder shall refer to the P&ID drg. no. 1-WT-220-01030 for terminal points and scope clarity. In case of any queries, bidder shall raise pre bid queries prior to bid submission and get clarification from the purchase.
2. Feed water for UF system will be supplied by BHEL at the common inlet pipe with flange having drilling standard ANSI B16.5 150 lbs near self cleaning strainer at 2 metre distance away from the strainer inlet header. Gasket, flange fasteners are in bidder's scope.
3. All chemical cleaning waste from the UF plant shall be terminated by the bidder at the nearest trench leading to the neutralization pit.
4. UF backwash waste water shall be led directly to Effluent Collection Tank without any intermediate pumping by bidder. UF backwash waste water shall be terminated by the bidder at the inlet (5m elevation from UF train bottom) of Effluent Collection Tank. Bidder may please refer to plant equipment layout drg. no. 1-WT-220-01032 for the location of Effluent Collection Tank which is around 150 m away from UF shed.
5. UF permeate water shall be terminated by the bidder at the UF permeate tank. Bidder may please refer to plant equipment layout drg. no. 1-WT-220-01032 for the location of UF permeate tank which is around 50 m away from UF shed.
6. Instrument air required for pneumatic valve operation shall be tapped off from the instrument air line running nearby the plant boundary. Bidder shall provide the instrument air requirement in their offer.

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7. Power cables for all the drives will be provided by BHEL at the terminal box of respective motors supplied by the bidder. Bidder shall provide the drives list in their offer. Power supply shall be 415 v, 3 phase, 50 Hz supply.
8. Control cables, Instrument cables shall be provided by the bidder up to the local junction box[JB] (by bidder) of individual UF skid / system. Customer will provide the cables from these local junction box up to PLC/LTMCC panel. PLC & MCC are in BHEL scope.
9. The UF system (UF Skids with valves, piping & headers, CIP pumps, backwash pumps within the UF shed and rest of the equipment outside the UF shed) equipment should be accommodated by the bidder within the given space indicated in the plant equipment layout drg. no. 1-WT-220-01032. No additional space will be provided. Bidder should provide the detailed arrangement layout drawings along with the bid. The pipe and header routings shall be considered above ground only. Necessary supports for the common headers alone for all the UF skids (feed header, permeate header, backwash header, CIP header etc.,) will be provided by the customer as per bidder's requirement. For that, bidder to provide the detailed support arrangement & fabrication drawing. Necessary clamping arrangements shall be in bidder's scope. The supports for the rest of the piping, headers & valves for individual skids are in bidder's scope.

9.0 TECHNICAL DETAILS FOR CIVIL WORKS

All civil works are excluded from bidder's scope. However, the bidder shall provide the equipment layout drawing along with bid. Detailed construction drawing with foundation requirement like load details, foundation pockets, etc., for all the skids, equipment, flooring requirements, trenches for pipe routing, cable routing & drains etc. shall be furnished for approval after order.

Any special requirement like handling arrangement, floor / trench protection etc. shall also be indicated in the drawings. All the plant drains & trenches are to be connected in a common trench and terminated near UF Plant boundary. The approximate area & location are indicated in the enclosed lay out drawing. Bidder to accommodate the UF system with in the stipulated area only as indicated in the typical layout drawing attached along with this specification.

10.0 VENDOR LIST

The vendor list is enclosed with this specification as Annexure-E. Successful bidder shall submit their sub vendor credential details as per the Annexure – C (sub-vendor questionnaire) for each item before ordering on the sub-vendor for our end customer's approval.

11.0 PAINTING

The painting specification is enclosed as Annexure-K.

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12.0 INSPECTION

Inspection for the all equipment at the manufacturer's works shall be carried out by BHEL / BHEL's customer / BHEL authorized agency as per the approved quality plan prior to dispatch.

13.0 PERFORMANCE GUARANTEE TEST

13.1 The bidder shall guarantee all equipment for workmanship, materials and satisfactory performance. The guarantee for performance will cover individual items and systems including electrical for their ratings / outputs as well as for the integrated operation of equipment and its auxiliaries as a whole. On completion of satisfactory commissioning, performance / acceptance tests shall be conducted on the equipment and system as a whole for demonstrating the guaranteed performance parameters specified. The guarantee tests shall cover the following but not be limited to the rated parameters for smooth operation of complete UF system:

- a. UF outlet water quality as indicated in section 3.3
- b. UF system net output capacity and recovery as indicated in section 3.3

13.2 Bidder shall provide necessary technical assistance during PG test. PG test shall be conducted in the presence of representative from BHEL, customer and successful bidder. Bidder shall comply to the approved PG test procedure issued by customer.

13.3 General

In addition to the guarantees mentioned above, the requirements of specifications on all guarantees as elaborated under relevant clauses of Technical Specifications should be met.

The guarantee period for the equipment shall be 18 months from the date of supply (or) 12 months from the date of commissioning, whichever is earlier.

Any part which proves defective either in design, materials / and / or manufacture within the above guarantee period shall be replaced at free of cost to the owner at site and the provision of this clause shall apply to the portions of the plant so replaced or renewed until the expiration of the guarantee period or from the date of replacement which ever is later.

14.0 AMC FOR GRP / HDPE PIPING

3 years annual maintenance contract (AMC) for the GRP / HDPE piping as the case may be shall be offered by the bidder. The scope of work under annual maintenance contract is specified in the cl. no. 3.09.02 A) xiii) / cl. no. 3.09.02 B) xi) of Annexure – A as the case may be

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15.0 SPARES

15.1 COMMISSIONING SPARES

Commissioning spares are those spares which may be required during the start-up and commissioning of the equipment/system without any hassle. Bidder shall ensure that sufficient commissioning spares are available to facilitate trouble free commissioning of the UF system. The price for commissioning spares shall be included in the main supply. The commissioning spares List and the individual item price break up shall be indicated separately and is considered for bid evaluation. The bid price shall include these spares also. Any unutilized commissioning spares shall be handed over to the purchaser. The commissioning spares shall be delivered well in time before the start-up & commissioning of the plant.

15.2 MANDATORY SPARES

The mandatory spares shall be delivered along with the main supply. Cost of the mandatory spares shall be indicated separately and the same is considered for Bid Evaluation.

The list of mechanical mandatory spares is given below. E,C&I Mandatory spares list is specified in E,C&I spec. no. ROS. 4165. Bidder may please refer the same.

Sl. No.	Mandatory Spare	Qty
1.	UF membranes	10% of total installed membranes
2.	Valves (except Control Valves)	1 number of each type / size / material of construction / rating

16.0 MEMBRANE MODULE TESTING & REPAIR KIT

16.1 DIRECT INTEGRITY TEST KIT

The bidder shall supply direct Integrity Test Kit containing arrangement and facilities like air pressure system, gaskets, instruments, valves, fittings and any other equipment as required as per manufacturer's standard practice to detect any leak from fibres/modules.

16.2 FIBER REPAIR KIT

Fiber Repair Kit consisting of (Concentrate tube plug, Air supply apparatus, glue-5 nos., repair pins, knife or diagonal cutters etc.), Oil-free compressor, Personal protection equipment (gloves, safety glasses, etc.) shall be supplied by the Bidder. Bidder shall also furnish the Fiber Repair Protocol from the OEM.

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17.0 ERECTION, COMMISSIONING, PG TEST & HANDING OVER

Erection, commissioning, PG test & Handing over for the UF system shall be as per the requirement mentioned elsewhere in the specification (ROS-9024). Completion period for erection, commissioning & PG test shall be as follows.

Erection, commissioning & PG test completion period shall be 3 months.

The date of start of erection shall be decided jointly during execution of the project based on the supply and site front readiness.

18.0 DOCUMENTATION:

18.1 GENERAL:

The documentation during bid and post order stage shall meet the following requirements.

1. All documents and drawing shall be submitted in English
2. Hard copies of all documents and drawings during bid stage to be submitted in duplicate.
3. Hard copies of all documents for approval shall be submitted in triplicate.
4. Hard copies of all final documents, drawings, Erection and O& M manual etc., shall be submitted in bound folder in 6 copies.
5. Soft copies of all final documents in MS word / MS office in the form of CD –1 set
6. Soft copies of all final calculations in MS excel/ MS office in the form of CD–1set
7. Soft copies of all final drawings in Auto Cad, latest version in the form of CD-1set

18.2 DOCUMENTS ALONG WITH BID:

The following drawings / documents are to be enclosed along with the bid for scrutiny.

1. Qualification Requirement (QR) documents as per Annexure - J
2. Technical write-up giving details of equipment operation, interlocks / control requirement.
3. Typical Quality Plan for major equipment (UF skid, UF membrane, pumps, blowers, tanks, dosing system, piping & valves etc.)
4. UF membrane projections/process calculations.
5. Typical membrane guarantee document.
6. Membrane storage procedure before commissioning.
7. Membrane preservation procedure (short term & long term) after commissioning
8. Membrane Datasheet
9. Correction curve/operating & performance data for variation in feed water turbidity (from 2 NTU to 10 NTU)
10. Preliminary P& I diagram

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11. Preliminary Equipment layout drawing
12. Typical arrangement drawing & isometric drawing of skid with membranes, piping, valves, headers arrangement including space for membrane removal, maintenance, walkway etc.,
13. Write-up about membrane removal & maintenance.
14. Filled up data sheets as called in the specification – Annexures 1 to 3
15. Chemical consumption for maintenance and recovery cleaning with frequency.
16. Utility requirements like instrument air, service air and service water for maintenance & recovery cleaning of UF Module
17. Cleaning sequence with flow rate, duration, effluent details, etc.,
18. Pump performance curves with marked duty point.
19. Preliminary civil requirements.
20. PLC I/O list.
21. Tentative quantity of Power, Control and Screened cables to be supplied for the UF System by the Purchaser.
22. Reference list of the plants of similar capacity of single stream executed in the last five years.
23. Deviation schedule duly filled, if any –Annexure – 6. Any deviation should have cost of withdrawal for our evaluation in the commercial bid.
24. Unpriced commercial offer on the scope of supply
25. Unpriced **commercial offer for the recommended spares list**

Bidder to note that failure to submit the above, will be considered as incomplete and offer is liable for rejection.

Note:

In case of any deviation, the Bidder shall indicate the deviation, clause by clause in the deviation format attached in Annexure - 6. If there is no deviation “NIL” statement shall be furnished. In the absence of the non-attachment of this Annexure-6, it will be construed that the bid confirms strictly to the specification.

18.3 DOCUMENTS AFTER ORDER

18.3.1 Phase-I (for approval-within 7 days from the date of LOI):

1. Technical Write-up and design basis
2. P&ID diagram including pipe sizes & terminal points.
3. Equipment layout showing building details, headroom, equipment.
4. Sizing , projections/process calculations for various equipment
5. Filled up datasheets for approval as per Annexures 1 to 4
6. UF system “Control Description” write-up including operation, controls, interlocks, protection, annunciation etc.

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7. Activity chart / Bar Chart and schedules for drawing submission, manufacturing, erection and commissioning.
8. Quality Plan and field quality checks, stage inspection etc. (for UF skid, UF membrane, pumps, blowers, tanks, dosing system, piping & valves etc.,).
9. Membrane Guarantee Document.
10. Membrane Datasheet.
11. Performance curves for pumps & motors
 - a) Flow Vs Head
 - b) Flow Vs efficiency
 - c) Flow Vs Power
 - d) Flow Vs NPSH
12. Instrument schedule.
13. Typical arrangement drawing & isometric drawing of skid with membranes, piping, valves, headers arrangement including space for membrane removal, maintenance, walkway etc.,
14. Write-up about membrane removal & maintenance.
15. PLC I/O list.

18.3.2 Phase-II (for information-within 2 weeks from the date of LOI):

1. Membrane storage procedure before commissioning
2. Membrane preservation procedure after commissioning
3. Sub vendor credential details as per the Annexure – C (sub-vendor questionnaire)
4. Piping and Valves schedule
5. Foundation Design drawings indicating foundation design, load data, anchor bolt location, pocket details, floor & trenches etc.
6. General arrangement drawings for all the equipment showing dimensions and details of materials.
7. As-built manufacturing drawing of the UF skid frame and equipment, assembly including piping & valve system arrangements with Bill of material (BOM)
8. Isometric drawing of pipe segments.
9. Cross sectional drawing of pump & blowers etc. with BOM
10. Details of *pneumatic actuator*

18.3.3 Phase-III (for information-before dispatch):

1. Erection Manual indicating
 - a. Erection/installation instructions of equipment.
 - b. Log sheet containing stage check parameters & clearance
 - c. Log sheets for alignment check of pump & motor
 - d. Field quality checks
2. Performance Test procedure

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3. All the documents called in Electrical specification.
4. Shipping list for BHEL's approval in BHEL format

18.3.4 Phase-IV (for review):

1. Pump & Blower performance test reports
2. Pump & blower performance guarantee certificates
3. Operation and maintenance manual indicating, Operating procedure for start-up, normal operation, chemical cleaning, shut down and emergency shutdown.(O & M manual shall be supplied with 6 sets of hard copies and one set in soft form in CD.
4. Maintenance instruction & assembly
5. Lubrication chart.
6. Electrical equipment layout, Cable trench layout, cable routing, cable schedules and cable termination details.
7. UF System Logic diagram & Sequential Flow Chart (SFC) for PLC.
8. Cable interconnection diagram for cables up to junction box & cable schedule.
9. Test Certificates for all the supplied instruments.
10. List of alarm, interlock & trip set points
11. Installation drawings for instruments
12. Wiring drawings & GA drawings for Local Panels, junction boxes.
13. As built drawings.
14. All other details ***called in Electrical specification.***

Note: Bidder to confirm in their offer that these details called in cl. no. 18 will be provided.

19.0 ATTACHMENTS

The following documents / drawings enclosed are part of this specification.

1. **PID for UF system** : **1-WT-220-01030**
2. **Legend for P&ID** : **1-WT-220-00966**
3. Plant equipment layout : 1-WT-220-01032
4. E, C & I specification no. ROS 4165
5. Erection, Commissioning, PG Test specification no. ROS 9024
6. Annexure A - Technical Requirements – Piping, Valves & Fittings
7. Annexure B - Material of Construction for Pipes
8. Annexure C - Sub vendor questionnaire
9. Annexure D - Type & Material of Construction of Valves
10. Annexure E – Vendor list
11. Annexure F - Technical Requirements - Pressure & Storage Vessels
12. Annexure G - Technical Requirements - Horizontal Centrifugal Pumps
13. Annexure H – data sheet for Bulk Chemical Storage & dosing system

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- 14. Annexure I - Technical Requirements – metering pumps
- 15. Annexure J – Qualification Requirement
- 16. Annexure K – painting specification
- 17. Annexure L – Raw sea water analysis

20.0 IMPORTANT POINTS TO BIDDERS

If the bidder has suggestions/requirements of any additional instruments /equipment over & above as shown in the P & ID drawing for the efficient functioning of the system, the same has to be clearly indicated and suitably covered in the commercial bid also separately.

The specification for the instruments/equipment available in the main specification has to be taken for such additional requirements (or) Customer should be contacted.

21.0 EXCLUSION

1. All civil works are excluded from bidder's scope
2. LTMCC & PLC
3. UF feed pumps & UF permeate transfer pumps
4. Mono–rail hoist
5. Supply of HCl, NaOH, NaOCl and chlorine required during commissioning & PG test are excluded from the scope of the bidder.

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Annexure – 1

DATA SHEET

1. UF OUTLET WATER QUALITY & QUANTITY

Sl. No.	Description	Unit	Values
1.	Net permeate output per UF stream	m ³ /hr	
2.	Total net permeate output from the UF system	m ³ /hr	
3.	UF System Recovery	%	
4.	Turbidity	NTU	
5.	SDI ₁₅	-	

2. CHEMICAL REQUIREMENT FOR ONE CLEANING

Sl. No.	Description	Unit	Per time / stream	Total per day / stream
1.	Acid (HCl) - 33%	kg		
2.	Alkali (NaOH) – 48%	kg		
3.	NaOCl - 6%	ltrs		
4.	Any other chemical			

3. CHEMICAL DOSING DURATION & FREQUENCY

Sl. No.	Description	Solution Conc. (%)	Duration in minutes	No. of cycles per day
1.	Acid (HCl)			
2.	Alkali (NaOH) – 48%			
3.	NaOCl			
4.	Any other chemical			

4. MEMBRANE GUARANTEE

Sl. No.	Description	Unit	Values
1.	Guaranteed life of the membrane	years	



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Annexure-2

ELECTRICAL POWER CONSUMPTION

Sl. No.	Equipment Description	Qty		Pump efficiency	Drive rating KW	Conn load. Load KW	Power consumption KW	Voltage, Phase
		W	SB					
A	FOR CONTINUOUS OPERATING EQPT							
1								
2								
3								
4								
5								
6								
	Sub total of A							
B	FOR INTERMITTENT OPERATING EQPTS.							
1								
2								
3								
4								
5								
	Grand Total							

Note: W – Working

SB – Standby

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EQUIPMENT DATA SHEET

Annexure- 3

AUTOMATIC MOTOR OPERATED SELF-CLEANING STRAINER		
Sl. No.	Description	Parameters / Data
1.	Make & Model	
2.	Location	
3.	Type	
4.	Filter Element Pore Size	
5.	Filter Element Area	
6.	Area of the strainer	
7.	Design flow per strainer	
8.	Design pressure	
9.	Test pressure	
10.	Min / Max allowable flow per strainer	
11.	Pressure drop at clean condition	
12.	Pressure drop at 50% clogged condition	
13.	DP to initiate flushing cycle	
14.	Designed Min/Max flow for flushing	
15.	Waste water per back wash cycle	
16.	Duration of back wash / cleaning	
17.	Back wash frequency per day	
18.	Inlet and out let nozzle size	
19.	Material of construction	
a.	Casing	
b.	Perforated sheet	
c.	Wire mesh	
d.	Screen	
20.	Flange standard	
23.	Power supply input	
24.	Control Voltage	
25.	Motor	Offered as per our spec. no. 4159 Yes / No
a)	Motor rating	

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EQUIPMENT DATA SHEET

Annexure- 3

A. UF PRESSURE VESSEL

Sl. No.	Description	Bidder to fill the details	
1.	Make		
2.	Model		
3.	Material of construction		
	- Pressure vessel		
	- End Plate		
	- End adapters		
	- Holding strips		
	- Support saddle		
	- O rings		
4.	Feed port		
	Permeate port		
5.	No. of pressure vessels offered per block		
6.	Pressure rating, psi		
7.	Design Pressure, psi		
8.	Test pressure, psi		
9.	Burst Pressure, psi		
10.	Port size / Orientation		
	- Feed		
	- Permeate		
11.	Port Victaulic Groove Style		
	- Feed		
	- Permeate		
12.	Empty weight, kg		
13.	Filled weight, kg		
14.	Shipment weight, kg		
15.	Vessel Drawing No.		

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Annexure- 3

B. UF MEMBRANE ELEMENT

Sl. No.	Description	Bidder to fill the details		
1.	Make			
2.	Model			
3.	Type / Material			
4.	Membrane pore size (Nominal/Absolute) micron			
5.	Membrane diameter, mm			
6.	Membrane length, mm			
7.	Nominal membrane area, m ²			
8.	Number of fibres			
9.	Fibre dimensions			
10.	Filtrate flow per element (min/max), m ³ /hr			
11.	Membrane flow mode / configuration	IN to OUT / OUT to IN		
12.	Quantity offered per stream (per skid)			
13.	Membrane Housing assembly	Vertical / Horizontal		
14.	Guaranteed Life of membrane, years			
15.	Recommended membrane replacement (If any)			
16.	Feed temperature (Design/Min/ Max)			
17.	Feed TSS (Design/ Min/ Max)			
18.	Feed pressure for design TSS, bar(g)			
19.	Trans Membrane Pressure(TMP) for design TSS for normal operation, bar(g)			
20.	Maximum applied feed pressure, bar(g)			
21.	Maximum permissible Trans Membrane Pressure(TMP), bar(g)			
22.	Maximum Backwash Trans Membrane Pressure, bar(g)			
23.	Max. chlorine exposure, ppm-hours			
24.	Feed Flow rates (Min/ Max), m ³ /hr			

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Annexure- 3

Sl. No.	Description	Bidder to fill the details	
25.	Permeate flow (Min/ Max), m ³ /hr		
26.	Recovery, %		
27.	Membrane flux (Design/Maximum), l/m ² /hr		
28.	Maximum permitted pressure drop in bar for the above operating conditions		
29.	Maximum permitted temperature in deg.C for membrane		
30.	Minimum permitted temperature in deg.C for membrane		
31.	Operating pH range		
32.	Guaranteed filtrate SDI ₁₅ / NTU		
33.	Maximum allowable organic loading - TOC ppm : - BOD ppm : - COD ppm :		
34.	Weight per element, kg		

1) PUMP : UF BW PUMP UF CC PUMP

I. TECHNICAL PARAMETERS

- 11 Make :
- 12 Model :
- 13 Fluid details
- a. Medium handled :
- b. PH range :
- c. TDS/Chloride range ppm :
- d. Temperature range deg.C :
- Rated flow / Head (at Disch) m³/hr & mwc :
- Min. & Max continuous flow m³/hr :
- Corresponding discharge Head mwc :
- Shut-off head mwc :
- NPSH required (minimum) mwc :
- Design Pressure kg/cm² :

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Annexure- 3

- Hydraulic test pressure kg/cm² :
- Pump efficiency at duty point % :
- BKW reqd. for pump at duty point kw :
- Maximum KW required kw :
- Recommended Motor KW kw :
- Rated speed rpm :
- Noise level at duty range dBA :
- Vibration level peak to peak mm :
- Balancing quality :

II. CONSTRUCTION DETAILS

d. Orientation Horizontal / Vertical :

e. Suction / Discharge nozzle

- Size mm :
- Rating psi :
- Orientation :
- Material :

UF BW PUMP UF CC Pump

f. Material of Construction / Make

- Pump Casing :
- Impeller :
- Shaft :
- Shaft Sleeve :
- Fasteners :
- Others if any :

g. No. of stages :

h. Impeller type :

i. Impeller diameter Trimmed / Untrimmed :

j. Bearings

- Type :
- Make :
- Lubrication oil spec. :

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EQUIPMENT DATA SHEET

Annexure- 3

- k. Performance Curve ref Nos. :
- l. Pump dimension L x W x H :
- m. Pump Weight :

III. COUPLING

- a. Type :
- b. Make, Model No. :
- c. Weight kg :

IV. BASE FRAME AND ACCESSORIES

- a. Material :
- b. Dimension detail mm :
- c. Weight kg :
- d. Foundation Bolt - Size & Qty mm & Nos. :
- MOC :

V. GENERAL

- a. Shipping package dimension mm :
- b. Total Assembly / Shipment weight kg :
- c. List of Special tools :
- d. Accessories details :
- g. G.A. Drawing No. :

04. AIR SCOUR BLOWER

A. TECHNICAL PARAMETERS

- a. Design flow Cu.m/Hr :
- b. Design Head – Discharge PSIG :
- c. Design Pressure bar(g) :
- d. Blower efficiency at duty point % :
- e. BHP reqd. For Blower at duty point KW :
- f. Maximum BHP required KW :
- g. Operating range from duty point % :

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Annexure- 3

- h. Rated speed rpm :
- i. Noise level at duty point with silencer : dBA at 1m distance
- j. Vibration level – Displacement microns :
- Velocity (Peak) mm/sec :
- k. Rotation of shaft viewing from drive end :

B. CONSTRUCTION DETAILS

- b. Suction filter silencer specification :
- c. Discharge silencer specification :
- d. Material of construction
- Blower casing :
 - Impeller :
 - Shaft :
 - Others if any :
- d. Type of bearings & Make :
- e. Bearing lubrication :
- f. Type of seal & Make :
- g. Blower weight kg :
- h. Moment of Inertia at Blower rotor kgm^2 :
- i. Performance curve reference No. :
- j. Foundation Drawing No. :
- k. Blower dimension L x W x H mm :

C. POWER TRANSMISSION

- c. Pulley PCD Motor / Blower mm :
- b. Type of mounting Motor / Blower :
- c. No. of Belts :
- d. Belt section & PCD :
- e. Belt guard : Yes / No.

D. BASE FRAME

- a. Material :
- b. Dimension detail L x W X H mm :

E. ACCESSORIES

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Annexure- 3

- a. List of special tools :
- b. Flexible connector Size, Rating :
- a. Filter restrictor Indicator specification :
- b. Pressure Relief Valve size, rating :
- c. Non-return valve size, rating :
- d. Pressure gauge size, rating :
- e. Other accessories if any :

F. GENERAL

- a. Overall assy. Dimensions L x W x H mm :
- b. Shipping package dimensions mm :
- c. Total assembly weight kg :
- d. Dimensional drawing No. :
- e. Total shipment weight kg :

05. CHEMICAL DOSING SYSTEM (Acid, Alkali, NaOCl)

I. Dosing Pump:

- a. Name of chemical dosing system : Acid Alkali NaOCl
- b. Make & Model No :
- c. Type :
- d. Flow – Design Min / Max lph :
- Rated Min / Max lph :
- e. Discharge Pres. – Design Max kg/cm² (g) :
- Rated Max kg/cm² (g) :
- f. Suction lift mwc :
- g. Stroke length Min / Max mm :
- h. Speed Min / Max rpm :
- i. Stroke adjustment Min / Max % :
- j. Flow Accuracy on design capacity % :
- l. Repeatability % :
- m. Power supply details V / Ph / Hz :
- Variation V / Ph / Hz % :
- Power consumption watts :

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EQUIPMENT DATA SHEET

Annexure- 3

n. Material of construction

- Dosing Head :
- Fittings :
- Valve balls :
- Spring in injection head :
- Diaphragm :
- Tubing :
- Mounting Fasteners :
- Other wetted parts :

o. Normal operating life at design capacity :

- Diaphragm hrs :
- Ceramic balls hrs :

Acid Alkali NaOCl

p. Pump overall size L, W,H mm :

q. Pump weight kg :

r. Tube size :

- pressure rating at 20 deg.C kg/cm²(g) :

- Suction Inches : ID x OD

- Discharge Inches : ID x OD

II. Accessories for Pump:

a. Anti-syphon / non-return valve :

b. Air Release Valve :

c. Pressure relief valve :

d. Pump mounting fasteners :

III. Day Tank / Preparation Tank

Acid Alkali NaOCl

a. Capacity ltr :

b. Size Dia height mm :

c. Tank thick, bottom, circumference :

Top cover :

d. Baffle plate size and quantity :

e. Material of construction :

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Annexure- 3

- e. Tank :
- f. Tank cover :
- g. Drain valve :
- h. Level indicator :
- i. Interconnecting valves & piping;
- j. Wetted parts :
- k. Non wetted parts :
- f. Type & make of low level switch :
- g. Level Indicator make & details :
- h. Colour of the tank :
- i. Type of strainer offered :
- j. Nozzle size of inlet, outlet, drain, overflow:
- k. Outlet & drain valve size & type :
- l. Mixer mounting arrangement :
- m. Weight of tank with lid :
- n. Type of resin used for FRP tank & Cover:
Inner / outer
- IV. Mixer (If applicable) :**
- a. Make & Type :
- b. Material of Construction
 - Impeller :
 - Shaft :
 - Protective coating :
 - Mounting fasteners :
- c. Shaft Dia x Length :
- d. Impeller Dia. :
- e. Impeller speed :
- f. Weight of mixer with motor :
- g. Mixer Motor - Make :
- l. Speed :
- m. Rating & Power consumption KW :
- n. Type of insulation & temp. :

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EQUIPMENT DATA SHEET

Annexure- 3

o. Power supply details V / Ph / Hz :

p. Variation V / Ph / Hz %:

06. FRP tanks

Backwash tank

CIP tank

Capacity ltr :

a. Size Dia height mm :

b. Tank thick, bottom, circumference :

Top cover :

c. Material of construction :

q. Tank :

r. Tank cover :

s. Drain valve :

t. Level indicator :

u. Interconnecting valves & piping;

v. Wetted parts :

w. Non wetted parts :

d. Type of resin used for FRP tank & Cover:

Inner / outer

e. Type & make of level transmitter :

f. Level Indicator make & details :

g. Colour of the tank :

h. Nozzle size of inlet, outlet, drain, overflow:

i. Outlet & drain valve size & type :

j. Empty Weight :

07. Manually / Pneumatic operated Butterfly valves

I. TECHNICAL PARAMETERS

a. Make :

b. Model / Type :

- Fluid details

a. Medium handled :

b. pH range :

c. Specific gravity :

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Annexure- 3

- d. TDS / Chloride range ppm :
- e. Temperature range Deg. C :
- d. Rated flow Cu.m/Hr :
- e. Cv of the valve :
- f. Valve rating :
- g. Pressure Drop (Maximum) Bar :
- h. Design pressure bar(g) :
- i. Hydraulic test pressure
- Body Bar(g) :
- Seat Bar(g) :
- j. Max. Shut off Pressure Bar(g) :

II. CONSTRUCTION DETAILS

Material of construction

- Body :
- Disc :
- Seat :
- Stem :
- Disc Screw :
- Bushing :
- Hand wheel :
- Gear Box – Make / Model :
- Lubrication type :
- b. Angle of operation :
- c. Rec. Min. Pipe ID in mm :
- d. Suggested valve support details :

III. GENERAL

- a. Total assembly weight Kg :
- b. List of special tools :
- c. Applicable standards :
- d. Drawing No. :

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Annexure - 4

VALVE SCHEDULE

Sl. No .	Service	Valve Type	Size	BODY	Disc / Ball / Diaphragm	Stem / Shaft	Valve seat / Seat ring	Hinge Pin	Valve Ends
1	Manual valves								
2	Pneumatic Valves								
3	Check Valves								

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Annexure - 5

RECOMMENDED SPARES FOR 3 YEARS O&M WITH PRICE

Sl. No.	Description of the equipment	Description of spares	Quantity	Unit Rate

Annexure - 6

TECHNICAL DEVIATIONS

Sl. No.	Sec. No.	Cl. No.	Pg. No.	Specification	Statement of Deviations / variations	Reason for Deviation

	GENERAL SPECIFICATION FOR ERECTION , COMMISSIONING, PG TEST & HANDING OVER FOR ULTRA FILTRATION(UF) SYSTEM-PRESSURIZED	SPEC. No: ROS:9024
		REV: 01

**BHARAT HEAVY ELECTRICALS LIMITED,
RANIPET- 632 406.**

**GENERAL SPECIFICATION
FOR
ERECTION, COMMISSIONING, PG TEST & HANDING OVER
OF
ULTRA FILTRATION SYSTEM
(Pressurized System)**

01	10.06.17	<i>Reli</i> YR 10/06/17	<i>Home</i> KMS	<i>Reli</i> MN	
00	20.12.13	IMRL	MSM/MN	SK	Fresh issue
Rev.No	Date	Prepared	Checked	Approved	Remarks

	GENERAL SPECIFICATION FOR ERECTION ,COMMISSIONING, PG TEST & HANDING OVER FOR ULTRA FILTRATION(UF) SYSTEM-PRESSURIZED	SPEC. No: ROS:9024
		REV: 01

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	GENERAL SPECIFICATION FOR ERECTION ,COMMISSIONING, PG TEST & HANDING OVER FOR ULTRA FILTRATION(UF) SYSTEM-PRESSURIZED	SPEC. No: ROS:9024
		REV: 01

1.0 **SCOPE OF WORK ON SERVICES**

The scope of Erection and Commissioning services covers erection, commissioning of UF system which comprises of collection of materials & equipment from site stores, transportation to erection spot, erection of complete system including site fabrication, stage clearance, testing, commissioning, Performance Guarantee Test , handing over of the UF system.

NOTE

- I. Successful commissioning means, erection of entire system, trial run / trial operation till achieving the performance both in terms of Quality (including electrical power consumption) and Quantity to prove the agreed performance of the system and the system is ready for PG Test. Once this stage is reached, Vendor will inform to BHEL that they are ready for PG Test. If BHEL's & Customer's Engineer is satisfied that the system is ready in all respect, PG test can be conducted by vendor and till such time the running of the system to be taken care of by the vendor. Conduct of PG Test shall be the responsibility of the Vendor. Necessary consumables and chemicals required for the trial run / trial operation till PG Test will be provided by BHEL at free of cost to Vendor. However, the requirement of consumables and chemicals details is to be provided well in advance (min. 4 months) before commissioning by the Vendor to BHEL. Further any testing chemicals for testing / calibration of instruments, consumables required for PG test shall also to be informed with minimum 4 months advance notice before commissioning, failing which the vendor has to take the responsibility of providing the same without any commercial implication.
- II. The applicable materials shall be drawn from BHEL stores as per the relevant procedure. The equipment shall be erected sequentially and shall be interconnected with the applicable piping and valve system. Necessary hydraulic testing of piping, valves etc. shall also be carried out as per supply specification. Necessary pump, blind-flanges, fasteners etc. required for the hydraulic testing are in vendor's scope.

The scope of major equipment covered for the erection & commissioning of the UF system at site is covered in Technical Specification.

Apart from the scope mentioned in Technical specification, the foundation grouting materials including foundation fasteners, packing shims and final grouting shall be in the scope of bidder.

The quantity and the details given are only indicative. However the bidder shall supply required quantity to fully cater to the system requirement and carry out the erection of all the items to meet the system requirement as complete without any commercial implication to BHEL.

	GENERAL SPECIFICATION FOR ERECTION ,COMMISSIONING, PG TEST & HANDING OVER FOR ULTRA FILTRATION(UF) SYSTEM-PRESSURIZED	SPEC. No: ROS:9024
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- 2.0 The Intent of this specification is to provide erection, commissioning & trial operation services for execution of projects according to most modern and proven techniques and codes. It is not the intent to specify completely herein, all aspects of the entire system. Nevertheless, the entire system shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation. The contract services towards installation of the Plant shall not relieve the contractor of the responsibility of providing such services, facilities to complete the project of portion of project awarded to him. The quoted rate shall deem to be inclusive of all such contingencies.
- 3.0 The Contractor shall carry out the work in accordance with instructions/ drawings/ specification/ standard practices supplied / approved by BHEL from time to time.
- 4.0 Modification / Rectification / repair / replacement of defective components if any shall be under bidder's scope within specified time.
- 5.0 Bidder to submit the erection schedule along with stage check data sheets. Each and every stage the bidder to get clearance from the BHEL Engineer / Consultant Engineer / Customer Engineer.
- 6.0 Establish the site co-ordination for identification of materials, withdrawal of material, storing and issue of materials, stage clearance for erection & commissioning.
- 7.0 Identification of consignment at BHEL stores, verification of the same in the presence BHEL official, taking delivery, co-ordination for the movement from store to erection work, safe custody, erection, commissioning and trial operation.
- 8.0 All the equipment and materials would be issued only at BHEL stores and it shall be the responsibility of the contractor to take delivery from BHEL stores, transport the same to site.
- 9.0 Necessary clearance for stage check, hydraulic test, leak check obtained from the customer engineer & pre – commissioning tests shall be carried out by the bidder.
- 10.0 Commissioning and putting into satisfactory operation of all the equipment at site including successful completion of trial operation and handing over of the system to the end user.
- 11.0 Finish coat (final coat) for all the equipment before hand over of the system to BHEL/Customer as per **Annexure-B** of the specification.

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14.0 EXCLUSIONS

The following are excluded from the scope of supplier and will be arranged by BHEL

14.1 All civil works pertaining to UF System

14.2 Service water/construction water at one point near UF system

14.3 Construction Power supply at one point near UF System

14.4 Supply of service / instrument air at one point

14.5 Chemicals for commissioning and trial operation is involved.

The requirement shall be specified by the bidder in their technical offer and the supply shall be limited to the specified quantities.

15.0 Intentionally Left Blank

16.0 Name plates, labels and directional marks:

Each equipment shall be provided with name plate/marked with paint designating the tag no., service of the item etc. Necessary directional arrow marks shall be provided.

17.0 Tools and Tackles:

All the Tools & tackles required for the complete erection of components shall be arranged by the contractor at his cost. The bidder shall have & own a complete set of special tools and tackles required erection, assembly, disassembly and maintenance. The bidder shall also supply any special tools and tackles that may be required additionally during commissioning. All tools & tackles shall be reputed make acceptable to the Purchaser and shall be handed over BHEL after the completion of erection & commissioning.

18.0 Commissioning Consumables / Spares:

The bidder shall supply all consumables like lubricating oil, Teflon tape, m-seal, cotton waste, tissue paper roll, sampling bottles, mugs, buckets etc required for commissioning the equipment shall be in bidder's scope.

The bidder shall consider sufficient quantity of the commissioning spares so that the commissioning of the system will not be delayed. The bidder shall also supply any spare components that may be required additionally during commissioning. These commissioning spares shall be included in the basic scope of supply.

19.0 Inspection & Testing:

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All the stage checks & materials shall be offered to BHEL / Customer/ BHEL'S authorized representative for inspection.

21.0 Additional requirements

21.1 After completion of all erection and commissioning works, the left out items shall be handed over to BHEL site stores.

21.2 During commissioning at site some smaller equipment may get added or Logics may have to be changed. The bidder shall carryout these changes at site without any commercial implications to BHEL.

22.0 GENERAL INSTRUCTIONS TO THE BIDDER

22.1 Bidder shall quote for complete work specified in the document. Incomplete quotations for the part of the work will not be considered.

22.2 Bidder shall contact BHEL and obtain additional details/data if any required to submit proper quotation.

22.3 The BHEL reserves the right to omit any one or more items of work at any time of the contact without assigning any reason what so ever.

22.4 The Bidder shall include all necessary commissioning spares in his basic scope of supply and the left out spares shall be handed over to BHEL after the completion of E & C.

22.5 Adequate lighting facilities such as low volt hand lamps shall be arranged by the contractor at the site of construction etc. at his cost.

22.6 All the lifting tackles including wire ropes, slings, shackles and electrically operated equipment shall be got approved by BHEL Engineer before they are actually put on use. Test certificates should be submitted before their usage. Test certificate obtained from the statutory authority should be submitted before their usage.

22.7 All equipment so used by contractor shall be of proven quality and safe in operation as approved by BHEL Site Engineers from time to time.

22.8 At periodic / intervals of work, complete and detailed account of the equipment so erected shall be submitted to the BHEL Engineer. The required format shall be submitted to BHEL Officials for approval.

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- 22.9 All equipment shall be handled very carefully to prevent any damage and loss. No bare wire ropes, slings etc..., shall be used for unloading and / or handling for equipment without the specific written permission of the BHEL engineer. The equipment from the storage yard shall be moved to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage for such equipment at site.
- 22.10 The work covered under this scope of work is of highly sophisticated nature requiring best quality / precision workmanship engineering and construction management. Contractor should also ensure successful and timely commercial operation of equipment installed. The contractor must have adequate quantity of precision tools, construction aids in possession. Contractor must also have adequate trained qualified and experienced supervisory staff and skilled personnel.
- 22.11 All the necessary certificates, licenses statutory clearances required to carry out his scope of work are to be arranged by the contractor then and there at no extra cost.
- 22.12 When the work is temporarily suspended contractor shall protect all construction materials equipment and facilities from causing damage to existing property interfering with the operations of the station when it goes into services. The contractor shall comply with all applicable provisions of the safety regulations clean – up programme and other precautionary measures which the BHEL has in effect at the site .
- 22.13 It will be the responsibility of the contractor to ensure the safe lifting of the equipment taking due precautions to avoid any accidents and damage to other equipments and personnel.
All piping shall be adequately supported and protected to prevent damage during handling and erection.
- 22.14 Sometimes it may become necessary for the contractor to handle certain un-required components in order to take out the required materials. The contractor has to take this contingency also into account. No extra payment is payable for such contingencies.
- 22.15 It shall be contractor`s responsibility to arrange for required labour, brush, paint and other consumable like thinner, cotton waste, cloth etc., for carrying out preservative painting. The quoted rates shall be inclusive of above work.
- 22.16 Due to atmospheric conditions erected materials are likely to get rusted more frequently. It is the responsibility of the contractor to preserve the erection materials drawn from stores for erection till these are commissioned and handed over to customer. The required paint, thinner all other consumables like painting

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brush, emery paper, cotton waste, cloth etc., have to be arranged by the contractor at his cost. The contractor should ensure that the materials are not rusted on any account till they are handed over to customer. The decision of the BHEL Engineer is final with regard to adequacy of application of paint.

23.0 SITE CLEANLINESS AND SAFETY REQUIRMENTS:

- 23.1 Contractor shall strictly follow all safety regulations / conditions as per general conditions of contract.
- 23.2 Non – conformity of safety rules and safety appliances will be viewed seriously and the BHEL has right to impose fines on the contractor as under.
- 23.3 Contractors shall ensure that the quality is maintained in all the works connected with this contract at all stages of the requirement of BHEL.
- 23.4 Contractor shall ensure that all Inspection, Measuring and Testing equipment that are used, are calibrated by the authorized agencies and the valid calibration certificate **will** be available with them for verification by BHEL. A list of such instruments possessed by contractor at site with its calibration status is to be submitted to BHEL Engineer for control.
- 23.5 Contractors shall arrange for the inspection of the works at various stages as required by BHEL. Immediate corrective action shall be taken by the contractor for the non-conformances if any, observed and pointed out by BHEL.

PART – B

SUB-SECTION – IIIA-03

PIPING, VALVES & FITTINGS

CLAUSE NO.	TECHNICAL REQUIREMENTS – PIPING VALVES & FITTINGS
1.00.00	GENERAL
1.01.00	Piping system includes all in plant interconnecting and transport piping, valves, fittings, supports and specialties.
1.02.00	The Design, manufacture, shop testing, erection, testing and commissioning of piping and valves shall conform to the latest revisions of the Indian / International Standards & Codes as <i>referred in below, in Annexure-1 of this Subsection</i> and elsewhere in the tender documents subject to any modification and requirement as specified hereinafter.
2.00.00	SCOPE
2.01.00	The scope of work covered under this specification include but not limited to design, fabrication, manufacture and assembly, inspection, shop testing at manufacturers works and transportation to site, supply, erection of In-plant piping system herein called the system as indicated in the drawings and specified herein. ▪ All types and sizes of piping, which includes but not limited to GRP, Duplex SS, SS, PVC, HDPE, UPVC, Mild steel, rubber lined MS, Galvanised MS piping ▪ Piping embedded in concrete within a structure or foundation, all embedded parts required for all tanks/water retaining structures made of RCC including puddle pipes ▪ All valves including gates, drains valves and air vent valves, specials, Strainers, sleeves, wall pipes and floor pipes shown, specified or required and incorporate them into the piping systems. ▪ Fittings such as bends, elbows, tees, branches laterals, crosses, reducers, expanders, unions, couplings, cap, expansion joints, flanges, reducing flanges, blank flanges, weldslet/sockets, Gaskets, O-rings, sampling connections, nipples etc. necessary for making a reliable piping system. ▪ Specialties such as expansion joints, manifolds, eductors, diffusers etc ▪ All joints, specials, couplings, Flanges, pipe spools and matching pipes to connect flow measuring orifice nozzles etc., branches/ Instrument tapping connection, for installing measurements stub and thermo-wells, Gaskets, ring joint, backing rings, jointing material etc. as required. required to complete installations of piping. ▪ All supporting attachments like saddles, shoes, sways, braces, guides, rollers, slides, anchors, clamps etc. ▪ Bolts, nuts, fasteners as required for interconnecting piping, valves and fitting, blind flanges (for future interconnection) as well as for terminal points. ▪ Anchor block (for buried/over-ground piping), Thrust Blocks, support brackets, clamps, support trestles, hangers, Tie Rods, Rigids, Duck feets,
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE	
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CLAUSE NO.	TECHNICAL REQUIREMENTS – PIPING VALVES & FITTINGS					
	bottom rigids etc. for the piping under the scope of contract. Secondary steel for pipe supports/trestles and embedded steel. ▪ Painting, anti-corrosive coatings, etc. inside and outside of pipes as necessary. ▪ Testing, cleaning and inspection. ▪ All materials required establishing compliance with these specifications shall be submitted in accordance with the provisions of the general conditions of contract.					
2.02.00	Requirements specified in this Sub-section is indicative only and Contractor shall take full responsibility for system sizing based upon actual equipment to be provided. All materials and components of valves, piping and other equipment and appurtenances shall be compatible with the respective chemicals. Piping shall be fabricated,/Supplied assembled, installed in proper operating condition in full conformity with detail drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer as approved by the engineer. To facilitate the Employer’s future operation and maintenance, products may be of the same major manufacturer, with devices of the same type and model as far as possible.					
3.00.00	DESIGN, CONSTRUCTION AND ERECTION OF PIPING & FITTINGS					
3.01.00	General Design Criteria					
3.01.01	All piping systems shall be capable of withstanding the maximum pressure in the corresponding lines at the relevant temperatures. The minimum thickness for pipes and fittings shall be adhered to. Higher thickness in equivalent material is acceptable. However, no credit will be given for higher thickness					
3.01.02	All the piping systems, fittings and accessories supplied under this package shall be designed to operate without replacement and with normal maintenance for a plant service life of about 25 years, and shall withstand the operating parameter fluctuations and cycling which can be normally expected during this period.					
3.01.03	All piping systems shall be properly designed to take care of hydraulic shocks and pressure surges which may arise in the system during operation. Bidder should provide necessary protective arrangement like anchor blocks/anchor bolts, etc. for the safeguard of the piping systems under above mentioned conditions. External and internal attachments to piping shall be designed so as not to cause flattening of pipes, excessive localised bending stresses or harmful thermal gradients in pipe walls.					
3.01.04	Bends, loops, off sets, expansion or flexible joints shall be used as required in order to prevent overstressing the piping system and to provide adequate flexibility. Flexibility analysis (using software packages such as Caesar-II etc.) shall be carried out for sufficiently long piping (straight run more than 300M) at any stretch of the piping.					
<table><tr><td>NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE</td><td>BID DOC. NO. CS-0260-132G-2</td><td>TECHNICAL SPECIFICATIONS SECTION VI, PART-B</td><td>SUB-SECTION – IIIA-03 PIPING, VALVES & FITTINGS</td><td>PAGE 2 OF 43</td></tr></table>		NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE	BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	SUB-SECTION – IIIA-03 PIPING, VALVES & FITTINGS	PAGE 2 OF 43
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CLAUSE NO.	TECHNICAL REQUIREMENTS – PIPING VALVES & FITTINGS
3.01.05	Wherever Bidder's/Contractor's piping coming under this specification, terminates at an equipments or terminal point not included in this specification, the reaction and the thermal movement imposed by bidder's/contractor's piping on equipment terminal point shall be within limits to be approved by the Employer.
3.01.06	The hot lines shall be supported with flexible connections to permit axial and lateral movements. Flexibility analysis shall be carried out for pipelines which have considerable straight run as indicated above and necessary loops/ expansion joint etc. shall be provided as may be necessary depending on layout.
3.01.07	Piping and fittings shall be manufactured by an approved firm of repute. They should be truly cylindrical of clear internal diameter specified, of uniform thickness, smooth and strong, free from dents, cracks and holes and other defects. They shall allow ready cutting, chipping or drilling, welding etc.
3.01.08	Inspection holes shall be provided at suitable locations for pipes 800 mm NB and above as required for periodic observations and inspection purposes
3.01.09	All piping design shall be as per the stipulation of ANSI B31.3 / ANSI B31.10 as the case may be
3.01.10	The primary consideration in a piping arrangement shall be to provide an economical, safe piping layout which allows ease of operation and maintenance of the plant. Adequate space shall be provided around the equipment for taking up convenient operation and maintenance.
3.01.11	All the piping shall be arranged with due consideration to pipe expansion, valve locations, pipe supports and access to accessories for maintenance.
3.01.12	In general wherever possible all pipes shall be routed over pipe pedestals. Where access and maintenance space is required pipe racks shall be considered. While crossing the roads/ cable /drain trenches which shall pass either through box culverts below ground level or cross over using a pipe bridges depending upon the requirements
3.01.13	The arrangement of piping systems and support structures shall be designed to provide for future expansion of the plant piping wherever specified/required with minimum disruption / disturbance to the existing piping systems with due importance given to the functional and aesthetic arrangement of present and future piping systems.
3.01.14	For easy handling & removal of equipments, valves etc. and for maintenance purpose, break up flanges for piping 65 NB and above sizes and suitable type of compression flexible coupling or flanged joints for pipings of 50 NB and below size shall be provided.
3.01.15	The over-ground piping wherever routed inside building, shall have a clear head room of minimum 2.1 meter from operating floor. Pipes shall be generally be routed above ground but where specifically indicated/specified the pipe may be laid in trenches or buried. Buried piping shall be generally installed so that the top of pipe
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CLAUSE NO.	TECHNICAL REQUIREMENTS – PIPING VALVES & FITTINGS					
	is 1.0 meter below the ground level unless otherwise specifically mentioned. Full length of buried piping shall be provided with 100 mm thick sand bed.					
3.01.16	Inside the building, the overhead portion of the pipe line may be supported from the building structures. No support shall be taken from the brick wall.. Crossing of the road shall be on a pipe bridge with a clear height of at least 7 meters over the road surface. All the steel structure for the pipe bridge and the supporting posts/trestles along with all necessary hangers clamps, connecting auxiliary steel, fixing bolts, nuts etc. shall be supplied and erected by the Bidder.					
3.01.17	Hangers and supports shall be capable of carrying the sum of all concurrently acting loads. They shall be designed to provide the required supporting effects and allow pipe line movements as necessary. All guides, anchors, braces, dampener, expansion joint and structural steel to be attached to the building/structure, trenches etc. shall be provided. Type of hangers and components for all piping shall be selected and approval obtained from the ENGINEER.					
3.01.18	For large size pipes/ducts, at high point and bends/change of direction of flow, air release valves shall be provided. Sizing criteria for air release valves shall be generally on the basis of valve size to pipe diameter ratio of 1:8. Requirement shall be decided as per relevant code					
3.01.19	A detailed Hydraulic transient analysis based on the method of characteristics shall be carried out for such piping system if included in the scope of supply. This study shall be carried out by a reputed consultant/Institute. The following shall be based on the results of the hydraulic transient study. ▪ Pump discharge valve closing time and pump stopping sequence. ▪ Conditions arising due to stopping/tripping of pumps ▪ Size, location and quantity of air release valves in the make-up water piping shall be provided by bidder. ▪ Pump discharge valve opening time during start-up condition and pump starting sequence. The report of transient analysis should consist of methodology adopted, characteristics curves/data for various boundary conditions, complete input data used for execution of software for various events and the results of the programme. The report shall be submitted to the Owner for approval. Based on the recommendations of such a study. Bidder shall take corrective measures and provide suitable surge suppression device in the piping system					
3.01.20	Pipe coming under purview of IBR should meet its requirements and getting the IBR approval shall be under Vendors scope.					
3.01.21	Sufficient up stream and down stream lengths shall be provided for flow measuring devices, control valves and other specialties.					
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CLAUSE NO.	TECHNICAL REQUIREMENTS – PIPING VALVES & FITTINGS																																			
3.01.22	All local instruments shall be located on pipe lines as to render them observable from the nearest available platforms.																																			
3.01.23	Openings provided in the wall for pipelines must be closed with bricks and mortar with 10-12 mm clearance between brick work and pipe after taking care of insulation and thermal movement, if any. The clear space must be filled with felt or asbestos or approved filling compound.																																			
3.01.24	Suitable slope shall be provided for all pipelines towards drain points. It is Bidder responsibility to identify the requirements of drains and vents, and supply the necessary pipe work, valves, fittings, hangers and supports etc. In addition to the system requirement all low points in the pipelines shall be provided with suitable draining arrangement and all high points shall be provided with vent connections where air or gas pockets may occur. Vent for use during hydrostatic test shall be plugged after the completion of the test. Vent shall not be less than 15mm size.																																			
3.01.25	Drains shall be provided at low points and at pockets in piping such that complete drainage of all systems is possible. Drain shall not be less than 15mm for line size upto 150mm, not less than 20mm upto 300mm and not less than 25mm for 350mm to 600mm pipes and not less than 50mm for 600mm and above pipes.																																			
3.01.26	Air piping shall be sloped so that any part of the system can be drained through the shut-off drain valve or drain plugs.																																			
3.02.00	Pipe Sizing																																			
3.02.01	Minimum sizes for various pipelines if any are indicated in the tender drawings/data sheet, Bidder to provide the same as specified. However, for pipe lines where sizes are not indicated, sizing shall be done based on the following velocities as indicated below:-.																																			
	<table><tr><th>Sl.</th><th>Description</th><th colspan="3">Velocity in meters/ second</th></tr><tr><th></th><th></th><th>Pipe size Below 50mm</th><th>Pipe Size 50 to 100 mm</th><th>Pipe Size 200 mm & above</th></tr><tr><td>a)</td><td>Pump suction</td><td>1.2 - 1.5</td><td>1.2 - 1.5</td><td>1.2 - 1.8</td></tr><tr><td>b)</td><td>Pump discharge</td><td>1.2 - 1.8</td><td>1.8 - 2.4</td><td>2.1 - 2.5 (*)</td></tr><tr><td>c)</td><td>Header</td><td>1.5 - 2.4</td><td>1.5 - 2.4</td><td>2.1 - 2.4</td></tr><tr><td>d)</td><td>Compressed air below 2 Kg/cm²(g)</td><td>15 – 20</td><td>20 – 30</td><td>25 – 35</td></tr><tr><td>e)</td><td>Compressed air 2 Kg/cm²(g) & above</td><td>20 – 30</td><td>25 – 40</td><td>35 – 45</td></tr></table>	Sl.	Description	Velocity in meters/ second					Pipe size Below 50mm	Pipe Size 50 to 100 mm	Pipe Size 200 mm & above	a)	Pump suction	1.2 - 1.5	1.2 - 1.5	1.2 - 1.8	b)	Pump discharge	1.2 - 1.8	1.8 - 2.4	2.1 - 2.5 (*)	c)	Header	1.5 - 2.4	1.5 - 2.4	2.1 - 2.4	d)	Compressed air below 2 Kg/cm ² (g)	15 – 20	20 – 30	25 – 35	e)	Compressed air 2 Kg/cm ² (g) & above	20 – 30	25 – 40	35 – 45
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CLAUSE NO.	TECHNICAL REQUIREMENTS – PIPING VALVES & FITTINGS			
	Velocity in meters/ second			
	f)	Suction to compressor/ Blowers	7 – 8	7 – 8
	Note (*): Velocity for High Pressure (30 bar & above) Sea Water & Brackish water may be in the range of 2.1 to 3.1 m /sec			
3.02.02	Pipe line under gravity flow shall be restricted to a flow velocity of 1 m/sec generally. Channels (Other than Cold water channel of Circulating Water System) under gravity flow shall be sized for a maximum flow velocity of 0.6 m/sec.			
3.02.03	For re-circulation pipes of pumping system the velocity limit upto 3.0 to 3.5 m /sec is acceptable. The re-circulation pipes of pumping system shall be sized for a flow as recommended by the pump manufacturer, however the same shall be about 40 to 50% of design flow of one pump.			
3.02.04	The following " C" Value shall be used in WILLIAM & HAZEN formula for calculating the friction loss in piping systems.			
	No	Pipe		Value
	i)	Carbon Steel pipe	-	100
	ii)	Carbon Steel pipe internally lined with Polyurethane/Solvent free epoxy/ Glass flake polyester acrylic polymer	-	120
	iii)	C.I Pipe / Ductile Iron	-	100
	iv)	Rubber lined steel pipe	-	120
	iv)	PVC / HDPE / GRP / CPVC / PP /pipes	-	140
	v)	Stainless Steel	-	100
3.02.05	For calculating the pump head , atleast 10% margin shall be taken over the pipe friction losses.			
3.03.00	Material & Dimensional Standards for Piping / Joints			
3.03.01	Material of construction for pipes carrying various fluids shall be as enclosed at Annexure-2 of this Subsection			
3.03.02	All piping system shall be capable of withstanding the maximum pressure and temperature in the corresponding line. The pressure rating of individual piping system component such as valves, flanges etc shall however be not less than that specified.			
3.03.03	Based on the inside diameter established based on design velocity criteria, thickness calculation shall be made as per ANSI B 31.1 / ANSI B 31.3, Outside diameter and thickness of pipes shall then be selected as per design standard of			
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	pipes. The wall thickness selection for a given pipeline diameter shall be such that the stresses in the pipe wall resulting from the most un-favourable expected combination of loading conditions described are within the permissible limits. The wall thickness selection shall take into consideration the corrosion allowances as recommended by ANSI 31.3 and AWWA. These corrosion allowances should be subtracted from the wall thickness when calculating stresses for operational conditions. However Corrosion allowance of 2mm shall be included for all type of pipes e.g. unlined/ un-coated pipes/ lined/coated pipes. Negative tolerance of pipes if any specified by the standard/Code shall be added to arrive at the final thickness. Pipe Crossings shall be designed for the highest total loading expected. The maximum expected long term radial deflection of the pipe due to dead and live loads shall be calculated using appropriate equations such as the Spangler equation. The maximum circumferential fibre stress in the pipe wall due to the external load shall be calculated using appropriate equations as defined by the design code. The design shall be governed by the maximum value of the sum of hoop stress due to internal pressure and the corresponding circumferential tensile stress due to external loading. AWWA-M-11 may be considered as a guideline for such design.
3.03.04	Spirally welded pipes are also acceptable in place of ERW pipes.
3.03.05	Preferably all steel pipes shall be supplied from the approved manufactures from their works. However, for Pipe Sizes 600NB and above, Bidder may fabricate pipes at site. Pipes to be fabricated by the bidder shall be rolled and butt welded from plates/coil conforming to ASTM A – 53 type E Gr. B / IS 2062 Grade B or Equivalent, of required thickness (as defined above) at site. The site-fabricated pipe (finished product) shall meet the required quality specified in the design Standard (IS:3589 GR40) with regard to Mechanical, Chemical Properties, Tolerances etc. However, for such site fabricated pipes, the Hydrostatic Test Pressure shall be 1.5 times the design pressure or 2 times the working pressure as the case may be. Other Testing requirements for such site-fabricated pipes shall be as per relevant Table in Sub-section-III E of Part-B of this Technical Specification.
3.04.00	Pipe Joints (Steel)
3.04.01	In general all steel pipe lines for liquid application of 65mm NB and above, are to be joined generally by butt welding except the locations where valves/fittings are to be installed with flanged connections. All air lines shall be of screwed or flanged connection as the case may be.
3.04.02	Pipes 50 NB and smaller shall have socket welded joints. For GI pipes, however the joint shall be screwed/flanged type. Also for smaller sizes(500 NB & below) internally lined(Polyurethane / Solvent free Epoxy / glass flake polyester acrylic polymer) pipes joints shall be flanged.
3.04.03	Screwed Joints (For steel pipes) a) Threading of pipes shall be carried out after bending, heat treatment etc. If not possible, threading may be done prior to these operations but proper care should be taken to protect them from damage.
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3.04.04	b)	Galvanised pipe shall generally be joined by screwing into sockets. The exposed threaded portion on the outside of the pipes shall be given a zinc silicate coating. Galvanised pipes shall not be joined by welding. Screwed ends of GI pipes shall be thoroughly cleaned and painted with a mixture of red and white lead before jointing. For galvanized pipe sizes above 150 mm NB, screw & socket jointing as per ASTM-A-865 shall be employed for both pipe-to-pipe and pipe-to-fitting jointing. For pipe to fitting connection since no direct threading can be done on the fittings (supplied as per ASTM-A-234 Gr. WPB and ANSI B-16.9) necessary straight pipe lengths acting as match pieces shall be welded to the fitting at both ends and subsequently the free ends of the straight lengths shall be threaded as per ASTM A-865 for jointing with main pipe. Once welding of fittings with match pieces and threading of free ends of match pieces are over, the entire fabricated piece shall be galvanised, or in case match pipes and fittings are already galvanised before the above mentioned fabrication then suitable application of Zinc-Silicate paste adequately at the welded surface (both in side & out side) after welding with zinc rich electrode, alongwith the nascent threaded metal portions at both free ends given the same application of Zinc Silicate paste. Alternatively flanged jointing may be employed for pipe sizes 150 NB and above. However, the bidder shall ensure the galvanized pipe joints do not fail during hydro test.			
	c)	Teflon tapes shall be used to seal out screwed joints and shall be applied to the male threads only. Threaded parts shall be wiped clean of oil or grease with appropriate solvent if necessary and allowing proper time for drying before applying the sealant. Pipe ends shall be reamed and all chips shall be removed. Screwed flanges shall be attached by screwing the pipe through the flange and the pipe and flange shall be refaced accurately.			
	d)	For pipe sizes from 350 mm NB to 550 mm NB (including 350 NB & 550 NB) the GI pipes shall be of flanged connection. However, the pipes after welding of flanges shall be completely galvanised. Any site welding done on galvanised pipes shall be done with zinc-rich special electrodes and the welded surfaces whether inside or outside shall be coated with zinc-silicate paste. Seal welding of flanges with zinc-rich electrode will be permitted only when any flange is leak-prone during hydro testing.			
	e)	For pipe sizes 600 mm NB and above, the GI pipes shall be of welded connection (with zinc-rich special electrodes) followed by application of zinc silicate coating at welded surfaces both inside and outside the pipe, except for the last blank/blind flange, or, equipment connection where application of zinc-silicate paste after welding cannot be done due to inaccessibility of the inside welded surface and where galvanic protection has been impaired due to welding of pipe-to-pipe joint. Thus the last erection joint shall be flanged joint			
	Welded Joints (For steel pipes) For making up welded joints (butt weld or socket weld) the welding shall be performed by manual shielded metal arc process in accordance with the				
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE		BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	SUB-SECTION – IIIA-03 PIPING, VALVES & FITTINGS	PAGE 8 OF 43

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3.04.05	requirements specified elsewhere in the spec. Any welder employed for carrying butt welding shall be qualified as per ASME section IX for the type of joints he is going to weld. Jointing by butt weld, or socket weld shall depend upon the respective piping material specifications All welding electrodes and welding rods including special ones, if any shall be furnished by the Bidder.			
	Flanged a) Flanged connections for pipes are to be kept to the minimum and used only for connections to vessel, equipments, flanged valves and other fittings like strainer/traps/orifices etc. for ease of connection and maintenance etc. However for galvanised pipe for 150 NB and above flange-jointed pipes may also be adopted as described above b) Rubber Lined pipes shall be jointed thru flanged connections only c) The field joints of internally (Polyurethane / Solvent free Epoxy / glass flake polyester acrylic polymer) coated smaller size pipes (up to 500 NB) shall be of flanged type to avoid manual coating at joints. All fitting & connections shall also be flanged. d) Steel pipe flanges shall be generally slip on flat face type. Weld neck flanges shall be used when flange follows immediately after a butt welding or where it is required with respect to service conditions. When weld neck or socket weld flanges are used, their bore must be made the same as that of the pipe being welded to. Socket welded or threaded flanges may be used, with the appropriate piping system for connection of pipe to the flanged equipment. e) Flange connections on pipes carrying chemicals or chemical solutions are to be fitted with corrosion-resistant, transparent, sleeves to prevent accidents in the event of leakage. For the same reason, pipelines, etc. carrying concentrated chemicals are to be jacketed in transparent plastic material. Similarly, all areas where concentrated chemicals are handled and mixing pieces are to have transparent shields for protection. f) All the piping flanges and counter flanges & their drilling shall generally conform to ANSI B 16.5 of relevant pressure & temperature class. Drilling on flanges of flanged valves must correspond to the drilling of flanges on the piping system on which the valves are installed. However wherever the interference is involved with the Owner's pipe, the flange/interconnection details shall be designed to match the piping and the details of which will be intimated later.			
3.05.00	Steel Fittings (Bends/ Elbows/ Mitre Bends/Tees/ Reducers etc): a) Unless otherwise specified elbows shall be of long radius type b) For pipe sizes upto 65Nb, long radius forged elbows or seamless pipe bends shall be used. Pipe bends, if used, shall be cold bent to a radius measured to the centre line of pipe of 3 to 5 times the pipe diameter			
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	c) For steel pipes 80 NB and above, seamless long radius forged elbows shall be used. For pipe size 350NB and above mitre bends may be used for all pipes except rubber lined pipes. The bend radius shall be 1½ times the nominal pipe diameter. For 90 deg. bends (mitre) 4 pieces (3 cuts) shall be adopted and 45 deg. mitre bends shall be in 3 pieces 22½ deg. Fabrication of mitre bends shall be as detailed in BS 2633/BS534. Mitre bends are not acceptable in case of rubber lined mild steel pipes d) For pipe fittings such as reducers and tees, the material shall be to ASTM-A-234 Gr. WPB up to 300 NB. However, for pipes up to 150 NB, pipe fittings may be supplied with material and dimension conforming to IS 1239 in case parent pipes also conform to IS 1239. For pipe reducers and tees above 300 NB, the fittings may be fabricated conforming to parent pipe material. Provision of compensation pads shall be kept as per ANSI B 31.1. The fitting shall conform to the dimensional standard of ANSI B-16.9. e) For pipes, above 1200 NB, reducer and tees shall be to dimensional standard of AWWA-C-208. f) For Mitered fittings to be employed in internally coated (Polyurethane / Solvent free Epoxy / glass flake polyester acrylic polymer) special care shall be taken to ensure that no weld burrs, protrusions/ projections or surface irregularities remain before lining material application for internal coating. Such burrs/projections shall be ground smooth to radius of atleast 3mm as specified in the relevant clause for surface preparation for lining. g) Stainless steel fittings shall conform to either ASTM-A-182 or ASTM-A-403 Class-S, for sizes upto and including 50 mm NB, i.e. the fittings shall be of seamless construction. However, for stainless fittings above 50 mm NB, the same shall conform to ASTM-A-403 Class W i.e. the fittings shall be of welded construction strictly in accordance with ASTM-A-403
3.06.00	Specific technical requirement of laying buried pipe under with anti corrosive treatment is described in Annexure-3 of this Sub-Section, Pipes laid inside a Hume pipe (in Road/pipe or trench crossings) shall be also be given protective coating as described in this Annexure -3
3.07.00	Internal Protection of Steel Pipes:
3.07.01	For rubber lined pipe, lining should be applied in two (2) layers, giving a total thickness not less than 3 mm. Surface hardness of rubber lining shall be 65 + 5 A class.
3.07.02	Specific technical requirement of Coating/Internal Lining (Polyurethane / Epoxy / glass flake polyester acrylic polymer) of Piping is described in Annexure-4 of this sub-section
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3.08.00	External Protection of Pipes			
	SURFACE PREPARATION AND EXTERNAL PAINTING FOR ABOVE GROUND/CULVERT MOUNTED/TRENCH-LAID PIPING EXPOSED TO ATMOSPHERE			
	Pipes shall be cleaned both internally and externally thoroughly by blast cleaning or power tool cleaning method, where blast cleaning is not feasible. In case of oil piping, cleaning will have to be done by pickling. No painting is required on stainless steel pipe or stainless steel surfaces. However, necessary colour banding for identification as per colour code shall be done. External surface of piping shall be cleaned and prepared as indicated in the painting schedule below:			
A)	Surface Preparation and Priming			
	All surfaces to be painted shall be clean, dry and free from contamination. Oil or grease should be removed in accordance with SSPC-SP1 solvent cleaning. External surfaces then are to be blast cleaned by abrasives to a minimum of SA 2½ finish of SIS-05-5900 (Swiss International standard) (ISO-8501-1:1988). If Oxidation has occurred between blasting and application of primer, the surface should be reblasted to the specified visual standard i.e. to near white metal. The primer coat shall be applied immediately after blast cleaning by Airless spray technique.			
B)	Painting:			
	The coating material and thickness for primer, intermediate, finish and top-finish coats are given as below:			
	(i)	Primer Coat :	Self-curing Inorganic Zinc Silicate (Level of zinc dust by weight present in the dried film shall be equal to or greater than 85%. Inorganic zinc silicate shall comply with SSPC SP20 Level-I Zinc content and Zinc purity as per ASTM D520 Type-II).	- 75 Micron (DFT) (minimum) to be applied by Airless spray
	(ii)	Intermediate Coat :	Polyamide cured pigmented Titanium Dioxide (TiO2) or Micaceous Iron Oxide (MIO) Epoxy based paint (solid by volume minimum 60%).	- 100 Micron (DFT) (minimum) to be applied by Airless spray technique.
			[This coat shall be applied after an interval of minimum 24 hours after application of Prime Coat]	
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C)	Note: Bidder shall choose anyone option for intermediate coat i.e. Titanium Dioxide (TiO2) based paint or MIO based paint and mention clearly in the Bid Data Sheet about the option exercised during the bidding stage only. No change is allowed during detailed engineering.				
	(iii)	Finish Coat :	Polyamide cured colour pigmented Epoxy based Paint (Solid by volume minimum 60%). This Coat shall be applied after an interval of Minimum 16 hours from the time of application of intermediate coat.	- 75 Micron (DFT) (minimum) to be applied before erection by Airless spray technique or after erection by brush and/or spray. Colour and shade of the coat shall be approved by the Employer. The Finish coat thickness of 75 micron can be built up either in single application or in two applications.	
	(iv)	Top-finish Coat:	Top-finish coat or Final finish coat of Polyurethane based colour pigmented Paint (Solid by volume minimum 40%). This coat shall be applied after an interval of minimum 24 hours from time of application of Finish coat but shall be within 4 days maximum.	- 50Micron (DFT) (minimum) to be applied by Airless spray or conventional spray technique and on very rare occasions by brush after erection. The colour & shade of the coat shall be approved by the employer.	
	Total dry film thickness of the external painting thus shall not be less than 300 micron.				
	Other requirements				
	(a)	Paint manufacturer's instructions shall be followed in method of application, handling, drying time etc.			
	(b)	The colour of the finish paint shall be as per approved colour coding scheme.			
	(c)	If finish paint was applied in shop, one coat of finish paint shall be applied at site.			
	(d)	Protection of other surfaces adjacent to the surface being painted is the responsibility of the Contractor.			
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D)	(e) The dry film thickness of the finish paint shall not be less than 300 micron. (f) All painting materials such as paints, varnishes, primer, solvents, thinners shall be supplied by the Contractor. All the services, tools etc. required for preparation/cleaning and painting shall be provided by the Contractor. The Contractor shall be required to estimate the quantity of painting material required. Application The paint manufacturer's instructions covering shelf-life, pot life, storing, safety, thinning, mixing ratio, method of application, handling, and drying and curing time shall be strictly followed and considered as a part of this specification. Flash point for all primers, paints, etc. shall be taken into consideration. Paint shall not be applied to damp surfaces or in rainy weather or when temperature is below 13⁰C or above 36⁰C, except when specifically permitted to do so as per manufacturer's instructions. In all cases, manufacturer's recommended temperature limit, relative humidity for applicable shall be followed. The colour of each coat shall generally contrast with the previous coats's colour to avoid skip and holidays. Apart from surface preparation of the piping etc. attention should be of paid to the details, particularly the following : (a) Sharp edges that may have a deleterious effects on coatings should be removed. (b) Burrs caused by removal of temporary lugs etc. should be ground flat. (c) Welds should be dressed and weld spatter removed by grinding. (d) Nuts and bolts should be properly treated. (e) Fasteners, such as pipe hangers, clamp etc., should be treated before being fixed to the main structure.				
	E)	Surfaces not to be painted (a) Surfaces of insulation need not be painted. (b) Surfaces of Stainless steel, nickle, copper, brass, monel, aluminium, Hastelloy lead, etc. need not painted. However, Galvanised Steel pipe external surface shall be painted as mentioned above. (c) Valve stem, pump shafts, gauges need not painted. (d) Bearing and control surfaces, lined or clad surfaces need not painted.			
F)	Inspection and Testing All painted surfaces shall be visually checked for uniformity.				
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G)	The dry film thickness of coatings of paint shall be measured.															
	Colour code for identification															
	The pipes shall be colour painted/ banded for identification as per the colour coding scheme of Employer. These sheets shall be furnished during detail engineering stage to the bidder and shall be generally as per IS-9404.															
	H)															
	Surfaces of insulation, Stainless steel, nickel, copper, brass, Gun Metal, monel, aluminium, Hastelloy, lead, Plastic materials such as HDPE, CPVC, GRP Valve stem, pump shafts, gauges, Bearing and control surfaces, lined or clad surfaces etc. need not painted. However, Galvanised Steel pipe external surface shall be painted as per the above clause.															
3.09.00	Non- Metallic Pipes (HDPE/ GRP/ PVC/ CPVC)															
3.09.01	Non-metallic Pipes shall be laid as per recommendations of the Design Standard and manufacturer adopting proven practice. Type of Joints shall be selected based service / pressure and recommendation of design standard Joining method, type of preparation of jointing procedure, installation and testing procedure shall be furnished by the pipe manufacturer as per Design Standard,/their proven practice and the same shall be approved by Employer. Installation & testing shall be carried out under the supervision of the supplier.															
3.09.02	TECHNICAL SPECIFICATION FOR GLASS FIBER REINFORCED PLASTIC (GRP) PIPES AND HIGH DENSITY POLYETHYLENE (HDPE) PIPES															
	A) SPECIFICATION FOR GLASS FIBER REINFORCED PLASTICS (GRP) PIPES, FITTINGS & SPECIALS															
	i) GENERAL															
	This specification covers the specific requirement of design, material, manufacture / fabrication, constructional features, inspection & testing; transportation, handling, lowering, laying, jointing, hydro testing and annual maintenance contract of Glass fiber Reinforced Plastics (GRP) Pipes, Joints, fittings and specials.															
	ii) CODE AND STANDARDS															
	The design, manufacture, inspection and testing of GRP water pipes shall comply with the latest ASTM D-3517 (Standard Specification for Fiberglass (Glass Fiber Reinforced Thermosetting Resin) Pressure Pipe in the case of pressure pipes) or AWWA C 950 (Standard for fiber glass pressure pipe) & AWWA M 45 (Fiberglass Pipe design) unless otherwise specified in this Technical Specification.															
	The various codes used in the design, manufacture and testing of GRP pipes are as follows:															
	<table><tr><td>Code No.</td><td>Code Title</td></tr><tr><td>AWWA C950</td><td>Standard for fiber glass pressure pipe</td></tr><tr><td>AWWA M 45</td><td>Fiberglass Pipe design</td></tr><tr><td>ASTM C 33</td><td>Standard specification for Concrete aggregates</td></tr><tr><td>ASTM D 638</td><td>Standard Test Method for Tensile Properties of Plastics</td></tr><tr><td>ASTM D 695</td><td>Standard test method for compressive properties of rigid</td></tr></table>				Code No.	Code Title	AWWA C950	Standard for fiber glass pressure pipe	AWWA M 45	Fiberglass Pipe design	ASTM C 33	Standard specification for Concrete aggregates	ASTM D 638	Standard Test Method for Tensile Properties of Plastics	ASTM D 695	Standard test method for compressive properties of rigid
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		plastics.		
	ASTM D 1599	Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings		
	ASTM D 2105	Standard Test Method for Longitudinal Tensile Properties of Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Tube		
	ASTM D 2290	Standard Test Method for Apparent Hoop Tensile Strength of Plastic or Reinforced Plastic Pipe by Split Disk Method		
	ASTM D 2412	Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading		
	ASTM D 2563	Standard practice clarifying visual defects in glass reinforced plastic laminated parts		
	ASTM D 2583	Standard Test Method for Indentation Hardness of Rigid Plastics by means of a Barcol Impressor		
	ASTM D 2992	Standard practice for obtaining hydrostatic or pressure design basis for Fiberglass Pipe and Fittings		
	ASTM D 2996	Standard specification for Filament-Wound Fiberglass (Glass-Fiber-Reinforced-Thermosetting-Resin) Pipe		
	ASTM D 3262	Standard Specification for Fiberglass (Glass-Fiber Reinforced Thermosetting Resin) Sewer Pipe, in the case of gravity sewer pipes.		
	ASTM D 3517	Standard Specification for Fiberglass (Glass Fiber Reinforced Thermosetting Resin) Pressure Pipe		
	ASTM D 3567	Standard practice for determining dimensions of Fiberglass (Glass Fiber Reinforced Thermosetting Resin) Pipe and Fittings		
	ASTM D 3681	Standard Test Method for Chemical Resistance of Fiberglass (Glass-Fiber-Reinforced Thermosetting - Resin) Pipe in a Deflected Condition		
	ASTM D 3754	Standard Specification for Fiberglass (Glass Fiber Reinforced Thermosetting Resin) Sewer and Industrial Pressure Pipe.		
	ASTM D 3839	Standard guide for underground installation of Fiberglass Pipes.		
	ASTM D 4161	Standard Specification for Fiberglass (Glass Fiber Reinforced Thermosetting Resin) Pipe Joints Using Flexible Elastomeric Seals		
	ASTM D 5365	Standard Test Method for Long-Term Ring-Bending Strain of Fiberglass (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe		
	ASTM D 5421	Standard specification for contact molded "Fiber glass" flanges.		
	ASTM F 477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe		
	BS 5480	British Standard Specification for Glass reinforced plastics (GRP) pipes, joints and fittings for use for water supply or sewerage		
	ISO 1172	Textile-glass-reinforced plastics -- Prepregs, moulding compounds and laminates -- Determination of the textile-glass and mineral-filler content -- Calcination methods		
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	iii) DESIGN REQUIREMENTS			
	Nominal Diameter			
	The nominal diameter of the pipe shall be as specified in the data sheet. The inside diameters and tolerances on diameters for the specified nominal diameter shall conform to the requirements stated in AWWA C 950 / ASTM D3517.			
	Length			
	Pipes shall be supplied in nominal lengths of 6m/9m/12m as per requirements. The tolerances on nominal lengths shall be as per relevant AWWA / ASTM standards to which they are supplied.			
	Wall Thickness			
	The average Wall thickness of the pipe shall not be less than the minimum wall thickness published in latest manufacturer’s catalogue. However, minimum wall thickness in these published wall thicknesses of manufacturer shall conform to the tolerance limit as given in relevant AWWA / ASTM standards to which GRP pipes are supplied.			
	Contractor shall submit design calculations as per AWWA M 45 & AWWA C 950 to establish the adequacy of pipe size, pressure class and stiffness class selected for the GRP pipes.			
	Pressure Class			
	GRP pipes shall have the pressure class as per the data sheet attached at the end of this subsection.			
Stiffness Class				
The pipe shall be stiff enough to meet the design requirement with particular regard to installation method, burial depths, deflection limits, buckling and vacuum requirements.				
GRP pipes shall have the stiffness class as per the data sheet attached at the end of this subsection.				
Hoop and Longitudinal tensile strength				
GRP pipe system shall meet the minimum hoop tensile strength and minimum longitudinal tensile strength requirements specified in AWWA C 950 / ASTM D3517 for the pressure class specified in the data sheet attached at the end of this subsection.				
iv) MATERIAL REQUIREMENTS				
Resin: A thermosetting polyester resin (isophthalic resin) to be used and quality parameters shall be as per relevant AWWA / ASTM standards.				
Glass Fiber Reinforcement: Glass fiber reinforcement shall be of commercial grade ‘E’ type and shall conform to relevant ASTM standards.				
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	Other Materials: Other materials used in the manufacturing of pipe like aggregates, fillers and additives shall be in accordance with the relevant AWWA / ASTM standards. v) MANUFACTURING REQUIREMENTS The pipe shall be manufactured through Filament winding process (Continuous Filament Winding process using advancing mandrel method or Helical Filament Winding process) by winding continuous glass fiber filaments saturated with liquid resin or preimpregnated with partially cured resin (subsequent heating may be required to polymerize the resin system) onto the outside of a mandrel in a predetermined pattern under controlled tension as described in ASTM D 2996 to result in a corrosion resistant, composite structure to meet the operating conditions. Wall composition: Structure of pipe shall have chemical resistant liner, reinforced structural layer and outer surface layer. GRP Pipes shall be provided with UV stabilizers in the resin coat of outer surface layer. Overground GRP pipes (as applicable) shall be provided with flame retardant in the resin coat of outer surface layer. vi) JOINTS The pipeline shall have a jointing system that shall provide for fluid tightness for the intended service condition. All GRP pipes and fittings shall be joined with unrestrained sleeve couplings (Double REKA joint) or un-restrained double 'O' ring bell-Spigot joints. Thrust blocks are to be provided at each bends irrespective of buried as well as over ground GRP piping. For over ground piping, anchors are to be provided at reducers, branch offs, Tee-offs, expanders and terminal points of other suppliers apart from at points in straight run separated by an interval of 90 meters approx. as per AWWA- M45 (for pipes upto 400 NB dia.) and as per system requirements for large sizes. Flanged Joint: Flanged joints shall be used for connecting GRP pipes with valves, pumps and other material piping etc. Flanged joints shall be used with EPDM gasket and hot dip galvanized bolts. The flanged joint is made from the same material as the pipe. Rubber gaskets: Rubber gasket used with push-on flexible joints shall conform to the requirements of ASTM F 477. Rubber gaskets for use with flanged joints shall conform to relevant ASTM/AWWA/ISO standard.			
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	vii) GRP FITTINGS & SPECIALS General : All GRP fittings, such as bend / elbows, ends, tees, flanges and reducers etc. shall be equal to or superior in performance to pipe of the same classifications and shall be smoothly finished internally. Generally, all GRP fittings are to be manufactured in factory. Dimensions of the fittings shall be as per relevant standards and drawings shall be submitted to Employer for approval. Only in exceptional circumstances, specific required fittings may be permitted (Employer's approval) to be fabricated / laminated at site under the supervision of manufacturer of pipes. However, such site fabricated / lapped fitting / branch off shall be hydro tested at pressure no less than 1.5 times the pressure class along-with the pipes. Fittings made from straight pipe: Fittings shall be fabricated from complete pipes or portions of straight pipe complying with ASTM standards as applicable for the pipe classifications. The fitting shall comply with the declared design requirement and be suitably mitred. The mitre shall be over wrapped externally and internally with liner, woven roving and/or chopped strand mat to ensure the longitudinal and circumferential tensile strength is at least equal by design to that of the pipe with which the fittings is to be used. All fittings shall have sufficient end length of pipe to accommodate over wrapped length of fitting and pipe. Fittings made by Moulding : Moulded GRP fittings shall be made by hand lay-up, contact moulding, hot or cold press moulding or tape winding with internal liner. viii) TYPE TESTS The type tests shall be carried out in presence of the Employer's representative, for which minimum 15 days notice shall be given by the contractor. The contractor shall obtain the Employer's approval for the type test procedure before conducting the type test. The type test procedure shall clearly specify the test set-up, instruments to be used, procedure, acceptance norms, recording of different parameters, interval of recording, precautions to be taken etc. for the type test(s) to be carried out. The Long term type tests stipulated in Cl.2.12A.09 below should have been conducted by the manufacturer or its technology provider on GRP pipes at an independent laboratory or duly approved by accredited third party agency. Contractor shall submit these type test reports to the Employer. The manufacturer shall however carry out the short term / reconfirmation/ requalification tests as stipulated in Cl.2.12A.09 below. Further, the Employer reserves the right to waive conducting of any or all type tests (short term/ reconfirmation tests based on the reports/certificates) under this contract. In case such type tests are waived for any reason whatsoever, the type test charges shall not be payable to the contractor.			
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	ix) THE FOLLOWING TYPE TESTS SHALL BE CARRIED OUT: a) Long term hydrostatic strength / Long term hydrostatic pressure: Manufacturer or its technology provider should have already carried out the full type testing as described in Procedure-B of ASTM 2992, duly approved by accredited third party agency. Further, the manufacturer shall carry out the requalification test as described in reconfirmation test of ASTM 2992 on the same pressure class & stiffness class as specified for the pipes under this package. b) Chemical resistance of pipe in a deflected condition: Manufacturer or its technology provider should have already carried out the full type testing as described in Procedure-A or Procedure-B of ASTM 3681, duly approved by accredited third party agency. Further, the manufacturer shall carry out the requalification test as described in reconfirmation test of ASTM 3681 on the same pressure class & stiffness class as specified for the pipes under this package. c) Joint testing: All joints shall meet the laboratory performance requirements of section 7 of ASTM D4161. It shall be conducted on joint prototypes of elastomeric gasket sealed couplings in accordance with section 7 of ASTM D4161 on the pipes supplied under this package. d) Long term Stiffness – Material creep: Manufacturer or his technology provider should have already carried out the full type testing following the guidelines of ISO 10468 and analyzed according to ISO 10928, method B. Further, the manufacturer shall carry out the reconfirmation test for 1000hrs on the same pressure class & stiffness class as specified for the pipes under this package. The test procedure for this reconfirmation test shall remain same as the Long term Stiffness test stipulated above. The acceptance criteria for this test shall be as given in Clause 11 of ASTM D 5365 or as per alternative method proposed by manufacturer subject to Employer's approval. e) Long term Ring bending strain test: Manufacturer or his technology provider should have already carried out the full type testing using guidelines of ASTM D5365. Further, the manufacturer shall carry out the short term reconfirmation test in accordance with ASTM D5365 on the same pressure class & stiffness class as specified for the pipes under this package.			
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	x) MARKING The marking on pipe shall include the following: a) Standard mark for the pipes conforming to AWWA / ASTM standards to which they are supplied. b) The manufacturer's name or trademark c) The nominal pipe diameter d) Class of pipe (Pressure & Stiffness) e) Batch no. or date of manufacture f) Colour bands for over ground piping xi) TRANSPORTATION AND DELIVERY OF PIPES a) GRP pipe shall be handled, stored and transported in strict accordance to the Manufacturer's instructions. Contractor shall have to submit a write up for safe handling and stacking of pipes during transportation and at site. b) All pipes fabricated in the factory and temporarily stacked in the Contractor's yard or factory shall be transported to site after shop testing & cleaning them internally. The loading in the factory shall be carried out by means of either a crane, gantry or with shear legs, so as not to cause any damage to the finished material. Similarly, while unloading and stacking, great care shall be taken to ensure that the material is not damaged or dented. c) The material being delivered at site shall be jointly inspected by the Employer and the Contractor. Defective or damaged pipe shall be rejected by Employer or in case of minor damage, the Employer may allow repair of the pipe by the Contractor to the satisfaction of the Employer. d) Props of proven designs shall be fixed to the pipes during transit to avoid undue sagging and consequent distortion. After the pipes are carefully stacked, props may be removed and re-used for subsequent operations. e) In case of transport by ship, packing shall be sea worthy so as to ensure safe delivery till site. f) At site, pipes shall be stacked in such a way that suitable gaps shall be left in the pipes at intervals to permit access from one side to the other. xii) LOWERING, LAYING, JOINTING AND HYDRO TESTING OF GRP PIPES a) Lowering, laying, jointing and hydro testing of pipe shall take place either by pipe manufacturer itself or under the supervision of pipe manufacturer if erection agency is not pipe manufacturer. Lowering and Laying shall take place only after the trench and the surface supporting the pipes have been prepared as described in civil works sub section. b) Before placing a pipe in the trench, it is necessary to clean any remains of earth, sand or mud from the inside of the socket and from the opposite end			
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	bearing the rubber ring gasket/packing. When cleaning has taken place, run a hand around inside the socket to ensure that there are no residues of hardened resin which can be removed readily with a chisel. It is also necessary to check that the groove has an even depth and has not been damaged. For a coupling type of joint, two rubber ring gaskets shall be first fixed into the groove inside the coupling and then the coupling is fixed at the coupling area of the pipe. c) Pipes shall be lowered in the trench with appropriate mechanical means like chain pulley block, excavators etc. d) Place the pipe in the trench, taking care to dig a small hollow at each end so that the groove and the socket are well separated from the sand gravels in the bottom of the trench. e) Anchor the first pipe section laid according to the method described and leave its ends free along a space enough for insertion of the next section and for checking. f) Place the next pipe section in the trench and leave enough space for the operator to be free to move and to work between the two pipe sections so as to carry out the cleaning and checking operations. g) Clean the coupling area of the joint once more with a cloth and also clean the flared portion of the lead-in using suitable lubricant. h) Clean the groove again, take the rubber ring gasket and lubricate it by running it between the hands and checking at the same time, it being in good condition. It shall be ensured that every portion of the ring or inside of the socket must not lacks lubricant as it will impair good insertion of the pipe. i) For socket and spigot type of joint, pass the rubber ring under the pipe until it settles into the groove, then pull it forcibly upwards and follow the ring with the hands so that three quarters of it is positioned in the groove, then lift the ring above the upper generating line of the pipe forcibly and then release it so that it falls into the groove thus being freed of ant twists. j) Run the hands around the pipe to check that the whole of the packing is in its seating and, in the case of large diameter pipes, smear lubricant again above the inserted rubber ring gasket/packing. k) Align and bring together the two pipe sections until rubber ring touches the flared portion of the lead-in. l) When this has taken place, examine the position of the ring and above all, ensure that there are no sand or other foreign bodies present. m) Fit the socket onto the spigot very slowly, dwelling halfway along the coupling area, and check the position of the packing visually. n) Proceed with the joint until the socket is halted by the abutment ledge. The next pipe section shall not be fitted until the previous pipe section has been anchored with an overlay of sand.				
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	o) Check the rubber ring gasket/packing after the joint has been coupled. This check must always be carried out and is performed with a blade of steel or of another metal having a thickness of 0.4/0.5 mm, a width of 15 mm and any length greater than 200 mm, the blade being inserted into the annular space between the socket and spigot. p) This check shall be conducted along the entire circumference where the packing is compressed so as to ensure that the rubber ring has a homogeneous depth and is therefore correctly positioned in its seating. If the ring is found to be seated differently at one point than other points or if there is any doubt, disconnect the joint, check the rubber ring and replace it if shows any permanent signs of faulty seating, check once more the coupling area of the joint, the flared lead-in of the socket and the groove on the spigot. When re-inserting the pipe section, take extra care to align the pipes perfectly. When uncoupling pipe sections, never use chains or steel cables in direct contact with the pipes. Check once again the position of the ring with the blade q) Checking the installed pipe - Initial diametrical deflection shall not exceed 3% of diameter. Bulges, flat areas, or other abrupt changes of pipe wall curvature are not permitted. Deflection checks shall be done when the first installed pipes have been backfilled to grade and continued periodically throughout the entire project. Laying shall not get too far ahead before verifying the installation quality. Pipes over 3% deflection shall be replaced completely. No attempt to jack or wedge the installed over deflected pipe into a round condition shall be made to avoid damage the pipe. r) Correcting over deflected pipe - Pipes installed with initial diametrical deflections exceeding the approved values shall be corrected to ensure the long term performance of the pipe. Damaged pipe shall be repaired or replaced as directed by the employer. Recompact/ backfill to grade and check the pipe deflections to verify they have not exceeded the values to the satisfaction of Employer. s) Misalignment of the joint - When for reasons of the lay-out of the line the joint has to be misaligned (but such misalignment must remain within the limits provided by the supplier of the pipes),such misalignment at the predetermined angle should be applied only after having inserted the pipe and the joint is thoroughly checked for its water tightness. t) Thrust Block - RCC thrust block shall be provided at bends and at places of reduction in cross section to take care of thrust. u) GRP pipes shall cross road through Hume pipes. When buried GRP pipes are crossing roads, sand bags shall be put around GRP pipes within Hume pipe. v) At the end of each working day and whenever work is interrupted for any period of time, the free ends of laid pipes shall be protected against the entry			
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	of dirt, water or other foreign matter by means of approved plugs or end caps. w) Site lapping of last joint during erection shall be done at a de-humidified condition by skilled worker to ensure correct curing. x) FIELD HYDROSTATIC TESTS The pipeline shall be hydro tested in stretches of suitable length at 1.5 times the pressure class. Water and other facilities as required for such hydro testing shall be arranged by the Contractor. Finally entire pipeline system shall be tested at system working pressure during operation of the Make-up water pumps. All the joints, which remain untested during sectional hydro tests shall be exposed and inspected for leakage. All the leakage/ defects observed shall be rectified by the Contractor and it shall be ensured that there is no visible leakage during continuous eight hours operation of the Make-up water pumps. After successful testing/ commissioning of entire pipelines, the area around exposed joints shall be restored. The detailed Filed Hydrostatic Testing Procedure based on International standard shall be submitted to Employer for Approval. xiii) ANNUAL MAINTENANCE CONTRACT (AMC) TERMS & CONDITIONS The Contractor shall tie-up with the GRP pipe manufacturer or its accredited reliable agency having experience of erecting, commissioning and maintaining such GRP piping system, to provide Comprehensive annual Maintenance Contract (AMC) for 3 years after completion of the warranty period. The following services shall be included under AMC: 1. Round the clock monitoring of GRP pipe installation for any leakage / rupture / damage of the pipeline. 2. Arranging all material (temporary & permanent), manpower (including skilled & unskilled labour), machineries, testing equipment, fixtures, maintenance tools & tackles consumables etc. for repair, maintenance, re-erection/ re-commissioning of any or whole portion of GRP piping system. 3. Repairing the damaged pipes / joints, replacing the damaged part of piping/ joints including fittings with new pipes / fittings, wherever necessary, making good damaged or excavated bed & trench of GRP pipe and restoring the trench bed to the original specified bed conditions. 4. Recharging, testing and re-commissioning the entire GRP pipe installation to the satisfaction of the Employer within 24 hours of the reporting of leakage / rupture / damage of the pipeline. DATA SHEET FOR GRP PIPES, FITTINGS AND SPECIALS <table><tr><th>Description</th><th>Units</th><th>Parameters</th></tr><tr><td>Pipe Material</td><td></td><td>Glass fiber Reinforced Plastic Pipe</td></tr><tr><td>Applicable standards</td><td></td><td>ASTM / AWWA as listed in technical</td></tr></table>	Description	Units	Parameters	Pipe Material		Glass fiber Reinforced Plastic Pipe	Applicable standards		ASTM / AWWA as listed in technical
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CLAUSE NO.	TECHNICAL REQUIREMENTS – PIPING VALVES & FITTINGS			
			specification	
	Design Flow thru each pipe		As per system requirement	
	Working pressure	mwc	As per system requirement	
	Vacuum pressure	Kg/cm2	-0.8	
	Maximum service temperature	oC	36	
	Hazen William's constant		150	
	Pipe Nominal diameter	NB	As per system requirement	
	Pipe Length		As per corridor survey	
	Pressure Class		As per system requirement but limited to PN15.	
	Stiffness Class		C	
	Stiffness Value	KPa	248 (minimum) at 5% deflection	
	Glass fiber reinforcement class		E	
	Pipeline Joint type		unrestrained sleeve couplings (Double REKA joint) or un-restrained double 'O' ring bell-Spigot joints	
	Pipe Joint type at valves, pumps and other piping		Flange Joints	
	Restrain mechanism at bends, specials etc.		Thrust Blocks	
	Fittings and specials		As per technical specification	
B) <u>SPECIFICATIONS FOR POLYETHYLENE (PE) PIPES, FITTINGS, SPECIALS & ACCESSORIES</u>				
i) GENERAL				
The specification covers the requirements for Design, Engineering, Supply, Erection, Testing & Commissioning of High Density Polyethylene (HDPE) pipes, fittings, specials and accessories				
1. HDPE piping shall be produced using virgin and pre-compounded PE100 black raw material.				
2. Polyethylene shall be blended with antioxidants, pigments and UV stabilizers to ensure the material is suitable for use. Amongst other factors, the range and quantities of co-monomers used can result in substantially different basic properties, e.g. melt flow rate, density, etc.				
3. The resulting compound shall normally be delivered to the manufacturer in the form of granules and the HDPE pipes shall be produced by extrusion process.				
4. The manufacturer/supplier shall submit proof of purchase of virgin and pre-compounded PE100 black raw material for the grade specified along with the test certificate issued by the raw material manufacturer at the time of inspection of the pipes.				
ii) APPLICABLE CODES				
The Design, Engineering, Supply, Erection, Testing & Commissioning the HDPE pipes shall comply with all currently applicable statutes, regulations, standards and codes. In particular, the following standards, unless otherwise specified herein, shall be referred. In all the cases, all the latest revision of the codes shall be referred to.				
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	Code No.	Description.		
	ISO 4427:2007	Polyethylene (PE) pipes for water supply specifications.		
	EN12201-1:2003	Plastic piping System for Water Supply – Polyethylene (PE) Part 1- General		
	EN12201-2:2003	Part 2- Pipes		
	EN12201-3:2003	Part 3- Fittings		
	EN12201-4:2003	Part 4- Valves		
	EN12201-5:2003	Part 5- Fitness for purpose of the system		
	BSEN ISO 1167-1:2006	Thermoplastics pipes for the conveyance of fluids. Determination of the resistance to internal pressures. General Method.		
	BSEN ISO 1167-2:2006	Thermoplastic pipes for the conveyance of fluids. Determination of the resistance to internal pressures. Preparation of pipe pieces.		
	BS ISO 4065:1996	Thermoplastic pipes universal wall thickness table.		
	ISO 4427-2:2007	Table-2, for wall thickness.		
	BS ISO 11922-1:1997	Thermoplastics pipes for the conveyance of fluids. Dimensions and tolerances.		
	BSEN 1092-1-3	Flanges & their joints, circular flanges for pipes,		
	BSEN 1092-2-4	valves, fittings & accessories PN designated Part 1 : Steel flanges Part 2 : Cast iron flanges Part 3 : Copper alloy flanges Part 4 : Aluminium alloy flanges		
	BS Table 10 D/ E / F	Flanges & their joints		
	BSEN 1092-1:2007	Flanges & their joints circular flanges for pipes, valves, fittings & accessories PN designated steel flanges		
	BSEN ISO 12162:1996	Thermoplastics material for pipes and fittings for pressure applications – clarifications – clarification and designation overall service (design-co-efficient).		
	ISO 161-1	Thermo Plastic pipes for the transport of fluids nominal out side diameter and nominal pressure		
	ISO 4427-2:2007(Table-1)	Mean outside diameter and out of roundness		
	DIN 8074 August 1999	Polyethylene pipes dimensions		
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	DIN 16963 1-15 series	Pipes joints and elements for high Density Polyethylene (PE) pressure pipe lines.		
	BS 7874:1998	Method of test for microbiological deterioration of elastomeric seals for joints in pipe work and pipes.		
	BSEN 681-1:1996	Elastomeric seals, material requirements for pipe joint seals used in water and drainage applications. Vulcanized rubber.		
	BSEN 681-2:2000	Elastomeric seals, material requirements for pipe joint seals used in water and drainage applications. Thermoplastic elastomers.		
iii) DESIGNATION				
Pipe shall be designated according to the grade of material followed by pressure rating & nominal diameter, for example, PE100 PN6 DN500 indicated a pipe pertaining to material grade 100 having a pressure rating .6MPa & outside nominal dia 500 NB.				
iv) TECHNICAL REQUIREMENTS				
1. Colour				
The colour of the pipe shall be either blue or black, or black with blue stripes (as per clause 5.2 of ISO 4427-2:2007)				
2. Raw material				
a) Raw material used to manufacture the HDPE pipes shall be 100% virgin PE100 pre-compound black resin conforming to ISO: 4427-1:2007. The supplier should attach the certificate by resin manufacturer as per the relevant clause of design standard. The resin proposed to be used for manufacturing the pipes should also comply with the norms as per ISO 9080:1982				
b) The resin should have been certified by an independent laboratory of repute for having passed 10,000 hours long term hydrostatic strength (LTHS) test extrapolated to 50 year to show that the resin has a minimum MRS of over 10 MPa. Internal certificate of resin manufacturer is not acceptable.				
c) Certificate for having passed full scale rapid crack propagation test as per ISO 13478 shall be submitted.				
d) The resin shall be pre-compounded with carbon black at the manufacturing stage itself. The carbon black content in the material; shall be within 2.5 +/- 0.5% as per ISO 6964 (Test method) and the dispersion of carbon black shall be satisfactory when tested as per ISO 18553 (Test method)				
e) Quality assurance certificate for raw material proposed to be used shall be obtained from any of the certifying agencies such Exova or Slevan or Advantica or any other internationally reputed organization.				
3. Antioxidant:				
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	The percentage of antioxidant used shall not be more than 0.3% by mass of finished resin. The anti-oxidant used shall be physiologically harmless and shall be selected from the list given in ASTM D3895-07. 4. Reworked Material No addition of Reworked/Recycled material is permissible in the manufacture of the pipe and 100% virgin resin compound shall only be used. 5. Maximum Ovality of Pipe The outside diameter of the pipe, tolerance and ovality of pipe shall be as per the design standard. Ovality shall be measured as the difference between maximum outside diameter and minimum outside diameter at the same cross section of the pipe, at 300 mm away from the cut end. Maximum out of roundness (Ovality) shall be as per Table-1 of ISO 4427-2:2007 6. Wall Thickness The minimum and maximum wall thickness of pipe for the PE100 the wall thickness shall be as per Table-2 of ISO 4427-2:2007 7. Length of straight pipe The length of straight pipe shall be minimum 6 metres. 8. The manufacturer of the HDPE pipe shall be preferably be supplying all HDPE fittings, flanges, flange adaptors and accessories as well as any adaptor and/or specials required to perform the work. 9. Fittings & Specials: All mechanical joints, fittings and systems shall confirm to the requirements specified in BS EN 12201-5/ISO 4427 as applicable. All fittings/specials shall be fabricated or injection moulded at factory only. No fabrication or moulding will be allowed at the site unless permitted by Engineer-in-Charge. Fittings will be but welded on to the pipes or other fittings by use of heat fusion. 10. Bends, Tees & Reducers: HDPE pipe bends, tees & reducers shall be Plain Square ended conforming to ISO 4427 or equivalent. 11. Joint Rings: The physical properties of elastomeric joint rings shall comply with EN 681-1:1996. The joint rings shall also comply with the relevant provisions in BS 7874:1 1998 for effects on water quality and resistance to microbiological deterioration. Joint rings shall be supplied by the pipe manufacturer. 12. Flanges: All flanges dimensionally shall be in accordance with BSEN 1092: 1 to 4: Flanges and their joints and BSEN 1515:2000 1 to 2 Flanges and their joints bolting. The screw threads in the pipes and fittings shall be complying with ISO			
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	Metric Screw Threads (ISO 7-1 and 2). Flanges shall be of PN16 nominal pressure rating and shall generally be flat faced. Material of construction of flanges shall be SS 316L. 13. Flange Joints for Pipes and Pipeline Fittings: Flanges for pipes and pipeline fittings shall unless otherwise stated comply with BS 4504: section 3.1: 1989 and BSEN 1092: Part 2: 1997. Flanges in accordance with BSEN 545 and ISO 2531 are dimensionally compatible with BS 4504: Section 3.1. Flanged joints shall be complete with all nuts, bolts, gaskets and two washers per bolt. The flanges of all fittings shall be integrally cast. The flanges of flanged pipes shall either be integrally cast or screwed or factory welded unless otherwise stated. Factory welded’ means that the flanges are welded to the pipes at the point of manufacture under factory conditions with inspection agency certification. 14. Steel Flange Converter: Steel Flange Converter shall be made out of polyethylene and shall conform to the EN 12201-3:2003 & EN 12201-5:2003 specification for mechanical fittings and joints including flanges for polyethylene pipes inclusive made of metal or plastics or a combination of both. 15. Gaskets for Flanged Joints: Gaskets for flanged pipe joints shall be of the inside bolt circle type and the dimensions shall comply with BSEN 1514-2:2005. The physical properties of gaskets shall comply with BS 7874:1998 (Method of test for microbiological deterioration of elastomeric seals for joints in pipework and pipelines for effects on water quality and resistance to microbiological deterioration). The Gaskets shall also comply with the relevant provisions in BS 7874:1998 for effects on water quality and resistance to microbiological deterioration. The Gasket material shall be Neoprene and shall be of average hardness of 65-75. The Gaskets shall be supplied by the manufacturer and shall suit for PN 16 flanges unless otherwise stated. 16. Nuts, Bolts and Washers: Nuts & bolts/studs shall be of duplex for installation of backing flanges for HDPE piping system. The bolting shall comply with the relevant provisions of BS 4504: Section 3.1:1989. The Bolt lengths shall be sufficient to ensure that nuts are full threaded when tightened in their final position with two threads showing.				
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	v) CONSTRUCTION, ERECTION & SITE INSPECTION/TESTING 1. All joints shall be made in strict compliance with the manufacturer recommendations. A factory qualified joining technician as designated by the pipe manufacturer or experienced, trained technician shall perform all heat fusion joints in the presence of purchaser/consultant representative. Jointing Procedure: All joints, fittings and systems shall confirm to the requirements specified in BS EN 12201-5/ISO 4427 as applicable. Jointing of HDPE pipes and specials shall be with fusion butt welding as per ASTM F2620-13 using automatic, hydraulically operated, superior quality butt fusion machines which will ensure good quality butt fusion welding of HDPE pipes. Normally Butt fusion welding shall include following activities: i. Aligning of pipe on welding M/C ii. Surface preparation for welding. iii. Heating of pipe ends iv. Holding pipe ends for welding v. Cooling etc. 2. The HDPE joints shall be made from the same class and type of raw material. Joints spacing between the walls of two ends shall be minimum 1/16” to a maximum 3/16”.The joints shall be visually inspected as to continuity of “ beads” from the melted material. 3. All fittings shall be butt fused fittings, thermos fused fittings/couplings, (up to 4” pipe dia, socket fused fittings can be used for branches) or flange adaptors. 4. The HDPE flange adaptors at pipe material transitions shall be backed up by stainless steel flanges (SS316L) conforming to ANSI B 16.5 and shaped as necessary to suit the outside dimensions of the pipe. The flange adaptors assemblies shall be connected with corrosion resisting bolts & nuts of type Duplex stainless steel. All bolts shall be tightened to the manufacturer’s specified torque. 5. HDPE installation shall be as per AWWA M-55 / ANSI/MSS SP-58-2009 6. Support Spacing: Suitable supports for the service conditions for horizontal over ground run of HDPE pipe with pipe clamps/brackets shall be used. For designing the allowable spans for supported or suspended pipelines, guidelines issued by AWWA M-55 / ANSI/MSS SP-58-2009 shall be referred. Under no circumstances, pipe mid span deflection will be more than 0.1inch or 2.54mm. vi) MARKING OF PIPES, FITTINGS AND SPECIALS: These requirements shall confirm to the requirements specified in BS EN 12201-5/ISO 4427 as applicable. vii) HANDLING, TRANSPORTATION AND STORAGE During handling, transportation and storage, all sections shall be handled by such means and in such a manner that no distortion or damage is done to the section or to the pipes as a whole. The following procedures shall generally be followed so as to eliminate the damage to the pipes and fittings and to maintain safety during unloading and storing. a. The maximum allowable depth of scoring of the external surface of the pipe is 5% of the wall thickness. Pipes and fittings showing obvious defects or excessive scoring should be strictly rejected. b. HDPE pipes should not be subjected to rough handling during loading and unloading operations. Rollers shall be used to move, drag the pipes across any surface. c. Metal chains, wire ropes or slings should not be brought into direct contact with the material. Webbed slings of polypropylene or nylon are recommended. d. Pipes shall not be dropped to avoid impact or bump. If anytime during handling or transit, any damage such as gouge, crack or fracture occurs, the pipe shall be replaced new.				
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	e. The truck used for transportation of HDPE pipes shall be exclusively used for HDPE pipes only with no other material loaded specially no metallic, glass or wooden items. The truck shall not have sharp edges that can damage the pipes. f. Damages during transit, handling, unloading and storage will be to the vendors account and replacement for such pipes has to be made by the vendor without any extra cost. viii) TESTING Testing shall be carried out fully in accordance with the requirements of ISO 4427 and DIN 8075-1999 or equivalent standard. a) Short-term Acceptance quality control tests Essential short-term quality control tests and procedures shall include the following • Appearance and surface condition • Dimensions • Thermal stability • Elongation at break • Hydrostatic pressure test at 80° C • Short term pressure test b) Long-term Type Tests In addition, long-term “Type Tests” shall be undertaken to demonstrate the long-term performance of the pipe. These “Type Tests” are detailed in the relevant standard and include the following: • Effect on water quality • Resistance to weathering • Long term hydrostatic pressure testing • Resistance to fracture on impact tensile strength, • Elongation and weld test It is worth bearing in mind that the above requirements for long-term performance levels are minimum values and manufacturers usually ensure that their products can comfortably meet these standards, i.e. the pipes have an additional factor of safety built into them to cover any manufacturing variables. ix) TOLERANCES Tolerances on wall thickness & weight, and length shall be in accordance with BS ISO 11922 - 1: 1997 or DIN 8074 1999 or ISO 4427. The tolerances on flange thickness and flange diameter shall be in accordance with BS4504: section 3.1:1989. The tolerances on flange thickness, flange diameter and bolt holes in polyethylene Steel flange converters to be used of connecting different type of material shall conform to BS 4504:1989 x) FINAL INSPECTION AT SITE All pipes, fittings, valves and accessories shall conform to the specification at site. Engineer shall carryout necessary inspections at site prior to final acceptance. xi) ANNUAL MAINTENANCE CONTRACT (AMC) TERMS & CONDITIONS The Contractor shall tie-up with the PE pipe manufacturer or its accredited reliable agency having experience of erecting, commissioning and maintaining such PE piping system, to provide Comprehensive annual Maintenance Contract (AMC) for 3 years after completion of the warranty period. The following services shall be included under AMC: 1. Round the clock monitoring of PE pipe installation for any leakage / rupture / damage of the pipeline.			
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	2. Arranging all material (temporary & permanent), manpower (including skilled & unskilled labour), machineries, testing equipment, fixtures, maintenance tools & tackles consumables etc. for repair, maintenance, re-erection/ re-commissioning of any or whole portion of PE piping system. 3. Repairing the damaged pipes / joints, replacing the damaged part of piping/ joints including fittings with new pipes / fittings, wherever necessary, making good damaged or excavated bed & trench of PE pipe and restoring the trench bed to the original specified bed conditions. 4. Recharging, testing and re-commissioning the entire PE pipe installation to the satisfaction of the Employer within 24 hours of the reporting of leakage / rupture / damage of the pipeline.			
4.00.00	VALVES, GATES & MISCELLANOUS ACCESSORIES			
4.01.00	General a) All the equipments such as Valves ,Gates and Accessories such as Strainers, resin /media traps etc shall be of proven design for the duty conditions and the contractor or manufacturer shall have sufficient experience in using the above equipments in water treatment application in the plants supplied earlier by them. b) In case owner desires, the experience list/feed back from the users shall be made available to owner for any or all the equipments during the detailed engineering phase. c) Valves, Strainers etc for the Chlorination Plant shall be got approved by the Chief Controller of Explosives-INDIA, by the contractor. d) Sizes of the valves shall be same as that of the interconnected pipe sizes except for the control valves e) The various equipments shall be installed so that they are easily approachable for the operating and maintenance personnel. Generally Valves shall be located about 1.2 metre to 1.5 metre from the operating platform and also they shall not preferably be located below the ground level such as in trenches etc. In such cases, extended spindle shall be provided with chain operating from operating floor. Valves which are installed below the ground floor shall be provided with a floor mounted pedestal at the top of the operating floor. The position indicator for such valves shall be also provided along with the stand. However valves which are provided (in the buried pipe line) with a valves chamber, shall have manual operator/Hand wheel inside the valve chamber. The valve chamber shall be provided with built in ladders/staircases and sufficient operating space within the chamber shall also be provided for easy operation of such valves. Wherever necessary for safety purpose locking device shall be provided. Further, if the valve is not accessible from a nearby available floor, grating or platform, necessary small platforms taking support from available structure for			
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CLAUSE NO.	TECHNICAL REQUIREMENTS – PIPING VALVES & FITTINGS					
4.02.00	facilitating easy valve operation shall be provided by the Contractor wherever necessary in consultation with project manager within the bid price.					
	f) Painting All the valves with actuators, strainers, resin traps etc. shall be provided with external painting as that of the interconnected piping as specified in Clause 3.08.00 above. No paint or filter shall be applied until all repairs, hydrostatic tests and final shop inspections are completed, but shall be applied prior to shipment If during transport, unloading/unpacking or erection at site any part of the painted surface gets damaged, the same shall be made good by the contractor by repainting to the satisfaction of the project manager					
	VALVES Valves will be used to start/stop or control flow. Gates will be primarily used for isolation of flow in open channels although these should be capable of throttling the flow too. Sample valves will be used in sample collection lines. Unless otherwise specified all the Valves shall be supplied with counter flanges by the Contractor.					
	Types of Valves and Material of construction for Valves carrying various fluids shall be as enclosed at Annexure-5 of this Subsection					
	General Design & Construction Requirements of Valves					
	All valves, shall be suitable for service conditions i.e. flow, temperature and pressure under which they are required. All the valves shall be of standard pressure rating of the relevant design standard. Non standard pressure rating shall not be accepted. The pressure and temperature rating of the valve shall be selected based on than the maximum expected pressure and temperature of the system in which valves are proposed to be installed.					
	Type of Actuators shall be as defined in relevant tender Drawings. All the actuators of the valves shall be designed to handle the maximum expected pressure differential across the valves and to overcome friction forces including that t bearing surfaces and unbalance forces due to the flow through valve.					
	The valves as well as all accessories shall be designed for easy disassembly and maintenance.					
	All rising stem valves shall be provided with back seat to permit repacking (of glands) with valves in operation. All valves shall preferably be of outside screw and yoke type.					
	All valves shall be closed by rotating the hand wheel in the clockwise direction when looking at the face of the handwheel. Suitable gearing arrangement shall be provided wherever input torque at handwheel rim exceeds 25 kgf or provision of gear is standard practice of the valve manufacturer.					
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CLAUSE NO.	TECHNICAL REQUIREMENTS – PIPING VALVES & FITTINGS					
4.04.06	All valves shall have indicators or direction clearly marked on the hand-wheel so that the valves opening/closing can be readily determined.					
4.04.07	Special attention shall be given to operating mechanism for large size valves with a view to obtaining quick and easy operation ensuring that a minimum of maintenance is required.					
4.04.08	The valves coming <i>in vacuum lines</i> shall be of extended gland type and/or water sealed.					
4.04.09	The actuator-operated valves shall be designed on the basis of the following: (1) The internal parts shall be suitable to support the pressure caused by the actuators; (2) The valve-actuator unit shall be suitably stiff so as not to cause vibrations, misalignments, etc. (3) All actuator operated valves shall be provided with hand operated gearing mechanism also. (4) All actuators operated valves shall open/ close fully within time required by the process but not later than 60 seconds after actuators starts.					
4.04.10	Valves coming under the purview of IBR shall meet IBR requirements.					
4.04.11	All valves shall be provided with embossed <i>name plate</i> giving details such as tag number, type, size etc.					
4.04.12	All valves except those with rising stems shall be provided with continuous <i>mechanical position indicators</i> ; rising stem valves shall have only visual indication through plastic/metallic stem cover for sizes above 50mm nominal bore.					
4.04.13	End Connections The end connections, shall comply with the following : a) Socket welding (SW) - ANSI B 16.11 b) Butt Welding (BW) - ANSI B 16.25. c) Threaded (SC) - ANSI B 2.1 d) Flanged (FL) - ANSI B 16.5& AWWA-C-207(steel flanges), ANSI B 16.1 (Cast Iron flanges), BS - EN -1092 All cast iron\ ductile-Ni iron body valves (gate, globe and non-return) shall have flanged end connections, (screwed ends for cast iron or D.2NI body valves are not acceptable). All steel and stainless steel body valves of sizes 65 mm and above shall generally have flanged or butt weldings ends. Valves of sizes below 65mm shall have flanged					
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CLAUSE NO.	TECHNICAL REQUIREMENTS – PIPING VALVES & FITTINGS				
4.05.00	or socket welded ends. Compatibility of welding between valve body material and connecting pipe material is a pre-requisite in case of butt-welded joints. All gun metal body valves shall have screwed ends. All flanged end valves/specialties. shall be furnished along with matching counter flanges, fasteners, gaskets etc. as required to complete the joints. GATE /SLUICE VALVES a) Gate/sluice valves shall be used for isolation of flow. Gate valves shall be provided with the following accessories in addition to other standard items: (1) Hand wheel (2) Position indicator (for above 50mm NB valve size). (3) Manually operated Valves of size 200 mm NB and above shall be provided with gear operator. Gear operator for lower size of valves may be provided if the system parameters so warrant or manufacturer so recommends. (4) Bypass Valve as required wherever high differential across the valves. (5) Draining arrangement wherever required. b) All gate valves shall be of the full-way type, and when in the full open position the bore of the valve shall not be constricted by any part of the gate. Gate valves shall be of the solid/elastic or articulated wedge disc and rising stem type, but shall be of proven design and usage in similar services c) Sluice /Gate Valves shall conform to IS: 780/ BS:5150/ BS:5163 / IS:14846/ API 600/ANSI B 16.34. Gate valves for sizes below 50 NB and below shall conforms to IS:778. d) Sluice/Gate Valves shall be provided with back seating bush to facilitate gland renewal during full open condition. e) All gate valves shall preferably be rising stem type and shall have limit switches for full OPEN and full CLOSED indication wherever required. This will include motor-operated valves also wherever required. f) For Cast Iron gate valves wherever thickness of body/bonnet is not mentioned in the valves standards, thickness mentioned in IS-1538 for fitting shall be applicable				
	4.06.00	GLOBE VALVES (a) Globe valves shall be generally used for regulation purposes. They shall be provided with hand wheel, position indicator, draining arrangement (wherever required) and arrow indicating flow direction.			
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4.07.00	b) All globe valves shall preferably be rising stem type and shall have limit switches for full OPEN and full CLOSED indication wherever required. This will include motor-operated valves also wherever required. In such cases the limit switches shall form an integral part of the valve. c) Manually operated Valves of size 200 mm NB and above shall be provided with gear operator. d) For Cast Iron globe valves wherever thickness of body/bonnet is not mentioned in the valves standards, thickness mentioned in IS-1538 for fitting shall be applicable. e) The globe valves shall have the following characteristics: i) Straight conveyed flow. ii) Right angle preferably, the valves shall be of the vertical stem type. iii) Globe valves shall preferably have radiused or spherical seating and discs shall be free to revolve on the spindle. iv) The pressure shall preferably be under the disc of the valve. However, globe valves, with pressure over the disc shall also be accepted provided no possibility exists that flow from above the disc can remove either the disc from stem or component from disc and manual globe valves can easily be operated by hand. If the fluid load on the top of the disc is higher than 40-60 KN, bypass valve shall be provided which permits the downstream system to be pressurised before the globe valve is opened. f) Globe valves with Nominal Bore smaller than or equal to 50 mm NB shall be preferably of the integral body type. Valves of this type shall be so as to permit the easiest disassembly of the internals (stem and disc). g) For the regulating valves ,valves with regulating plug & parabolic outline disc type is preferred. h) All motorised globe valves with regulating plug for which indication of percentage (%) opening are required in the control room shall be provided with necessary position transmitter. i) Design Standard of Globe Valves shall be generally IS:778/ BS 5152/ ANSI B 16.34 / Equivalent				
	CHECK VALVES a) Check valves shall be used for non-return service. They shall be swing. check type or double door (Dual plate)check type with a permanent arrow inscription on the valve body indicating the fluid flow direction.				
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4.08.00	b) In long distance pipe-lines with possibility of surge-occurrence, dual plate check valves are preferable for its spring controlled opening /closing of flaps/doors against flow reversals. c) However, dual plate check valves shall not be used for sizes more than 600mm NB. d) Design Standard of Check Valves shall be IS:778 / IS:5312 / BS:1868 / BS:5153 / API 594/ API 60(6D) or Equivalent. d) For CI check valves wherever thickness of body/bonnet is not mentioned in the valves standards, thickness mentioned in IS-1538 for fitting shall be applicable. f) Check valves shall generally comply with the following characteristics: i) For bore greater than 2" the valves must be swing check type or dual plate check type suitable for installation in all positions (vertical and horizontal); ii) For bore smaller than or equal to 2" the valves must be of the piston type to be installed, in horizontal position. - iii In the case of swing check valves, the body seat shall be inclined at such an angle from the vertical as will facilitate closing and prevent chatter. iv) Dual Plate check valves shall be double flanged type. However upto 150 NB size, Dual plate check valves of lugged wafer construction are also acceptable. v) Drilling on flanges of flanged valves must correspond to the drilling on flanges of the piping system on which the valves are to be installed. vi) All flanged valves intended for installation in steel piping systems shall have their flanges drilled to ANSI B 16.5 (or equivalent) and according to the pressure class. vii) Counter flanges to be installed on air pipes shall be screwed-on type irrespective of size or welded flanges followed by hot-dip galvanising in the Galvanising both to ensure Zinc Layer				
	BALL VALVES a) Design Standard of Ball valves shall be BS-5351 latest version. b) Ball Valves shall be with welded / flanged ends, Split Body & Seat supported construction. c) Manually operated Valves of size 200 mm NB and above shall be provided with gear operator				
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4.09.00	d) All the valves shall be provided with an indicator for showing the position of the ball port. e) Valves shall be designed to be directly operatable by a wrench/ Hand lever. Suitable stops shall be provided for both the fully open and close condition f) Anti- static device shall be provided for the ball valves. g) Valves shall be generally Full Bore type. However for sizes below 80 NB the reduced-bore design may be provided for handling clear fluid. h) If the Ball valves are used for hazardous chemicals, air etc where leakage is not tolerated, they shall be of Fire safe design & tested to API-607
	BUTTERFLY VALVES a) The valve rating of butterfly valves shall be selected based on the for the design pressure/temperature. b) The design standard of butterfly valves shall conform to latest revision of AWWA C –504 or BS: EN:593 or equivalent Standard of required class/rating. c) Fabricated steel butterfly valves instead of cast Iron body valves are also acceptable for large size i.e 600 mm NB and above for ordinary water application other than sea-water, Brackish Water and DM water. d) Proof of Design (P.O.D.) test certificates shall be furnished by the Bidder for all applicable size-ranges and classes of Butterfly valves supplied by them. In the absence of certificates, actual P.O.D. test shall be conducted by the bidder in the presence of Employer's representative. All valves that are designed and manufactured as per AWWA-C-504 shall be governed by the relevant clauses of P.O.D. test in AWWA-C-504. For Butterfly valves designed and manufactured to EN-593 or equivalent, the P.O.D test methods and procedures shall generally follow the guidelines of AWWA-C-504 in all respect except that Body & seat hydro test and disc-strength test shall be conducted at the pressures specified in EN-593 or the applicable code. Actuators shall also meet requirement of P.O.D. test of AWWA-C-504. e) The valves shall be suitable for installation in any position (horizontal/vertical etc.) and shall be generally of double-flanged construction. However, for sizes 600NB and below the valves of wafer construction are also acceptable. f) The Geometry, overall dimensions, laying length, body shell thickness, shaft diameter, shaft torque value shall be as per design standard adopted and of applicable design class. For Valves of sizes not covered in AWWA C-504 (which are designed as per AWWA C-504), the same shall be extrapolated. For valves designed as per AWWA C-504, valve flanges shall conform to ANSI B16.1 Class 125 for Cast Iron Valves and AWWA C 207 Class D for fabricated type. The counter flanges shall conform to AWWA C-207 Class D.
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	For Valves designed as per BS: EN: 593 the flanges shall conform to relevant pressure class/rating. g) For all types of valves, the design with shaft eccentric to the disc is preferred. The shaft shall be solid type and shall pivot on bushings. Bushings/sleeve type bearings shall be contained in the hub of valve body. The bearing shall be self-lubricated type with low coefficient of friction and should not have any harmful effect on fluid handled and on valve components.. h) All the butterfly valves shall be provided with Hand wheel or lever as per the requirements. i) For larger sizes i.e. 150 NB and above hand wheel shall be provided. For lever/wrench operated valves, means shall be provided for positively holding the disc in not less than three intermediate positions. j) Valves shall be provided with reduction gear unit for valves of size 250 NB and above. Valve provided with motorised or pneumatic actuator shall also be provided with a hand wheel & Gear reduction unit for manual operation. Manual operation of valve shall be through gear arrangement having totally enclosed gearing with handwheel diameter and gear ratio designed to meet the required operating torque It shall be designed to hold the valve disc in intermediate position between full open and full closed position without creeping or fluttering. All the valves shall be provided with adjustable stops shall be provided to prevent over travel in either direction. k) The seals, both on the body (sleeve) and on the disc shall be of the material specified. Necessary shaft seal shall be provided and adequately designed to ensure no leakage across the seal. This seal shall be designed so that they will allow replacement without removal of the valve shaft. The sealing ring on the disk shall be continuous type and easily replaceable. l) The design of the shaft shall be such that it will safely sustain maximum differential pressure across the closed valve. The shaft and any key (taper pin etc.) for transmitting the torque between shaft and disc shall be capable of withstanding the maximum torque required to operate the valve. However ,the shaft diameter shall not be less than the minimum shaft diameter specified in relevant code. Necessary Torque Calculation and the torque class selected on the basis of the same shall be furnished to the Employer for information if required. m) The disc shall rotate from the full open to the tight shut position. The disc shall be contoured to ensure the least possible resistance to flow and shall be suitable for throttling operation. While the disc is in the throttled position, valve shall not create any noise or vibration. n) The operating mechanism shall be mounted directly on or supported from the valve body.				
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CLAUSE NO.	TECHNICAL REQUIREMENTS – PIPING VALVES & FITTINGS				
4.10.00	o) All valves shall be complete with Position indicator (located in a visible place) arrow indicating the flow direction and adjustable mechanical stop limiting devices to prevent over-travel of valve disc in open/close position. p) Hand operated valves shall have local hand controls to close the valve with clockwise rotation & to provide an easy maneuver under most severe conditions. The hand controls shall be provided with locking systems suitable to avoid the disc assuming a non-desirable position during the operation. q) Handwheel shall be with arms and rims of adequate strength. The hand wheel of diameters 300mm or less shall be provided with handles for ease of operation. The pulling force required on the hand wheel rim shall not exceed 25 Kgf when operating the valve under full flow and operating pressure.. r) Valves-350Nb and above shall have pressure equalizing bypass valves, wherever system parameters warrant the same. s) Limit and torque switches (if applicable) shall be enclosed in water tight enclosures along with suitable space heaters for valves, which may be either for On-Off operation or inching operation with position transmitter.				
	FLOAT OPERATED VALVES				
	a) Valve shall automatically control the rate of filling and will shut off when a predetermined level is reached and close to prevent over flow on pre-set maximum water level. Valve shall also open and close in direct proportion to rise or fall of water level.				
	b) Design and Construction Features i) Valves shall be right angled or globe pattern. ii) Valves shall be balance piston type with float ball. iii) Leather liner shall not be provided.				
	c) For raw / clarified water /filtered water application, the body and cover material shall be cast iron conforming to ASTM-A 126 Grade 'B' or IS:210 Grade 200 or equivalent, and Float shall be of copper with epoxy painting of two (2) coats.				
4.11.00	d) Valves shall be suitable for flow velocities of 2 to 2.5m/sec.				
	e) The valves shall have flanged connections				
	The safety valves / relief valves at the down stream of positive displacement type metering pumps shall be of the standard type manufactured by the pump manufacturer and the material of construction shall suit to the fluid handled				
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CLAUSE NO.	TECHNICAL REQUIREMENTS – PIPING VALVES & FITTINGS				
4.12.00	Automatic Air Release Valves				
	a)	The automatic air release cum vacuum breaker valves shall be of automatic double air valve with two orifices and two floats conforming to IS14845. The float shall not close the valve at higher air velocities. The Orifice Contact joint with the float shall be leak tight joint. An isolation valve shall be provided for each release valve. The Air release valve in cross country application shall be provided with a suitable enclosure with locking arrangement so that the same is not tampered.			
	b)	Air release valves shall not have any integral isolation device within them. Each Air release valve shall be mounted, preceded by a separate isolation gate/ butterfly valve.			
	b)	The valve shall efficiently discharge the displaced air automatically form ducts/ pipes while filling them and admit air automatically into the duct / pipes while they are being emptied. The valve shall also automatically release trapped air from ducts/ pipes during normal working at the normal working pressure.			
	c)	Material of construction of automatic air release valves for other than corrosive water such as sea water, brackish & brine water shall be as follows.			
	i)	Body & Cover	:	Cast iron IS-210 Gr. FG 260	
	ii)	Ball, small orifice	:	Nitrile Rubber	
	iii)	Ball, large orifice	:	Vulcanite(ebonite)	
	iv)	Splash Cover	:	Cast iron IS-210 Gr. FG 260	
	v)	Ball seat	:	13% Cr. Stainless steel	
4.13.00	vi)	Spindle	:	SS 316	
	vii)	Gasket	:	Nitrile Rubber	
	d)	However, for corrosive fluids such as sea-water, brackish & brine water Body of the air release valves shall be ASTM-A-439 (D2-NI) and internals of Duplex Stainless Steel or equivalent.			
	The safety valves / relief valves at the down stream of positive displacement type metering pumps shall be of the standard type manufactured by the pump manufacturer and the material of construction shall suit to the fluid handled.				
	4.14.00				
	Gates				
	a)	Design standard for gates shall be IS:3042 or Equivalent. For sizes not covered under IS::3042, the gates shall generally as be per IS:13349.			
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4.15.00 4.15.01	b)	The gates shall be rectangular or square sluice, rising spindle type conforming to class-1 of IS:3042.			
	c)	Material of Construction for non-corrosive application such as raw water, clarified water / filtered water shall be as follow:-,			
	i)	Frame and Door	:	Cast Iron IS:210 Gr.260	
	ii)	Spindles, bolts & nuts	:	M.S. to IS:2062	
	iii)	Face & seat rings	:	Gun metal (as per IS:3042).	
	All the parts of gates shall be applied with the coats of heavy duty bitumastic paint.				
	d)	The gates for DM plant drains/Condensate Polishing Plant, Sea Water, Brackish water and brine shall be rubber lined to a minimum thickness of 4.5 mm.			
	e)	Each of the gates shall be provided with hand wheel, and a position indicato			
	MISCELLANEOUS PIPING ACCESSORIES				
	Basket type Strainers				
a)	The strainer shall be provided with screwed blow off connection fitted with a removable plug and vent connections.				
b)	The free area of the strainer element shall be at least four (4) times the internal area of the connecting pipe lines. Flow area in any portion of Basket strainer assembly shall not be less than the pipe cross sectional area				
c)	The strainer element shall be 20 mesh. Pressure drop in clean condition shall not be more than 4.0 MWC				
d)	Wire mesh of the strainers shall be suitably reinforced, to avoid buckling under operation. Strainer shall have screwed blow off connection fitted with a removable plug.				
e)	The strainer will have a permanent stainless steel tag fixed on the strainer body indicating the strainer tag number and service and other salient data.				
f)	The size of the strainer and the flow direction will be indicated on the strainer body casting.				
g)	Thickness of the strainer element should be designed to withstand the pressure developed within the strainer due to 100% clogged condition exerting shut-off pressure on the element.				
h)	The material of construction of various parts shall be as follows:				
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4.15.02		i)	Body	:	<u>For raw /clarified & filtered water application:</u> IS:318, Gr.2 upto 50 mm NB, and IS:210 Gr. FG 260 or Fabricated mild steel : IS:2062 Gr B/ ASTM-A-515 Gr 70/75 (Tested quality) for sizes above 50 mm NB. <u>For DM water & Alkali</u> Carbon steel IS: 2062 Gr B/ CI IS :210 FG Gr 260 internally lined with with 4.5 mm thick rubber OR Stainless Steel AISI 316 <u>For Sea Water & Brine</u> Body : A-439 D2-Ni for Size above 50 NB with epoxy painted internals and Duplex Stainless Steel or equivalent for size 50 NB & below
		ii)	Strainer Element	:	Wire shall be stainless steel (AISI:316) for non-sea water application and Duplex Stainless Steel or equivalent for sea water application.
		iii)	Drain plugs/ Nuts	:	SS-316 L/ Duplex Stainless Steel or equivalent for sea water application.
		h)			Ends shall be screwed upto 50mm NB and flanged above 50 mm NB. Gasket shall be of full face type
		i)			Duplex type Strainer shall be provided with lifting lugs Duplex strainers shall not be supported on pipes but shall be supported on a concrete foundation.
		j)			Duplex type strainers shall have manual / auto change-over facility for each strainer section by means of 3-way valve or flow diverter arrangement, supplied as a standard feature along with the Duplex strainer both at inlet and outlet of the strainer. Change-over of each strainer section (basket) shall be done based on Differential Pressure across the strainers
	Y-Type Strainers				
		a)			Y-Type strainers shall in general conform to requirements specified for Basket strainers under Clause. 4.15.02(a) to (h) above
		b)			Ends of Y-type strainers shall be flanged:
		c)			For acid services, apart from the rubber lined body material, the screen material, shall be Polypropylene or HDPE wire cloth of suitable mesh and thickness.
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CLAUSE NO.	TECHNICAL REQUIREMENTS – PIPING VALVES & FITTINGS
4.15.03	Strainers for the application of chlorine gas (Wet / Dry) and liquid chlorine shall be of standard make and type of the chlorination plant manufacturer and material of construction shall be suitable for the duty conditions.
4.15.04	Resin Traps The resin traps for the Ion exchange vessels shall be provided for the collection of Ion exchange resin shall conform to the following: a) The body shall be of mild steel (IS:2062) and lined internally with rubber (Hard/Soft rubber), Saran or polypropylene. The internals (rod and screen) for all resin traps shall be of AISI 316 construction. All screen components shall be welded at each intersection of wire and support rod for good strength, Resin traps screen opening shall not exceed 120 percent of the associated process vessel under drain/backwash collection header nozzle screen opening and shall be suitably selected to retain even the minimum size of the resin selected for the process. b) The resin traps shall be provided with a draining arrangement with a valve for collection of trapped resins. Resin trap body shall have lifting lug for easy handling during maintenance/erection.
5.00.00	TESTING FOR PIPING, VALVES & FITTINGS
5.01.00	TESTS AT SITE All piping, valves, Gates, resin traps, strainers and other fittings after erection at site shall be tested to hydraulically test pressure as per Filed Quality Plant All valves/gates (Manual/Automatic) shall be operated through-out 100% of the travel manually and as well as from control panel (if applicable) and these should function without any trouble whatsoever.
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE	
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PART – B
ANNEXURE – 1 TO
SUB-SECTION – IIIA-03
LIST OF STANDARDS

CLAUSE NO.	TECHNICAL REQUIREMENTS- PIPING, VALVES & FITTINGS			
	ANNEXURE-1 MAJOR STANDARDS AND CODES IS :5 : Colour ready made paints and enamels IS : 210 : Specifications for grey CI Castings IS : 554 : Pipe thread for pressure tight joints. IS : 778 : Gunmetal gate, globe and check valves for general purpose. IS : 780 : Sluice valves for water works purpose (50-300mm size) IS : 800 : Code of practice for use of structural steel in general building construction. IS : 816 : Code of practice for use of metal arc welding for general construction in mild steel. IS : 817 : Code of practice for training and testing of metal arc welders. IS : 822 : Code of procedure/practice for inspection of welds. IS : 1079 : Hot rolled carbon steel sheet and strip. IS : 1239 : Mild steel tubes and fittings - Part I & II. IS : 1363 : Black hexagon bolts, nuts and lock nuts. IS : 1367 : Technical supply condition for threaded steel fasteners introduction and general information. IS : 1364 : Precision and semi-precision hexagon bolts, screws, nuts and lock nuts. IS :1367 : Technical supply condition for threaded steel fasteners introduction and general information IS : 1477 : Code of practice for painting of ferrous metals in building. IS : 1538 : Cast iron fittings for pressure pipes for water, gas and sewage. IS: 1703 : Ball valves (horizontal) plunger type including floats for water supply purposes. IS : 1875 : Specification for carbon steel billets,, blooms,, slabs and bars for forging. IS : 2016 : Plain washers. IS : 2062 : Structural steel fusion welding quality. IS : 2379 : Colour for the identification of pipe line. IS : 2685 : Code of practice for erection, installation, and maintenance of sluice valves. IS : 2712 : Gaskets.			
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE		BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	ANNEXURE-1 TO SUB-SECTION – IIIA-03 LIST OF STANDARDS PAGE 1 OF 3

CLAUSE NO.	TECHNICAL REQUIREMENTS- PIPING, VALVES & FITTINGS			
	IS : 2825 : Code of unfired pressure vessels. IS : 2906 : Sluice valve for water works purposes IS : 2937 : Specification for enamel, synthetic, exterior type-1. i) Under coating ii) Finishing IS : 3042 : Single faced sluice gates (200 to 1200 mm). IS : 3114 : Code of practice for CI Pipes. IS : 3138 : Hexagonal bolts and nuts (M - 42 to M 150). IS : 3589 : Electrically welded steel pipes for Water gas & sewage (200 to 2000 mm). IS : 4038 : Foot valve for water works purposes. IS: 4682 : Code of practice for lining of vessels and equipment for chemical processes Part 1 Rubber lining IS : 4736 : Hot dip zinc coating on steel tubes. IS : 4984 : High Density polyethylene pipes. IS : 4985 : Unplasticised PVC Pipes. IS : 5312 : Swing check type reflux (non-return) valve Part-I. IS : 9404 : Colour code for identification of pipelines used in thermal power plants. IS : 10221 : Code of practice for coating and wrapping of underground mild steel pipelines. IS : 14846 : Sluice valves for water purpose. BS : 534 : Steel pipe fittings and specialties for water, gas sewage. BS : 916 : Black bolts, screws and nuts. BS : 1868 : Specification for steel check valves flange and butt welding ends. BS : 2633 : Specification for class - I arc welding of ferritic steel for pipe work carrying fluids. BS : 4360 : Weldable structural steel. BS : 4504 : Flanges and bolting for pipes, valves and fittings metric series. BS : 5142 : CI globe valve. BS : 5150 : Cast iron wedge and double disc gate valves for general purposes. BS : 5152 : Specification for CI globe, stop and check valves for general purpose.			
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE		BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	ANNEXURE-1 TO SUB-SECTION – IIIA-03 LIST OF STANDARDS
		PAGE 2 OF 3		

CLAUSE NO.	TECHNICAL REQUIREMENTS- PIPING, VALVES & FITTINGS				
	BS : 5153 : Cast iron check valves for general purpose. BS : 5154 : Copper alloy globe/globe stop and check and gate valves for general purpose. BS: EN 593 : Industrisal Valves – Metallic Butterfly Valves BS : 5156 : Standard for Diaphragm valve. ASTM-A 106 : Gr.C Seamless carbon steel pipe. ASTM - 53 : Seamless carbon steel. AWWA-C 200 : Steel water pipe 6" and above. AWWA-C 203 : Coal tar protection coating and lining of steel water pipelines. AWWA-C-504 : Rubber seated butterfly valve. AWWA M11 : Steel Pipe – A Guide for design and installation. ANSI B 2.1 : Dimensions of American taper pipe threads. ANSI B 16.1 : Cast Iron Pipe flanges and flanged fittings. ANSI B 16.5 : Steel pipe flanges, flanged valves and fittings. ANSI B 16.9 : Factory made wrought steel butt welding fittings. ANSI B 16.10 : Face to face and end to end dimension of ferrous valves. ANSI B 16.11 : Forged steel fittings (socket-welding and threads) ANSI B 16.21 : Non-metallic gaskets for pipes flanges. ANSI B 16.25 : Butt welding ends. ANSI B 16.28 : Steel short radius fittings. ANSI B 16.34 : Steel valves flanged and butt welding ends. ANSI B31.1 : Power piping code. ANSI B31.3 : Process Piping ASTM A-36 : Structural steel. ASTM A-53 : Pipe, steel block and hot dipped zinc coated welded and seamless.				
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE		BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	ANNEXURE-1 TO SUB-SECTION – IIIA-03 LIST OF STANDARDS	PAGE 3 OF 3

PART – B
ANNEXURE – 2 TO
SUB-SECTION – IIIA-03
MATERIAL OF CONSTRUCTION FOR PIPES

CLAUSE NO.	TECHNICAL REQUIREMENTS- PIPING, VALVES & FITTINGS				
	S.No	Service	Material of Construction		
	1.	Low Pressure Sea Water and Brine from SWRO & RO plant (For Sea Water intake, Pipeline upstream and downstream of Clarifiers, filters & Ultra-filtration (UF) of SWRO plant, up to suction of HP Feed Pumps of SWRO plant, Brine at the downstream of ERU to Brine Water storage tank, filter backwash water lines}	1) GRP as per ASTM D3517/ AWWA C950/ AWWA M45 or 2) High density polyethylene(HDPE) pipes to ISO 4427:2007		
	2.	High Pressure Sea Water and Brine from SWRO plant (From discharge of HP Feed pumps of SWRO plant up to ERU inlet)	High Austenitic Stainless Steel : 1) UNS S31254 as per ASTM A 182/ASTM A 269 (254 SMO)/ASTM A312/ Equivalent - Refer Note * 2) UNS S32750 as per ASTM A 790 / A 182/Equivalent. – (*) Note (*): Having PREN (Pitting Resistance Equivalent Number) greater than 40		
	3.	Permeate from SWRO Plant (Product water of SWRO Plant to Degassers, piping at the upstream and downstream of product water transfer pumps up to Storage tanks/Potable water treatment system/2 nd stage RO Plant)	High Austenitic Stainless Steel : 1) UNS S31254 as per ASTM A 182/ASTM A 269 (254 SMO)/ASTM A 312/Equivalent - Refer Note * 2) UNS S32750 as per ASTM A 790 / A 182/Equivalent. – (*) Note (*): Having PREN (Pitting Resistance Equivalent Number) greater than 40		
	4.	Permeate from 2 nd Stage RO plant (From RO plant to degasser inlet)	<u>Stainless Steel:</u> Stainless steel to ASTM A312, Gr. 316L sch.40s seamless for sizes 50mm and below Stainless Steel to ASTM A312, Gr. 316L welded for sizes 65 mm NB and above.		
	5.	Degasified Water. (RO Plant) (Upstream and Downstream of degassed water pumps of 2 nd stage RO plant) and De-cationised & De-anionised water	<u>Rubber lined Carbon Steel</u> ASTM-A-53 Type-E Grade B / ASTM A 36 / ASTM A-36/ASTM - 53 Type- E, Grade B/ Equivalent and Galvanized internally lined with 3 mm thick Rubber of shore hardness 65 ± 5°A) Note : The inside surface of pipes shall be completely de-beaded and made suitable for rubber lining		
	6.	Demineralised Water	<u>Stainless Steel:</u> Stainless steel to ASTM A312, Gr. 316L sch.40s seamless for sizes 50mm and below Stainless Steel to ASTM A312, Gr. 316L welded for sizes 65 mm NB and above.		
	7.	Concentrated Hydrochloric Acid (5 -30% Conc.)	1) <u>PP lined Carbon Steel:</u> IS:1239 Part-I (Heavy grade-Black), ASTM-A-53 Type-E Grade B/ASTM A 36/ IS: 3589-Grade 410/Equivalent and Galvanized to IS:4736 or equivalent, internally lined with 3 mm thick Polypropylene 2) CPVC as per ASTM F441, CPVC 4120 Schedule 80		
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRA-FILTRATION PLANT PACKAGE		BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	ANNEXURE-2 TO SUB-SECTION – IIIA-03 (MOC FOR PIPES)	PAGE 1 OF 3

CLAUSE NO.	TECHNICAL REQUIREMENTS- PIPING, VALVES & FITTINGS				
	S.No	Service	Material of Construction		
	8.	Dilute Hydrochloric Acid (Less than 5% Conc.)	1) <u>Rubber lined Carbon Steel</u> : IS:1239 Part-I (Heavy grade-Black), ASTM-A-53 Type-E Grade B/ASTM A 36/ IS: 3589 – Grade 410 / Equivalent and Galvanized internally lined with 3 mm thick Rubber of shore hardness 65 ± 5°A). 2) Chlorinated Polyvinyl chloride (CPVC) as per ASTM F441 CPVC 4120 Schedule 80		
	9.	<u>Sulfuric Acid</u> a) Strong (Conc.)	Alloy 20/Equivalent (Butt-weld fittings shall be used)		
		b) Dilute (up to 10%)	Polypropylene lined steel/ Equivalent.		
	10.	<u>Alkali (Sodium Hydroxide)</u> a) Strong (5% and above)	Stainless Steel SS-316		
		b) Dilute (below 5%)	Polypropylene lined steel/CPVC as per ASTM F441 CPVC 4120		
	11.	Coagulant (Alum)	Rubber lined Steel/CPVC 4120 Sch.80		
	12.	Lime slurry/Solution/ Suspensions	Galvanised Steel /(as referred above) or CPVC as per ASTM F441 CPVC 4120		
	13.	Coagulant(Ferric Chloride), Anti-oxidant and Anti -scalant	CPVC as per ASTM F441 CPVC 4120 Sch.80 or Equivalent.		
	14.	Coagulant aid Solution	Rubber lined Steel (as refereed above)/CPVC as per ASTM F441 CPVC 4120, Schedule 80/equivalent.		
	15.	Liquid and Gas Chlorine (Under Pressure)	Seamless Carbon Steel Schedule 80 (Heavy Duty)		
	16.	Chlorinated Water	1) Rubber lined Steel (as referred above) or CPVC as per ASTM F441 CPVC 4120 Schedule 80/ equiv. 2) <u>HDPE</u> as per ASTM D3350 CL 34543C, FM Class 150 or Equivalent for buried portion		
	17.	Wet Chlorine gas (Under Vacuum)	1) Polypropylene pipe as per relevant standard 2) CPVC as per ASTM F441 CPVC 4120 Schedule 80/equivalent.		
	18.	Sludge (From Clarifier /tube settler/lamella clarifiers)	1) GRP as per ASTM D3517/ AWWA C950-88/ AWWA M45 2) HDPE as per ASTM D3350 CL 34543C, FM Class 150 or Equivalent for buried portion		
	19.	Waste (Neutralized) effluent (Regeneration waste from Neutralization pits of DM plant & Condensate Polishing Plant.)	1) Rubber lined Steel (as referred above) 2) HDPE as per ASTM D3350 CL 34543C, FM Class 150 or Equivalent for buried portion.		
	20.	Chemical Waste from vessels and tanks	1) CPVC as per ASTM F441 CPVC 4120 Schedule 80/equivalent. 2) HDPE (as referred above)		
	21.	Resin water slurry (for resin transfer application)	Stainless Steel: Stainless Steel ASTM A 312 Gr 304 Sch. 40 /Equivalent.		
	22.	Backwash/Rinse water in DM plant (from discharge of Backwash water pumps)	Stainless steel to ASTM A312, Gr. 316L sch.40s seamless for sizes 50mm and below Stainless Steel to ASTM A312, Gr. 316L welded for sizes 65 mm NB and above.		
	23.	<u>For Electro-chlorination System</u>			
	24.	a) Sea Water	High Austenitic Stainless Steel :		
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRA-FILTRATION PLANT PACKAGE		BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	ANNEXURE-2 TO SUB-SECTION – IIIA-03 (MOC FOR PIPES)	PAGE 2 OF 3

CLAUSE NO.	TECHNICAL REQUIREMENTS- PIPING, VALVES & FITTINGS		
	S.No	Service	Material of Construction
			1) UNS S31254 as per ASTM A 182/ASTM A 269 (254 SMO)/ASTM A312/ Equivalent - Refer Note * 2) UNS S32750 as per ASTM A 790 / A 182/Equivalent. – (*) Note (*): Having PREN (Pitting Resistance Equivalent Number) greater than 40
		b) Sodium hypo chloride solution	High Austenitic Stainless Steel : 1) UNS S31254 as per ASTM A 182/ASTM A 269 (254 SMO)/ASTM A312/ Equivalent - Refer Note * 2) UNS S32750 as per ASTM A 790/A 182 - Refer Note * 3) Titanium as per ASTM B 861 / B862 Note (*) : Having PREN (Pitting Resistance Equivalent Number) greater than 40

	CORPORATE QUALITY ASSURANCE SUB-VENDOR QUESTIONNAIRE
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i.	Item/Scope of Sub-contracting		
ii.	Address of the registered office		Details of Contact Person (Name, Designation, Mobile, Email)
iii.	Name and Address of the proposed Sub-vendor's works where item is being manufactured		Details of Contact Person: (Name, Designation, Mobile, Email)
iv.	Annual Production Capacity for proposed item/scope of sub-contracting		
v.	Annual production for last 3 years for proposed item/scope of sub-contracting		
vi.	Details of proposed works		
1.	Year of establishment of present works		
2.	Year of commencement of manufacturing at above works		
3.	Details of change in Works address in past (if any)		
4.	Total Area		
	Covered Area		
5.	Factory Registration Certificate	Details attached at Annexure – F2.1	
6.	Design/ Research & development set-up (No. of manpower, their qualification, machines & tools employed etc.)	Applicable / Not applicable if manufacturing is as per Main Contractor/purchaser design Details attached at Annexure – F2.2 (if applicable)	
7.	Overall organization Chart with Manpower Details (Design/Manufacturing/Quality etc)	Details attached at Annexure – F2.3	
8.	After sales service set up in India, in case of foreign sub-vendor (Location, Contact Person, Contact details etc.)	Applicable / Not applicable Details attached at Annexure – F2.4	
9.	Manufacturing process execution plan with flow chart indicating various stages of manufacturing from raw material to finished product including outsourced process, if any	Details attached at Annexure – F2.5	

	CORPORATE QUALITY ASSURANCE SUB-VENDOR QUESTIONNAIRE
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10.	Quality Control exercised during receipt of raw material/BOI, in-process , Final Testing, packing			Details attached at Annexure – F2.6		
11.	Manufacturing facilities (List of machines, special process facilities, material handling etc.)			Details attached at Annexure – F2.7		
12.	Testing facilities (List of testing equipment)			Details attached at Annexure – F2.8		
13.	If manufacturing process involves fabrication then-			Applicable / Not applicable		
	List of qualified Welders			Details attached at Annexure – F2.9		
	List of qualified NDT personnel with area of specialization			(if applicable)		
14.	List of out-sourced manufacturing processes with Sub-Vendors' names & addresses			Applicable / Not applicable		
				Details attached at Annexure. –F2.10 (if applicable)		
15.	Supply reference list including recent supplies			Details attached at Annexure – F2.11 (as per format given below)		
	Project/ package	Customer Name	Supplied Item (Type/Rating/Model /Capacity/Size etc)	PO ref no/date	Supplied Quantity	Date of Supply
16.	Product satisfactory performance feedback letter/certificates/End User Feedback			Attached at annexure - F2.12		
17.	Summary of Type Test Report (Type Test Details, Report No, Agency, Date of testing) for the proposed product (similar or higher rating) Note:- Reports need not to be submitted			Applicable / Not applicable		
				Details attached at Annexure – F2.13 (if applicable)		
18.	Statutory / mandatory certification for the proposed product			Applicable / Not applicable		
				Details attached at Annexure – F2.14 (if applicable)		
19.	Copy of ISO 9001 certificate (if available)			Attached at Annexure – F2.15		
20.	Product technical catalogues for proposed item (if available)			Details attached at Annexure – F2.16		
Name:				Desig:		
				Sign:		
				Date:		

Company's Seal/Stamp:-

PART – B
ANNEXURE – 5 TO
SUB-SECTION – IIIA-03
TYPE & MATERIAL OF CONSTRUCTION OF VALVES

CLAUSE NO.	TECHNICAL REQUIREMENTS- PIPING, VALVES & FITTINGS			
S.No	Service	Type of Valves / Material of Construction		
1.	-	-		
2.	Low Pressure Sea Water, Brine from SWRO & RO plant. (Sea Water intake, Pipeline upstream and downstream of Clarifiers upto Ultrafiltration (UF) System, Pipeline upstream and downstream of UF system upto suction of HP Feed Pumps of SWRO plant, Sea water pipeline of electro-chlorination system, Brine from downstream of ERU to Brine Water storage tank/filter backwash water lines, effluent disposal pipeline)	2.1 – Type of Valves <u>For Isolation</u> a) Gate or Sluice or Ball or Globe type for Sizes up to 50 mm NB b) Gate or Sluice or Ball or Butterfly type for Sizes 65 NB to 200 mm NB c) Butterfly type for Sizes 250 mm NB & above <u>For Regulation /Control</u> a) Globe type for Sizes up to 50 mm NB b) Globe or Butterfly type for Sizes 65 mm NB & above <u>For non-return /Check</u> a) Lift Check type / Swing Check / Dual Plate type for sizes up to 40 mm NB b) Swing Check or Dual Plate type valve for sizes 50 mm NB & above 2.2 - Material of Construction Valves <u>Sluice & Gate Valves</u> a) Stem shall be of stainless steel ASTM A276 Gr. S31803/ ASTM A 296 Gr./Duplex SS/ Ferralium 255/ Equivalent b) Seat ring shall be of stainless steel ASTM A890 J 93370/ Equivalent c) Wedge facing ring shall be of same material as that of body/bonnet. d) Body /Bonnet shall be Stainless steel of ASTM A 890 Grade J93404 or Austenitic Ductile Iron of ASTM-A 439 D2 (D2 Ni) e) All other internal parts shall be epoxy coated against corrosion by sea water <u>Butterfly Valves & Globe Valves</u> a) Body & Disc shall be Stainless steel of ASTM A 890 Grade J93404 OR Austenitic Ductile Iron of ASTM-A 439 D2 (D2 Ni) b) Shaft shall be of Stainless steel to ASTM. A 276 Gr S31803 / ASTM. A 296 Gr/ Duplex SS/Ferralium 255. c) Seat shall be ASTM A 890 J93370 or equivalent d) Seals shall be Nitrile rubber, EPDM (Ethylene propylene rubber), Hypalon <u>Ball Valves</u> a) Body shall be Stainless steel of ASTM A 890 Grade J93404 or Austenitic Ductile Iron of ASTM-A 439 D2 b) Ball & Stem shall be Stainless steel to ASTM. A 276 Gr S31803 / ASTM. A 296 Gr/ Duplex SS/Ferralium 255 c) Seat Ring shall be PTFE d) Seats shall be ASTM A 890 J93370 or equivalent <u>Check Valves</u> a) Body & Cover, Hinge Disk/Door shall be ASTM A 890 Grade J93404 or Austenitic Ductile Iron of ASTM-A 439 D2 (D2 Ni) b) Hinge Pin and Door/Disc Pin shall be of Stainless		
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE		BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	ANNEXURE-5 TO SUB-SECTION – IIIA-03 (TYPE & MOC OF VALVES) PAGE 1 OF 7

CLAUSE NO.	TECHNICAL REQUIREMENTS- PIPING, VALVES & FITTINGS				
	S.No	Service	Type of Valves / Material of Construction		
			steel to ASTM. A 276 Gr S31803/ ASTM. A 296 Gr/ Duplex SS/Ferralium 255 c) Bearing bushes, Disc facing ring and Body Seat rings shall be ASTM. A 276 Gr S31803 / ASTM. A 296 Gr/ Duplex SS/Ferralium 255 d) Material of construction of spring in dual type valve shall be of INCONEL or better		
	3.	High Pressure Sea Water, Permeate and Brine from SWRO plant	3.1 – Type of Valves <u>For Isolation</u> a) Gate or Sluice or Ball or Globe type for Sizes upto 50 mm NB b) Ball or Globe type for Sizes 65 mm NB and above <u>For Regulation /Control</u> Globe type <u>For non-return / Check</u> Swing Check or Dual Plate type 3.2 - Material of Construction Valves Same as specified under 2.2 above		
	4.	---	---		
	5.	High pressure Feed water of 2 nd Stage RO plant (From discharge of HP Feed pumps of RO plant upto degasser inlet)	5.1 – Type of Valves <u>For Isolation</u> a) Gate or Sluice or Ball or Globe type for Sizes upto 50 mm NB b) Gate or Sluice or Ball or Butterfly type for Sizes 65 mm NB to 200 mm NB c) Butterfly type for Sizes 250 mm NB & above <u>For Regulation /Control</u> a) Globe type for Sizes upto 50 mm NB b) Globe or Butterfly type for Sizes 65 mm NB & above <u>For non-return / Check</u> Swing Check or Dual Plate type valve 5.2 – Material of Construction Valves: <u>Sluice & Gate Valves</u> a) Stem, seat ring and wedge facing ring of shall be of stainless steel (SS 316) construction b) Body/Bonnet shall be Stainless steel of ASTM A 351 Gr. CF 8M/ ASTM A 182 S30451/ Eqvt. c) All other internal parts shall be epoxy coated against corrosion by sea water <u>Butterfly Valves & Globe Valves</u> a) Body & Disc shall be Stainless steel of ASTM A 351 Gr. CF 8M/ ASTM A 182 S30451/ Eqvt. b) Shaft shall be of Stainless steel to ASTM. A 276 Gr S41000 / ASTM A 473 S41000 /. ASTM A 351 Gr.CF 8M / Eqvt. c) Seat shall be ASTM A182 F317/ASTM A 276 S31700/ASTM A 890 J93370 or Equivalent d) Seals shall be Nitrile rubber, EPDM (Ethylene propylene rubber), Hypalon <u>Ball Valves</u> a) Body shall be of Stainless steel of ASTM A 351 Gr. CF 8M/ ASTM A 182 S30451 b) Ball shall be Stainless steel to ASTM. A 276 Gr		
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE		BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	ANNEXURE-5 TO SUB-SECTION – IIIA-03 (TYPE & MOC OF VALVES)	PAGE 2 OF 7

CLAUSE NO.	TECHNICAL REQUIREMENTS- PIPING, VALVES & FITTINGS				
	S.No	Service	Type of Valves / Material of Construction		
			S31600 / ASTM A 473 S31600/ Eqvt c) Stem shall be ASTM A276 Gr S41000/ASTM A473 S41000 /Eqvt. d) Seat Ring shall be PTFE /Equivalent. e) Seats shall be ASTM A182 F316 /ASTM A 276 S31600/ Equivalent <u>Check Valves</u> a) Body & Cover, Hinge Disk/Door shall be ASTM A 351 Gr. CF 8M/ ASTM A 182 S30451 b) Hinge Pin and Door/Disc Pin shall be of Stainless steel to ASTM. A 276 Gr S3160 / ASTM A 473 S31600/Equivalent. c) Bearing bushes, Disc facing ring and Body Seat rings shall be ASTM. A 276 Gr S30400 / ASTM A 473 S30400/Equivalent. d) Material of construction of spring in dual plate type valve shall be of INCONEL or better		
	6.	--			
	7.	--			
	8.	Acid Service (Hydrochloric)	8.1 – Type of Valves <u>For Isolation</u> Saunder's Patented Diaphragm Valves <u>For non-return / Check</u> Flap type/Swing Check type /Dual Plate type 8.2 - Material of Construction Valves: <u>Diaphragm Valves</u> a) Body shall be Cast Iron to IS: 210 Gr FG 260/ ASTM A 48 Cl.40; BS: 1452 Gr.220 OR Cast Steel to ASTM. A 216 GR. WCB and Body shall be internally lined with Soft Natural rubber, Ebonite or Polypropylene b) Diaphragm shall be shall be of reinforced TEFLON, EPDM/Black Butyl/approved equivalent c) Stem, Compressor & Bush shall be Stainless steel Construction <u>Check Valves</u> a) Body & Cover, Hinge Disk/Door shall be Cast Iron to IS: 210 Gr FG 260/BS:1452 Gr.220 or Equivalent and <u>internally lined with natural Rubber, PTFE or Viton or Hastalloy –B</u> b) Hinge Pin and Door/Disc Pin shall be of steel with PVDF, or suitable elastomer c) Disc facing ring and Body Seat rings shall be SS-317 L or resilient materials such as natural rubber, PTFE or Viton d) Bearing bushes shall be PTFE or Equivalent e) Material of construction of spring in dual type valve shall be of INCONEL or better		
	9.	Alkali Services	9.1 – Type of Valves <u>For Isolation</u> Saunder's Patented Diaphragm Valves <u>For non-return / Check</u> Swing Check type /Dual Plate type		
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE		BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	ANNEXURE-5 TO SUB-SECTION – IIIA-03 (TYPE & MOC OF VALVES)	PAGE 3 OF 7

CLAUSE NO.	TECHNICAL REQUIREMENTS- PIPING, VALVES & FITTINGS		
	S.No	Service	Type of Valves / Material of Construction
			9.2 - Material of Construction Valves: <u>Diaphragm Valves</u> a) Body shall be Cast Iron to IS: 210 Gr FG 260/ ASTM A 48 Cl.40; BS: 1452 Gr.220 OR Cast Steel to ASTM. A 216 GR. WCB and Body shall be internally lined with Soft Natural rubber, Ebonite or Polypropylene b) Diaphragm shall be shall be of reinforced Neoprene/Hypalon/ /Equivalent c) Stem, Compressor & Bush shall be Stainless steel Construction d) Hand wheel shall be of Cast Iron <u>Check Valves</u> The complete valve shall be of stainless steel construction (AISI-316L)
	10.	Acid (Sulphuric) Service	10.1 – Type of Valves <u>For Isolation</u> Saunder's Patented Diaphragm Valves <u>For non-return / Check</u> Swing Check type /Dual Plate type 10.2 - Material of Construction Valves: <u>Diaphragm Valves</u> a) Body shall be Cast Iron to IS: 210 Gr FG 260 /ASTM A 48 Cl.40; BS: 1452 Gr.220 OR Cast Steel to ASTM. A 216 GR. WCB b) For Diluted Sulfuric acid, body shall be Teflon lined/Alloy 20/Hastelloy C/Eqvt. c) Diaphragm shall be of reinforced TEFLON/ Equivalent. d) Stem, Compressor & Bush shall be Stainless steel Construction, Hand wheel shall be of Cast Iron <u>Check Valves</u> The complete valve shall be of Alloy-20/Hastelloy C / Equivalent
	11.	Coagulant (Alum) and Coagulant aid Services	11.1 – Type of Valves <u>For Isolation</u> a) Saunder's Patented Diaphragm Valves b) Ball Valves in CPVC pipes <u>For non-return / Check</u> Swing Check type /Dual Plate type 11.2 - Material of Construction Valves: <u>Diaphragm Valves</u> a) Body shall be Cast Iron to IS: 210 Gr FG 260/ ASTM A 48 Cl.40; BS: 1452 Gr.220/Equivalent. OR Cast Steel to ASTM. A 216 GR. WCB and Body shall be internally lined with Soft Natural rubber, Ebonite or Polypropylene b) Diaphragm shall be shall be of reinforced rubber /Hypalon/ approved equivalent c) Stem, Compressor & Bush shall be Stainless steel Construction <u>Ball Valves in CPVC Pipe lines</u> a) Body , Ball & stem shall be of CPVC b) Seat ring & Packing shall be EPDM / or equivalent <u>Check Valves</u> a) Body & Cover, Hinge Disk/Door shall be Cast Iron
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE	BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	ANNEXURE-5 TO SUB-SECTION – IIIA-03 (TYPE & MOC OF VALVES)
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CLAUSE NO.	TECHNICAL REQUIREMENTS- PIPING, VALVES & FITTINGS		
	S.No	Service	Type of Valves / Material of Construction to IS: 210 Gr FG 260/ ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt and <u>shall be lined with natural Rubber, PTFE or Viton</u> or Stainless Steel – 316 b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB and <u>shall be coated with PVDF, or suitable elastomer</u> or Stainless Steel – 316 c) Disc facing ring and Body Seat rings shall be Stainless Steel d) Bearing bushes shall be SS – 316 e) Material of construction of spring in dual type valve shall be of INCONEL or better 12.1 – Type of Valves <u>For Isolation</u> Non-lubricated Plug Valves <u>For non-return / Check</u> Swing Check type /Dual Plate type 12.2 - Material of Construction Valves: <u>Plug Valves</u> a) Body shall be Cast Iron to IS: 210 Gr FG 260 / ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt b) Plug shall be Stainless steel to AISI 316 c) Body Sleeve & Seat shall be PTFE d) Gland & Gland nut shall be SS 304/316 e) Cover shall be of Cast Steel to ASTM A 216 Gr WCB <u>Check Valves</u> a) Body & Cover, Hinge Disk/Door shall be Cast Iron to IS: 210 Gr FG 260 / ASTM A 48 Cl.40; BS: 1452 Gr.220 or Eqvt and <u>shall be lined with natural Rubber, PTFE or Viton</u> or Stainless Steel – 316 b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB and <u>shall be coated with PVDF, or suitable elastomer</u> or Stainless Steel – 316 c) Disc facing ring and Body Seat rings shall be Stainless Steel d) Bearing bushes shall be SS-316 e) Material of construction of spring in dual type valve shall be of INCONEL or better 13.1 – Type of Valves <u>For Isolation</u> a) Saunder's Patented Diaphragm Valves b) Ball Valves in CPVC pipeline <u>For non-return / Check</u> Swing Check type /Dual Plate type 13.2 - Material of Construction Valves: <u>Diaphragm Valves</u> a) Body shall be Cast Iron to IS: 210 Gr FG 260/ ASTM A 48 Cl.40; BS: 1452 Gr.220 OR Cast Steel to ASTM. A 216 GR. WCB/Eqvt. and Body shall be internally lined with Soft Natural rubber, Ebonite or Polypropylene or Stainless Steel b) Diaphragm shall be of reinforced Neoprene/Hypalon/ approved equivalent c) Stem, Compressor & Bush shall be Stainless steel
	12.	Lime slurry/Solution/ Suspensions	
	13.	Coagulant Aid (Ferric Chloride), Anti-Oxidant & Anti- Scalant	

CLAUSE NO.	TECHNICAL REQUIREMENTS- PIPING, VALVES & FITTINGS				
		S.No	Service	Type of Valves / Material of Construction	
				Construction. d) Hand wheel shall be of Cast Iron <u>Ball Valves in CPVC Pipe lines</u> a) Body , Ball & stem shall be of CPVC b) Seat ring & Packing shall be EPDM / or equivalent <u>Check Valves</u> The complete valve shall be of CPVC.	
		14.	Chlorine Gas	14.1 -- Type of Valves Needle Valve for shut off / Isolation and Angle type Needle Valve chlorine tonne container Isolation 14.2 -- Material of Construction a) Body : Bronze (Silver plated) / Brass b) Needle : Monel c) Valve seat : Teflon / Monel d) Stem : Monel e) Gland/Gland nut : Bronze/ Brass f) Packing : Teflon	
		15.	Liquid Chlorine	15.1 -- Type of Valves Ball Valves for Isolation 15.2 -- Material of Construction a) Body :Carbon Steel b) Ball : PVDF / Monel c) Stem :Stainless Steel AISI 316 L d) Bolts & nuts :AISI 316 L e) Gland / Gland nut: Bronze/ Brass f) Seat ring : PTFE	
		16.	Chlorinated Water Service	16.1 -- Type of Valves a) Butterfly Type / Ball Valve in CPVC lines b) Saunder's Patented Diaphragm Valves in rubber lined steel pipes 16.2 -- Material of Construction <u>Butterfly / Ball Valves</u> a) Body: CPVC b) Shaft: Carbon Steel Nickel plated c) Disc/ Ball Stem: CPVC d) Seating Rings: Viton e) Bush / O-ring (Butterfly type): PTFE <u>Diaphragm Valves</u> a) Body shall be Cast Iron ASTM A 48 Cl.40; BS: 1452 Gr.220 OR Cast Steel to ASTM. A 216 GR. WCB and shall be internally lined with Soft Natural rubber, Ebonite or Polypropylene b) Diaphragm shall be shall be of reinforced rubber /Hypalon/ approved equivalent c) Stem, Compressor & Bush shall be Stainless steel Construction d) Hand wheel shall be of Cast Iron	
		17.	-	- -	
		18.	Sludge (From Clarifier / tube settlers/Lamella clarifiers - For Systems handling sea water)	18.1 -- Type of Valves <u>For Isolation</u> Gate or Sluice or Knife edge type Slide Valves <u>For non-return / Check</u>	
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE		BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	ANNEXURE-5 TO SUB-SECTION – IIIA-03 (TYPE & MOC OF VALVES)	PAGE 6 OF 7

CLAUSE NO.	TECHNICAL REQUIREMENTS- PIPING, VALVES & FITTINGS			
	S.No	Service	Type of Valves / Material of Construction	
			Swing Check type /Dual Plate type	
			18.2 -- Material of Construction Same as specified under 2.2 above	
	19.	Air (Service/Instrument/Air from Blower)	19.1 -- Type of Valves <u>For Isolation</u> a) Globe or Ball or Diaphragm Valves for Sizes 50 NB and below b) Butterfly or Ball valves for Sizes above 50 NB. <u>For non-return / Check</u> Swing Check type /Dual Plate type 19.2 -- Material of Construction <u>Globe Valves</u> a) Body Bonnet, stuffing Box and seat rings shall be Leaded Tin Bronze b) Disc, stem shall be of Stainless Steel to AISI 316/Equivalent. <u>Ball Valves</u> a) Body shall be Leaded Tin Bronze or Stainless Steel (AISI 316) b) Ball & Stem shall be Stainless steel to ANSI 410 c) Seat Ring shall be PTFE d) Seats shall be Nitrile rubber/PTFE. <u>Butterfly Valves</u> a) Body & Disc shall be Cast Iron IS: 210 Gr FG 260 / ASTM A 48 Cl.40; BS: 1452 Gr.220 OR SG Iron - BS: 278/Equivalent; Cast Steel - ASTM. A 216 GR. WCB; BS: 1504 Eq. <u>Body shall be internally lined with elastomer such as PVDF or PTFE</u> OR Stainless Steel Construction (AISI 304/316) b) Shaft shall be of Stainless steel to ASTM. A 296 Gr. CF8M/AISI 316/ AISI 420/ AISI 410/BS 970 Gr.316; BS: 970 Gr.420 S45. c) Seat rings shall be Nitrile rubber, EPDM (Ethylene propylene rubber), Hypalon <u>Check Valves</u> a) Body & Cover, Hinge Disk/Door shall be Cast Iron IS: 210 Gr FG 260/ASTM A 48 Cl.40; BS:1452 Gr.220/Equivalent. and <u>shall be lined with natural Rubber, PTFE or Viton or Stainless Steel – 316</u> b) Hinge Pin and Door/Disc Pin shall be of Cast steel ASTM A 216 Gr. WCB and <u>shall be coated with PVDF, or suitable elastomer or</u> Stainless Steel-316 c) Disc facing ring and Body Seat rings shall be Stainless Steel d) Bearing bushes shall be SS-316 e) Material of construction of spring in dual type valve shall be of INCONEL or better	
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE	BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	ANNEXURE-5 TO SUB-SECTION – IIIA-03 (TYPE & MOC OF VALVES)	PAGE 7 OF 7

PROJECT : VALLUR TPP (3x500 MW)			INDICATIVE LIST OF SUB CONTRACTORS				DOC. NO.	CS-0260-132G-2			Annex-I
PACKAGE : ULTRAFILTRATION PLANT PACKAGE							Revision No.	0			
MAIN CONTRACTOR :							Date				
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Sr. No	Item	QPI INSP CAT	QP NO			Sub Supplier	Place	SC APPL. Status/ Cat			Remark
1	2	3	4	5	6	7	8	9	10	11	12
[A]	MECHANICAL:										
1	MS PRESSURE VESSELS/ ATMOSPHERIC STORAGE TANKS FOR PRESSURE UPTO 10KG/CM2	I				MURTHAL TANKS & VESSELS	SONEPAT	A			
						S V FABRICATORS	NAVI MUMBAI	A			
						SYSCON ENGINEERS	AMBERNATH	A			
						JASMINO POLYMERTECH	TALOJA	A			
						TITAN	DURGAPUR	A			
						RISHI INDUSTRIES	BAHALGARH	A			
						CHEM PROCESS SYSTEM	SANAND	A			MS UPTO 40MM THICK, SIZE UPTO 8.5M x 3.5M DIA
						GRAVITAS	FARIDABAD	A			ATMOSPHERIC STORAGE TANKS OF SIZE UPTO 4MX5M AND PRESSURE VESSELS (DESIGN PRESSURE UPTO 10 KG/CM2) OF SIZE UPTO 3MX3M
					DRIPLEX UNIT-I	HARDWAR	A				
					BELCO	GR. NOIDA	A				
					MAXWELL PROJECTS	GR. NOIDA	A			UPTO 3000MM DIAMETER	
2	HORIZONTAL & VERTICAL CENTRIFUGAL PUMPS UPTO 1000 M3/HR & 100 MWC	I				KIRLOSKAR BROS LTD.	KIRLOSKARWADI	A			
						MATHER & PLATT	PUNE/ KOLHAPUR	A			KOLHAPUR UPTO 270KW MOTOR RATING
						SAM TURBO	COIMBATORE	A			
						FLOWMORE	GHAZIABAD	A			
						BEST AND CROMPTON	CHENNAI	A			
						JYOTI	VADODARA	A			
						WPIL	GHAZIABAD	A			
						KISHORE PUMPS	PUNE	A			UPTO 500M3/HR
KSB	PUNE	A									
3	DRAINAGE PUMP (SUBMERSIBLE TYPE) 50 M3/HR, 20 MWC	I				KISHORE PUMPS	PUNE	A			
						KSB	PUNE	A			
						KIRLOSKAR BROS LTD.	KIRLOSKARWADI	A			
						AQUA MACHINERY	AHMEDABAD	A			
						DARLING PUMPS	INDORE	A			
						WPIL	GHAZIABAD	A			
						MBH	AHMEDABAD	A			UPTO 15KW POWER RATING
4	CI/ CIRL/ CSS DUAL PLATE CHECK VALVE UPTO 500 NB, CLASS 150	I				ADVANCE VALVES	GR. NOIDA	A			
						LEADER	JALANDHAR	A			
						R & D MULTIPLES	VALSAD	A			CI- UP TO 6000NB CLASS#150
						HAWA ENGINEERS	AHMEDABAD	A			UPTO 300NB, CLASS #150
5	CCS/ CSS BALL VALVE UPTO 200 NB, CLASS 150	I				WEIR BDK	HUBLI	A			
						MICRO FINISH	HUBLI	A			
						FLOWCHEM	KALOL	A			
						L&T VALVES LIMITED	COIMBATORE	A			UPTO 150NB, CLASS #150/300, AND UPTO 50NB, CLASS #800
						HAWA ENGINEERS	AHMEDABAD	A			UPTO 100NB, CLASS #150

PROJECT : VALLUR TPP (3x500 MW) PACKAGE : ULTRAFILTRATION PLANT PACKAGE			INDICATIVE LIST OF SUB CONTRACTORS				DOC. NO.	CS-0260-132G-2			Annex-I
MAIN CONTRACTOR :							Revision No.	0			
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Sr. No	Item	QPI INSP CAT	QP NO			Sub Supplier	Place	SC APPL. Status/ Cat			Remark
1	2	3	4	5	6	7	8	9	10	11	12
6	CI BUTTERFLY VALVE (MANUAL/ PNEU/ ELECT) UPTO 1200 NB, PN 10	I				INTERVALVE (INDIA) PVT. LTD.	PUNE	A			CI- UP TO 1400NB PN-10, UP TO 500NB PN-16, CSS- UP TO 500NB PN-16
						WEIR BDK	HUBLI	A			CI - UPTO 1050 NB PN-10, UP TO 600NB PN-10 SS - UP TO 400NB PN-16
						PENTAIR VALVES	HALOL	A			FOR ss up to 500 NB PN-10, CI- UP TO 900NB PN-10, UP TO 500NB PN-16
						CRANE FLOW PROCESS	SATARA	A			CI & SS UPTO 500 NB
						FLOWSERVE	CHENNAI	A			UPTO 600 NB, CI ONLY
						FOURESS	BANGALORE	A			CI- UP TO 1200 PN-10, UP TO 350 PNM-16 SS - UP TO 300NB PN-10
						KBL	KONDHAPURI	A			
						R & D MULTIPLE	VALSAD	A			CI- UP TO 1000NB PN-10, UP TO 2300NB CL-75, UP TO 900 CL-250
						ADVANCE	GAGRET	A			SOFT SEATED, CONCENTRIC BFV OF CI/ CS/ SS OF SIZE UPTO 250MM AND PRESSURE RATING UPTO CLASS #150.
						ADVANCE	GREATER NOIDA	A			METAL SEATED, TRIPLE ECCENTRIC, SS BFV OF SIZE UPTO 100NB, AND PRESSURE RATING UPTO CLASS #300.
7	CI GATE, GLOBE & SWING CHECK VALVES UPTO 500NB, CLASS 150	I				L&T	KANCHEEPURAM	A			UPTO 400NB, CLASS #150
						HAWA ENGINEERS	AHMEDABAD	A			CI/ CS & FABRICATED UPTO 1200MM, CLASS #150, SS UPTO 250MM, CLASS#150
						LEADER	JALANDHAR	A			GLOBE UPTO 300 NB ONLY
						A V VALVES	AGRA	A			UPTO 300 NB
						H SARKER	HOWRAH	A			
8	CCS/ CSS GATE, GLOBE & SWING CHECK VALVES UPTO 400 NB, CLASS 150	I				BANKIM	HOWRAH	A			
						WEIR BDK	HUBLI	A			
						LEADER	JALANDHAR	A			GLOBE UPTO 300 NB ONLY
						OSWAL INDUSTRIES	AHMEDABAD	A			ONLY FOR CCS VALVES UPTO 300 NB
						FOURESS	AURANGABAD	A			
9	CI/ CIRL DIAPHRAGM VALVES (MANUAL/ PNEU) UPTO 300 NB, PN 10	I				STEEL STRONG	RABALE	A			GATE VALVE- CS UPTO 600NB, SS UPTO 300NB; GLOBE VALVE- CS/SS UPTO 300NB; CHECK VALVE- CS UPTO 600NB, SS UPTO 250NB
						HAWA ENGINEERS	AHMEDABAD	A			UPTO 300NB, CLASS #300
						WEIR BDK	HUBLI	A			
						CRANE PROCESS FLOW TECH	SATARA	A			
						WEIR BDK	HUBLI	A			UPTO 250 NB - PN 10
						PROCON ENGINEERS	MUMBAI	A			UPTO 200 NB - PN 10
						JASMINO RUBBER	TALOJA	A			

PROJECT : VALLUR TPP (3x500 MW) PACKAGE : ULTRAFILTRATION PLANT PACKAGE			INDICATIVE LIST OF SUB CONTRACTORS				DOC. NO.		CS-0260-132G-2		Annex-I	
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Sr. No	Item	QPI INSP CAT	QP NO			Sub Supplier	Place	SC APPL. Status/ Cat			Remark	
1	2	3	4	5	6	7	8	9	10	11	12	
10	RUBBER LINING OF TANKS/ VESSELS/ PIPES/ VALVES	I				CORI ENGINEERS	CHENNAI	A				
						WESTERN RUBBER	MUMBAI	A				
						ELASTOMER LINING	AMBERNATH	A				
						EMKAY RUBBER	MUMBAI	A				
						RISHI	BAHALGARH	A				
						POLY RUBBER	MUMBAI	A				
						TEMSEC RUBBER	KOLKATA	A				
						INDUSTRIAL LINING	VADODARA	A				
						PRESIDENCY RUBBER	HOWRAH	A				
						ARUL RUBBER PVT LTD	HOSUR	A			NOT FOR VALVES RUBBER LINING	
11	MS PIPES (BLACK/ GI) IS:1239 & IS:3589 UPTO 1200 NB	III				SAIL	ROURKELA	A			MTC with Delivery Challan shall be reviewed.	
		II				MAHARASHTRA SEAMLESS	RAIGAD	A			ONLY ERW 200 TO 500 NB	
		II				JINDAL	GHAZIABAD	A			ONLY ERW UPTO 350 NB	
		I				INDUS TUBES	G B NAGAR	A			ONLY ERW UPTO 300 NB. GI UPTO 150 NB	
		II				SURYA ROSHNI	BAHADURGARH	A			ONLY ERW UPTO 400 NB	
		III				TISCO	JAMSHEDPUR	A			ONLY ERW UPTO 150 NB	
		II				WELSPUN	ANJAR	A			SAW UPTO 2600 NB	
		II				WELSPUN	BHARUCH	A			SAW UPTO 1300 NB	
		II				MAN INDUSTRIES	INDORE	A			SAW UPTO 1400 NB	
		I				SAMSHI	VADODARA	A			SAW 450 TO 2540 NB	
		II				MUKUT TANKS & VESSELS	TARAPUR	A			SAW 200 TO 1200 NB	
		II				MUKAT PIPES	RAJPURA	A			SAW UPTO 900 NB	
		I				DADU PIPES	SIKANDERABAD	A			UPTO 300 NB BLACK ONLY	
		II				LALIT PROFILES	THANE	A			SAW 350 TO 1400 NB	
		II				SURENDRA ENGG	RAJPURA	A			SAW 200 TO 500 NB	
		II				RATNAMANI	CHATRAL	A			SAW 600 TO 2600 NB	
		II				RATNAMANI	KUTCH	A			SAW 400 TO 1800 NB	
		II				PSL	CHENNAI/ DAMAN/ VIZAG/ KUTCH	A			SAW 450 TO 1600 NB	
		I				JINDAL	HISAR	A			UPTO 300 NB BLACK ONLY	
		I				JCO PIPES	CHHINDWARA	A			SAW UPTO 1600 NB	
12	PR./ VACCUUM RELIEF VALVES	III				LEADER	JALANDHAR	A				
						FISHER SANMAR	CHENNAI	A				
						FAINGER LESER	AURANGABAD	A				
						SPIREX MARSHAL	PUNE	A				
13	SS PIPE ASTM A 312 UPTO 100 NB	II				REMI	TARAPUR	A			ERW UPTO 400 NB, SEAMLESS UPTO 50 NB ONLY	
		RATNAMANI				CHATRAL/ KUTCH	A			ERW UPTO 500 NB, SEAMLESS UPTO 50 NB ONLY		
		SUMITOMO				JAPAN	A					
		SOSTA				GERMANY	A					
		OUTO KOMPU				SWEDEN	A					
		II				PRAKASH STEELAGE	VALSAD	A			ONLY FOR SEAMLESS UPTO 50NB	
		I				APEX	BEHRORE	A			ERW UPTO 400 NB, SEAMLESS UPTO 50 NB.	

PROJECT : VALLUR TPP (3x500 MW) PACKAGE : ULTRAFILTRATION PLANT PACKAGE			INDICATIVE LIST OF SUB CONTRACTORS				DOC. NO.	CS-0260-132G-2			Annex-I
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1	2	3	4	5	6	7	8	9	10	11	12
14	AIR BLOWERS (LOBE TYPE)	I				SWAM PNEUMATIC	NOIDA	A			
						EVEREST TRANSMISSION	NEW DELHI	A			
						EVEREST BLOWERS	BAHADURGARH	A			
						KAY INTERNATIONAL	NEW DELHI	A			
						KULKARNI POWER TOOLS	SHIROL	A			
						USHA COMPRESSORS	AHMEDABAD	A			
15	METERING PUMPS DIAPHRAGM TYPE	I				MILTON ROY	CHENNAI	A			
						SWELLORE	AHMADABAD	A			
						SHAPOO TOOLS	MUMBAI	A			
						V K PUMPS	NASIK	A			
		I				POSITIVE METERING	NASIK	A			UPTO 10 KW RATING, SUBJECT TO CARRYING OUT TYPE TEST ON VALVE DIAPHRAGM
III				GRUNDFOS ALLDOSS	GERMANY	A			MANF. TC TO BE SUBMITTED.		
16	ELECTRIC HOIST UPTO 5T	II				REVA INDUSTRIES	FARIDABAD	A			
		II				HERCULES HOIST (INDEF BRAND)	MUMBAI	A			
		II				EDDY CRANES	PUNE	A			
		II				LIFTING EQUIPMENT	DELHI	A			
		II				CONSOLIDATED HOIST	PUNE	A			
		II				TRACTEL TIRFOR	PALVAL	A			
		II				ARMSSELL	BANGALORE	A			
		II				GRIP ENGINEERS	FARIDABAD	A			
17	STRAINER Y TYPE/ BASKET TYPE	I				MULTITEX	NOIDA	A			
						GRAND PRIX	NEW DELHI	A			
						JAYPEE	FARIDABAD	A			
						FILTRATION ENGR.	NAVI MUMBAI	A			
						GUJRAT OTOFILT	AHMEDABAD	A			
18	PLUG VALVE UPTO 100 NB, CLASS 150	III				FISHER XOMOX SANMAR	VADUGAPATTI	A			MANUFACTURER'S TC TO BE SUBMITTED
						WEIR BDK	HUBLI	A			
						VASS	CHENNAI	A			
						MICROFINISH	HUBLI	A			
19	VENTILATION FANS (AXIAL FANS)	I				MARATHON ELECTRIC	KOLKATA	A			
						DUVENT	BANGALORE	A			
						FLAKT	KOLKATA	A			
						S K SYSTEM	DELHI	A			
						ALMONARD	CHENNAI	A			
						TCF NADI	CHENNAI	A			
						SOLYVENT FLAKT	KOLKATA	A			
						KHAITAN	KOLKATA	A			
						C B DOCTOR	AHMEDABAD	A			
20	EXHAUST FAN	III				ALSTOM	KOLKATA	A			
						KHAITAN ELECTRICALS	KOLKATA	A			
21	CI PIPES & FITTINGS	II				ELECTROSTEEL	CHENNAI	A			CI SPUN PIPES (SOCKET & SPIGOT TYPE UPTO 1000 NB.
						KAPILANSH DHATU UDYOG	NAGPUR	A			CI SPUN PIPE (SOCKET & SPIGOT TYPE) UPTO 300NB AND CLASS-B

Annex-I											
PROJECT : VALLUR TPP (3x500 MW)			INDICATIVE LIST OF SUB CONTRACTORS				DOC. NO.		CS-0260-132G-2		
PACKAGE : ULTRAFILTRATION PLANT PACKAGE							Revision No.		0		
MAIN CONTRACTOR :							Date				
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Sr. No	Item	QP/ INSP CAT	QP NO			Sub Supplier	Place	SC APPL. Status/ Cat			Remark
1	2	3	4	5	6	7	8	9	10	11	12
21	CI PIPES & FITTINGS	II				TRUFORM ENGINEERS	NAGPUR	A			CI SPUN PIPE (SCREWED FLANGE TYPE) UPTO 400NB AND CLASS-B
						TRUFORM TECHNO PRODUCTS	NAGPUR	A			ONLY FOR CI PIPE FITTINGS UPTO 400NB
22	AIR BLOWERS (CENTRIFUGAL)	II				PATEL AIR FLOWS	AHMEDABAD	A			
						C B DOCTOR	AHMEDABAD	A			
						DATTA AIR SYSTEMS	MUMBAI	A			
						UNIVERSAL	MUMBAI	A			
23	CS SEAMLESS PIPES ASTM A 106 UPTO 350NB	II				ISMT	AHMADNAGAR/ BARAMATI	A			AHMADNAGAR UPTO 150NB, BARAMATI UPTO 200 NB
						MAHARASHTRA SEEMLESS	RAIGAD	A			
LEGEND											
A - FOR THESE ITEMS PROPOSED VENDOR IS ACCEPTABLE TO NTPC. DR : FOR THESE ITEMS DETAILS ARE REQUIRED FOR NTPC REVIEW.											
NOTED: FOR THESE ITEMS VENDOR ARE APPROVED BY MAIN SUPPLIER AND ARE BEING ACCEPTED BY NTPC WITHOUT SPECIFIC VENDOR APPROVAL.											
2. QP / INSPECTION CATEGORY:											
CAT I: For these items the quality plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC.											
CAT II: For these items the quality plans are approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis of review of document as per approved QP.											
CAT III: For these items Main Supplier approves the Quality Plans. The final acceptance by NTPC shall be on the basis of certificate of conformance by the main supplier.											
UNITS / WORKS: Place of Manufacturing. Place of Main Supplier of Multy units/works.											

 Project NTECL Power Project (3x500 MW) Vallur Thermal Power Project				Indicative Vendor List				DOC.NO.	:	0260- -QOE-01
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1	HT Motors					Marathon	Kolkata	A		Upto 11kV, 1600kW
						Jyoti	Baroda	A		Upto 6.6kV, 2250kW
						BHEL	Bhopal	A		
						CGL	Mandideep	A		Upto 6.6kV, 1600kW
						ABB	Baroda	A		Upto 6.6kV, 2500kW
						WEG	Hosur	A		Upto 11kV, 7080kW
						KEC	Bangalore	A		6.6 KV & 11 KV Class
2	L T (415 V) Motors					Siemens	Thane, Kalwa	A		Upto 3.3 kV, 485KW
						CGL	Ahmednagar	A		
						ABB	Faridabad/ Bangalore	A		Upto 55kW/ From 55-200kW
						SIEMENS	MUMBAI	A		
						Marathon	Kolkata	A		
						KEC	Hubli/Bangalore	A		Upto 90kW/ Upto 200kW
						Bharat Bijlee	NAVI MUMBAI	A		Upto 690 V, 500 KW for Inverter Duty & upto 415V, 200 KW for Non-Inverter Duty
						JYOTI	BARODA	A		
						NGEF	BANGALORE	A		UPTO 15KW
						TMEIC	JAPAN(Nagasaki)	A		
						HYOSUNG	KOREA	A		
						HYUNDAI	KOREA	A		
						WEG	BRAZIL	A		
						ABB	SWEDEN	A		UPTO 55KW
						SIEMENS	CZECH	A		UPTO 45KW
						TIPM	JAPAN	A		UPTO 15KW
						LHP	SOLAPUR	A		UPTO 120KW
3	LT transformer (oil filled)					CEMP	ITALY	A		UPTO 4KW
						Emco	Jalgaon	A		Upto 16 MVA
						Emco	Umala			Upto 2 MVA, 33KV
						ABB	Vadodara	A		
						BHEL	Jhansi	A		
						Siemens	Navi Mumbai	A		
						Technical Associates	Sitarganj	A		
						Tesla Transformers (U-2)	Bhopal	A		Upto 5 MVA, 33 KV
						CGL	Malanpur	A		Upto 3.5 MVA, 11KV
						Schnieder	Baroda	A		Upto 16 MVA
						Kanohar Electricals Ltd.	Meerut	A		Upto 16 MVA
						ECE	Sonepat	A		Upto 4 MVA, 11 KV
						Voltamp Transformers	Savli	A		Upto 3.5 MVA, 33KV
						T&R (India) Ltd.	Ahmedabad	A		Upto 16 MVA
						Toshiba	Hyderabad	A		Upto 2 MVA
						KEC	Mysore / Pune	A		Upto 16MVA/2MVA, 33KV
						Indotech	Chennai	A		Upto 16 MVA, 11KV
						Andrew Yule	Chennai	A		Upto 10MVA, 33KV
						PETE	Hyderabad	A		Upto 10 MVA, 33KV
						SUDHIR TRANSFORMER	BANGALORE	A		UPTO 125KVA, 415V
4	Dry Type Transformer					Raychem	Pune	A		UPTO 2.5 MVA, 33 KV CLASS
						KEC	Mysore	A		
						Voltamp Transformers	Savli	A		
						BHEL	Jhansi	A		
						Toshiba	Hyderabad	A		

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Sl No	ITEM	QP / Insp. Cat.	QP No: 0260-QVE	QP Sub. Sch.	QP approval Sch.	Proposed sub-supplier	Place	Sub-Supplier approval status / category	Sub-supplier Details submission on sch	Remark
5	Cable Gland					Sunil & Co	Kolkata	A		
						Arup Engg	Kolkata	A		
						Comet	Mumbai	A		
						Quality Precision	Kolkata	A		
						Standard Metal Industries	Mumbai	A		
6	Cable Lugs					Dowell	Mumbai	A		
						3D	Umbergaon	A		
						Chetna	Nasik	A		
7	Junction Box					Main contractor approved sources subject to galvanization at NTPC approved sources		Noted		
8	Push Button					Main Contractor's approved make with VDE or CE or UL or CSA marking or BIS approved with CML no.		Noted		
9	Switch Fuse Unit/MCCB					C&S Ltd	Noida	A		
						GE	Bangalore	A		
						L&T	Mumbai	A		
						SIEMENS	Mumbai/Aurangabad	A		
						Main Contractor's approved make with VDE or CE or UL or CSA marking or BIS approved with CML no.		Noted		
10	Cable tray					Industrial Perforation	Kolkata	A		Galvanizing at NTPC Approved Sources
						Techno Engg	Chandigarh	A		
						Indiana	Mumbai	A		
						Ratan Engineering	Kolkata	A		
						Steelite	Mumbai	A		
						Vatco	Mumbai	A		
						Rabi	Kolkata	A		
						Premier Power Products	Kolkata	A		
						Jamna Metals	Delhi/Sonepat	A		
						Kanade Anand Udyog	Thane	A		
						Inar Profile	Anakapally	A		
						Indiana Gratings	Pune	A		
						Amtech	Pune	A		
						India Electric Syndicate	Kolkata	A		
						T.R.G	Chennai	A		
						Amtech	Pune	A		
						Rukmani	Raipur	A		
						Passive Infra	Hasangarh (Rohtak)	A		
						Unitech Fabricators &	Howrah/ Hoogly (Kolkata)	A		
						Patny System	Hyderabad	A		
						Indmarkformtech Pvt Ltd	Pune	A		
						M J Engg	Delhi/Bhiwadi	A		

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Sl No	ITEM	QP / Insp. Cat.	QP No: 0260-QVE	QP Sub. Sch.	QP approval Sch.	Proposed sub-supplier	Place	Sub-Supplier approval status / category	Sub-supplier Details submission sch	Remark
11	Flexible Cable Support System					Amtech	Pune	A		Galvanizing at NTPC approved sources
						Inar Profile	Anakapally	A		
						Indiana Gratings	Pune	A		
						Ratan Engineering	Kolkata	A		
						Premier power products	Kolkata	A		
						Industrial Perforation	Kolkata	A		
12	Cable Termination kits and straight through jointing kits					M/s 3M Electro & communication	Pune	A		
						Raychem	Mumbai	A		
13	H.T. Cable up to 11KV					Universal Cable Ltd.	Satna	A		
						NICCO	Shamnagar, Kolkata	A		
						Torrent Cable Ltd	Nadaid	A		
						Incab	Pune	A		
						Polycab Wires Pvt. Ltd	Daman	A		
						KEI Industries	Bhiwadi	A		
						Havells India Ltd.	Alwar	A		
						Sri ram Cables	Bhiwadi	A		
						Krishna Electrical Industries Ltd	Gwalior	A		
						Uniflex	Valsad	A		
						Finolex	Pune	A		
						KEC International	Vadodara	A		
14	Floor mounted Fixed type Indoor LT Switchgear Panel (ACDB / DCDB / Lighting DB/ Solenoid valve distribution boards/ Control Panel)					Switching Circuits	Kolkata	A		With fabrication & painting at unit II & MP Electrical Narendrapur Prior type testing
						Tricolite	Sahibabad / Manesar	A		
						Hindustan Control & equipment Ltd	Kolkata	A		
						Maktel	Vadodara	A		
						Jakson	Greater Noida	A		
						Vidyut Control	Ghaziabad	A		
						Adlec Power	Rohad (Jhajjar)	A		
						Pyrotech	Udaipur	A		
						Anand Power Ltd.	Noida	A		
Additionally all vendors identified for Floor mounted Draw out type indoor LT Switchgear Panel						A				

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Sl No	ITEM	QP / Insp. Cat.	QP No: 0260-QVE	QP Sub. Sch.	QP approval Sch.	Proposed sub-supplier	Place	Sub-Supplier approval status / category	Sub-supplier Details submission on sch	Remark
15	Floor mounted Draw out type indoor LT Switchgear Panel (MCC etc.)					L&T	Mumbai / Coimbatore	A		
						GE	Bangalore	A		
						Siemens	Mumbai	A		
						C&S Electric	Noida / Hardwar	A		
						Schneider	Nasik	A		ACB from Schneider, France (non ACB manufacturer)
16	Wall mounted fixed type indoor /outdoor LT Switchgear non compartmentalized Panel (Lighting panels / AC / DC Fuse boards / MCB boxes)					Unilec	Gurgaon	A		
						Positronics	Vadodara	A		
						Pyrotech	Udaipur	A		
						Control Devices	Kolkata	A		
						Jasper	Noida	A		
						Conquerent Control Systems	Manesar	A		For meter boards / feeder pillars / lighting panels Up to 1250 A
						Havells	Faridabad	A		
						Novateur Electrical & distribution systems	Murthal	A		
						Avaid Technovator	Manesar	A		
						Additionally all vendors identified in serial no. 14 & 15 are also acceptable				
17	MV Switchgear panel upto 33 KV					Siemens	Mumbai	A		
						BHEL	Bhopal	A		
						Megawin	Salem	A		
						Jyoti	Vadodara	A		
						ABB	Nasik	A		
						L&T	Ahmednagar	A		
						Areva	Kolkata	A		
18	IEC 61850 Compliant Numerical Relays					SEL	Pullman, USA	A		To be tested as per NTPC appd FAT Procedure.
						AlSTOM T&D	Stafford, UK/Chennai	A		
						GE Multilin	Zamudio, Vizcaya, Spain/ Markham, Ontario, Canada	A		
						Schneider	Stone, UK	A		
						ABB	Finland/ Baroda	A		
						Siemens	Goa/Germany	A		

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19	Thermal Overload Relay					C&S Electric	Noida	A		
						Siemens	Mumbai / Aurangabad	A		
						GE	Bangalore	A		
						L&T	Mumbai	A		
						Main Contractor's approved make's model with VDE or CE or UL or CSA marking or BIS approved with CML no .				
20	ACB					Siemens	Mumbai	A		
						L&T	Mumbai	A		
						C&S	Noida	A		
						Schneider	France	A		
						GE	Bangalore	A		
21	LT Contactor					C&S Electric	Noida	A		
						GE	Bangalore	A		
						L&T	Mumbai	A		
						Siemens	Mumbai / Aurangabad	A		
						Main Contractor's approved make's model with VDE or CE or UL or CSA marking or BIS approved with CML no .				
22	Auxiliary Relays					ABB	Bangalore	A		
						Siemens	Germany	A		
						Alstom	Chennai	A		
						Jyoti	Baroda	A		RE Series
						Main Contractor's approved make's model with VDE or CE or UL or CSA marking or BIS approved with CML no .				
23	Coupling Relays					OEN	Cochin	A		
						PLA	Mumbai	A		
						Main Contractor's approved make's model with VDE or CE or UL or CSA marking or BIS approved with CML no .				
24	Static Energy Meters					Elster	Mumbai	A		
						Conzerv	Bangalore	A		
						Genus Overseas	Jaipur	A		
						SEMS	Udaipur	A		
						CG Schlumberger	Mumbai	A		
						Rishabh	Nasik	A		For Multi Function Meters only
Main Contractor's approved make's model with VDE or CE or UL or CSA marking or BIS approved with CML no .										
25	A) IEC 61850 complaint Ethernet Switches (Industrial type)					Kema Certified Model (*)		A		
26	B) RS485 to Ethernet, RS 485 to RS 232, RS 485 to Fiber Optic Converter									
27	Optical Fibre Cable, LAN Cable , Communication Cable					DOT approved sources (*)		A		

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28	A) LT AC / DC Control & Selector Switch B) Indicating Meters C) Transducer D) Indicating Lamp E) LT fuse F) Push Button G) Terminal Block H) MCB					Main Contractor's approved make's model with VDE or CE or UL or CSA marking or BIS approved with CML no .				
29	Aluminum for Bus-bars					Indalco	India	A		
						Balco	India	A		
						Hindalco	India	A		
						Jindal	India	A		
30	Copper for Bus Bar					Hindustan Copper Ltd	India	A		
						Hindalco	India	A		
						Sterlite	India	A		
31	HR Sheets/CRCA Sheets					SAIL	India	A		
						Tisco	India	A		
						Jindal	India	A		
						Essar	India	A		
						Bhushan Steel	India	A		
32	LT CT / PT/ CBCT/ Control Transformer / Lighting Transformer					Kappa	Bangalore	A		
						G&M	Baroda	A		
						Ind Coil	Mumbai	A		
						Pragati	Thane	A		
						AE	Mumbai	A		
						Silkaans	Mumbai	A		
						Prayog	Pune	A		
						Precise	Mumbai	A		
						Southern Electric	Chennai	A		
						Logicstat	Delhi	A		For Control Transformer only
						C&S Electric	Noida	A		For CT only
33	Digital Energy Meter					SEMS	Udaipur	A		
						Elster	Mumbai	A		
						CG Schlumberger	Mumbai	A		
						Schneider	Bangalore	A		
34	Battery					HBL Power System	Hyderabad	A		(Ni-Cd only) Up to 990 Ah
						Amcosaft	Bangalore	A		(Ni-Cd only) 8Ah to 990Ah- KPH type, 10Ah to 1365 Ah- KPM type, 11Ah to 1550Ah - KPL type
						Exide	Kolkata	A		Plante only

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35	Battery Charger					Amararaja	Tirupati	A		Up to 220, V 850 A
						HBL- Power System	Hyderabad	A		
						Chhabi Electrical	Jalgaon	A		
						Chloride Power	Kolkatta	A		
						Statcon	Pikhuwa	A		
						Saft Nife Power Systems	Singapore	A		
36	Lighting Fixtures/ Luminaries					Dubas	Bangalore	A		Up to 220 V, 250 A *- under DR category for LED type Luminaire/Fixture
						M/s Crompton	Mumbai	A*		
						M/s Bajaj Electricals	Mumbai	A*		
						M/s Philips	Kolkata	A*		
37	MCCB / SFU					M/s Wipro	Mumbai	A*		
						C&S Ltd	Noida	A		
						GE	Bangalore	A		
						L&T	Mumbai	A		
						SIEMENS	Mumbai/ Aurangabad	A		
38	Ceiling Fans with Regulators and exhaust fans					Any make's model with VDE or CE or UL or CSA marking or BIS approved with CML no .		Refer Note 6		
						M/s Crompton	INDIA	NOTED		
						M/s Orient				
						M/s Khaitan				
						M/s Bajaj				
39	Lighting Mast with raise & Lower Type Lantern Carriage / Polygonal Poles					Bajaj	Pune	A		Fabrication, galvanization and testing at M/S. B.P. Project, Kolkata
						CGL	Mumbai	A		
						Philips	Mumbai	A		
40	LT PVC Copper Wires					Main Contractor's approved make with VDE or CE or UL or CSA marking or BIS approved with CML no.		A		
41	PVC Conduit/Hume Pipe/ GI Pipes					Main Contractor's approved make with VDE or CE or UL or CSA marking or BIS approved with CML no.		A		
42	GI Conduit/ Epoxy Conduit					Main Contractor's approved make with VDE or CE or UL or CSA marking or BIS approved with CML no.		A		
43	Industrial Receptacles					BCH	Faridabad	A		
						Schneider	Nasik	A		
						Shakti & Crown	Chennai	A		
						Ajmera	Mumbai	A		
44	Local Motor Starter					L&T	Mumbai / Coimbatore	A		
						Siemens	Mumbai	A		
						C&S	Noida	A		
						BCH	Faridabad	A		
						Main Contractor's approved make with VDE or CE or UL or CSA marking or BIS approved with CML no.		A		
45	LT VFD Panel					SCHNEIDER	BANGALORE	A		VFD from Schneider- France, upto 415V, 160KW
						DANFOSS	Oragadam	A		(upto 415V, 11kW), VFD drives with VFD sourced from Danfoss-Denmark/USA and Panel sourced from Rittal
						L&T -YASKAWA	MUMBAI	A		VFD from Yasakawa- Japan, Upto 415V, 132KW
						ROCKWELL AUTOMATION	SAHIBABAD	A		VFD from Rockwell(Allen Bradley)- USA, (Upto 415 V, 600 KW)
						ABB	BANGALORE	A		VFD from ABB-Finland, Upto 690V, 750 KW
						SIEMENS	NASIK	A		VFD from SIEMENS- Germany, Upto 690V,900KW
						VACON	BANGALORE	A		VFD (NXP model) from VACON Finland, upto 400KW,415V and upto 900KW, 690V

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Sl No	ITEM	QP / Insp. Cat.	QP No: 0260-QVE	QP Sub. Sch.	QP approval Sch.	Proposed sub-supplier	Place	Sub-Supplier approval status/ category	Sub-supplier Details submission sch	Remark
46	LT Busduct (air insulated non segregated type)					C&S Electric	G.Noida			
						Unilec	Gurgaon			upto 3200 A
						KGS Engg. Ltd.	Chennai			
						Spaceage Switchgear Ltd.	Bawal			
						REEP	Chennai			
						Enpro	Chennai			
						Jasper Engg Ltd	Noida			With Copper Flexible
47	Earthing and Lightning Protection Material					Main contractor Approved Sources	A			
48	Lighting Poles					BIS Licensee as per IS 2713				
49	FQP for electrical items									
LEGENDS : 1. SYSTEM SUPPLIERS/SUB-SUPPLIERS APPROVAL STATUS CATEGORY(SHALL BE FILLED BY NTPC) A-For this items proposed vendor is acceptable to NTPC.To be indicated with letter "A" in the list along with condition of approval,if any DR -For these items "Details required for NTPC review.To be identified with letter "DR" in the list. NOTED - For these items vendors are approved by Main Supplier & accepted by NTPC without specific vendor approval from NTPC.To be identified with "NOTED". 2. QP/INSPN CATEGORY CAT-I :For these items the Quality Plans approved by NTPC & final acceptance will be on physical inspection witness by NTPC CAT-II :For these items the Quality Plans approved by NTPC.However no physical inspection shall be done by NTPC.The final acceptance by NTPC shall be on basis of review of documents as per approved QP CAT-III :For these items Main supplier approves the Quality Plans.The final acceptance by NTPC shall be on basis of certificate of conformance by the main supplier. * : Control measure of item covered in quality plan of main item. 3. UNITS/WORKS : Place of manufacturing Place of Main Supplier of multi units/works.										

		PROJECT : NTECL-VALLUR(2 X 500 MW + 1 X 500 MW)) PACKAGE: ULTRA FILTRATION PLANT SUPPLIER : CONT. NO.: CS-0260-132G-2			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL SUB SYSTEM: C & I		DOC. No. :
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SL.NO.	ITEM	QP/IN SPN CAT	QP NO.	PROPOSED SUPPLIER	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
1	INSTRUMENTATION CABLE	I		DELTON CABLES LTD	FARIDABAD	A	PVC, FRLS TYPE
				PARAMOUNT COMMUNICATION LTD	KHUSHKHERA	A	PVC, FRLS TYPE
				CORDS CABLE INDUSTRIES LTD	BHIWADI/KAHARANI	A	PVC, FRLS TYPE
				KEI INDUSTRIES LTD	BHIWADI	A	PVC, FRLS TYPE
				POLYCAB WIRES PVT. LTD	DAMAN	A	PVC, FRLS TYPE
				THERMOCABLES	HYDERABAD	A	PVC, FRLS TYPE
				ELKAY TELELINKS	FARIDABAD	A	PVC, FRLS TYPE
				GUPTA POWER	KHURDHA	A	PVC, FRLS TYPE
2	PLC SYSTEM	I		ABB	BANGALORE	A	
				SCHNEIDER	BANGALORE	A	
				SIEMENS	NASIK	A	
				ROCKWELL AUTOMATION	SAHIBABAD	A	
				GE INTELLEGENT PLATFORMS	BANGALORE	A	
				HONEYWELL	PUNE	A	
3	Ni-Cd BATTERY	I		AMCO SAFT	BANGALORE	A	
		II		SAFT	FRANCE/ SWEEDEN	A	
		II		HOPPECHHE	GERMANY	A	
		I		HBL POWER	HYDERABAD	A	

	PROJECT : NTECL-VALLUR(2 X 500 MW + 1 X 500 MW)) PACKAGE: ULTRA FILTRATION PLANT SUPPLIER : CONT. NO.: CS-0260-132G-2			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL SUB SYSTEM: C & I			DOC. No. :
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SL.NO.	ITEM	QP/IN SPN CAT	QP NO.	PROPOSED SUPPLIER	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
4	CABLE (FIBER OPTIC)	II		FINOLEX	PUNE / GOA	A	
				BIRLA ERICSON	REWA	A	
				AKSH FIBRE	BHIWADI	A	
				R&M	SWITZERLAND	A	
				HFCL	GOA	A	
5	CONDUITS LEAD COATED (FLEXIBLE)	III		PLICA	GHAZIABAD	A	
				BANSAL LABORATORIES	BHOPAL	A	
7	TEMPERATURE TRANSMITTER	III		EMERSON	PAWANE	A	
				M-SYSTEM	JAPAN	A	
				YOKOGAWA	BANGALORE	A	MAKE-YOKOGAWA JAPAN
				E & H	GERMANY/ AURANGABAD	A	
				ABB	BANAGLORE	A	MAKE-ABB-GERMANY
8	CONDUITS / PIPE (GI)	III		BIS APPROVED SOURCES		A	BIS MARKED
9	TEMPERATURE GAUGE	III		AN INSTRUMENTS	NARENDRAPUR	A	
				WIKI	PUNE	A	
				BAUMER	VAPI	A	
				ASHCROFT	GANDHINAGAR	A	
				H GURU (SI)	BANGALORE	A	
				GOA THERMOSTATIC	GOA	A	

	PROJECT : NTECL-VALLUR(2 X 500 MW + 1 X 500 MW)) PACKAGE: ULTRA FILTRATION PLANT SUPPLIER : CONT. NO.: CS-0260-132G-2			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL SUB SYSTEM: C & I		DOC. No. :	
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SL.NO.	ITEM	QP/IN SPN CAT	QP NO.	PROPOSED SUPPLIER	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
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10	PR./ VACCUUM/ DP GAUGES	III		H GURU INDUSTRIES LTD	RISHRA/ MUZAFFARPUR	A	
				GOA INSTRUMENT INDUSTRIES PVT. LTD	GOA	A	
				FORBES MARSHALL	HYDERABAD	A	
				GAUGES BOURDEN	PANVEL	A	
				GLUCK(I) MANUFACTURING CO.	MUMBAI	A	
				AN INSTRUMENTS	NARENDRAPUR	A	
				MANOMETER INDIA	MUMBAI	A	
				WIKA	PUNE	A	
				GAUGES BOURDON	PANVEL	A	
				BAUMER	VAPI	A	
				H GURU INDUSTRIES LTD	RISHRA/ MUZAFFARPUR	A	
				ASHCROFT	GANDHINAGAR	A	
				WALCHANDNAGAR INDUSTRIES	WALCHANDNAG AR		
				H GURU (SI)	BANGALORE	A	
				FORBES MARSHALL	HYDERABAD	A	
11	INSTRUMENT VALVE	II		BHEL	TRICHY	A	
				EXCEL HYDRO	MUMBAI	A	
				INSTRUMENTATION LIMITED	PALGHAT	A	
				HP VALVES AND FITTINGS	CHENNAI	A	
				FLUID CONTROL	PUNE	A	
				BALDOTA	MUMBAI	A	
12	ELECTRICAL ACTUATOR	II		ROTORK CONTROLS	CHENNAI/ BANGALORE	A	
				LIMITORQUE	FARIDABAD	A	
				AUMA	BANGALORE	A	

		PROJECT : NTECL-VALLUR(2 X 500 MW + 1 X 500 MW)) PACKAGE: ULTRA FILTRATION PLANT SUPPLIER : CONT. NO.: CS-0260-132G-2			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL SUB SYSTEM: C & I		DOC. No. :
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13	TEMPERATURE ELEMENT(THERMO COUPLE , RTD & THERMOWELL)	II		DETRIV INSTRUMENTATION & ELECTRONICS LTD.	MUMBAI	A	
				THERMAL INSTRUMENTS INDIA PVT.LTD	SAWANTVADI	A	
				PYRO ELECTRIC	GOA	A	
				TEMPSSENS	UDAIPUR	A	
				TECHNO INSTRUMENT	AHMADABAD	A	
14	INTELIGENT BATTERY CHARGER 24 V DC & DCDB/BHMS	I		CHABBI ELECTRICALS	JALGAON	A	MODULES FROM EMERSON
				ELTEK	GURGAON	A	MODULES FROM ELTEK
				MASTECH	JALGAON	A	MODULES FROM ELTEK
				EMERSON	AMBERNATH	A	MODULES FROM EMERSON-CHINA
15	VALVE MANIFOLDS	II		ASTECH	MUMBAI	A	
				HP VALVES AND FITTINGS	CHENNAI	A	
				FLUID CONTROL	PUNE	A	
				MICROPRECISION	FARIDABAD	A	
				EXCEL HYDRO	MUMBAI	A	
				BALDOTA	MUMBAI	A	
16	DOUBLE COMPRESSION FITTINGS(SS)	II		HAMLET	ISRAIL	A	
				PARKER	USA	A	
				PRECISION	MUMBAI	A	
				DK TECH	KOREA	A	
				HY LOK	KOREA	A	
				ASTECH	MUMBAI	A	

	PROJECT : NTECL-VALLUR(2 X 500 MW + 1 X 500 MW)) PACKAGE: ULTRA FILTRATION PLANT SUPPLIER : CONT. NO.: CS-0260-132G-2			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL SUB SYSTEM: C & I		DOC. No. :	
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				FLUID CONTROL	PUNE	A	
				HP VALVES AND FITTINGS	CHENNAI	A	FERRULEAS ARE TO BE HARDENED AT EXIM HOLLAND FOR PRESSURE 9000 CLASS AND ABOVE.
				EXCEL HYDRO	MUMBAI	A	FERRULEAS ARE TO BE HARDENED AT EXIM HOLLAND FOR PRESSURE 9000 CLASS AND ABOVE.
				SWAGELOCK	USA	A	
				PANAM	MUMBAI	A	
17	ELECTRONIC TRANSMITTER (PRESSURE, DP,FLOW,LEVEL APPLICATION)	III		EMERSON (ROSEMOUNT)	USA/ PAWANE	A	
				FUJI ELECTRIC	FRANCE	A	
				SIEMENS	FRANCE/KALWA	A	
				YOKOGAWA INDIA LIMITED	BANGALORE	A	MAKE : YOKOGAWA, JAPAN
				HONEYWELL	USA / PUNE	A	
				LAXONS AUTOMATION INDIA PVT LTD	DAMAN	A	MAKE- SMAR BRAZIL
				ABB	BANGALORE	A	2600 T SERIES
18	PRESSURE/DP/VACUUM SWITCH	II		SWITZER PROCESS INSTRUMENT	CHENNAI	A	Up to 40kg/cm2 & not for Compound Switch and except 900 series
				TRAFAG	GURGAON	A	Up to 40kg/cm2 & not for Compound Switch

	PROJECT : NTECL-VALLUR(2 X 500 MW + 1 X 500 MW)) PACKAGE: ULTRA FILTRATION PLANT SUPPLIER : CONT. NO.: CS-0260-132G-2			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL SUB SYSTEM: C & I		DOC. No. :	
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SL.NO.	ITEM	QP/IN SPN CAT	QP NO.	PROPOSED SUPPLIER	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS

				SWITZER PROCESS INSTRUMENT	GHAZIABAD	A	Up to 40kg/cm2 & not for Compound Switch
				ASHCROFT	GANDHINAGAR	A	
				GAUGES BOURDON	PANVEL	A	Up to 40kg/cm2 & not for Compound Switch
19	TEMPERATURE SWITCH	II		SWITZER PROCESS INSTRUMENT	CHENNAI	A	up to 200 Deg. C
				TRAFAG	GURGAON	A	up to 200 Deg. C
				SWITZER PROCESS INSTRUMENT	GHAZIABAD	A	up to 200 Deg. C
				ASHCROFT	GANDHINAGAR	A	
20	FLOW SWITCH	III		DK INSTRUMENT	KOLKATA	A	
				LEVCON	KOLKATA	A	
				KHRONE MARSHALL	PUNE	A	
				SWITZER	CHENNAI	A	
21	LEVEL SWITCH(FLOAT/ DISPLACER TYOPE)	III		ENDRESS & HOUSER	AURANGABAD	A	
				LEVCON	KOLKATA	A	
				SBEM	PUNE	A	
				SIGMA INDUSTRIES	MUBMAI	A	
				D K INSTRUMENT	KOLKATA	A	
				PUNE TECHTROL	PUNE	A	

	PROJECT : NTECL-VALLUR(2 X 500 MW + 1 X 500 MW)) PACKAGE: ULTRA FILTRATION PLANT SUPPLIER : CONT. NO.: CS-0260-132G-2			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL SUB SYSTEM: C & I		DOC. No. :	
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				V AUTOMAT	NEW DELHI	A	
22	UPS SYSTEM /ACDB	I		FUJI ELECTRIC	JAPAN	A	
				EMERSON	AMBERNATH	A	Approved up to 150 kVA, 1Φ
				EMERSON(DB POWER)	PUNE	A	Approved up to 120 kVA, 1Φ
				HITACHI-HIREL	GANDHINAGAR	A	Approved up to 120 Kva, 1Φ
23	PH/CONDUCTIVITY ANALYSER	III		YOKOGAWA	JAPAN	A	
				ABB	UK	A	
				EMERSON	PAWANE	A	
				HACH	USA/ SWITZERLAND	A	
24	SILICA ANALYSER	III		ABB	UK	A	
				HACH	SWITZERLAND	A	POLYMETRON BRAND
				HACH	USA	A	
25	TURBIDITY ANALYSER	III		ABB	UK	A	
				WTW	GERMANY	A	
				HACH	USA	A	
				E & H	GERMANY	A	
				EMERSON	PAWANE	A	

		PROJECT : NTECL-VALLUR(2 X 500 MW + 1 X 500 MW)) PACKAGE: ULTRA FILTRATION PLANT SUPPLIER : CONT. NO.: CS-0260-132G-2			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL SUB SYSTEM: C & I		DOC. No. :
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SL.NO.	ITEM	QP/IN SPN CAT	QP NO.	PROPOSED SUPPLIER	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
26	ROTAMETER TYPE FLOW INDICATOR	III		TRAC	HYDERABAD	A	
				PLACKA	CHENNAI	A	
				SCIENTIFIC DEVICES	MUMBAI	A	
				FLOW STAR	FARIDABAD	A	
				IEPL	HYDERABAD	A	
				EUREKA	PUNE	A	
27	RESIDUAL CHLORINE ANALYSER	III		E & H	GERMANY	A	
				EMERSON PROCESS	PAWANE	A	
				HACH	USA	A	

LEGENDS:

A – For those items proposed Sub-vendors are acceptable to NTPC subject to meeting NTPC Technical Specification Requirement.

INSPECTION CATEGORY:

Cat I: For those items the quality plans are approved by NTPC and final acceptance will be on physical inspection witness by NTPC.

CAT II: For those items the quality plans are approved by NTPC. However no physical inspection will be done by NTPC. The final acceptance by NTPC shall be on the basis of review of documents as per QP.

CAT III: For those items Main Supplier approves quality plans. The final acceptance by NTPC shall be on the basis of certificate of conformance. By Main Supplier

Annex-I			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL				DOC. NO.		CS-0260-132G-2		Revision No.		0	
PROJECT : NTECL VALLUR TPP (3X500MW)							Date		12.10.2016- 24.10.2016					
PACKAGE : ULTRAFILTRATION PLANT PKG							PAGE							
MAIN CONTRACTOR : M/S. BHEL							Place							
CONTRACT NO: CS-0260-132G-2							SC APPL.							
Sr. No	Item	QP/ INSP CAT	QP NO			Proposed Sub Supplier		Status/ Cat						Remark
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
[A]	MECHANICAL:													
1	ATMOSPHERIC STORAGE TANKS (MS) FABRICATION	I				TECHNO FAB ENGINEERING LIMITED	NEW DELHI	DR						
						UNITECH MACHINES LTD(INFRASTRUCTURE DIVISION)	GURGAON	DR						
						SAKTHI HI-TECH CONSTRUCTIONS PVT LTD	KANCHEEPURAM	DR						
						GMW PRIVATE LIMITED	VADODARA	DR						
						THERMO PADS (P) LTD	HYDERABAD	DR						
						THERMOSYSTEMS PVT. LIMITED.,	HYDERABAD	DR						
						TECHNO ELECTRIC & ENGINEERING CO LTD.,	KOLKATA	DR						
						BRIDGE AND ROOF CO.(INDIA) LTD.	CHENNAI	DR						
						DIAMOND FABRICATIONS (I) PVT. LTD.	PUNE	DR						
						STEEL FAB INDUSTRIES	MUMBAI	DR						
2	HORIZONTAL CENTRIFUGAL PUMPS UPTO 1500 M3/HR CAPACITY	I				FLOWSERVE INDIA CONTROLS (P)	COIMBATORE	DR						
						KIRLOSKAR BROTHERS LIMITED	CHENNAI	DR						
						KIRLOSKAR BROTHERS	MAHARASTRA	DR						
						MATHER AND PLATT PUMPS LTD.,	CHENNAI	DR						
						WILO MATHER & PLATT PUMPS	CHINCHWAD PUNE	A						
						SULZER PUMPS INDIA LIMITED	CHENNAI	DR						
						SULZER PUMPS INDIA LTD.,	NAVI MUMBAI	DR						
						KSB PUMPS LTD.,	CHENNAI	DR						
						KSB PUMPS LIMITED	PUNE	A						
						BEST & CROMTON ENGG LIMITED	CHENNAI	A						
						GRUNDFOS PUMPS INDIA PVT LTD	CHENNAI	DR						
						FLOWMORE LIMITED	GURGAON	DR						
						WPIL LTD	CHENNAI	DR						
						S.J.INDUSTRIES	CHENNAI	DR						
						JEE PUMPS (GUJ) PVT LTD	AHMEDABAD	DR						
3	DRAINAGE PUMP 60 M3/HR, 20 MWC (SUBMERSIBLE TYPE)	I				WELLWIN ASSOCIATES	NEW DELHI	DR						
						JEE PUMPS (GUJ) PVT LTD	AHMEDABAD	DR						
						HICK HARGREAVES & CO. LTD.,	UK	DR						
						RKR VERDICHTERTECHNIK GMBH.	GERMANY	DR						
4	METERING PUMPS DIAPHRAGM TYPE	I				PSI ENGINEERING SYSTEMS P. LTD	CHENNAI	DR						
						ACCUDYNE INDUSTRIES INDIA PRIVATE LTD	CHENNAI	A						
						GRUNDFOS PUMPS INDIA PVT LTD	CHENNAI	DR						
5	CI/ CIRL/ CSS DUAL PLATE CHECK VALVE UPTO 600NB, CLASS 150	I				ADVANCE VALVES	GREATER NOIDA	A						
						LEADER	JALANDHAR	A						
						R&D MULTIPLES	VALSAD	A						
						HAWA ENGINEERS	AHMEDABAD	A						
						FLOCON SYSTEMS PVT. LTD	GUMMIDIPOONDI	DR						
						FOURESS ENGG. (I) PVT. LTD.,	BENGALURU	DR						
						L & T VALVES LIMITED	CHENNAI	DR						

ONLY FOR CI UPTO 600NB,
CLASS #150
UPTO 300NB, CLASS #150

Annex-I PROJECT :NTECL VALLUR TPP (3X500MW) PACKAGE : ULTRAFILTRATION PLANT PKG MAIN CONTRACTOR : M/S. BHEL CONTRACT NO: CS-0260-132G-2			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL				DOC. NO. Revision No. Date PAGE		CS-0260-132G-2 0 12.10.2016- 24.10.2016			
Sr. No	Item	QI/ INSP CAT	QP NO			Proposed Sub Supplier	Place	SC APPL. Status/ Cat			Remark	
1	2	3	4	5	6	7	8	9	10	11	12	
						INTERVALVE POONAWALLA LTD WEIR BDK VALVES WEIR BDK VALVES SIGMA INDUSTRIES BRAY CONTROLS INDIA PRIVATE LIMITED SAP INDUSTRIES LTD	CHENNAI HUBLI VELACHERY,CHENNAI NAVI MUMBAI DIST-VADODARA AHMEDABAD	DR DR DR DR DR DR				
6	CI/ CIRL DIAPHRAGM VALVES (MANUAL/ PNEU) UPTO 300 NB, PN 10	I				WEIR BDK VALVES PROCON INSTRUMENTS SIGMA INDUSTRIES	HUBLI CHENNAI NAVI MUMBAI	A DR DR			UPTO 250 NB - PN 10	
7	CCS/ CSS BALL VALVE UPTO 200 NB, CLASS 150	I				INTERVALVE POONAWALLA LTD WEIR BDK VALVES JCF FLUID FLOW INDIA PVT. LTD., MICROFINISH VALVES PVT LTD VIRGO VALVES & CONTROLS PRIVATE LIMITED DELVAL FLOW CONTROLS PVT LTD SIGMA INDUSTRIES BRAY CONTROLS INDIA PRIVATE LIMITED SAP INDUSTRIES LTD	CHENNAI HUBLI CHENNAI HUBLI CHENNAI CHENNAI NAVI MUMBAI DIST-VADODARA AHMEDABAD	DR A DR A DR DR DR DR DR				
8	CCS/ CSS BALL VALVES, PRESSURE RATING CLASS #600	I				INTERVALVE POONAWALLA LTD WEIR BDK VALVES JCF FLUID FLOW INDIA PVT. LTD., MICROFINISH VALVES PVT LTD VIRGO VALVES & CONTROLS PRIVATE LIMITED DELVAL FLOW CONTROLS PVT LTD SIGMA INDUSTRIES BRAY CONTROLS INDIA PRIVATE LIMITED SAP INDUSTRIES LTD	CHENNAI HUBLI CHENNAI DHARWAD CHENNAI CHENNAI NAVI MUMBAI DIST-VADODARA AHMEDABAD	DR DR DR DR DR DR DR DR DR				
9	CI BUTTERFLY VALVE (MANUAL/ PNEU/ ELECT) UPTO 1200 NB, PN 10	I				L & T VALVES LIMITED WEIR BDK VALVES CRANE PROCESS FLOW MICROFINISH VALVES PVT LTD SIGMA INDUSTRIES MASCOT VALVES PVT LTD KIRLOSKAR BROTHERS LIMITED JCF FLUID FLOW INDIA PVT. LTD., BRAY CONTROLS INDIA KAMALA VALVES & ENGINEERING SAP INDUSTRIES LTD FOURESS ENGG. (INDIA) LTD.,	CHENNAI HUBLI PUNE HUBLI NAVI MUMBAI AHMEDABAD CHENNAI CHENNAI VADODARA HOWRAH AHMEDABAD CHENNAI	DR A DR DR DR DR DR DR A DR DR DR		UPTO 1050 NB UPTO 400NB, PN16/ CLASS 150		
10	CSS BUTTERFLY VALVES, PRESSURE RATING CLASS #600	I				L & T VALVES LIMITED INTERVALVE POONAWALLA LTD	CHENNAI CHENNAI	DR DR				

Annex-I											
PROJECT : NTECL VALLUR TPP (3X500MW)			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR				DOC. NO.	CS-0260-132G-2			
PACKAGE : ULTRAFILTRATION PLANT PKG			APPROVAL				Revision No.	0			
MAIN CONTRACTOR : M/S. BHEL							Date	12.10.2016- 24.10.2016			
CONTRACT NO: CS-0260-132G-2							PAGE				
Sr. No	Item	QPI INSP CAT	QP NO			Proposed Sub Supplier	Place	SC APPL. Status/ Cat			Remark
1	2	3	4	5	6	7	8	9	10	11	12
						WEIR BDK VALVES	HUBLI	DR			
						CRANE PROCESS FLOW	PUNE	DR			
						MICROFINISH VALVES PVT LTD	HUBLI	DR			
						SIGMA INDUSTRIES	NAVI MUMBAI	DR			
						MASCOT VALVES PVT LTD	AHEMEDABAD	DR			
						KIRLOSKAR BROTHERS LIMITED	CHENNAI	DR			
						JCF FLUID FLOW INDIA PVT. LTD.	CHENNAI	DR			
						BRAY CONTROLS INDIA	VADODARA	DR			
						KAMALA VALVES & ENGINEERING	HOWRAH	DR			
						SAP INDUSTRIES LTD	AHMEDABAD	DR			
						FOURESS ENGG. (INDIA) LTD.,	CHENNAI	DR			
11	CI GLOBE & SWING CHECK VALVES UPTO 500NB, CLASS 150	I				KRISHNA ELECTRICAL	GWALIOR	DR			FOR GLOBE VALVES
						KSB PUMPS LTD.,	CHENNAI	DR			FOR GLOBE VALVES
						JCF FLUID FLOW INDIA PVT. LTD.,	CHENNAI	DR			FOR GLOBE VALVES
						KOSO INDIA PRIVATE LIMITED	NASHIK	DR			FOR GLOBE VALVES
						SEVERN GLOCON INDIA PVT LTD	CHENNAI	DR			FOR GLOBE VALVES
						JOSHJAMPALA ENGINEERING PVT	SATARA	DR			FOR GLOBE VALVES
						DEMBLA VALVES LTD.,	THANE	DR			FOR GLOBE VALVES
						MASCOT VALVES PVT LTD	AHEMEDABAD	DR			FOR GLOBE VALVES
						FLOCON SYSTEMS PVT. LTD	GUMMIDIPOONDI	DR			FOR SWING CHECK VALVES
						FOURESS ENGG. (I) PVT. LTD.,	BENGALURU	DR			FOR GLOBE & SWING CHECK VALVES
						L & T VALVES LIMITED	CHENNAI	DR			FOR SWING CHECK VALVES
						INTERVALVE POONAWALLA LTD	CHENNAI	DR			FOR SWING CHECK VALVES
						WEIR BDK VALVES	HUBLI	A			FOR GLOBE & SWING CHECK VALVES
						WEIR BDK VALVES	VELACHERY, CHENN	DR			FOR SWING CHECK VALVES
						SIGMA INDUSTRIES	NAVI MUMBAI	DR			FOR GLOBE & SWING CHECK VALVES
						BRAY CONTROLS INDIA PRIVATE	DIST-VADODARA	DR			FOR SWING CHECK VALVES
						SAP INDUSTRIES LTD	AHMEDABAD	DR			FOR GLOBE & SWING CHECK VALVES
12	CCS/ CSS GLOBE & SWING CHECK VALVES UPTO 400 NB, CLASS 150	I				KRISHNA ELECTRICAL	GWALIOR	DR			FOR GLOBE VALVES
						KSB PUMPS LTD.,	CHENNAI	DR			FOR GLOBE VALVES
						JCF FLUID FLOW INDIA PVT. LTD.,	CHENNAI	DR			FOR GLOBE VALVES
						KOSO INDIA PRIVATE LIMITED	NASHIK	DR			FOR GLOBE VALVES
						SEVERN GLOCON INDIA PVT LTD	CHENNAI	DR			FOR GLOBE VALVES
						JOSHJAMPALA ENGINEERING PVT	SATARA	DR			FOR GLOBE VALVES
						DEMBLA VALVES LTD.,	THANE	DR			FOR GLOBE VALVES
						MASCOT VALVES PVT LTD	AHEMEDABAD	DR			FOR GLOBE VALVES
						FLOCON SYSTEMS PVT. LTD	GUMMIDIPOONDI	DR			FOR SWING CHECK VALVES
						FOURESS ENGG. (I) PVT. LTD.,	BENGALURU	DR			FOR GLOBE & SWING CHECK VALVES
						L & T VALVES LIMITED	CHENNAI	DR			FOR SWING CHECK VALVES
						INTERVALVE POONAWALLA LTD	CHENNAI	DR			FOR SWING CHECK VALVES
						WEIR BDK VALVES	HUBLI	A			FOR GLOBE & SWING CHECK VALVES
						WEIR BDK VALVES	VELACHERY, CHENN	DR			FOR SWING CHECK VALVES
						SIGMA INDUSTRIES	NAVI MUMBAI	DR			FOR GLOBE & SWING CHECK VALVES
						BRAY CONTROLS INDIA PRIVATE	DIST-VADODARA	DR			FOR SWING CHECK VALVES
						SAP INDUSTRIES LTD	AHMEDABAD	DR			FOR GLOBE & SWING CHECK VALVES

Annex-I											
PROJECT : NTECL VALLUR TPP (3X600MW)			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR				DOC. NO.	CS-0260-132G-2			
PACKAGE : ULTRAFILTRATION PLANT PKG			APPROVAL				Revision No.	0			
MAIN CONTRACTOR : M/S. BHEL							Date	12.10.2016- 24.10.2016			
CONTRACT NO: CS-0260-132G-2							PAGE				
Sr. No	Item	QP/ INSP CAT	QP NO			Proposed Sub Supplier	Place	SC APPL. Status/ Cat			Remark
1	2	3	4	5	6	7	8	9	10	11	12
13	CCS/ CSS GLOBE & SWING CHECK VALVES UPTO PRESSURE RATING CLASS #600	I				KRISHNA ELECTRICAL INDUSTRIES LIMITED	GWALIOR	DR			FOR GLOBE VALVES
						KSB PUMPS LTD.,	CHENNAI	DR			FOR GLOBE VALVES
						JCF FLUID FLOW INDIA PVT. LTD.,	CHENNAI	DR			FOR GLOBE VALVES
						KOSO INDIA PRIVATE LIMITED	NASHIK	DR			FOR GLOBE VALVES
						SEVERN GLOCON INDIA PVT LTD	CHENNAI	DR			FOR GLOBE VALVES
						JOSHIJAMPALA ENGINEERING PVT LTD	SATARA	DR			FOR GLOBE VALVES
						DEMBLA VALVES LTD.,	THANE	DR			FOR GLOBE VALVES
						MASCOT VALVES PVT LTD	AHMEDABAD	DR			FOR GLOBE VALVES
						FLOCON SYSTEMS PVT. LTD	GUMMIDIPOONDI	DR			FOR SWING CHECK VALVES
						FOURESS ENGG. (I) PVT. LTD.,	BENGALURU	DR			FOR GLOBE & SWING CHECK VALVES
						L & T VALVES LIMITED	CHENNAI	DR			FOR SWING CHECK VALVES
						INTERVALVE POONAWALLA LTD	CHENNAI	DR			FOR SWING CHECK VALVES
						WEIR BDK VALVES	HUBLI	A			FOR GLOBE & SWING CHECK VALVES
						WEIR BDK VALVES	VELACHERY, CHENNAI	DR			FOR SWING CHECK VALVES
						SIGMA INDUSTRIES	NAVI MUMBAI	DR			FOR GLOBE & SWING CHECK VALVES
						BRAY CONTROLS INDIA PRIVATE LIMITED	DIST-VADODARA	DR			FOR SWING CHECK VALVES
14	PR/ VACCUUM RELIEF VALVES OF PRESSURE RATING CLASS #150	III				LEADER VALVES LIMITED	JALANDHAR	A			
						VARUNA ENGG CO.,	JALANDHAR	DR			
						M/S BROSCO VALVES PVT LTD	NAVI MUMBAI	DR			
15	MS PIPES (BLACK/ GI) IS:1239 & IS:3589	I				UI PIPE FITTINGS PVT. LTD	HYDERABAD	DR			
						TUBE PRODUCTS INCORPORATE	BARODA	DR			
						HARDWARE & MILL STORES	VELLORE	DR			
						RELIABLE SUPPLY AGENCY	CHENNAI	DR			
						UNIVERSAL HARDWARE MART,	CHENNAI	DR			
						HINDUSTHAN PIPE FITTING CO.,	CHENNAI	DR			
						ALLIANCE PIPES & FITTINGS	MUMBAI	DR			
						RELIABLE HARDWARE SYNDICATE	CHENNAI	DR			
						UNIVERSAL PIPE DISTRIBUTO	CHENNAI	DR			
16	CI PIPES & FITTINGS	II				ELECTROSTEEL	CHENNAI	A			CI SPUN PIPES (SOCKET & SPIGOT TYPE UPTO 1000 NB
						KAPILANSH DHATU UDYOG	NAGPUR	A			CI SPUN PIPE (SOCKET & SPIGOT TYPE) UPTO 300NB AND CLASS

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Annex-I		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR APPROVAL					DOC. NO.	CS-0260-132G-2			NTPC	
PROJECT : NTECL VALLUR TPP (3X600MW)							Revision No.	0				
PACKAGE : ULTRAFILTRATION PLANT PKG							Date	12.10.2016- 24.10.2016				
MAIN CONTRACTOR : M/S. BHEL							PAGE					
CONTRACT NO: CS-0260-132G-2							Place	SC APPL. Status/ Cat			Remark	
Sr. No	Item	QP/ INSP CAT	QP NO			Proposed Sub Supplier						
1	2	3	4	5	6	7	8	9	10	11	12	
						BALAJI FIBER REINFORCE PVT LTD	VADODARA	DR				
						EPP COMPOSITES PRIVATE LIMITED	RAJKOT	A				UPTO 900MM SIZE
						REINHOLD POLY GLASS	HOSUR	DR				
						CHEMICAL PROCESS PIPING PVT LIMITED	MUMBAI	DR				
20	HDPE PIPES SIZE UPTO 800MM	I				MODERN FABRICATORS AND SPAN CORPORATION	KASTURIBAI NAGAR ADYAR, C	DR				
						JAIN IRRIGATION SYSTEMS LTD	CHENNAI	DR				
						GODAVARI POLYMERS PVT LTD	CHENNAI	DR				
						HASTI PIPES LTD.	AKOLA	DR				
						AEROCHEM PIPING P. LTD	AHMEDABAD	DR				
21	PP & PTFE LINED PIPES / FITTINGS / SPOOLS	III				MAIN CONTRACTOR APPROVED SOURCES		NOTED				PIPES SHALL BE TAKEN FROM NTPC APPD SOURCES
22	PIPE FABRICATION (PIPE TO PIPE AND PIPE TO FLANGE WELDING)- CS/SS	III				MAIN CONTRACTOR APPROVED SOURCES		NOTED				PIPES SHALL BE TAKEN FROM NTPC APPD SOURCES.
23	RUBBER LINING OF TANKS/ VESSELS/ PIPES/ VALVES	I				CORI ENGINEERS	CHENNAI	A				
						WESTERN RUBBER	MUMBAI	A				
						ELASTOMER LINING	AMBERNATH	A				
						EMKAY RUBBER	MUMBAI	A				
						RISHI	BAHALGARH	A				
						POLY RUBBER	MUMBAI	A				
						TEMSEC RUBBER	KOLKATA	A				
						INDUSTRIAL LINING	VADODARA	A				
						PRESIDENCY RUBBER	HOWRAH	A				
24	STRAINER BASKET TYPE	I				PARAMOUNT LTD	VADODARA	DR				
						HYDROTHERMS.	BENGALURU	DR				
						BHATIA ENGG. COMPANY	DELHI	DR				
						CHAMPIONS FILTERS MANUFACTURING COMPANY,	CHITTOOR DISTRICT A.P	DR				
25	SELF-CLEANING STRAINER	I				AMAD	MUMBAI	DR				
						HYDAC	UK	DR				
						ARKAL	MUMBAI	DR				
						AZUD	HARYANA	DR				
26	UF MEMBRANE	I				GE India Pvt Limited	Banglore	DR				SUBJECT TO SUB-QR CLEARANCE ENGINEERING. FROM
						Dow Chemicals	Vikroli(Mumbai)	DR				
						Hydranetics	Mumbai	DR				
						Koch Membrane System	USA	DR				
						Hyflux Engineering India Pvt. Limited	Chennai	DR				
						X Flow BV	NETHERLANDS	A				
27	FRP TANKS	I				COSMO PLAST	MADURAI	DR				
						MODERN ENGINEERING PLASTICS PV	SALEM	DR				

Annex-I			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR				DOC. NO.		CS-0260-132G-2			
PROJECT : NTECL VALLUR TPP (3X600MW)			APPROVAL				Revision No.		0			
PACKAGE : ULTRAFILTRATION PLANT PKG							Date		12.10.2016- 24.10.2016			
MAIN CONTRACTOR : M/S. BHEL							PAGE					
CONTRACT NO: CS-0260-132G-2							Place		SC APPL.		Remark	
Sr. No	Item	QP/ INSP CAT	QP NO			Proposed Sub Supplier		Status/ Cat				
1	2	3	4	5	6	7	8	9	10	11	12	
						DAKLE REINFORCED PLASTICS PVT LTD	VAPI	DR				
						SHRIRAM SEPL COMPOSITES PVT LTD	MARSHALL'S ROAD, EGMORE, C	A				DIAMETER UPTO 1.2M & HEIGHT UPTO 2.3M.
						CREATIVE COMPOSITES		DR				
						BALAJI FIBER REINFORCE PVT LTD	VADODARA	DR				
						EPP COMPOSITES PRIVATE LIMITED	RAJKOT	DR				
						REINHOLD POLY GLASS	HOSUR	DR				
						CHEMICAL PROCESS PIPING PVT LTD	MUMBAI	DR				
28	AIR BLOWERS (LOBE TYPE)	I				ITO ENGINEERING CO.LTD.,	JAPAN 424-0923	DR				
						EURO ENTERPRISES LTD	BARODA	DR				
						SWAM PNEUMATICS	NOIDA	A				
						CB DOCTOR VENTILATORS PVT LTD	COIMBATORE	DR				
						PATELS AIRFLOW LTD.	AHMEDABAD	DR				
						NADI TECHNOLOGIES PVT LTD.,	CHENNAI	DR				
						VACUNAIR ENGG. CO. PVT. LTD	AHMEDABAD	DR				
						DRAFT AIR INDIA PVT LTD	AHMEDABAD	DR				
						AIR CONTROL & CHEMICAL ENGINEERING CO.LTD	AHMEDABAD	DR				
						C DOCTOR & COMPANY PVT LTD	COIMBATORE	DR				
						INDUSTRIAL SYSTEMS & EQUIPMENT	CHENNAI	DR				
29	VENTILATION FANS (AXIAL FANS)	I				MARATHON ELECTRIC	KOLKATA	A				
						DUVENT	BANGALORE	A				
						FLAKT	KOLKATA	A				
						S K SYSTEM	DELHI	A				
						ALMONARD	CHENNAI	A				
						TCF NADI	CHENNAI	A				
						SOLYVENT FLAKT	KOLKATA	A				
						KHAITAN	KOLKATA	A				
						C B DOCTOR	AHMEDABAD	A				
30	EXHAUST FAN	III				ALSTOM	KOLKATA	A				
						KHAITAN ELECTRICALS	KOLKATA	A				
31	ELECTRIC HOIST UPTO 5T	II				LIFTING EQUIPMENTS & ACCESSORIES LTD	NEW DELHI	A				
		I				POWER BUILD LTD	CHENNAI	DR				
		I				TRACTEL TIRFOR INDIA (P) LTD.	CHENNAI	DR				
		I				UNIVERSAL HOIST-O-FABRIK	MUMBAI	DR				
		I				BRADY & MORRIS ENGG.CO.LTD	CHENNAI	DR				
		II				ARMSEL MHE PVT LTD	BENGALURU	A				
		II				CONSOLIDATED HOIST(P) LTD	PUNE	A				
		I				DYNAMTECH CRANES PVT LTD	THANE	DR				
		I				STELLAS EQUIPMENT PVT LTD	CHENNAI	DR				
32	PP ACID/ ALKALI UNLOADING PUMPS	I				ANTICOROSIVE	MUMBAI	A				
		I				POLY PUMP INDUSTRIES	BEHRAMPUR	DR				
		I				S J INDUSTRIES	CHENNAI	DR				

Annex-I											
PROJECT : NTECL VALLUR TPP (3X500MW)			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB CONTRACTOR				DOC. NO.		CS-0260-132G-2		
PACKAGE : ULTRAFILTRATION PLANT PKG			APPROVAL				Revision No.		0		
MAIN CONTRACTOR : M/S. BHEL							Date		12.10.2016- 24.10.2016		
CONTRACT NO: CS-0260-132G-2							PAGE				
Sr. No	Item	QP/ INSP CAT	QP NO			Proposed Sub Supplier	Place	SC APPL Status/ Cat			Remark
1	2	3	4	5	6	7	8	9	10	11	12
		I				JEE PUMPS	AHMEDABAD	DR			
33	AGITATORS/ MIXERS	II				MAIN CONTRACTOR APPROVED SOURCES		NOTED			
34	MS/ CS/ SS PIPE FITTINGS (WELDED/ SEAMLESS/ FORGED) , MS/ CS/ SS FLANGES (PLATE/ FORGED), ACTIVATED CARBON, UF SKID FABRICATION, VESSEL INTERNALS, HOSE PIPE, VICTAULIC COUPLING, PP STRAINERS, NEEDLE VALVES FOR INSTRUMENT ISOLATION, UPVC/ CPVC	III				MAIN CONTRACTOR APPROVED SOURCES		NOTED			
35	SAFETY SHOWER	III				BIS APPROVED SOURCES		A			
36	FQP FOR MATERIAL RECEIPT & STORAGE	FQP				MAIN CONTRACTOR AT SITE					
37	FQP FOR MATERIAL ERECTION	FQP				MAIN CONTRACTOR AT SITE					
LEGEND A - FOR THESE ITEMS PROPOSED VENDOR IS ACCEPTABLE TO NTPC. DR : FOR THESE ITEMS DETAILS ARE REQUIRED FOR NTPC REVIEW. NOTED: FOR THESE ITEMS VENDOR ARE APPROVED BY MAIN SUPPLIER AND ARE BEING ACCEPTED BY NTPC WITHOUT SPECIFIC VENDOR APPROVAL. 2. QP / INSPECTION CATEGORY: CAT I: For these items the quality plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC. CAT II: For these items the quality plans are approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis of review of document as per approved QP. CAT III: For these items, final acceptance by NTPC shall be on the basis of certificate of conformance by the main supplier. UNITS / WORKS: Place of Manufacturing, Place of Main Supplier of Multy units/works.											

(Signature)
Dypte

(Signature)
Hilak Raj

(Signature)
Ajay Kumar
(BHEL)

Project :Vallur NTECL (3 x500 MW)				ELECTRICAL ITEMS				Doc No	:	0260-132G-QOE-R0
Package :Ultrafiltration Plant				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL				Rev No	:	0
Supplier :BHEL								Date	:	26.10.2016
Contract No.: CS-0260-132G								Page	:	1 of 12
Sl No	ITEM	QP / Insp. Cat.	QP No: 0260-132G-QVE-	QP Sub. Sch.	QP approval Sch.	Proposed sub-supplier	Place	Sub-Supplier approval status / category	Sub-supplier Details submission sch	Remark
1	LT (415 V) Motors (Refer Note: 1)	Refer Note: 2	Q-001			CGL	AHMEDNAGAR	A		
						SIEMENS	MUMBAI	A		
						JYOTI	BARODA	A		
						BHARAT BIJLEE	NAVI MUMBAI	A		Upto 690 V, 500 KW for Inverter Duty & upto 415V, 200 KW for Non-Inverter Duty
						ABB	FARIDABAD	A		UPTO 55KW
						ABB	BANGALORE	A		55KW – 200KW
						NGEF	BANGALORE	A		UPTO 15KW
						KEC	BANGALORE	A		
						KEC	HUBLI	A		UPTO 90KW
						LHP	SOLAPUR	A		UPTO 120KW
						MARATHON	KOLKATA	A		
						Hindustan Motor	Mumbai	DR		
						CROMPTON GREAVES LIMITED	CHENNAI	DR		
						KIRLOSKAR ELECTRIC CO. LTD.,	CHENNAI	DR		
						POWER HOUSE	CHENNAI	DR		
						BHEL ELECTRICAL MACHINES LTD.,	KASARAGOD	DR		
						BHARAT BULEE LIMITED	CHENNAI	DR		
						ABB LIMITED	CHENNAI	DR		
2	LT Switchgear	I	Q-002			L&T	Mumbai / Colmbatore/Ahmednagar	A		
						GE	Bangalore	A		
						Siemens	Mumbai	A		
						C&S Electric	Noida / Haridwar	A		
						Schneider	Nasik	A		ACB from Schneider, France
						Unilec	Gurgaon	A		ACB from NTPC approved sources
						Siemens	Kalwa	A		
						BHEL	Bangalore	DR		

26/10/16
(H. Shekhar)

26/10/16
Ajay Kumar
BHEL
(Tarak 2-j)
RHEL

	Project :Vallur NTECL (3 x500 MW)			ELECTRICAL ITEMS				Doc No	:	0260-132G-QOE-R0
	Package :Ultrafiltration Plant			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL				Rev No	:	0
	Supplier :BHEL							Date	:	26.10.2016
	Contract No.: CS-0260-132G							Page	:	2 of 12
Sl No	ITEM	QP / Insp. Cat.	QP No: 0260-132G-QVE-	QP Sub. Sch.	QP approval Sch.	Proposed sub-supplier	Place	Sub-Supplier approval status / category	Sub-supplier Details submission sch	Remark
3	LT VFD	I	Q-003			DANFOSS	Oragadam	A		(upto 415V, 11kW), VFD drives with VFD sourced from Danfoss-Denmark/USA and Panel sourced from Rittal
						YASKAWA	Japan	A		VFD from Yasakawa- Japan, Upto 415V, 132KW
						ROCKWELL AUTOMATION-AB	SAHIBABAD	A		VFD from Rockwell(Allen Bradley)- USA, (Upto 415 V, 600 KW)
						ABB	BANGALORE	A		VFD from ABB-Finland, Upto 690V, 750 KW
						SIEMENS	NASIK	A		VFD from SIEMENS- Germany, Upto 690V,900KW
						VACON	BANGALORE	A		VFD(NXP model) from VACON Finland, upto 400KW,415V and upto 900KW, 690V
						SCHNEIDER ELECTRIC INDIA PVT LTD	Bangalore	A		VFD from Schnider France upto 415V 160 KW
						ABB LIMITED	CHENNAI	DR		
						SIEMENS INDIA LTD	CHENNAI	DR		
						SCHNEIDER ELECTRIC INDIA PVT LTD	NASIK	DR		
						BHARAT HEAVY ELECTRICALS LIMITED	BENGALURU	DR		
						SUN INDUSTRIAL AUTOMATION & SOLUTIONS	CHENNAI	DR		
						ROCKWELL AUTOMATION INDIA PVT LTD	CHENNAI	DR		
						EURO PROCESS AUOMATIK	CHENNAI	DR		
						TREND ELECTRIC CO.	CHENNAI	DR		
4	Enclosure / Panel for LT VFD	III				Rittal	Bangalore	A		
						Pyrotech	Udaipur	A		
						C&S Electric	Noida/Hardwar	A		
						Positronics	Vadodara	A		

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Project :Vallur NTECL (3 x500 MW)				ELECTRICAL ITEMS				Doc No	:	0260-132G-QOE-R0
Package :Ultrafiltration Plant				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL				Rev No	:	0
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5	LT Oil filled transformer	I	Q-004			BHEL	Bhopal	A		up to 400 kV Class
						Toshiba	Hyderabad	A		up to 400 kV Class
						Technical Associates	Sitarganj	A		
						ABB	Vadodara	A		up to 400 kV Class
						EMCO	Thane	A		up to 400 kV Class
						EMCO	UMALA	A		Upto 2 MV 33 KV
						BHEL	Jhansi	A		up to 220 kV Class
						Schneider	Vadodara	A		up to 50 MVA, 132 kV Class
						T&R	Ahmedabad	A		up to 16 MVA, 132 kV Class
						Kanohar	Merrut	A		up to 16 MVA, 132 kV Class
						EMCO	Jaigaon	A		up to 16 MVA, 132 kV Class
						Kirloskar	Mysore	A		up to 16 MVA, 33 kV Class
						Andrew Yule	Chennai	A		up to 10 MVA, 33 kV Class
						Tesla (unit-2)	Bhopal	A		up to 5.0 MVA, 33 kV Class
						Indotech Transformers	Chennai	A		up to 16 MVA, 11 kV Class
						PETE	Hyderabad	A		up to 10 MVA, 33 kV Class
						CGL	Malanpur	A		up to 3.5 MVA, 11 kV Class
						ECE	Sonepat	A		up to 4.0 MVA, 11 kV Class
						Voltamp	Savli	A		up to 3.5 MVA, 33 kV Class
						Kirloskar	Pune	A		up to 2.0 MVA, 33 kV Class
						RAYCHEM RPG	Pune	A		Up to 5 MVA, 33 kV Class
						Esennar	Medak	A		Up to 16 MVA, 66 kV Class
						BHARAT BIJLEE LTD.,	MUMBAI	DR		
						BHARAT BIJLEE LIMITED	CHENNAI	DR		
						CROMPTON GREAVES Ltd	CHENNAI	DR		
						KARNATAKA VIDUYUTH KARKHARE	BENGALURU	DR		
						THANE ELECTRIC SUPPLY CO LTD.,	SECUNDERABAD	DR		
						RIMA TRANSFORMERS & CONDUCTORS PVT LTD	BANGALORE	DR		

Project :Vallur NTECL (3 x500 MW)				ELECTRICAL ITEMS				Doc No	:	0260-132G-QOE-R0
Package :Ultrafiltration Plant				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL				Rev No	:	0
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6	Dry Type Transformer	I	Q-005			ABB	Savli	A		up to 8 MVA, 24 kV Class
						Raychem	Pune	A		Up to 2.5 MVA, 33 kV Class
						Toshiba	Hyderabad	A		Up to 2.0 MVA, 33 kV Class
						BHEL	Jhansi	A		Up to 6.3 MVA, 33 kV Class
						Kirloskar	Pune	A		Up to 4.0 MVA, 33 kV Class
						Voltamp	Savli	A		Upto 2.5 MVA, 0.433/11kV Class
7	Junction Boxes (GI)	III	*			Main contractor approved sources subject to galvanization at NTPC approved sources as per Note-7		A		
8	Lighting poles	III				BIS Licensee as per IS 2713		A		
9	Lighting fixtures with accessories including lamp (Filament type)	Refer Note5	Q-006			Crompton	Mumbai	A		
						Bajaj Electricals	Mumbai	A		
						Philips	Noida	A		
						Wipro	Mumbai	A		
						CROMPTON GREAVES LTD	CHENNAI	DR		
						HAVELLS INDIA LTD.	CHENNAI	DR		
						PHILIPS INDIA LTD	CHENNAI	DR		
						BAJAJ ELECTRICALS LTD	CHENNAI	DR		
						WIPRO CONSUMER CARE & LIGHTING	CHENNAI	DR		
						SPACE AGE SWITCH GEARS LTD	GURGAON	DR		
						SQUARE A ENTERPRISES	HYDERABAD	DR		
						MIKA ENGINEERS	MUMBAI	DR		

	Project :Vallur NTECL (3 x500 MW)			ELECTRICAL ITEMS				Doc No	:	0260-132G-QOE-R0
	Package :Ultrafiltration Plant			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL				Rev No	:	0
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10	Lighting fixtures with accessories including lamp (LED type)	Refer Note: 5	Q-007			Wipro	Pune	A		Conditions apply
						Surya Roshni	Noida	A		
						Bajaj	Mumbai	A		
						CROMPTON GREAVES LIMITED	CHENNAI	DR		
						HAVELLS INDIA LTD.	CHENNAI	DR		
						PHILIPS INDIA LTD	CHENNAI	DR		
						BAJAJ ELECTRICALS LIMITED,	CHENNAI	DR		
						WIPRO CONSUMER CARE & LIGHTING	CHENNAI	DR		
						SPACE AGE SWITCH GEARS LTD	GURGAON	DR		
						SQUARE A ENTERPRISES	HYDERABAD	DR		
						MIKA ENGINEERS	MUMBAI	DR		
11	LT Busduct	I	Q-008			C&S Electric	G.Noida	A		
						Unilec	Gurgaon	A		Upto 3200 Amp
						KGS Engg Ltd	Chennai	A		
						Spaceage Swgr Ltd	Bawal	A		
						REEP	Chennai	A		
						Enpro	Chennai	A		
						Jasper Engg Ltd	Noida	A		With Copper flexible

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Project :Vallur NTECL (3 x500 MW) Package :Ultrafiltration Plant Supplier :BHEL Contract No.: CS-0260-132G				ELECTRICAL ITEMS				Doc No	:	0260-132G-QOE-R0
				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL				Rev No	:	0
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12	1.1 KV Power cable (PVC & XLPE) & 1.1 KV Control Cable	Refer Note: 4	Q-009			Universal Cable Ltd.	Satna	A		
						NICCO	Sharnagar, Kolkata	A		
						Torrent Cable Ltd	Nadiad	A		
						Incab	Pune	A		
						Hindustan Vidyut Products	Faridabad	A		
						KEI Industries	Bhiwadi	A		
						Delton Cable Ltd	Faridabad	A		
						Paramount Cable	Khushkhara	A		
						Polycab Wires Pvt. Ltd	Daman	A		
						Gemscabs Industries	Bhiwadi	A		
						Cords Cables	Bhiwadi	A		
						Havells India Ltd.	Alwar	A		
						Sri ram Cables	Bhiwadi	A		
						Ravin Cables	Pune	A		
						Thermocables	Hyderabad	A		
						Sbee Cables	Bangalore	A		
						Suyog Cables	Vadodara	A		
						Gupta Power Cables	Khurda	A		
						Finolex	Pune	A		
						Scot Innovation wires & cables	Baddi	A		
						SPM Cables	Hyderabad	A		
						R.R. Kabel	Silvassa	A		
						Elkay Telelink	Faridabad	A		
						Radiant Cables	Hyderabad	A		
						KEC INTERNATIONAL LTD,	MUMBAI	DR		
						KEC INTERNATIONAL LTD	CHENNAI	DR		
						C M I LTD.	FARIDABAD	A		FOR CONTROL CABLE ONLY
						POLYCAB WIRES PVT LTD	MUMBAI	DR		
						POLYCAB WIRES PVT LTD	CHENNAI	DR		
						GOYOLINE FIBRE (I) PVT LTD	MUMBAI	DR		
						KRISHNA ELECTRICAL INDUSTRIES LIMITED	GWALIOR	DR		

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	Project :Vallur NTECL (3 x500 MW)			ELECTRICAL ITEMS				Doc No	:	0260-132G-QOE-R0
	Package :Ultrafiltration Plant			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL				Rev No	:	0
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						ASSOCIATED CABLES PVT LTD	MUMBAI	DR		
						RAVIN CABLES LTD	MUMBAI	DR		
						GLOSTER CABLES LIMITED	SECUNDERABAD	DR		
						HAVELLS INDIA LIMITED	NOIDA	DR		
						ADVANCE CABLE TECHNOLOGIES (P) LTD	BENGALURU	A		
						IMT CABLES PVT LTD	NEW DELHI	DR		
						EPSILON CABLES PVT LTD	NAGPUR	DR		
						SPECIAL CABLES PVT LTD	NEW DELHI	DR		
						GOVIND CABLE INDUSTRIES	KOLKATA	DR		
						APAR INDUSTRIES LTD	BENGALURU	DR		
						T C COMMUNICATION PVT LTD	DELHI	DR		
						FORTUNEART WIRES & CABLES PVT LTD	SECUNDERABAD	DR		
						PRIME CABLE INDUSTRIES	DELHI	DR		
						INDO ALUSYS INDUSTRIES LTD	NEW DELHI	DR		
						ICON CABLES LTD	NEW DELHI	DR		
						ICON CABLES LTD	ALWAR	DR		
						SHYAM CABLE INDUSTRIES	NOIDA	DR		
						N.C.CABLES LIMITED	NEW DELHI	DR		
						SRIRAM CABLES PVT LTD	DELHI	DR		
						PAGODA CABLES PVT LTD	NOIDA	DR		
						SRINI LINK	VALSAD DIST	DR		
						STEP INDUSTRIES PVT LTD	ALWAR DISTRICT	DR		
						SPM Power & TELECOM PVT LTD	Hyderabad	DR		

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Project :Vallur NTECL (3 x500 MW) Package :Ultrafiltration Plant Supplier :BHEL Contract No.: CS-0260-132G				ELECTRICAL ITEMS				Doc No	:	0260-132G-QOE-R0
				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL				Rev No	:	0
								Date	:	26.10.2016
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SI No	ITEM	QP / Insp. Cat.	QP No: 0260-132G-QVE-	QP Sub. Sch.	QP approval Sch.	Proposed sub-supplier	Place	Sub-Supplier approval status / category	Sub-supplier Details submission sch	Remark
13	CABLE TRAY FLEXIBLE SUPPORT SYSTEM	Refer Note: 3 & 7	Q-010			Ratan Engg.	Kolkata	A		Galvanising at Sigma Mumbai
						Inar profiles	Enkapalli	A		
						Industrial perforations	Kolkata	A		
						Premier power products	Kolkata	A		
						Indiana gratings	Pune	A		
						Amtech	Pune	A		Galvanising at Poona Galvaniser
14	GI CABLE TRAYS	Refer Note: 3 & 7	Q-011			Inar Profiles Ltd	Ankapalli (Vizag)	A		
						Vatco	Mumbai	A		Galvanization at Sigma Mumbai
						Indiana cable trays	Mumbai	A		Galvanization at Karamtara galvaniser
						Industrial Perforation	Kolkata	A		
						Ratan Engineering	Kolkata	A		Galvanization at BP Projects
						India Electric Syndicate	Kolkata	A		Galvanization at BMW Industries/B.P Projects
						Premier Power Products	Kolkata	A		Galvanising at Neha Galvaniser
						Indiana Gratings	Pune	A		Galvanization at Poona Galvanizer
						M.J. Engineering	Okhla/ Bhiwadi	A		
						Jamna Metal	Delhi/ Kundli	A		
						T.R.G	Chennai	A		Galvanization at TM Radhakrishna Chetty & Co
						Amtech	Pune	A		Galvanization at B.G. Shirke - Pune
						Rukmani	Raipur	A		Ladder type cable trays only
						Passive Infra	Hasangarh (Rohtak)	A		
						Unitech Fabricators & Engineers	Howrah/ Hoogly	A		
						Patny System	Hyderabad	A		Galvanisation at Gurpreet galvaniser - Hyderabad
						Rabi Engg	Kolkata	A		Galvanizing from NTPC approved sources
						Indmarkformtech Pvt Ltd	Pune	A		Galvanizing at B.G.Shirke - Pune
						KANADE ANAND UDYOG	MUMBAI	A		
						CAUVERY ENGINEERING WORKS	PUDUKKOTTAI	DR		
						PRAMMEN INDUSTRIES	PUDUKOTTAI	DR		
						PARMAR METALS PVT LTD	RAJKOT	DR		

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	Project :Vallur NTECL (3 x500 MW)			ELECTRICAL ITEMS				Doc No	:	0260-132G-QOE-R0
	Package :Ultrafiltration Plant			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL				Rev No	:	0
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						RUKMANI ELECTRICAL & COMPONENTS PRIVATE LTD	KOLKATA	DR		
						VINFAB ENGINEERS INDIA PRIVATE LTD	DISTRICT-THANE	DR		
						SILVERLINE POWER INFRASTRUCTURE PVT LTD	VADODARA	DR		
						METALEMMS BOMBAY	THANE WEST	DR		
						NAMDHARI INDUSTRIAL TRADERS PVT LTD	LUDHIANA	DR		
						EROS METAL WORKS P LTD	NAGPUR	DR		
15	HT Cable upto 11kV	I	Q-012			Universal Cable Ltd.	Satna	A		
						NICCO	Sharnagar, Kolkata	A		
						Torrent Cable Ltd	Nadaid	A		
						Incab	Pune	A		
						Polycab Wires Pvt. Ltd	Daman	A		
						KEI Industries	Bhiwadi	A		
						Havells India Ltd.	Alwar	A		
						Sri ram Cables	Bhiwadi	A		
						Krishna Electrical Industries Ltd	Gwalior	A		
						Uniflex	Valsad	A		
						Finolex	Pune	A		
						KEC International	Vadodara	A		
						HINDUSTAN VIDYUT PRODUCTS LTD	NEW DELHI	DR		
						SRINI LINK	VALSAD DIST	DR		
16	Local Emergency Push Button Station	Refer Note: 8	Q-013			Main contractor approved sources (with Push Button as per Note: 6)		A		

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Project :Vallur NTECL (3 x500 MW)				ELECTRICAL ITEMS				Doc No	:	0260-132G-QOE-R0
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17	Cable Lugs	III	•			Dowell	Mumbai	A		
						Billets Elektro Werke (3D)	Umbergaon	A		
						Chetna	Nasik	A		
						Additional Vendors with Make-Model having mark as per Note: 5		A		
18	Cable Gland	III	•			Main contractor approved sources		A		
19	Battery	I	Q-014			HBL Power system	Hyderabad	A		
						Amcosoft	Bangalore	A		
						Exide	Kolkata	A		
20	Battery Charger	I	Q-015			Amararaja	Tirupati	A		
						HBL Power system	Hyderabad	A		
						Chhabi Electrical	Jalgaon	A		
						Chloride Power	Kolkatta	A		
						Statcon	Pikhuwa	A		
						Saft Nife Power System	Singapore	A		
						Dubas	Bangalore	A		
						BCH	Faridabad	A		
21	Industrial Receptacles	III	•			Schneider	Nasik	A		
						Shakti & Crown	Chennai	A		
						Ajmera	Mumbai	A		
						BHEL		A		
22	FQP for Electrical Items	I	G-001							

LEGENDS:**1. SYSTEM SUPPLIERS/SUB-SUPPLIERS APPROVAL STATUS CATEGORY(SHALL BE FILLED BY NTPC)**

A-For this items proposed vendor is acceptable to NTPC.To be indicated with letter "A" in the list along with condition of approval,if any

DR-For these items "Details required for NTPC review.To be identified with letter "DR" in the list.

NOTED- For these items vendors are approved by Main Supplier & accepted by NTPC without specific vendor approval from NTPC.To be identified with "NOTED".

2. QP/INSPN CATEGORY

CAT-I :For these items the Quality Plans approved by NTPC & final acceptance will be on physical inspection witness by NTPC

CAT-II :For these items the Quality Plans approved by NTPC.However no physical inspection shall be done by NTPC.The final acceptance by NTPC shall be on basis of review of documents as per approved QP

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Project : Vallur NTECL (3 x500 MW)		ELECTRICAL ITEMS					Doc No	:	0260-132G-QOE-R0	
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CAT-III : For these items Main supplier approves the Quality Plans. The final acceptance by NTPC shall be on basis of certificate of conformance by the main supplier.

* : Control measure of item covered in quality plan of main item.

3. UNITS/WORKS : Place of manufacturing Place of Main Supplier of multi units/works.

NOTES:

Note 1: Relevant certificates shall be submitted for NTPC approval. Approval conditions attached to above identified vendors, as applicable shall be adhered to.

Note 2: For LT Motors:

a) Less than 30 KW: Acceptance of Motor less than 30 KW is based on COC of the manufacturer & the contractor confirming as follows:

It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage & frequency variation, hot start torque, starting KVA/KW, temp. rise, distance between centre of stud & gland plate and tested in accordance with approved drawing /data sheets.

b) For 30 KW to 50KW: Acceptance of Motor rating between 30 KW & 50 KW is based on NTPC review of Routine Test Inspection report as per IS 325 witnessed by main contractor along with COC of manufacturer & the contractor confirming as follows:

It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage & frequency variation, hot start torque, starting KVA/KW, temp. rise, distance between centre of stud & gland plate, space heater and tested in accordance with approved drawing /data sheets.

c) Above 50 KW: as per NTPC approved Quality Plan

Note 3: Category of Inspection for Cable Trays:

For Total Contract Quantity per Size	Category of Inspection
Less than or equal to 1 km	Cat-III - submission of TC & Certificate of Conformance by Main Contractor
Greater than 1 Km & Less than or equal to 5 Km	Cat-II
Greater than 5 Km	Cat-I

TOTAL CONTRACT QUANTITY PER TYPE	CATEGORY OF INSPECTION
LESS THAN EQUAL TO 1KM OF SUPPORT CHANNEL	CAT-III AND SUBMISSION OF TC AND CERTIFICATE OF CONFORMANCE BY MAIN CONTRACTOR
GREATER THAN TO 1KM AND LESS THAN 5 KMS OF SUPPORT CHANNEL	CAT-II
GREATER THAN TO 5KM OF SUPPORT CHANNEL	CAT-I

TOTAL CONTRACT QUANTITY PER SIZE / TYPE	CATEGORY OF INSPECTION
LESS THAN EQUAL TO 500 NOS. OF CANTILEVER ARMS	CAT-III AND SUBMISSION OF TC AND CERTIFICATE OF CONFORMANCE BY MAIN CONTRACTOR
GREATER THAN TO 500 NOS. AND LESS THAN 2500 NOS CANTILEVER ARMS	CAT-II
GREATER THAN TO 2500 NOS. CANTILEVER ARMS	CAT-I

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Project : Vallur NTECL (3 x500 MW)		ELECTRICAL ITEMS				Doc No	:	0260-132G-QOE-R0		
Package : Ultrafiltration Plant		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL				Rev No	:	0		
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Note 4: Category of inspection for LT Cables:

	Category Of Inspection
For Total Contract Quantity per Size	Cat-III - submission of TC & Certificate of Conformance by Main Contractor
Less $\leq$ 1 KM	Cat-II
For cable conductor cross-section area up to 35 mm ² & total quantity $\leq$ 2.5 km per size/type	Cat-I
For cable conductor cross-section area up to 35 mm ² & total quantity $>$ 2.5 km per size/type	Cat-I
For cable conductor cross section area $>$ 35 mm ² & quantity $>$ 1km	Cat-I

Note 5: Cat I: For fixtures $\geq$ 500 nos. per model type, Cat III for fixtures $<$ 500 nos. per model type

Note 6: VDE / CE / UL / CSA Marking Certification preferably from Third Party Agency or BIS Approval Letter shall be submitted for NTPC's Verification /Information.

Note 7: NTPC approved Galvanizers

1. M/s M J Engg, Delhi	8. M/s National Galvanizer, Kolkata	15. M/s Sigma, Mumbai
2. M/s Jamna Metal, Delhi	9. M/s Unistar Galvanizer, Kolkata	16. M/s Radhakrishnan Shetty, Chennai
3. M/s A.V. Engg, Kolkata	10. M/s B.P. Project. Kolkata	17. Karamtara Mumbai
4. M/s Inar Profiles, Vishakapatnam	11. M/s Bajaj Pune	18. Poona Galvanizers Pune
5. M/s Anand Udyog, Mumbai	12. M/s Electrocare Industries, Mumbai	19. Neha Galvanizer- Kolkata
6. M/s Techno Engg, Chandigarh	13. M/s B.G. Shirke, Pune	20. Unitech Fabricators & Galvanizers- Hoogly
7. M/s Steelite Engg, Mumbai	14. M/s Gurpreet Galvanizer, Hyderabad	

Note 8: Category of inspection for Local Emergency Push Button Station:

TOTAL CONTRACT QUANTITY PER SIZE / TYPE	CATEGORY OF INSPECTION
LESS THAN EQUAL TO 50 NOS.	CAT-III AND SUBMISSION OF TC AND CERTIFICATE OF CONFORMANCE BY MAIN CONTRACTOR
GREATER THAN 50 NOS.	CAT-II

		PROJECT : NTECL-VALLUR (3 X 500 MW) PACKAGE: ULTRAFILTRATION PLANT EQUIPEMENT SUPPLIER : BHEL CONT. NO.: CS-0260		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL SUB SYSTEM: C & I		DOC. No. :	
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1	INSTRUMENTATION CABLE (REFER NOTE -1)	*		KEC INTERNATIONAL LTD,	MUMBAI	DR	
		*		KEC INTERNATIONAL LTD	CHENNAI	DR	
		*		C M I LTD.,	FARIDABAD	DR	
		I		DELTON CABLES LIMITED	FARIDABAD	A	PVC, FRLS TYPE
		I		KEI INDUSTRIES LIMITED	BHIWADI	A	PVC, FRLS TYPE
		I		PARAMOUNT COMMUNICATION LTD	KHUSHKERA	A	PVC, FRLS TYPE
		I		POLYCAB WIRES PVT LTD	DAMAN	A	PVC, FRLS TYPE
		I		CORDS CABLE INDUSTRIES LIMITED	BHIWADI / KAHARANI	A	PVC, FRLS TYPE
		I		ELKAY TELELINKS LTD	FARIDABAD	A	PVC, FRLS TYPE
		*		GOYOLENE FIBRE (I) PVT LTD	MUMBAI 40	DR	
		*		TORRENT CABLES LTD	AHMEDABAD	DR	



PROJECT : NTECL-VALLUR (3 X 500 MW)
PACKAGE: ULTRAFILTRATION PLANT
EQUIPEMENT
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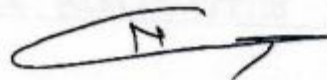
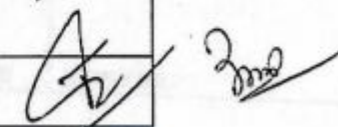
LIST OF ITEMS
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		*		ASSOCIATED CABLES PVT LTD	MUMBAI	DR	
		*		SUYOG ELECTRICALS LTD	BARODA	DR	
		I		THERMO CABLES LIMITED	HYDERABAD	A	PVC, FRLS TYPE
		*		ADVANCE CABLE TECHNOLOGIES (P) LTD	BENGALURU	DR	
		*		IMT CABLES PVT LTD	NEW DELHI	DR	
		I		GUPTA POWER INFRASTRUCTURE LTD	KHURDHA	A	PVC, FRLS TYPE
		*		GEMSCAB INDUSTRIES LIMITED	DELHI	DR	
		*		SPECIAL CABLES PVT LTD	NEW DELHI	DR	
		*		T C COMMUNICATION PVT LTD	DELHI	DR	
		*		SHYAM CABLE INDUSTRIES	NOIDA	DR	
		*		N.C.CABLES LIMITED	NEW DELHI	DR	

		PROJECT : NTECL-VALLUR (3 X 500 MW) PACKAGE: ULTRAFILTRATION PLANT EQUIPEMENT SUPPLIER : BHEL CONT. NO.: CS-0260		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL SUB SYSTEM: C & I		DOC. No. : Revision No. : 00 DATE: 24.10.2016 PAGE : 3 OF 14	
SL.NO.	ITEM	QP/IN SPN CAT	QP NO.	PROPOSED SUPPLIER	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
		*		PAGODA CABLES PVT LTD	NOIDA	DR	
		*		SRINI LINK	VALSAD DIST	DR	
		*		ABB LIMITED	CHENNAI	DR	
	CONDUITS LEAD COATED (FLEXIBLE)	III		PLICA	GHAZIABAD	A	
				BANSAL LABORATORIES	BHOPAL	A	
3	TEMPERATURE TRANSMITTER	III		EMERSON PROCESS MANAGEMENT(INDIA) PVT LTD	PAWANE	A	
		*		HONEYWELL AUTOMATION INDIA LIMITED	CHENNAI	DR	
		III		YOKOGAWA INDIA LIMITED	BANGALORE	A	MAKE-YOKOGAWA JAPAN
		III		ENDRESS + HAUSER (INDIA) PVT LTD	Germany / Aurangabad	A	
		*		FUJI ELECTRICS	CHENNAI	DR	
		*		CHEMTROLS INDUSTRIES. LTD	MUMBAI	DR	

 PROJECT : NTECL-VALLUR (500 MW) PACKAGE: ULTRAFILTRATION PLANT EQUIPEMENT SUPPLIER : BHEL CONT. NO.: CS-0260		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL SUB SYSTEM: C & I		L. No. :			
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NO.	ITEM	QP/IN SPN CAT	QP NO.	PROPOSED SUPPLIER	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
		*		MAGNETROL INSTRUMENTS N.V.		DR	
		*		KROHNE MARSHALL LTD	PUNE	DR	
		*		A N INSTRUMENTS PVT LTD	KOLKATA	DR	
	TEMPERATURE GAUGE	III		H.GURU INSTRUMENTS (S.I) P.LTD	BENGALURU	A	
		*		WAAREE INSTRUMENTS LIMITED/ BAUMER	VAPI	DR	
		III		ASHCROFT INDIA PVT LTD	GANDHINAGAR	A	
		III		GAUGES BOURDON INDIA PVT LTD	PANVEL	A	
		III		FORBES MARSHALL (HYD) PVT. LTD	HYDERABAD	A	
		III		WIKI INSTRUMENTS INDIA PVT. LTD	PUNE	A	
		III		GOA THERMOSTATIC INSTRUMENTS	GOA	A	
		*		A N INSTRUMENTS PVT LTD	KOLKATA	DR	
	PR./ VACCUUM/ DP GAUGES	III		A.N.INSTRUMENTS (P) LTD.,	NARENDRAPUR	A	

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		*		PREMIER INSTRUMENTS & CONTROLS	COIMBATORE	DR	
		III		MANOMETER(INDIA) PVT LTD	MUMBAI	A	
		III		H.GURU INSTRUMENTS (S.I) P.LTD	RISHRA/ MUZAFFARPUR	A	
		*		PYRO ELECTRIC INSTRUEMNTS (GOA) PVT. LTD	GOA	DR	
		III		WALCHANDNAGAR INDUSTRIES LIMITED	WALCHANDNAGAR	A	
		III		GAUGES BOURDON INDIA PVT LTD	PANVEL	A	
		*		NEW SCIENTIFIC REPAIRS & TRADING CO	KOLKATA	DR	
		*		GOA INSTRUMENTS INDUSTRIES PVT LTD	GOA	DR	
		III		BAUMER TECHNOLOGIES INDIA PVT. LTD.,	VAPI	A	
		III				A	
6	INSTRUMENT VALVE	II		BHEL	TRICHY	A	
				EXCEL HYDRO	MUMBAI	A	



PROJECT : NTECL-VALLUR (3 X 500 MW)
PACKAGE: ULTRAFILTRATION PLANT
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				INSTRUMENTATION LTD	PALGHAT	A	
				HP VALVES AND FITTINGS	CHENNAI	A	
				FLUID CONTROL	PUNE	A	
				BALDOTA	MUMBAI	A	
	ELECTRICAL ACTUATOR	II		LIMITORQUE INDIA LIMITED	FARIDABAD	A	
				AUMA (INDIA) PRIVATE LIMITED	BENGALURU	A	
				ROTORK CONTROLS (INDIA) PRIVATE LIMITED	CHENNAI/ BANGALORE	A	
	TEMPERATURE ELEMENT(THERMO COUPLE , RTD & THERMOWELL)	*		EXOTHERM INSTRUMENTS	THANE	DR	
		*		TOSHNIWAL INDUSTRIES PVT LTD	AJMER	DR	
		II		PYRO ELECTRIC INSTRUEMNTS (GOA) PVT. LTD	GOA	A	
		*		GOA INSTRUMENTS INDUSTRIES PVT LTD	GOA	DR	

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 PROJECT : NTECL-VALLUR (3 X 500 MW) PACKAGE: ULTRAFILTRATION PLANT EQUIPEMENT SUPPLIER : BHEL CONT. NO.: CS-0260		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL SUB SYSTEM: C & I		DOC. No. : Revision No. : 00 DATE: 24.10.2016 PAGE : 7 OF 14			
SL.NO.	ITEM	QP/IN SPN CAT	QP NO.	PROPOSED SUPPLIER	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
		*		AAVAD INSTRUMENT	AHMEDABAD	DR	
		*		GAUGES BOURDON INDIA PVT LTD	CHENNAI	DR	
		II		DETRIV INSTN. & ELEC. LTD.,	MUMBAI	A	
		*		TELEVISION & ELECTRONIC SERVIC	CHENNAI	DR	
		*		SERTEL ELECTRONICS (P) LTD	CHENNAI	DR	
		*		BAUMER TECHNOLOGIES INDIA PVT LTD.,	CHENNAI	DR	
		*		BAUMER TECHNOLOGIES INDIA PVT. LTD.,	VAPI	DR	
		II		THERMAL INSTRUMENT INDIA PVT LTD	SAWANTVADI	A	
		II		TEMPSSENS INSTRUMENTS (I) PVT. LTD.,	UDAIPUR	A	
		*		WALCHANDNAGAR INDUSTRIES LIMITED	DHARWAD	DR	
9	VALVE MANIFOLDS	II		HP VALVES & FITTINGS INDIA PVT LTD	CHENNAI	A	
				ASTECH	MUMBAI	A	
				FLUID CONTROL	PUNE	A	



PROJECT : NTECL-VALLUR (3 X 500 MW)
PACKAGE: ULTRAFILTRATION PLANT
EQUIPEMENT
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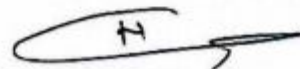
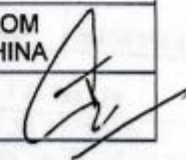
LIST OF ITEMS
REQUIRING QUALITY
PLAN AND SUB-
SUPPLIER APPROVAL
SUB SYSTEM: C & I

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NO.	ITEM	QP/IN SPN CAT	QP NO.	PROPOSED SUPPLIER	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
				MICRO PRECISION	FARIDABAD	A	
				EXCEL HYDRO	MUMBAI	A	
				BALDOTA	MUMBAI	A	
	DOUBLE COMPRESSION FITTINGS(SS)	*		HARDWARE & MILL STORES	VELLORE	DR	
		*		HYDRO PNEUMATIC ACCESSORIES	CHENNAI	DR	
		*		HINDUSTHAN PIPE FITTING CO.,	CHENNAI	DR	
		*		INTERNATIONAL TRADING	CHENNAI	DR	
		*		THE CENTRAL HARDWARE STORES,	CHENNAI	DR	
		*		ABB LIMITED	CHENNAI	DR	
	PLC SYSTEM	*		SIEMENS INDIA LTD	CHENNAI	DR	
		*		SCHNEIDER ELECTRIC INDIA PVT LTD	NASIK	DR	

		PROJECT : NTECL-VALLUR (3 X 500 MW) PACKAGE: ULTRAFILTRATION PLANT EQUIPEMENT SUPPLIER : BHEL CONT. NO.: CS-0260		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL SUB SYSTEM: C & I		DOC. No. : Revision No. : 00 DATE: 24.10.2016 PAGE : 9 OF 14	
SL.NO.	ITEM	QP/IN SPN CAT	QP NO.	PROPOSED SUPPLIER	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
		I		GE INTELLIGENT PLATFORMS PRIVATE LIMITED	BENGALURU	A	
		*		HONEYWELL AUTOMATION INDIA LIMITED	CHENNAI	DR	
		*		ROCKWELL AUTOMATION INDIA PVT LTD	CHENNAI	DR	
12	NI-CD BATTERY	I		HBL Power system	Hyderabad	A	
				Amcosoft	Bangalore	A	
13	PRESSURE TRANSMITTER (PRESSURE, DP, FLOW, LEVEL APPLICATION)	III		ABB LIMITED	BANGALORE	A	MODEL-2600T SERIES
		III		EMERSON (Rosemount)	USA / PAWANE	A	
		III		HONEYWELL AUTOMATION INDIA LIMITED	USA / PUNE	A	
		III		YOKOGAWA INDIA LIMITED	BANGALORE	A	MODEL EJA-E 110,410,530 SERIES
		III		FUJI ELECTRICS	FRANCE	A	
		*		VEGA INDIA LEVEL AND PRESSURE MEASUREMENT PVT LTD	PUNE	DR	
		*		ENDRESS + HAUSER (INDIA) PVT LTD	CHENNAI	DR	
		III		SIEMENS	FRANCE / KALWA	A	

 PROJECT : NTECL-VALLUR (3 x 500 MW) PACKAGE: ULTRAFILTRATION PLANT EQUIPEMENT SUPPLIER : BHEL CONT. NO.: CS-0260		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL SUB SYSTEM: C & I				Doc. No. :	
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						PAGE : 10 OF 14	
O.	ITEM	QP/IN SPN CAT	QP NO.	PROPOSED SUPPLIER	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
	FIBRE OPTIC CABLE	II		FINOLEX	PUNE / GOA	A	
				BIRLA ERICSON	REWA	A	
				AKSH FIBRE	BHIWADI	A	
				R&M	SWITZERLAND	A	
				HFCL	GOA	A	
	UPS SYSTEM/ACDB	I		FUJI ELECTRIC	JAPAN	A	
				EMERSON	AMBERNATH	A	Approved up to 150 kVA, 1Φ
				EMERSON(DB POWER)	PUNE	A	Approved up to 120 kVA, 1Φ
				HITACHI - HIREL	GANDHINAGAR	A	Approved up to 120 Kva, 1Φ
	INTELLIGENT BATTERY CHARGER 24 V DC & DCDB WITH BHMS	I		CHABBI ELECTRICALS	JALGOAN	A	MODULES FROM EMERSON
				ELTEK	GURGOAN	A	MODULES FROM ELTEK
				MASTECH	JALGOAN	A	MODULES FROM ELTEK
				EMERSON	AMBERNATH	A	MODULES FROM EMERSON-CHINA
		*		INFOS INDUSTRIES LIMITED	CHENNAI	DR	


SL.NO.		ITEM	QP/IN SPN CAT	QP NO.	PROPOSED SUPPLIER	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
		PROJECT : NTECL-VALLUR (3 X 500 MW) PACKAGE: ULTRAFILTRATION PLANT EQUIPEMENT SUPPLIER : BHEL CONT. NO.: CS-0260			LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL SUB SYSTEM: C & I		DOC. No. : Revision No. : 00 DATE: 24.10.2016 PAGE : 11 OF 14	
17	PRESSURE/DP SWITCH	II			TRAFAG CONTROLS INDIA PVT. LTD	GURAGAON	A	Up to 40kg/cm2 & not for Compound Switch
		II			SWITZER PNEUMATICS PVT LIMITED	CHENNAI	A	Up to 40kg/cm2 & not for Compound Switch and except 900 series
		*			BAUMER TECHNOLOGIES INDIA PVT LTD.,	CHENNAI	DR	
		II			BAUMER TECHNOLOGIES INDIA PVT. LTD.,	VAPI	A	
		II			SWITZER PROCESS INSTRUMENTS PRIVATE LIMITED	GHAZIABAD	A	Up to 40kg/cm2 & no for Compound Switch
		II			GAUGES BOURDON INDIA PVT LTD	PANVEL	A	
		II			SWITZER PROCESS INST	CHENNAI	A	up to 200 Deg. C
18	TEMPERATURE SWITCH	II			TRAFAG	GURGAON	A	up to 200 Deg. C
		II			SWITZER PROCESS INST	GHAZIABAD	A	up to 200 Deg. C
		II			ASHCROFT	GHANDHINAGAR	A	
		II			D.K. INSTRUMENTS PRIVATE LIMITED	KOLKATA	A	
19	FLOW SWITCH	III			LEVCON INSTRUMENTS PVT. LTD	KOLKATA	A	
		III			SWITZER PROCESS INSTRUMENTS PRIVATE LIMITED	CHENNAI	A	
		III			RODINE MARSHALL LTD	PUNE	A	
		III						

C	PROJECT : NTECL-VALLUR (3 X 500 MW)		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL SUB SYSTEM: C & I		DOC. No. :		
	PACKAGE: ULTRAFILTRATION PLANT				Revision No. : 00		
	EQUIPEMENT				DATE: 24.10.2016		
	SUPPLIER : BHEL				PAGE : 12 OF 14		
CONT. NO.: CS-0260							
ITEM	QP/IN SPN CAT	QP NO.	PROPOSED SUPPLIER	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS	
	*		UNIVERSAL FLOW MONITORS INC		DR		
	*		ROJARAM CONSULTANTS	CHENNAI	DR		
	*		BAUMER TECHNOLOGIES INDIA PVT LTD.,	CHENNAI	DR		
LEVEL SWICH (FLOAT/DISPLACER TYPE)	III		LEVCON INSTRUMENTS PVT. LTD	KOLKATA	A		
			SBEM PVT LTD	PUNE	A		
			PUNE TECHTROL PVT LTD.,	PUNE	A		
			V.AUTOMAT AND INSTRUMENTS (P) LTD	NEW DELHI	A		
RESIDUAL CHLORINE ANALYSER	III		E & H	GERMANY	A		
			EMERSON PROCESS	PAWANE	A		
			HACH	USA	A		
PH/CONDUCTIVITY ANALYSER	III		ABB LIMITED	UK	A		
	III		EMERSON PROCESS MANAGEMENT(INDIA) PVT LTD	PAWANE	A		
	*		HONEYWELL AUTOMATION INDIA LIMITED	CHENNAI	DR		
	III		YOKOGAWA INDIA LIMITED	JAPAN	A		

		PROJECT : NTECL-VALLUR (3 X 500 MW) PACKAGE: ULTRAFILTRATION PLANT EQUIPEMENT SUPPLIER : BHEL CONT. NO.: CS-0260		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL SUB SYSTEM: C & I		DOC. No. : Revision No. : 00 DATE: 24.10.2016 PAGE : 13 OF 14	
SL.NO.	ITEM	QP/IN SPN CAT	QP NO.	PROPOSED SUPPLIER	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS
23	SILICA ANALYSER	III		HACH COMPANY	USA	A	POLYMETRON BRAND
				HACH COMPANY	SWITZERLAND	A	
				ABB	UK	A	
24	TURBIDITY ANALYSER	III		ABB	UK	A	
				WTW	GERMANY	A	
				HACH	USA	A	
				E & H	GERMANY	A	
				EMERSON	PAWANE	A	
25	ROTAMETER TYPE FLOW INDICATOR	•		FLUIDYNE INSTRUMENTS PVT LTD	MUMBAI	DR	
				INSTRUMENTATION ENGRS. PVT LTD	HYDERABAD	DR	
			III	PLACKA INSTS. & CONTROLS	CHENNAI	A	
26	FRP JUNCTION BOX	III		Main Contractor Approved Sources			
27	Hand Held Calibrator	III		Main Contractor Approved Sources			

	PROJECT : NTECL-VALLUR (3 X 500 MW)		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL SUB SYSTEM: C & I		DOC. No. :		
	PACKAGE: ULTRAFILTRATION PLANT				Revision No. : 00		
	EQUIPEMENT				DATE: 24.10.2016		
	SUPPLIER : BHEL				PAGE : 14 OF 14		
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NO.	ITEM	QP/IN SPN CAT	QP NO.	PROPOSED SUPPLIER	PLACE	SUB-SUPPLIER APPROVAL STATUS/ CATEGORY	REMARKS

GENDS:

A – For those items proposed Sub-vendors are acceptable to NTPC subject to meeting NTPC Technical Specification Requirement
DR - For those items "Detailed Required" for NTPC review. To be identified with letter "DR" in the list.
NOTED : For these items vendors are approved by Main Supplier and accepted by NTPC without specific vendor approval from NTPC. To be identified with "NOTED"

INSPECTION CATEGORY:

Cat I: For those items the quality plans are approved by NTPC and final acceptance will be on physical inspection witness by NTPC.
CAT II: For those items the quality plans are approved by NTPC. However no physical inspection will be done by NTPC. The final acceptance by NTPC shall be on the basis of review of documents as per QP.
CAT III: For those items Main Supplier approves quality plans. The final acceptance by NTPC shall be on the basis of certificate of conformance. By Main Supplier

* - Inspection category will be decided during vendor evaluation.

Note-1 :- For Instrument cable quantity less than 1 KM of each type inspection category is CAT-III and Less than 2.5 Km of each type inspection Category is CAT-II


NITIN SANGWAR
(NTPC Ltd)

ANNEXURE-IV

PROJECT: VALLUR TPP (3X500 MW)		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL				NTPC DOC NO	
PACKAGE: ULTRAFILTRATION PLANT		SUB SYSTEM: CIVIL WORKS				REV. NO.	0
MAIN SUPPLIER: BHEL						DATE	24.10.2016
CONTRACT NO.: CS-0260-132G-2							
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
1.	CEMENT	III	-	CCI	-	N	
				GUJARAT AMBUJA	-	N	
				JK LAXMI	-	N	
				JAYPEE	-	N	
				GRASIM	-	N	
				BIRLA	-	N	
				LAFARGE	-	N	
				ACC	-	N	
				SHREE	-	N	
				INDIA CEMENT	-	N	
				PENNA CEMENT	-	N	
				MADRAS CEMENT	-	N	
				PRISM	-	N	
				ULTRATECH	-	N	
				ORIENT	-	N	
				MANCHERIAL	-	N	
				JSW	-	N	
				ANDHRA CEMENT	-	N	
				PARASHAKTI	-	N	
				SAGAR	-	N	
				MAIHAR	-	N	
				BHARTHI CEMENT	-	N	
				CHETTINAD CEMENT	-	N	
				KONARK	-	N	

ANNEXURE-IV

PROJECT: VALLUR TPP (3X500 MW)		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL				NTPC DOC NO	
PACKAGE: ULTRAFILTRATION PLANT						REV. NO.	0
MAIN SUPPLIER: BHEL						DATE	24.10.2016
CONTRACT NO.: CS-0260-132G-2		SUB SYSTEM: CIVIL WORKS					
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
2.	CONSTRUCTION CHEMICALS - ADMIXTURES, PLASTISIZERS, RETARDERS WATER PROOFING COMPOUNDS GROUTS	III	-	MANIKGARH	-	N	
				SIKA INDIA LTD	-	N	
				CICO TECHONOLOGIES LTD	-	N	
				FOSROC CHEMICALS (I) PVT LTD	-	N	
				BASF	-	N	
3.	FALSE CEILING - GLASS REINFORCED GYPSUM SYSTEM, MINERAL FIBRE BOARD SYSTEM, PREPAINTED COIL COATED STEEL SYSTEM	III	-	SAINT GOBAIN	NEW DELHI	N	
				HUNTER DOUGLOUS	MUMBAI	N	
				TIGER STEEL	PUNE/MUMBAI	N	
				INTERARCH	NOIDA	N	
				LLOYD INSULATION	-	N	
				MG INDUSTRIES	FARIDABAD	N	
				ARM STRONG	NEW DELHI	N	
				BERGER	-	N	
4.	PAINT AND PAINTING SYSTEM	III	-	SHALIMAR PAINTS	-	N	
				JENSON AND NICHOLSON	-	N	
				KANSAI NEROLAC	-	N	
				AKZO NOBEL	-	N	
				ASIAN PAINTS	-	N	
				UNION STEEL	KOREA	A	
5.	COLOUR COATED SHEET (FOR COIL)	I	-	DONGBU STEEL	KOREA	A	
				BHUSHAN STEEL AND STRIPS LTD.	RAIGAD	A	
				ESSAR STEEL LTD	PUNE	A	
				NATIONAL STEEL AND AGRO	DHAR	A	

ANNEXURE-IV

PROJECT: VALLUR TPP (3X500 MW)		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL				NTPC DOC NO	
PACKAGE: ULTRAFILTRATION PLANT		SUB SYSTEM: CIVIL WORKS				REV. NO.	0
MAIN SUPPLIER: BHEL						DATE	24.10.2016
CONTRACT NO.: CS-0260-132G-2						APPROVAL STATUS / CATEGORY	REMARKS
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING		
				JSW STEEL COATED PRODUCTS LTD	KAMLESHWAR	A	Formerly JSW ISPAT Steel Ltd
				BHUSHAN STEEL LTD.	SAHIBABAD	A	
				JSW LTD	THANE	A	
				BHUSHAN POWER AND STEEL LTD	SAMBALPUR (ODISHA)	A	
				TATA BLUESCOPE STEEL LTD	JAMSHEDPUR	A	
				UNIMET PROFILES LIMITED	DHARUHERA	A	
				MULTICOLOUR STEEL INDIA LIMITED	GURGAON	A	
				ISOLLOYD	SOLAN	A	
				NATIONAL STEEL AND AGRO	DHAR	A	
				ERA BUILD SYS	RUDRAPUR	A	
				TATA BLUE SCOPE	PUNE	A	HINJEWARI WORKS
				TATA BLUE SCOPE	BHIWADI	A	
				ALFA STEEL BUILDING SOLUTIONS	HOSUR	A	
				PENNAR INDUSTRIES	ISNAPUR, HYDERABAD	A	
				BHUSHAN POWER AND STEEL LTD	SAMBALPUR (ODISHA)	A	
				METALKRAFT FORMING INDUSTRIES PVT LTD	MEDAK	A	
				MULTICOLOUR STEEL INDIA LIMITED	GURGAON	A	
				UNIMET PROFILES LIMITED	DHARUHERA	A	
6.	PROFILERS FOR DECKING SHEETS	I					
7.	PROFILERS FOR CLADDING SHEETS	I					

ANNEXURE-IV

PROJECT: VALLUR TPP (3X500 MW)		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL				NTPC DOC NO	
PACKAGE: ULTRAFILTRATION PLANT						REV. NO.	0
MAIN SUPPLIER: BHEL		SUB SYSTEM: CIVIL WORKS				DATE	24.10.2016
CONTRACT NO.: CS-0260-132G-2							
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
					HARYANA		
				ERA BUILD SYS	RUDRAPUR	A	
				TATA BLUE SCOPE	PUNE	A	HINJEWARI WORKS
				TATA BLUE SCOPE	BHIWADI	A	
				PENNAR INDUSTRIES	TARAPUR	A	
				BHUSHAN POWER AND STEEL LTD	SAMBALPUR (ODISHA)	A	
				ISOLLOYD	SOLAN	A	
				NATIONAL STEEL AND AGRO	DHAR	A	
				ALFA STEEL BUILDING SOLUTIONS	HOSUR	A	
				METALKRAFT FORMING INDUSTRIES PVT LTD	MEDAK	A	
				INDIANA GRATING	PUNE	A	
8.	ELECTROFORGED GRATING	II		PREMIER POWER PRODUCTS PVT LTD	HOWRAH	A	
				GREATWELD	PUNE	A	
				BHOLA RAM STEELS	PATNA	A	
				KANADE ANAND UDYOG	THANE	A	
				ANKIT ELECTROGRATING	RAIPUR	A	
				VINFAB ENGINEERS	THANE	A	
				PINAX STEEL INDUSTRIES	PATNA	A	
						N	
9.	GI PIPES	III	-	BIS APPROVED SOURCES HAVING VALID BIS LICENCE		N	
10.	PVC WATER STOP	III	-	DURON POLYVINYL PVT. LTD	GURGAON	N	

ANNEXUR

	PROJECT: VALLUR TPP (3X500 MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL				NTPC DOC NO	
	PACKAGE: ULTRAFILTRATION PLANT					REV. NO.	0
	MAIN SUPPLIER: BHEL	SUB SYSTEM: CIVIL WORKS				DATE	24.10.2016
	CONTRACT NO.: CS-0260-132G-2						
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
				KANTA RUBBER	HYDERABAD	N	
				MARUTI RUBBER	NOIDA	N	
				JYOTI POLYVINYL	VADODARA	N	
				DEEP-JYOTI RUBBER PVT LTD	NOIDA	N	
11.	BITUMEN ASPHALT	III	-	ALL GOVERNMENT REFINARIES	-	N	
12.	PLASTIC/ PVC PIPES	III	-	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	N	
13.	BITUMEN IMPREGNATED FIBER BOARD JOINT FILLER , BITUMEN SEALING COMPOUND	III	-	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	N	
14.	CERAMIC / VITRIFIED TILES	III	-	KAJARIA	-	N	
				SOMANY	-	N	
				SPARTEK INDIA	-	N	
				NITCO	-	N	
				ORIENT BELL	-	N	
				MARBITO	-	N	
				RESTILE	-	N	
				JOHNSON	-	N	
15.	ACID / ALKALI RESISTANCE TILES, AR BRICKS, AR CEMENT (POTASSIUM SILICATE BASED CEMENT MORTAR, PHENOLIC BASED RESIN CEMENT)	III	-	PELICAN	BHIWADI	N	
				CAMBRIAN	ALWAR	N	
				KERATECH	VADODARA	N	
				CHAMPION CERAMICS	CHAMPA	N	

ANNEXURE-IV

	PROJECT: VALLUR TPP (3X500 MW)	LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL				NTPC DOC NO	
	PACKAGE: ULTRAFILTRATION PLANT					REV. NO.	0
	MAIN SUPPLIER: BHEL	SUB SYSTEM: CIVIL WORKS				DATE	24.10.2016
	CONTRACT NO.: CS-0260-132G-2						
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
	AR BITUMASTIC			MAHAKOSHAL POTTRIES	KATNI	N	
				PERFECT ACID WARE	JABALPUR	N	
				BABA BAIDNATH REFRACTORIES	PURULIA	N	
				SUNSHINE CERAMICS	CHAMPA	N	
				GOODEARTH MINERALS	MORBI	N	
16.	FIRE PROOF DOORS	III	-	NAVAIR INTERNATIONAL LTD.	NEW DELHI	N	
				SHAKTI HORMANN	HYDERABAD	N	
				SUPER STEEL	DELHI	N	FOR SINGLE LEAF ONLY
				SIGNUM FIRE PROTECTION	NAGPUR	N	
				RADIANT SAFE DOORS	AHMEDABAD	N	
17.	PARTICLE BOARDS, PLYWOOD, MDF	III	-	NOVAPAN	-	N	
				ECOBORD	-	N	
				BHUTAN BOARD	-	N	
				KITPLY	-	N	
				CENTURY	-	N	
				GREEN PLY	-	N	
				DUROPLY	-	N	
				MERINO	-	N	
18.	ALUMINUM SECTIONS	III	-	HINDALCO	-	N	
				ALOM EXTRUSIONS LTD	-	N	
				BALCO (VEDANTA)	-	N	

mandatory.

ANNEXURE-IV

PROJECT: VALLUR TPP (3X500 MW)		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL				NTPC DOC NO	
PACKAGE: ULTRAFILTRATION PLANT		SUB SYSTEM: CIVIL WORKS				REV. NO.	0
MAIN SUPPLIER: BHEL						DATE	24.10.2016
CONTRACT NO.: CS-0260-132G-2							
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
				NALCO	-	N	
				JINDAL	-	N	
19.	HIGH SOLID CONTENT LIQUID APPLIED URETHANE BASED ELASTOMERIC MEMBRANE FOR WATER PROOFING	III	-	STP	-	N	
				IWL INDIA LTD	-	N	
				CIPY POLYURETHANES	SHIRWAL	N	
				LLOYDS	-	N	
				CICO TECHONOLOGIES LTD	-	N	
20.	SANITARY ITEMS	III		PARRYWARE	-	N	
				HINDWARE	-	N	
				SEABIRD	-	N	
				ORIENT	-	N	
				HINDUSTAN	-	N	
				CERA	-	N	
21.	CP BRASS TAP AND OTHER SANITARY FITTINGS	III	-	GEM	-	N	
				PARKO	-	N	
				JAQUAR	-	N	
				MARC	-	N	
22.	POLYTHENE WATER STORAGE TANKS	III	-	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	N	
23.	RCC PIPES	III	-	BIS APPROVED SOURCES HAVING VALID BIS LICENCE	-	N	
24.	POLYCARBONATE SHEETS	III	-	GE PLASTIC (SABIC)	-	N	
			-	BAYER (MAKROLON)	-	N	
25.	MINERAL WOOL FOR THERMAL	III		ROCKWOOL INDIA LTD.	HYDERABAD	A	

ANNEXURE-IV

PROJECT: VALLUR TPP (3X500 MW)		LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB- SUPPLIER APPROVAL				NTPC DOC NO	
PACKAGE: ULTRAFILTRATION PLANT						REV. NO.	0
MAIN SUPPLIER: BHEL		SUB SYSTEM: CIVIL WORKS				DATE	24.10.2016
CONTRACT NO.: CS-0260-132G-2							
SR. NO.	ITEM	QAP / INSP. CAT	QAP NO.	PROPOSED SUB SUPPLIER	PLACE OF MANUFACTURING	APPROVAL STATUS / CATEGORY	REMARKS
	INSULATION			ROCKWOOL INDUSTRIES	BHILAI	A	
				LAPINUS	MALANPUR (MP)	A	
				MINWOOL	RAJANANDGAON	A	
				LLOYD INSULATION	BHILAI	A	
				GOENKA ROCKWOOL (I) PVT LTD	RAIPUR	A	
				SHREERAM EQUITECH PVT LTD	DURG	A	
				U.P. TWIGA	BULEND SHAHAR	A	
26.	CI PIPES	III	-	BIS APPROVED SOURCES HAVING VALID BIS LICENCE		N	

LEGENDS:

1. SYSTEM SUPPLIER/SUB-SUPPLIER APPROVAL STATUS CATEGORY (SHALL BE FILLED BY NTPC)
 A – For these items proposed vendor is acceptable to NTPC. To be indicated with letter "A" in the list along with the condition of approval, if any.
 DR – For these items "Details required" for NTPC review. To be identified with letter "DR" in the list.
 'N' NOTED – For these items vendors are approved by Main Supplier and accepted by NTPC without specific vendor approval from NTPC. To be identified with 'NOTED.'

2. QP/INSPN CATEGORY:
 CAT-I : For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC.
 CAT-II : For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved quality plan.
 CAT-III : For these items Main Supplier approves the Quality Plans.
 UNITS/ WORKS : Place of manufacturing Place of Main Supplier of multi units/works.

NOTE 1: For the items placed in CAT-III for Civil Works, the review and final acceptance shall be done by NTPC-EIC/FQA on the basis of MTC / certificate of conformance in line with Indicative FQP / Technical Specifications.

PART – B

SUB-SECTION – IIIA-04

PRESSURE & STORAGE VESSELS

CLAUSE NO.	TECHNICAL REQUIREMENTS - PRESSURE & STORAGE VESSELS				
	PRESSURE AND STORAGE VESSELS				
1.00.00	GENERAL				
1.01.00	This specification covers the design manufacture, construction feature, erection, inspection, testing the performance at vendor’s works/owner’s site of pressure and storage vessels.				
2.00.00	CODES AND STANDARDS				
2.01.00	The design, manufacture, shop testing, site fabrication and erection, testing and commissioning of the pressure and storage vessels shall conform to the latest revisions of the following standards, in addition to other standards mentioned elsewhere in the tender document subject to any modification and requirement, as specified here in after. a) IS: 803 - Code of practice for design, fabrication and erection of Vertical Mild Steel cylinderi-cal welded oil storage tanks. b) IS: 816 - Code of practice for use of metal arc welding for general construction in mild steel. c) IS: 817 - Code of practice for training and testing of metal arc welders. d) IS: 822 - Code of procedure for inspection of welds. e) IS:1363 - Black hexagonal bolts, nuts and locknuts (dia 6 to 39 mm) and black hexagon screws (dia to 24 mm). f) IS:1367 - Technical supply conditions for threaded fasteners. g) IS:2062 - Specification for weldable structural steel. h) IS:2002 - Steel plates for pressure vessels for intermediate and High temperature service including boilers. i) IS:2825 - Code of unfired pressure vessels. j) IS:3133 - Manhole and inspection opening for chemical equipment. k) IS:4049 - Specification for formed ends for tanks and pressure vessels. l) IS:4682 - Code of practice for lining of vessels and equipment for chemical processes Rubber Lining. m) BS:2594 - Specification for carbon steel welded horizontal cylindrical storage tanks. n) ASME - Boiler and pressure vessel Section VIII code. o) ASTM - American Society for Testing and Materials.				
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRA-FILTRATION PLANT PACKAGE		BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	SUB-SECTION – IIIA-04 PRESSURE & STORAGE VESSELS	PAGE 1 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS - PRESSURE & STORAGE VESSELS				
3.00.00	GENERAL DESIGN FEATURES				
3.01.00	Design				
3.01.01	Design of all pressure vessels shall conform to ASME Section VIII / ASME Section X (for FRP tanks) regulations or acceptable equivalent standard Design pressure shall be the maximum expected pressure to which the vessels may be subjected to plus 5% additional margin. Maximum expected pressure for vessels placed in the discharge line of pumps shall be based on the shut-off head of the pumps plus static head at pumps suction if any. Design pressure of condensate polisher service vessels is indicated in Technical Data Sheets. For all other pressure vessels, design pressure shall be atleast 8 Kg/cm²(g).				
3.01.02	Design of all vertical cylindrical atmospheric storage tanks (steel tanks) containing water, acid, alkali and other chemicals shall conform to IS:803.				
3.01.03	Design of all horizontal cylindrical atmospheric storage tanks (steel tanks) containing water, acid, alkali and other chemicals shall conform to BS:2594.				
3.01.04	Design temperature of all pressure vessels and storage tanks shall be 10 deg. C higher than the maximum temperature that any part of the vessel/tank is likely to attain during operation.				
3.01.05	In case, tank is subjected to vacuum, the same shall be taken care in designing the tank.				
3.01.06	The design of vertical Demineralised water/ Permeate water Potable water storage tanks (Vertical type) shall conform to IS:803. Supporting frame where required shall be in accordance with IS:800. The tank shall be "Non-pressure" fixed roof type with atmospheric vents.				
3.02.00	All vessels/tanks without inside (rubber / Polyurethane / Epoxy / Glass Flake Polyester Acrylic Polymer) lining shall have a corrosion allowance of minimum 2 mm and mill allowance (minimum 0.3 mm) for shell and dished ends. Thinning allowance of 2 mm (minimum) shall be considered for dished end.				
3.03.00	All the atmospheric tanks shall have sufficient free board above the “Level High”/”Normal Level” as the case may be. The overflow level shall be kept at least 20 cm or 10% of vessel height above the “Level High”/”Normal Level” for all the tanks except for the DM tanks for which a minimum height of 300 mm shall be provided over the “High Level”. Further, a minimum 100 mm free board shall be provided above the top of overflow level to the top of the tank. Wall thickness of atmospheric tanks shall not be less than 6 mm.				
3.04.00	The material of construction for various connections for all the lined unlined vessels / tanks shall be same as that of interconnecting piping material suitably lined wherever required. The nozzle flanges, manhole/manhole covers reinforcement pads etc. shall be fabricated out of the same material sa that of one used for the vessel/tank. However, screwed fittings for instrumentation, sample connection, drain				
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRA-FILTRATION PLANT PACKAGE		BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	SUB-SECTION – IIIA-04 PRESSURE & STORAGE VESSELS	PAGE 2 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS - PRESSURE & STORAGE VESSELS				
	connection of size 25 NB and less shall be of stainless steel construction (ASME SA 479 Gr.316)				
3.05.00	Interior surfaces of tanks shall be clear of stiffeners and other structural supports. Tanks shall be of reinforced and stiffened externally as required				
3.06.00	Vessels coming under preview of IBR shall be designed accordingly.				
3.07.00	General Requirements for FRP Vessels and Tanks				
	a)	Design of all FRP pressure vessels shall conform to ASME Section X standard.			
	b)	Resins used for the tanks shall be a commercial grade corrosion-resistant thermoset, fully tested and accepted for the service conditions. Resins shall not contain fillers, pigments, dyes or colorants. Clear UV absorbers shall be used in final resin coat. Tanks shall be covered top with suitable reinforcing and bracing.			
	c)	Regardless of the theoretical design requirements, the minimum total laminate thickness of the filament wound tank shall not be less than 12 mm.			
	d)	All surfacing shall be finished as so to obtain complete cure of the resin without air inhibition. Acetone sensitivity on any surface shall be considered evidence of unsatisfactory cure.			
	e)	Unless otherwise specified, the inner surface shall consist of a resin-saturated layer of 0.25 to 0.50 mm thick Type C glass surfacing mat. No resin gelcoat shall be used.			
	f)	The longitudinal strength of the cylindrical shell shall be atleast 25% of the hoop strength No paints or pigmented, coloured, or dyed resins shall be used the outside surface of the tank.			
	g)	Unless otherwise specified, nozzles shall have a flanged faces perpendicular to the vertical centerline of the tank / to radial centerlines as the case may be.			
	h)	There shall be no vertical joints (in axial direction) in the cylindrical shell. The entire thickness of the cylindrical shell shall be built up prior to removal of the shell from the mandrel. Heads may be fabricated integrally with the shell or may be fabricated separately; heads fabricated separately shall be moulded with an integral skirt. The minimum skirt length shall be 100 mm. The entire head including knuckle radius and skirt shall be fabricated in one piece. The tanks shall have bolted and gasketed covers.			
	i)	Tanks shall be designed so that no external bracing, ribs, hoops or support wires are required.			
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRA-FILTRATION PLANT PACKAGE		BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	SUB-SECTION – IIIA-04 PRESSURE & STORAGE VESSELS	PAGE 3 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS - PRESSURE & STORAGE VESSELS				
	j) Saddle supports or legs as specified and bolts for anchoring tank to concrete pedestal shall be provided. k) Tanks shall have internal support members. The bulk storage tanks shall be fabricated with that all edges having a minimum corner radius of 3.2 mm. Tanks shall have Teflon gaskets. All linings and coatings shall extend through all tank openings and nozzles and around to flange faces. Flanges shall be 1.034 bar class D meeting the requirements of AWWAC202. l) Each tank shall have two support saddles with extend no more than 150 mm at the center beyond the tank diameter m) Each FRP tank shall be equipped with the following minimum accessories: - Lifting lugs, - Required Nozzles for top fill, vent, overflows, with interior down pipe, drains, suction, connections for instruments, flange for mixer/ agitators. - Identification labels noting tank designation (150 mm high lettering)				
4.00.00	MATERIAL OF CONSTRUCTION				
4.01.00	The pressure vessels shall be fabricated from carbon steel plates conforms to SA 515 Gr.70 or SA 516 Gr. 70 if the pressure vessels are designed as per ASME Section VIII.				
4.01.01	If the pressure vessels are designed as per IS 2825 following criterion shall be followed : The pressure vessels shall be fabricated of steel as per IS:2002 Gr. 3 (normalised condition) or SA:515/516 Gr. 70 (normalised), in case the vessels are designed as per Class 1 or Class 2 of IS:2825. If the pressure vessels are designed as per Class 3 of IS:2825, the material of construction shall conform to IS:2062 or IS:2002 Gr. 2 or Gr 3 (Normalised quality).or SA 515 /516 Gr 70				
4.02.00	All atmospheric tanks shall be fabricated of steel conforming to IS: 2062.				
4.03.00	The material of construction for various connection, for all the lined or unlined vessels/tanks shall be same as that of interconnecting piping material suitably lined wherever required. The pipe flanges, manhole/manhole covers reinforcement pads etc. shall be fabricated out of the same material as that one used for the vessel/tank. However, screwed fittings for instrumentation, sample connection, drain connection of size 25 NB and less shall be of stainless steel construction (SS: 316).				
5.00.00	FABRICATION				
5.01.00	The vessel ends for storage tanks of vertical type shall have flat bottom. However, the ends of horizontal storage tanks, and all the pressure vessels shall be dished design of Torispherical type designed and constructed by forging, pressing or				
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CLAUSE NO.	TECHNICAL REQUIREMENTS - PRESSURE & STORAGE VESSELS				
	spinning. The dished ends shall have a minimum straight flange length of 60 mm. Conical or flat (with or without reinforcement) ends shall not be accepted.				
5.02.00	Interior surfaces of all tanks shall be clear of stiffeners and other structural supports. Tanks shall be reinforced and stiffened externally as required.				
5.03.00	The plates to be used for fabrication shall preferably have a minimum width of 1500 mm.				
5.04.00	All the joints (circumferential/longitudinal) shall be double butt welded with full penetration or single butt welded without backing strip. For joints involving small thickness 6 mm or less, back chipping to sound metal followed by DP test and re-welding shall be done to have full penetration.				
5.05.00	Vessel/tanks seams shall be so positioned that they do not pass through vessel connections and connections shall be flushed with inner surface and welded continuous on both sides of the shell. Sharp inside edges shall be rounded to a minimum 3 mm radius.				
5.06.00	All welds or inner tank surface shall be free of voids, gaps craters, pits, high spots, sharp edges, abrupt ridges and valleys or undercut edges. High spots, irregularities and sharp edges shall be removed by grinding. Inside weld seams shall be ground flush and smooth applicable for corrosion resistant costing or lining.				
5.07.00	All internal baffles, wear plates, pipes etc. shall be continuously welded on both sides at all contact points with full fillet welds which shall be free of voids, gaps, craters, high spots, sharp edges, and undercutting. Sharp edges shall be ground to a 3 mm minimum radius.				
5.08.00	Weld splatter shall be removed.				
5.09.00	All welding shall be performed by ASME qualified welders under Section-IX of ASME Boiler and Pressure Vessel code and welding electrodes shall be as per relevant Codes/Standards viz. AISC Section 1.17 etc.				
5.10.00	Welding sequence shall be adopted in such a way so as to minimise the distortion due to welding shrinkage. Contractor shall indicate in his drawing the sequence of welding proposed by him which should meet prior approval of the engineers. Welding shall not be carried out when the surface of the parts to be welded are wet from any cause and during periods of rain and high winds unless the welder and work are properly shielded.				
5.11.00	The plates for cylindrical tanks shall be accurately formed in bending rolls to the diameters called for, and the completed shells be concentric and plump plates shall be cold-rolled by plate bending machine in a number of passes to true curvature and joined by welding.				
5.12.00	All pressure vessels and storage tanks except Demineralised water (D.M.) shall be fabricated complete and tested at manufacturer's works to ensure better workmanship.				
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CLAUSE NO.	TECHNICAL REQUIREMENTS - PRESSURE & STORAGE VESSELS				
6.00.00	APPURTANCES				
6.01.00	Manholes/Hand Holes				
6.01.01	All the pressure vessels and horizontal type storage tanks shall be provided with atleast one manhole of 500 mm diameter minimum size at the top head, complete with cover plate, lifting handle, davit cap, nuts, bolts, gaskets etc. to ensure leak tightness at the test pressure. Manhole covers of nominal weight more than 20 kg shall be provided with hinged arms. All tanks internals must be replaceable through the manhole. Prefabricated vessels must as a minimum have a coat of primer applied before transport. They shall be cleaned and internally dry. All openings must be secured closed before transport.				
6.01.02	The vertical type storage tanks shall be provided with a manhole of 500 mm dia on the top cover, if the diameter of the tank is 1200 mm or more. For the DM water storage tanks, manholes shall be provided as per IS:803.				
6.01.03	All the vessels and tanks shall be normally provided with a hand hole of 150 mm gasketted located near the bottom of the straight side.				
6.01.04	The required lining/coating for the inside surface of the manhole/handhole, nozzle and cover plate of the manhole/handhole shall be same as that of the respective vessel/tank.				
6.02.00	Tank Connections				
6.02.01	Bidder shall furnish all pipe material required for tank connection for the process requirement. In addition to these, additional connections, if required by the Owner for the inter-connection of their piping, instrumentation etc. shall also be provided. Such additional requirement will be intimated to the successful Bidder later and Contractor shall provide these fittings to match with the Owner's items. Adequate pipe support attachments in the external surface of the tank/vessel shall be provided for Owners pipes for all the vessels/tanks. All lined vessels connections shall be conforms to ANSI 300 lb class. Nozzle material shall be ASTM-106 Grade B, Schedule 80.				
6.02.02	All flanged connections should be supplied complete with matching counter flanges, nuts bolts and gasket materials. The flange design, (thickness and drilling etc.) shall match with the interconnected piping flanges.				
6.02.03	Bolts and nuts to be used externally to the vessels shall be of hexagonal head conforming to IS:1367. However, internal fasteners if any, shall be of IS:316/SS-304 or Hastalloy-B as per the duty conditions.				
6.02.04	Gaskets shall be of full face type.				
6.03.00	Sight glasses shall be provided for the tanks/vessels as specified in the standard specification. The material for sight glass shall be high quality transparent PLEXIGLASS of sufficient thickness to withstand the test pressure. The sight glass shall be provided with suitable gaskets and bolts to ensure leak tightness at the test pressure.				
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CLAUSE NO.	TECHNICAL REQUIREMENTS - PRESSURE & STORAGE VESSELS
6.04.00	Vessels Supports & Lifting Lugs
6.04.01	Adequate supporting arrangements like straps, saddles, skirt boards, pillars etc. shall be provided to transfer all loads to civil foundation. All foundation bolts, inserts etc. shall also be provided.
6.04.02	All vessels of internal, diameter of 1200 mm or greater shall be provided with minimum four (4) lifting lugs for safe and effective handling during erection. Smaller vessels shall be provided with atleast two (2) lifting lugs.
6.04.03	Material of construction for these vessel supports, saddles, lugs shall conform to IS:2062 of tested quality.
6.05.00	Special Accessories for Vessels /Storage Tanks
6.05.01	Vessel internals wherever required shall be provided as detailed out elsewhere in the specification.
6.05.02	All the pressure vessels and tanks shall be provided with drain connections alongwith drain valves of suitable size. Further all the atmospheric storage tanks shall be provided with over flow connection designed for the filling rate of the respective tank.
6.05.03	All the pressure and tanks shall be provided with the vent connections. The design shall be as to offer adequate area for venting. Venting area shall be such that over pressure/vacuum is not created in the tank during maximum filling/drain-off rate. The maximum draw off rate for the DM storage tanks shall be intimated later to the successful bidder.
6.05.04	Various instrumentation and the fittings required for the same shall be supplied as elaborated in data sheets.
6.05.05	Water seal shall be provided for the overflow line of DM and degassed water storage tanks (for DM System). The vent and overflow lines of alkali preparation /measuring / day tanks and vent line of DM storage tanks shall be provided with Carbon-di-oxide absorber of proven design to prevent contamination from atmospheric air. Carbon dioxide absorber shall preferably be located at ground level. The vent and overflow lines of Acid measuring tanks shall be provided with fume absorber using suitable packing material, such as pall rings/rasching rings.
6.05.06	Conservation vent valves shall be provided in the vent line of DM storage tanks so that, at a vacuum to the extent of 65 mm water column, the valve shall open to relieve the vacuum. Body and trim of the valve shall be Die Cast Aluminium.
7.00.00	PROTECTIVE LININGS, PAINTING ETC.
7.01.00	Inside surfaces of all tanks/vessels shall be protected by anticorrosive paints or rubber lining as required/specified. External surfaces of all tanks/vessels shall be protected by anti corrosive painting.
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CLAUSE NO.	TECHNICAL REQUIREMENTS - PRESSURE & STORAGE VESSELS					
7.02.00	All inside surface shall be cleared thoroughly by the wire brushing to remove completely all loose dirt, rust, mill and any deleterious material.					
7.03.00	For vessels requiring lining and epoxy painting all inside surface shall be blast cleared using non-sillicious abrasive after usual wire brushing.					
7.04.00	Natural rubber lining shall be provided on the inside of vessels and tanks in three layers resulting in a total thickness not less than 4.5 mm.					
7.05.00	Surface hardness of rubber lining shall be 65 +/- 5 deg. A (shore).					
7.06.00	Coating/Internal Lining of Polyurethane / Epoxy / glass flake polyester acrylic polymer for vessels & tanks, if specified in data sheets shall generally conform to the requirements of coating/lining work of Pipes as described in Annexure-4 of subsection titled “Piping, Valves & Fittings” in Part-B of Technical Specification.					
7.07.00	Specification for the application of Epoxy coating for internal protection of DM Water/ Permeate water/ Potable Water Tanks shall be as follows : Primer : One coat of unmodified epoxy resin along with polyimide hardener. Paint : Two (2) coats unmodified epoxy resin along with Aromatic adduct hardener. Total thickness of primer and paint should not be less than 400 microns.					
7.08.00	Specification for application of paint for external protection vessel and tanks shall be as follows : i) For Indoor Vessel and Tanks a) Surface preparation shall be done either manually or by any other approved method. b) Primer coat shall consist of one coat of chlorinated rubber based zinc phosphate primer having minimum DFT of 50 microns. c) Intermediate coat (or under coat) shall consist of one coat of chlorinated rubber based paint pigmented with Titanium dioxide with minimum DFT of 50 microns. d) Top coat shall consist of one coat of chlorinated rubber paint of approved shade and colour with glossy finish and DFT of 50 microns. Total DFT of paint system shall not be less than 150 microns. ii) For Outdoor Vessels/Tanks (a) Surface preparation shall be done by means of sand blasting, which shall conform to Sa 2-1/2 Swiss Standard.					
<table><tr><td>NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRA-FILTRATION PLANT PACKAGE</td><td>BID DOC. NO. CS-0260-132G-2</td><td>TECHNICAL SPECIFICATIONS SECTION VI, PART-B</td><td>SUB-SECTION – IIIA-04 PRESSURE & STORAGE VESSELS</td><td>PAGE 8 OF 9</td></tr></table>		NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRA-FILTRATION PLANT PACKAGE	BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	SUB-SECTION – IIIA-04 PRESSURE & STORAGE VESSELS	PAGE 8 OF 9
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CLAUSE NO.	TECHNICAL REQUIREMENTS - PRESSURE & STORAGE VESSELS					
	(b) Primer coat shall consist of one coat of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns. (c) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns. (d) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns. Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided. The paint may be applied in one coat, in case high built paint is used, otherwise two coats shall be applied. Total DFT shall not be less than 300 microns.					
7.09.00	The following surfaces shall not be painted: Stainless steel, galvanised steel, aluminum, copper, brass, bronze and other nonferrous materials.					
7.10.00	No painting, or filler shall be applied until all repairs, hydrostatic tests and final shop inspection are completed.					
8.00.00	PROTECTION					
8.01.00	After the lining is completed, the vessel shall not be subjected to any prolonged exposure to direct sunlight in course of its transportation, erection etc. They shall not be stored in direct sunlight. No further lining or burning shall be carried out on the vessel, after application of the lining.					
8.02.00	All lining projecting outside of the vessel, shall be protected adequately from mechanical damages during shipment, handling storage etc.					
8.03.00	Suitable warnings, indicating the special care that must be taken with respect to these lined vessels shall be stenciled on their outside surface with the letters at least 12 mm high. Example:- “Working-Tank is filled” “Do not weld or Burn”; “Do not store in Direct sunlight” etc.					
<table><tr><td>NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRA-FILTRATION PLANT PACKAGE</td><td>BID DOC. NO. CS-0260-132G-2</td><td>TECHNICAL SPECIFICATIONS SECTION VI, PART-B</td><td>SUB-SECTION – IIIA-04 PRESSURE & STORAGE VESSELS</td><td>PAGE 9 OF 9</td></tr></table>		NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRA-FILTRATION PLANT PACKAGE	BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	SUB-SECTION – IIIA-04 PRESSURE & STORAGE VESSELS	PAGE 9 OF 9
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PART – B

SUB-SECTION – IIIA-02

HORIZONTAL CENTRIFUGAL PUMPS

CLAUSE NO.	TECHNICAL REQUIREMENTS – HORIZONTAL CENTRIFUGAL PUMPS
	HORIZONTAL CENTRIFUGAL PUMPS 1.00.00 SCOPE 1.01.00 The specification covers general requirements in respect of design, material, constructional features, manufacture, inspection, testing the performance at the Vendor's/ Sub-Vendor's works and delivery to site erection, field testing and commissioning of Horizontal Centrifugal Pumps. 2.00.00 CODES AND STANDARDS 2.01.00 The design, material, construction manufacture inspection and performance testing of Horizontal Centrifugal Pumps shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. The equipment supplied shall comply with the latest applicable Indian standards listed below. Other National Standards are acceptable, if they are established to be equal or superior to the Indian Standards. 2.02.00 List of Applicable Standards i) IS : 1520 - Horizontal Centrifugal Pumps for clear cold fresh water. ii) IS : 5120 - Technical requirements of rotodynamic special purpose pumps iii) API – 610 - Centrifugal pumps for general refinery service. iv) IS : 5639 - Pumps Handling Chemicals & corrosion liquids. v) IS : 5659 - Pumps for process water vi) - Hydraulic Institute Standards ; USA vii) ASTM-I-165-65 - Standards Methods for Liquid Penetration Inspection. 2.03.00 In case of any contradiction with aforesaid standards and the stipulations as per the technical specifications as specified hereinafter the stipulations of the technical specifications shall prevail. 3.00.00 DESIGN REQUIREMENTS 3.01.00 Specific Requirements of High Pressure Feed pumps are described in subsection titled "RO System" in Part-B of Technical Specification. 3.02.00 The Pump shall be capable of developing the required total head at rated capacity for continuous operation. Also the pumps shall be capable of being operated to give satisfactory performance at any point on the H-Q characteristics curve over the operating range. Operating range for operation of pumps shall generally be 40% to 120% of rated flow for sustained period of operation. The maximum efficiency of pumps shall be preferably be within $\pm 10\%$ of the rated design flow indicated in data sheets enclosed.
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CLAUSE NO.	TECHNICAL REQUIREMENTS – HORIZONTAL CENTRIFUGAL PUMPS									
3.03.00	The total head capacity curve shall be continuously rising from the operating point towards shut – off without any zone of instability with the highest head at shut-off condition. Shut-off head shall be more than the rated design head and the percentage variation may vary depending on the specific speed of the pumps (i.e) 10-15% for pumps of specific speed upto1000 US units, about 15 to 20% for specific speed in the range of 1000 to 2000 US units, about 20% to 40% for specific speed of 2000 to 4000 US units and above 50% for specific speed of 4000 to 7000 US Units.									
3.04.00	Pumps of a particular category shall be identical and shall be suitable for parallel operation with equal load division. The head Vs capacity and BHP Vs capacity characteristics should match to ensure even load sharing and trouble free operation throughout the range. Components of identical pumps shall be interchangeable.									
3.05.00	Pumps shall run smoothly without undue noise and vibration. Peak to peak vibration limits shall be restricted to the following values during operation or as per Hydraulic institute Standards as the case may be whichever is lower.. <table><tr><td><u>Speed</u></td><td><u>Antifriction bearing</u></td><td><u>Sleeve bearing</u></td></tr><tr><td>1500 rpm and below</td><td>75.0 micron</td><td>75.0 micron</td></tr><tr><td>3000 rpm</td><td>50.0 micron</td><td>65.0 micron</td></tr></table> The noise level shall not exceed 85 dBA. Overall sound pressure level reference 0.0002 microbar (the standard pressure reference for air sound measurement) at a distance of 1M from the equipment surface.	<u>Speed</u>	<u>Antifriction bearing</u>	<u>Sleeve bearing</u>	1500 rpm and below	75.0 micron	75.0 micron	3000 rpm	50.0 micron	65.0 micron
<u>Speed</u>	<u>Antifriction bearing</u>	<u>Sleeve bearing</u>								
1500 rpm and below	75.0 micron	75.0 micron								
3000 rpm	50.0 micron	65.0 micron								
3.06.00	The pumps shall be capable of starting with discharge valve fully open and close condition. Motors shall be selected to suit to the above requirements..									
3.07.00	Pumps shall be so designed that pump impellers and other accessories of the pumps are not damaged due to flow reversal.									
3.08.00	The Contractor under this specification shall assume full responsibility in the operation of pump and motor as a unit.									
4.00.00	DESIGN CONSTRUCTION									
4.01.00	Design and construction of various components of the pumps shall confirm to the following general specifications. For material of construction of the components, data sheets shall be referred to.									
4.02.00	Pump casing									
4.02.01	Casing shall have axially or radially split type construction. The casing shall be designed to withstand the maximum shut – off pressure developed by the pump at the pumping temperature									
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE BID DOC. NO. CS-0260-132G-2 TECHNICAL SPECIFICATIONS SECTION VI, PART-B SUB-SECTION – IIIA-02 HORIZONTAL CENTRIFUGAL PUMPS PAGE 2 OF 5										

CLAUSE NO.	TECHNICAL REQUIREMENTS – HORIZONTAL CENTRIFUGAL PUMPS
4.02.02	Pump casing shall be provided with a vent connection and piping with fittings & valves Casing drain as required shall be provided complete with drain valves, piping and plugs. It shall be provided with a connection for suction and discharge pr. Gauge as standard feature. It shall be structurally sound to provide for the pump assembly and shall be designed hydraulically to minimum radial load at part load operations.
4.03.00	Impeller
4.03.01	Impeller shall be closed or semi-closed as specified elsewhere and designed in conformance with the detailed analysis of the liquid being handled.
4.03.02	The impeller shall be secured to the shaft, and shall be retained against circumferential movement by keying pinning or lock rings.
4.04.00	Impeller/ Casing Wearing Rings
4.04.01	Replaceable type wearing rings shall be provided at suitable locations pumps as per the manufacturer's standard practice. Suitable method of locking the wearing ring shall be used.
4.05.00	Shaft
4.05.01	The critical speed shall be well away from the operating speed and in no case less than 130% of the rated speed.
4.05.02	The shaft be ground and polished to final dimensions and shall be adequately sized to withstand all stresses from rotor weight hydraulic loads, vibration and torque coming in during operation.
4.05.03	The shaft shall be ground and polished to final dimensions and shall be adequately sized to withstand all stresses from rotor weight, hydraulic loads vibration and torque coming in during operation.
4.06.00	Shaft Sleeves
4.06.01	Renewable type fine finished shaft sleeves shall be provided at the stuffing beyond the outer faces of gland packing of seal and plates so as to distinguish between the leakage between shaft and shaft sleeve and that past the seals/ gland.
4.06.02	Shaft sleeves shall be fastened to the shaft to prevent any leakage or loosening. Shaft and shaft sleeve assembly should ensure concentric rotation.
4.07.00	Bearings
4.07.01	Heavy duty bearings, adequately designed for the type of service specified in the enclosed pump data sheet and for long, trouble - free operation shall be furnished.
4.07.02	The bearings offered shall be capable of tanking both the radial and axial thrust coming into play during operation. In case, sleeve bearings are offered additional
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE	
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SUB-SECTION – IIIA-02 HORIZONTAL CENTRIFUGAL PUMPS	PAGE 3 OF 5

CLAUSE NO.	TECHNICAL REQUIREMENTS – HORIZONTAL CENTRIFUGAL PUMPS
	thrust bearings are offered additional thrust bearings shall be provided. Anti-friction bearings of standard type, if provided, shall be selected for a minimum life 16,000 hrs. of continuous operation at maximum axial and a radial loads and rated speed.
4.07.03	Proper lubricating arrangement for the bearings shall be provided such that lubricating element does not contaminate the liquid pumped. Where there is a possibility of liquid entering the bearings suitable arrangement in the form of deflectors or any other suitable arrangement must be provided ahead of bearing assembly.
4.07.04	Bearings shall be easily accessible without disturbing the pump assembly. A drain plug shall be provided at the bottom of each bearing housing.
4.08.00	Stuffing Boxes Stuffing boxes of packed ring construction type shall be provided wherever specified. Packed ring stuffing boxes shall be properly lubricated and sealed as per service requirements and manufacturer's standard. If external gland sealing is required, it shall be done from the pump discharge. The Bidder shall provide the necessary piping, valves, fitting etc. for the sealing connection.
4.09.00	Mechanical Seals
4.09.01	Wherever specified in pump data sheet, mechanical seals shall be provided. Mechanical seals shall be single type with either sliding gasket or bellows between to auxiliary moving face and shaft sleeves or any other suitable type. The sealing face should be highly lapped surfaces of material known for their low fractional co-efficient & resistance to corrosion against the liquid being pumped.
4.10.00	The pump supplier shall coordinate with the seal maker in establishing the seal chamber of circulation rate of maintaining a stable film at the seal face. The seal piping system shall form on integral part of the pump assembly. For the seals under vacuum service, the seal design must ensure sealing against atmospheric pressure even when the pumps are not operating. Necessary provision for seal water supply alongwith complete piping fitting and valves as required shall form integral part of pump supply.
4.11.00	Pump Shaft Motor Shaft Coupling
4.11.01	The Pump and motor shaft shall be connected with a adequately sized flexible coupling of proven design with a spacer to facilitate dismantling of the pump without disturbing the motor. Necessary coupling guards shall be provided.
4.12.00	Base Plate
4.12.01	A common base plate mounting both for the pump and motor shall be furnished. The base plate shall be of fabricated steel and of rigid construction, suitable ribbed and reinforced. Base plate and pump supports shall be constructed and the piping unit so mounted as to minimise misalignment caused by mechanical forces such as normal piping strain, internal differential thermal expansion and hydraulic piping
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE	
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CLAUSE NO.	TECHNICAL REQUIREMENTS – HORIZONTAL CENTRIFUGAL PUMPS
	strain, internal differential thermal expansion and hydraulic piping thrust. Suitable drain troughs and drip lip shall be provided.
4.13.00	Assembly and Dismantling
4.13.01	Assembly and dismantling of each pump with drive motor shall be possible without disturbing the grouting base plate or alignment.
4.14.00	Drive Motor (Prime Mover)
4.14.01	Continuous Motor rating (at 50 ° C ambient) shall be at least ten percent (10%) above the maximum load demand of the pump in the entire operating range to take care of the system frequency variation and in no case less than the maximum power requirement at any condition of the entire characteristic curve of the pump. The KW rating of the drive unit shall be based on continuously driving the connected equipment for the conditions specified. However, in cases where parallel operation of the pumps are specified, the actual motor rating is to be selected by the Bidder considering overloading of the pumps in the event of tripping of operating pump(s).
5.00.00	PAINTING The requirements of painting shall conform to the detailed descriptions in the Sub-section titled “ Piping, Valves & Fittings ” of Part-B of Technical Specifications
6.00.00	FIELD PERFORMANCE TESTS
6.01.00	After installation, the pumps offered shall be operated to prove satisfactory performance as described in Part-A, of this Technical Specification.
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE	
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Clause No.	SCOPE OF SUPPLY & SERVICES – MECHANICAL			
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4) ACID HANDLING, STORAGE AND DOSING SYSTEM				
A) ACID UNLOADING CUM TRANSFER PUMPS				
No	Description	Parameters/ Data		
1)	Purpose	a) To pump Acid from Tankers to Bulk Acid Storage Tanks and		
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE		BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-A	ANNEXURE-1 TO SUB-SECTION – IIA-01 PAGE 2 OF 9

CLAUSE NO.		SCOPE OF SUPPLY & SERVICES – MECHANICAL	
No	Description	Parameters/ Data	
		b) To transfer Acid from Bulk Acid Storage Tanks to Acid Measuring tanks	
2)	Chemical to be used	Hydrochloric Acid - 30- 33% Concentration/ H ₂ SO ₄ . 98% Concentration	
3)	Type	Horizontal Centrifugal	
4)	Duty	Intermittent	
5)	Design flow rate of each pump	15 m ³ /hr	
6)	Rated Head of pump	As required	
7)	<u>Material of Construction</u>		
a)	Casing	PP/ As per manufacturer's Standard suiting to Chemical	
b)	Impeller	PP/ As per manufacturer's Standard suiting to Chemical	
c)	Shaft	PP / EN-8/ As per manufacturer's Standard suiting to Chemical	
d)	Shaft Sleeve	PP/ As per manufacturer's Standard suiting to Chemical	
e)	Sets of Hoses with coupling & Diaphragm type Isolation Valves	Two (2)	

B). BULK ACID STORAGE & PREPARATION TANKS

No	Description	Bulk Tanks	Measuring Tanks
1)	Chemical to be handled	Hydrochloric Acid of 30–33% conc./ H ₂ SO ₄ . 98% Concentration	-
2)	Design Dosage rate (Minimum)	---	As recommended by UF provider
3)	Total Capacity	To be designed for design dosage rate & design flow for one (1) month	To be designed for design dosage rate & design flow for one (1) day
4)	Type of Tank	Horizontal atmospheric	Vertical, atmospheric;

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CLAUSE NO.		SCOPE OF SUPPLY & SERVICES – MECHANICAL	
No	Description	Bulk Tanks	Measuring Tanks
		vessel	Covered
5)	Material of Construction	Mild steel rubber lined/ Mild steel	Mild steel rubber lined/ FRP
6)	Accessories	Manholes/hand holes, filling connection,vent,overflow, drains, fume absorbers, valves operating platform, ladders etc. as applicable	

C). ACID DOSING PUMPS

No	Description	Parameters/ Data
1)	Pump Designation	Acid Dosing Pumps-UF
2)	Purpose	For Ultra-filtration plant
3)	Chemical to dosed	Hydrochloric Acid of about 5% concentration
4)	Type	Simplex hydraulically operated Diaphragm type
5)	Duty	Continuous
6)	Design flow rate of each dosing pump	To suit minimum dosage rate of 25 ppm
7)	Rated Head of pump	As required
8)	Capacity control	----- 0 -100% of capacity by micrometer dial -----
9)	Pump stroke speed per minute	----- 100 maximum -----
10)	<u>Material of Construction</u>	
a)	Liquid end	----- PVC/Equiv. suiting to Chemical -----
b)	Diaphragm	----- TEFLON -----
c)	Shaft	EN8-BS-970 / As per manufacturer’s Standard suiting to Chemical

5). ALKALI HANDLING, STORAGE AND DOSING SYSTEM

A). ALKALI UNLOADING PUMPS & ALKALI TRANSFER CUM RECIRCULATION PUMPS

No	Description	Unloading Pumps	Transfer cum recirculation pumps

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CLAUSE NO.		SCOPE OF SUPPLY & SERVICES – MECHANICAL	
No	Description	Unloading Pumps	Transfer cum recirculation pumps
1)	Purpose	To pump Alkali from Tankers to Bulk Alkali Storage Tanks.	a) To pump Alkali from Bulk Alkali Storage Tanks to Alkali measuring tanks and preparation tanks. b) To pump alkali prepared using flakes from alkali preparation tanks to Bulk alkali storage tanks
2)	Chemical to be used	----- Sodium Hydroxide (48% Conc.) -----	
3)	Type	-----Horizontal Centrifugal -----	
4)	Duty	Intermittent	Intermittent
5)	Design flow rate of each pump	15 m³/hr	10 m³/hr
6)	Rated Head of pump	As required	As required
7)	<u>Material of Construction</u>		
a)	Casing	----- SS-316 -----	
b)	Impeller	----- SS-316 -----	
c)	Wearing Rings	----- SS-316 -----	
d)	Shaft	----- SS-410 -----	
8)	Sets of Hoses with coupling & Diaphragm type Isolation Valves	Two (2)	

B). BULK ALKALI STORAGE TANKS & PREPARATION TANKS

No	Description	Bulk Alkali Tanks	Alkali Preparation Tanks
1)	Purpose	To store one (1) month requirement of Alkali	To Prepare alkali from flakes
2)	Chemical to handled	...Pure grade sodium hydroxide (48% w/v in flakes or lye form)...	
3)	Total Capacity of Tank	To be designed for design dosage rate & design flow for one (1) month	2 cubic metre (m³)

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Clause No.		SCOPE OF SUPPLY & SERVICES – MECHANICAL		
No	Description	Bulk Alkali Tanks	Alkali Tanks	Preparation
4)	Design Dosage rate (Minimum)	-----	-----	
5)	Type of Tank	Horizontal atmospheric vessel	Vertical, atmospheric; Covered	
6)	Material of Construction	Mild steel rubber lined	Mild steel rubber lined	
a)	Number of agitators	Not applicable	One (1)	
b)	Shaft Material of Agitator	Not applicable	SS-316	
c)	Impeller Material of Agitator	Not applicable	SS-316	
d)	Accessories	Manholes/Hand holes, Filling Connection, Vent, overflow, drains, CO ₂ absorbers, valves operating platform, ladders etc. as applicable.		

C). ALKALI MEASURING TANKS

No	Description	Measuring Tanks (for UF Plant)
1)	Purpose	To prepare & store alkali for Ultra-filtration system
2)	Chemical to handled	Sodium Hydroxide of 5% concentration
3)	Design Dosage rate (Dosage rate indicated are minimum)	As recommended by UF provider
4)	Capacity of each tank (Minimum)	To hold 12 hours requirement
5)	Type of Tank	Vertical, atmospheric; Covered
6)	Material of Construction	Mild steel rubber lined/ FRP
7)	Number of agitators	One (1)
8)	Shaft Material of Agitator	SS-316
9)	Impeller Material of Agitator	SS-316

D). ALKALI DOSING PUMPS

No	Description	Parameters/ Data
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NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRAFILTRATION PLANT PACKAGE	BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-A	ANNEXURE-1 TO SUB-SECTION – IIA-01	PAGE 6 OF 9
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CLAUSE NO.		SCOPE OF SUPPLY & SERVICES – MECHANICAL	
No	Description	Parameters/ Data	
1)	Pump Designation	Alkali Dosing Pumps-UF	
2)	Purpose	For Ultra-filtration plant	
3)	Chemical to dosed	Sodium Hydroxide soln.	
4)	Type	Simplex hydraulically operated Diaphragm type	
5)	Duty	Continuous	
6)	Design flow rate of each dosing pump	As recommended by UF provider	
7)	Rated Head of pump	As required	
8)	Capacity control	---- 0 to 100% of capacity by micrometer dial ----	
9)	Pump stroke speed per minute	----- 100 maximum -----	
10)	Material of Construction		
a)	Liquid end	----- SS-316 -----	
b)	Diaphragm	----- TEFLON -----	
c)	Shaft	EN8-BS-970 / As per manufacturer's Standard suiting to Chemical	

6). SODIUM HYPOCHLORITE (NaOCl) HANDLING, STORAGE AND DOSING SYSTEM

A) NaOCl UNLOADING CUM TRANSFER PUMPS

No	Description	Parameters/ Data
1)	Purpose	a) To pump Acid from Tankers to Bulk NaOCl Storage Tanks and b) To transfer NaOCl from Bulk Acid Storage Tanks to Acid Measuring tanks
2)	Chemical to be used	NaOCl - 10- 30% Concentration
3)	Type	Horizontal Centrifugal
4)	Duty	Intermittent
5)	Design flow rate of each pump	15 m³/hr
6)	Rated Head of pump	As required

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CLAUSE NO.		SCOPE OF SUPPLY & SERVICES – MECHANICAL	
No	Description	Parameters/ Data	
7)	Material of Construction		
a)	Casing	PP/As per manufacturer's Standard suiting to Chemical	
b)	Impeller	PP/As per manufacturer's Standard suiting to Chemical	
c)	Shaft	PP/EN-8/As per manufacturer's Standard suiting to Chemical	
d)	Shaft Sleeve	PP/As per manufacturer's Standard suiting to Chemical	
e)	Sets of Hoses with coupling & Diaphragm type Isolation Valves	Two (2)	

B). BULK NaOCl STORAGE & PREPARATION TANKS

No	Description	Bulk Tanks	Measuring Tanks
1)	Chemical to be handled	NaOCl - 10- 30% Concentration	-
2)	Design Dosage rate (Minimum)	---	As recommended by UF provider
3)	Type of Tank	Horizontal atmospheric vessel	Vertical, atmospheric; Covered
4)	Material of Construction	Mild steel rubber lined/ Mild steel	Mild steel rubber lined/ FRP
5)	Total Capacity	To be designed for design dosage rate & design flow for one (1) month	To be designed for design dosage rate & design flow for one (1) day
6)	Accessories	Manholes/hand holes, filling connection,vent,overflow, drains, fume absorbers, valves operating platform, ladders etc. as applicable	

C). NaOCl DOSING PUMPS

No	Description	Parameters/ Data
1)	Pump Designation	NaOCl Dosing Pumps-UF

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Clause No.	Scope of Supply & Services – Mechanical			
No	Description	Parameters/ Data		
2)	Purpose	For Ultra-filtration plant		
3)	Chemical to dosed	Sodium Hypochlorite soln.		
4)	Type	Simplex hydraulically operated Diaphragm type		
5)	Duty	Continuous		
6)	Design flow rate of each dosing pump	As recommended by UF provider		
7)	Rated Head of pump	As required		
8)	Capacity control	---- 0 to 100% of capacity by micrometer dial ----		
9)	Pump stroke speed per minute	----- 100 maximum -----		
10)	<u>Material of Construction</u>			
a)	Liquid end	- As per manufacturer's Standard suiting to Chemical -		
b)	Diaphragm	- Teflon/As per manufacturer's Standard suiting to Chemical -		
c)	Shaft	EN8-BS-970 / As per manufacturer's Standard suiting to Chemical		

NTECL POWER PROJECT (3X500 MW)
(VALLUR THERMAL POWER PROJECT 3X500 MW)
ULTRAFILTRATION PLANT PACKAGE

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TECHNICAL SPECIFICATIONS
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PART – B

SUB-SECTION – IIIA-06

METERING PUMPS

CLAUSE NO.	TECHNICAL REQUIREMENTS – METERING PUMPS			
	METERING PUMPS			
1.00.00	GENERAL This specification provides guidelines for design, manufacturing and testing of positive displacement pumps with variable capacity to inject chemicals, generally used in the treatment of water in metered amounts.			
2.00.00	GENERAL DESIGN FEATURES a) Pumps shall be simplex displacement hydraulically operated diaphragm design, driven by squirrel cage induction motor through suitable speed reduction unit. Maximum pump stroke speed shall not exceed 100 per minute. b) The stroke shall be continuously adjustable to give a capacity variation 10-100% range while the pumps is running or stopped. Adjustment of capacity shall be done by automatically from remote location and / or manually (micrometric adjusting type) locally for each of the pump as described elsewhere. c) Capacity variation may be effected by changing eccentricity of the driving crank or by suitable hydraulic circuit. Pump accuracy shall be industry standard $\pm$ 1% of capacity setting. d) Pumps shall be provided with an integral relief valve, spring operated, to release pressure when delivery line blockage occurs. e) Crank case shall be constructed of high quality cast iron which will also house the gear box and guides for cross head. f) Guided, controlled travel, double-ball check valves or equivalent, shall be provided both on the suction and discharge sides. g) Material of construction of the various parts shall be as per the data sheets. h) Suitable gland seal be provided to prevent leakage.			
3.00.00	TEST AT SITE After erection at site pumps as detailed under different groups shall be operated to prove satisfactory performance as individual equipment as well as a system. If the performance at site is found to be not to the requirements, then the equipment shall be rectified or replaced by the vendor at no extra cost to the Employer.			
NTECL POWER PROJECT (3X500 MW) (VALLUR THERMAL POWER PROJECT 3X500 MW) ULTRA-FILTRATION PLANT PACKAGE		BID DOC. NO. CS-0260-132G-2	TECHNICAL SPECIFICATIONS SECTION VI, PART-B	SUB-SECTION – IIIA-06 METERING PUMPS
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PAINTING SPECIFICATION

Annexure K to Spec.
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PAINTING SPECIFICATION

Painting surface shall be cleaned both internally and externally thoroughly by blast cleaning or power tool cleaning method, where blast cleaning is not feasible. In case of oil piping, cleaning will have to be done by pickling. **No painting is required on stainless steel pipe or stainless steel surfaces.** However, necessary colour banding for identification as per colour code shall be done.

A) SURFACE PREPARATION AND PRIMING

All surfaces to be painted shall be clean, dry and free from contamination. Oil or grease should be removed in accordance with SSPC-SP1 solvent cleaning. External surfaces then are to be blast cleaned by abrasives to a minimum of SA 2½ finish of SIS-05-5900 (Swiss International standard) (ISO-8501-1:1988). If Oxidation has occurred between blasting and application of primer, the surface should be reblasted to the specified visual standard i.e. to near white metal. The primer coat shall be applied immediately after blast cleaning by Airless spray technique.

B) PAINTING

The coating material and thickness for primer, intermediate, finish and top-finish coats are given as below:

- | | | |
|--------------------------|---|--|
| (i) Primer Coat : | Self-curing Inorganic Zinc Silicate (Level of zinc dust by weight present in the dried film shall be equal to or greater than 85%). Inorganic zinc silicate shall comply with SSPC SP20 Level-I Zinc content and Zinc purity as per ASTM D520 Type-II). | - 75 Micron (DFT) (minimum) to be applied by Airless spray |
| (ii) Intermediate Coat : | Polyamide cured pigmented Titanium Dioxide (TiO ₂) or Micaceous Iron Oxide (MIO) Epoxy based paint (solid by volume minimum 60%). [This coat shall be applied after an interval of minimum 24 hours after application of Prime Coat] | - 100 Micron (DFT) (minimum) to be applied by Airless spray technique. |



PAINTING SPECIFICATION

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- (iii) Finish Coat : Polyamide cured colour pigmented Epoxy based Paint (Solid by volume minimum 60%). This Coat shall be applied after an interval of Minimum 16 hours from the time of application of intermediate coat.
- 75 Micron (DFT) (minimum) to be applied before erection by Airless spray technique or after erection by brush and/or spray.
- Colour and shade of the coat shall be approved by the Employer. The Finish coat thickness of 75 micron can be built up either in single application or in two applications.
- (iv) Top-finish Coat: Top-finish coat or Final finish coat of Polyurethane based colour pigmented Paint (Solid by volume minimum 40%). This coat shall be applied after an interval of minimum 24 hours from time of application of Finish coat but shall be within 4 days maximum.
- 50Micron (DFT) (minimum) to be applied by Airless spray or conventional spray technique and on very rare occasions by brush after erection.
- The colour & shade of the coat shall be approved by the employer.

Total dry film thickness of the external painting thus shall not be less than 300 micron.

C) OTHER REQUIREMENTS

- Paint manufacturer's instructions shall be followed in method of application, handling, drying time etc.
- The colour of the finish paint shall be as per approved colour coding scheme.
- If finish paint was applied in shop, one coat of finish paint shall be applied at site.
- Protection of other surfaces adjacent to the surface being painted is the responsibility of the Contractor.
- The dry film thickness of the finish paint shall not be less than 300 micron.
- All painting materials such as paints, varnishes, primer, solvents, thinners shall be supplied by the Contractor. All the services, tools etc. required for



PAINTING SPECIFICATION

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preparation / cleaning and painting shall be provided by the Contractor. The Contractor shall be required to estimate the quantity of painting material required.

D) APPLICATION

The paint manufacturer's instructions covering shelf-life, pot life, storing, safety, thinning, mixing ratio, method of application, handling, and drying and curing time shall be strictly followed and considered as a part of this specification. Flash point for all primers, paints, etc. shall be taken into consideration.

Paint shall not be applied to damp surfaces or in rainy weather or when temperature is below 130C or above 360C, except when specifically permitted to do so as per manufacturer's instructions. In all cases, manufacturer's recommended temperature limit, relative humidity for applicable shall be followed.

The colour of each coat shall generally contrast with the previous coats's colour to avoid skip and holidays.

Apart from surface preparation of the piping etc. attention should be of paid to the details, particularly the following :

- a. Sharp edges that may have a deleterious effects on coatings should be removed.
- b. Burrs caused by removal of temporary lugs etc. should be ground flat.
- c. Welds should be dressed and weld spatter removed by grinding.
- d. Nuts and bolts should be properly treated.
- e. Fasteners, such as pipe hangers, clamp etc., should be treated before being fixed to the main structure.

E) SURFACES NOT TO BE PAINTED

- a. Surfaces of insulation need not be painted.
- b. Surfaces of Stainless steel, nickle, copper, brass, monel, aluminium, Hastelloy lead, etc. need not painted.
However, **Galvanised Steel pipe external surface shall be painted as mentioned** above.
- c. Valve stem, pump shafts, gauges need not painted.
- d. Bearing and control surfaces, lined or clad surfaces need not painted.

F) INSPECTION AND TESTING

All painted surfaces shall be visually checked for uniformity. The dry film thickness of coatings of paint shall be measured.

	PAINTING SPECIFICATION	Annexure K to Spec. No. ROS:6166
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G) COLOUR CODE FOR IDENTIFICATION

The pipes shall be colour painted/ banded for identification as per the colour coding scheme of Employer. These sheets shall be furnished during detail engineering stage to the bidder and shall be generally as per IS-9404.

H) Surfaces of insulation, Stainless steel, nickel, copper, brass, Gun Metal, monel, aluminium, Hastelloy, lead, Plastic materials such as HDPE, CPVC, GRP Valve stem, pump shafts, gauges, Bearing and control surfaces, lined or clad surfaces etc. need not painted. However, Galvanised Steel pipe external surface shall be painted as per the above clause.

CLAUSE NO.	SCOPE OF SUPPLY & SERVICES – MECHANICAL																																																																																																																																																																																													
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